CONTENTS

Base Conversion

1. What is the binary representation of the hexadecimal number 89?

   A. 00101101
   B. 01011010
   C. 10110100
   D. 10011000
   E. 10001001

   [1984-CE-CS 1A-17]

2. Which of the following hexadecimal number is equal to the binary number 10011101?

   A. 5A
   B. FF
   C. 9D
   D. 9E
   E. 9F

   [1985-CE-CS 1A-17]

3. What is the number of 1's in the binary representation of $16^2 + 9 \times 16 + 3$?

   A. 2
   B. 4
   C. 5
   D. 6
   E. 8

   [1987-CE-CS 1A-9]

4. To convert a binary number into hexadecimals, a number of binary digits (bits) in the binary number are grouped together to form one hexadecimal digit. How many bits should be grouped?

   A. 2
   B. 3
   C. 4
   D. 8
   E. 16

   [1987-CE-CS 1A-12*]

5. Which of the following hexadecimal number is equivalent to the binary number 110110000000?

   A. D71
   B. D7
   C. D80
   D. D81
   E. E80

   [1988-CE-CS 1A-11]

6. The binary equivalent of the hexadecimal number ABC is

   A. 101010100011.
   B. 101010000011.
   C. 101010101010.
   D. 101010111100.
   E. 101011001011.

   [1989-CE-CS 1A-10]

7. The decimal representation of the binary number 11110 is

   A. 28.
   B. 30.
   C. 32.
   D. 34.
   E. 36.

   [1989-CE-CS 1A-11]

8. Which of the following is **not** a hexadecimal number?

   A. ABCGEF
   B. BCAEFC
   C. ACBDFA
   D. AFBCBF
   E. CEEFDA

   [1993-CE-CS 1A-6]

9. The decimal quantity represented by binary 1001 is __________.

   A. 1001
   B. 17
   C. –7
   D. 9
   E. 2

   [1999-CE-CS 1A-9]

10. Which of the following numbers is prime?

    A. 100_2
    B. 101_3
    C. 110_4
    D. 111_5
    E. None of the above

    [1972-CE-MATHS B1-1]

11. Convert the decimal number $2^{13} + 2^4 + 3$ to a binary number.

    A. 10000000000111_2
    B. 10000000001011_2
    C. 10000000010011_2
    D. 10000000100011_2

    [2006-CE-MATHS 2-39]

12. $ABCDE70000_{16}$ =

A. $10(16^9) + 11(16^8) + 12(16^7) + 13(16^6) + 14(16^5) + 7(16^4)$.
B. $10(16^{10}) + 11(16^9) + 12(16^8) + 13(16^7) + 14(16^6) + 7(16^5)$.
C. $11(16^9) + 12(16^8) + 13(16^7) + 14(16^6) + 15(16^5) + 7(16^4)$.
D. $11(16^{10}) + 12(16^9) + 13(16^8) + 14(16^7) + 15(16^6) + 7(16^5)$.

[2007-CE-MATHS 2-41]

13. 11000011000111_2 =

A. $2^{13} + 2^{12} + 2^7 + 2^6 + 7$.
B. $2^{13} + 2^{12} + 2^7 + 2^6 + 14$.
C. $2^{14} + 2^{13} + 2^8 + 2^7 + 7$.
D. $2^{14} + 2^{13} + 2^8 + 2^7 + 14$.

[2008-CE-MATHS 2-40]

14. Convert the decimal number $16^{12} + 14$ to a hexadecimal number.

A. $10000000000D_{16}$
B. $10000000000E_{16}$
C. $100000000000D_{16}$
D. $100000000000E_{16}$

[2009-CE-MATHS 2-40]

15. Convert the decimal number $11 \times 16^8 + 4 \times 16^3 + 14 \times 16^1 + 8$ to a hexadecimal number.

A. $A00040D8_{16}$
B. $B00040E8_{16}$
C. $A000040D8_{16}$
D. $B000040E8_{16}$

[2010-CE-MATHS 2-40]

16. 1000010000101_2 =

A. $5 + 2^7 + 2^{12}$.
B. $5 + 2^8 + 2^{13}$.
C. $10 + 2^7 + 2^{12}$.
D. $10 + 2^8 + 2^{13}$.

[2011-CE-MATHS 2-41]

HKDSE Problems

17. 1010010001001_2 =

A. $2^{12} + 2^{10} + 137$.
B. $2^{12} + 2^{10} + 273$.
C. $2^{13} + 2^{11} + 137$.
D. $2^{13} + 2^{11} + 273$.

[SP-DSE-MATHS 2-33]

18. $B0000000023_{16}$ =

A. $11 \times 16^{10} + 23$.
B. $11 \times 16^{10} + 35$.
C. $12 \times 16^{11} + 23$.
D. $12 \times 16^{11} + 35$.

[PP-DSE-MATHS 2-32]

19. $AD0000002012_{16}$ =

A. $(10)16^{11} + (13)16^{10} + 8210$.
B. $(10)16^{12} + (13)16^{11} + 131360$.
C. $(11)16^{11} + (14)16^{10} + 8210$.
D. $(11)16^{12} + (14)16^{11} + 131360$.

[2012-DSE-MATHS 2-33]

20. $A00000E00011_{16}$ =

A. $10 \times 16^{11} + 14 \times 16^5 + 17$.
B. $11 \times 16^{11} + 15 \times 16^5 + 17$.
C. $10 \times 16^{12} + 14 \times 16^6 + 272$.
D. $11 \times 16^{12} + 15 \times 16^6 + 272$.

[2013-DSE-MATHS 2-33]

21. $7 \times 2^{10} + 2^8 + 5 \times 2^3 - 2^3$ =

A. 111010100000_2 .
B. 111100010000_2 .
C. 1110100100000_2 .
D. 1111000010000_2 .

[2014-DSE-MATHS 2-34]

22. $11 + 2^6 + 2^{10} + 2^{11}$ =

A. 110001001011_2 .
B. 110100100011_2 .
C. 1100001001011_2 .
D. 1101001000011_2 .

[2015-DSE-MATHS 2-33]

23. $BC000DE000000_{16}$ =

A. $188 \times 16^{11} + 222 \times 16^6$.
B. $205 \times 16^{11} + 239 \times 16^6$.
C. $188 \times 16^{12} + 222 \times 16^7$.
D. $205 \times 16^{12} + 239 \times 16^7$.

[2016-DSE-MATHS 2-33]

24. $8^3 + 8^{19}$ =

A. 10000000000010_{16} .
B. 20000000000020_{16} .
C. 100000000000100_{16} .
D. 200000000000200_{16} .

[2017-DSE-MATHS 2-32]

25. $100110000010110_2 =$

A. $19 \times 2^{10} + 22$
B. $19 \times 2^{10} + 44$
C. $19 \times 2^{11} + 22$
D. $19 \times 2^{11} + 44$

[2019-DSE-MATHS 2-33]

26. $B000000000000030_{16} =$

A. $10 \times 2^{60} + 48$

B. $11 \times 2^{60} + 48$

C. $10 \times 2^{64} + 768$

D. $11 \times 2^{64} + 768$

[2020-DSE-MATHS 2-31]

Basic Arithmetic

1. Which of the following expressions will remain unchanged in value if both a and b are increased to k times of their original value?

   (1) $a - b$

   (2) $(\frac{a+b}{2a+b})^2$

   (3) $\frac{a+b}{a^2+b^2}$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1977-CE-MATHS 2-14]

2. Let a be a positive number. Which of the following has no meaning in mathematics?

   (1) $0 \times a$
   (2) $0 \div a$
   (3) $a \div 0$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [SP-CE-MATHS 2-33]

3. In order to double the value of the expression

   $$(a + \frac{b}{c}) \div \frac{d}{e}$$

   which one of the numbers in the expression should be doubled?

   A. a
   B. b
   C. c
   D. d
   E. e

   [1979-CE-MATHS 2-2]

4. If $x + y = 0$, then which of the following are true?

   (1) both x and y must be zero
   (2) $(x^2 + y^2)$ must be zero
   (3) xy must be zero

   A. none of them
   B. (1) only
   C. (2) only
   D. (3) only
   E. (1), (2) and (3)

   [1979-CE-MATHS 2-37]

Divisibility

5. x and y are two unequal positive integers. Both are divisible by 3. Which of the following numbers **must** be divisible by 9?

   (1) $x + y^2$
   (2) $x + 2y$
   (3) $x^2 + 3y$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1978-CE-MATHS 2-42]

6. x, y and z are three consecutive positive integers. Which of the following is true?

   A. $x+y+z$ must be odd
   B. $x+y+z$ must be even
   C. xyz must be odd
   D. xyz must be even
   E. $x^2+y^2+z^2$ must be even

   [1980-CE-MATHS 2-36]

7. x is a positive integer such that $x^2 + 2x + 7$ is even. What are the possible value of x?

   A. x can be any positive integers
   B. x can be any positive even number
   C. x can be any positive odd number
   D. x must be an even number greater than 10000
   E. x must be a positive odd number less than 10000

   [1980-CE-MATHS 2-40]

8. If n is a positive integer, which of the following numbers is/are odd?

   (1) 2^{2n+1}
   (2) $3(2^n)$
   (3) $(2n+1)^2$

   A. (2) only
   B. (3) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1981-CE-MATHS 2-37]

9. Let n be a positive integer. Which of the following numbers is/are odd?

(1) 2^{2n+1}
(2) $2^n + 1$
(3) $3(2^n)$

A. (1) only
B. (2) only
C. (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1987-CE-MATHS 2-44]

10. Which of the following is/are true?

(1) If both 2 and 3 are factors of m, then 6 is also a factor of m.
(2) If 15 is a factor of n, then both 3 and 5 are factors of n.
(3) If p is a multiple of both 4 and 6, then p is also a multiple of 24.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1989-CE-MATHS 2-10]

11. Let a and b be two consecutive positive integers. Which of the following must be true?

(1) $a+b$ is odd
(2) ab is odd
(3) a^2+b^2 is odd

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-37]

12. Let m be a positive integer. Which of the following must be true?

(1) m^2 is even.
(2) $m(m+1)$ is even.
(3) $m(m+2)$ is even.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1999-CE-MATHS 2-14]

H.C.F. & L.C.M. of Numbers

13. Given two numbers, one even and one odd, their H.C.F.

(1) must be odd,
(2) must be even,
(3) may be odd or even;

their L.C.M.

(4) must be odd,
(5) must be even,
(6) may be odd or even.

Which of the following is true?

A. (1) and (5)
B. (1) and (6)
C. (2) and (4)
D. (2) and (5)
E. (3) and (4)

[SP-CE-MATHS 2-19]

14. The Highest Common Factor of two unequal positive integers a and b is 8. Which of the following must be true?

(1) The difference between a and b is divisible by 8.
(2) $(a+b)$ is divisible by 16.
(3) ab is divisible by 64.

A. (3) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1980-CE-MATHS 2-35]

15. m and n are multiples of 3 and 4 respectively. Which of the following must be true?

(1) mn is a multiple of 12.
(2) The H.C.F. of m and n is even.
(3) The L.C.M. of m and n is even.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1996-CE-MATHS 2-37]

Scientific Notations

1. $2\times10^{-5}+3\times10^{-4}=$

A. 3.2×10^{-4}.
B. 3.2×10^{-5}.
C. 2.3×10^{-5}.
D. 5×10^{-9}.
E. 6×10^{-9}.

[1978-CE-MATHS 2-1]

2. $(4.5\times10^{8})\div(9\times10^{2})=$

A. 2×10^{5}.
B. 2×10^{6}.
C. 5×10^{4}.
D. 5×10^{5}.
E. 5×10^{6}.

[1979-CE-MATHS 2-1]

Significant Figures

3. Which of the following is $\sqrt{0.0006}$, correct to 4 significant figures?

A. 0.7746
B. 0.2449
C. 0.07746
D. 0.02449
E. 0.007746

[1972-CE-MATHS B1-3]

4. When 0.001 844 81 is expressed correct to 3 significant figures, it becomes

A. 0.001 80 .
B. 0.001 84 .
C. 0.001 85 .
D. 0.001 90 .
E. 0.002 .

[SP-CE-MATHS 2-6]

5. Round off the number 0.044449 to 3 significant figures.

A. 0.04
B. 0.044
C. 0.045
D. 0.0444
E. 0.0445

[1995-CE-MATHS 2-1]

6. Evaluate $1.15\div15$ correct to 3 significant figures.

A. 0.076
B. 0.077
C. 0.0766
D. 0.0767
E. $0.07\dot{6}$

[1996-CE-MATHS 2-1]

7. Express π^2 as a decimal correct to 3 significant figures.

A. 9.86
B. 9.87
C. 9.88
D. 9.860
E. 9.870

[1997-CE-MATHS 2-1]

8. If $0.8448 < a < 0.8452$, which of the following must be true?

A. $a=0.9$ (correct to 1 significant figure)
B. $a=0.85$ (correct to 2 significant figures)
C. $a=0.845$ (correct to 3 significant figures)
D. $a=0.8450$(correct to 4 significant figures)

[2003-CE-MATHS 2-9]

9. Express $\sqrt{2007}$ as a decimal correct to 5 significant figures.

A. 44.790
B. 44.799
C. 44.79955
D. 44.800

[2007-CE-MATHS 2-12]

10. 0.0498765 =

A. 0.050 (correct to 2 decimal places).
B. 0.050 (correct to 3 significant figures).
C. 0.0499 (correct to 4 decimal places).
D. 0.0499 (correct to 5 significant figures).

[2008-CE-MATHS 2-17]

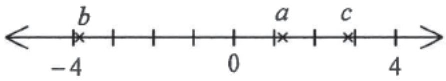
Estimation

11. If the radius of a sphere is measured as 8 cm correct to the nearest cm, then the least possible surface area of the sphere is

A. 64π cm^2.
B. 225π cm^2.
C. 256π cm^2.
D. $\frac{1125\pi}{2}$ cm^2.

[2008-CE-MATHS 2-16]

12. The figure shows the positions of three real numbers a, b and c on the number line. Which of the following is the best estimate of $c(a-b)$?



A. −15
B. −9
C. 9
D. 15

[2009-CE-MATHS 2-15]

13. If the length and the breadth of a rectangle are measured as 12 cm and 10 cm respectively and all the measurements are correct to the nearest cm, then the least possible area of the rectangle is

A. 99 cm^2.
B. 109.25 cm^2.
C. 120 cm^2.
D. 131.25 cm^2.

[2010-CE-MATHS 2-17]

14. The figure shows the positions of four real numbers p, q, r and s on the number line. Which of the following is the best estimate of $(p-q)(r+s)$?

A. −36
B. −12
C. 12
D. 36

[2011-CE-MATHS 2-14]

HKDSE Problems

15. The lengths of the three sides of a triangle are measured as 15 cm, 24 cm and 25 cm respectively. If the three measurements are correct to the nearest cm, find the percentage error in calculating the perimeter of the triangle correct to the nearest 0.1%.

A. 0.8%
B. 2.3%
C. 4.7%
D. 6.3%

[SP-DSE-MATHS 2-15]

16. 0.009049999 =

A. 0.00905 (correct to 3 decimal places).
B. 0.00905 (correct to 3 significant figures).
C. 0.00905 (correct to 6 decimal places).
D. 0.00905 (correct to 6 significant figures).

[PP-DSE-MATHS 2-14]

17. 0.0322515 =

A. 0.032 (correct to 3 significant figures).
B. 0.0322 (correct to 4 decimal places).
C. 0.03225 (correct to 5 significant figures).
D. 0.032252 (correct to 6 decimal places).

[2012-DSE-MATHS 2-13]

18. The length of a piece of thin string is measured as 25 m correct to the nearest m. If the string is cut into n pieces such that the length of each piece is measured as 5 cm correct to the nearest cm, find the greatest possible value of n.

A. 445
B. 566
C. 567
D. 650

[2012-DSE-MATHS 2-14]

19. 0.0504545 =

A. 0.051 (correct to 2 significant figures).
B. 0.0505 (correct to 3 decimal places).
C. 0.05045 (correct to 4 significant figures).
D. 0.05046 (correct to 5 decimal places).

[2013-DSE-MATHS 2-4]

20. The width and the length of a thin rectangular metal sheet are measured as 8 cm and 10 cm correct to the nearest cm respectively. Let x cm^2 be the actual area of the metal sheet. Find the range of values of x.

A. $71.25 \leq x < 89.25$
B. $71.25 < x \leq 89.25$
C. $79.5 \leq x < 80.5$
D. $79.5 < x \leq 80.5$

[2014-DSE-MATHS 2-11]

21. 0.0023456789 =

A. 0.00235 (correct to 6 decimal places).
B. 0.002345 (correct to 6 decimal places).
C. 0.002346 (correct to 6 significant figures).
D. 0.00234568 (correct to 6 significant figures).

[2015-DSE-MATHS 2-4]

22. There is a bag of white sugar. The weight of white sugar in the bag is measured as 5 kg correct to the nearest kg. If the bag of white sugar is packed into n packets such that the weight of white sugar in each packet is measured as 10 g correct to the nearest g, find the greatest possible value of n.

A. 429
B. 500
C. 578
D. 579

[2015-DSE-MATHS 2-14]

23. 0.0765403 =

A. 0.076 (correct to 2 significant figures).
B. 0.0765 (correct to 3 decimal places).
C. 0.07654 (correct to 4 significant figures).
D. 0.076540 (correct to 5 decimal places).

[2016-DSE-MATHS 2-4]

24. $\frac{1}{\pi^4}$ =

A. 0.0102 (correct to 3 significant figures).
B. 0.01025 (correct to 4 significant figures).
C. 0.01026 (correct to 5 decimal places).
D. 0.010266 (correct to 6 decimal places).

[2017-DSE-MATHS 2-4]

25. If $0.06557 < x < 0.06564$, which of the following is true?

A. $x = 0.065$ (correct to 2 decimal places)
B. $x = 0.065$ (correct to 2 sig. fig.)
C. $x = 0.0656$ (correct to 3 decimal places)
D. $x = 0.0656$ (correct to 3 sig. fig.)

[2019-DSE-MATHS 2-6]

Complex Numbers

1. If $i = \sqrt{-1}$, then $2i^2 + 3i^3 + 4i^4 + 5i^5 =$

A. $2 + 2i$.
B. $2 + 8i$.
C. $2 - 8i$.
D. $-6 - 8i$.
E. $-6 + 2i$.

[SP-CE-MATHS 2-46]

2. If $i = \sqrt{-1}$, then $\frac{i^{23}}{i^{10}} =$

A. 1 .
B. -1 .
C. i .
D. $-i$.
E. $i^{2\frac{3}{10}}$.

[SP-CE-MATHS 2-47]

3. If $i = \sqrt{-1}$, then $(1 + ai)(1 + bi) =$

A. $1 + ab$.
B. $2 + (a + b)i$.
C. $(1 - ab) + abi$.
D. $(1 - ab) + (a + b)i$.
E. $(1 + ab) + (a + b)i$.

[1979-CE-MATHS 2-27]

HKDSE Problems

4. If k is a real number, then $4k - \frac{6 + ki}{i} =$

A. $3k + 6i$.
B. $3k - 6i$.
C. $5k + 6i$.
D. $5k - 6i$.

[SP-DSE-MATHS 2-34]

5. If x is a real number, then the real part of $(x + 3i)(3 + i)$ is

A. $3x$.
B. $x + 3$.
C. $3x + 3$.
D. $3x - 3$.

[PP-DSE-MATHS 2-34]

6. $i^3(\beta i - 3) =$

A. $\beta + 3i$.
B. $\beta - 3i$.
C. $-\beta + 3i$.
D. $-\beta - 3i$.

[2012-DSE-MATHS 2-35]

7. The real part of $i + 2i^2 + 3i^3 + 4i^4$ is

A. 2 .
B. -2 .
C. 6 .
D. -6 .

[2013-DSE-MATHS 2-36]

8. If β is a real number, then $\frac{\beta^2 + 4}{\beta + 2i} =$

A. $\beta - 2i$.
B. $\beta + 2i$.
C. $2 - \beta i$.
D. $2 + \beta i$.

[2014-DSE-MATHS 2-36]

9. Let $z = (a + 5)i^6 + (a - 3)i^7$, where a is a real number. If z is a real number, then $a =$

A. -5 .
B. -3 .
C. 3 .
D. 5 .

[2015-DSE-MATHS 2-35]

10. Let $u = \frac{7}{a + i}$ and $v = \frac{7}{a - i}$, where a is a real number. Which of the following must be true?

(1) uv is a rational number.
(2) The real part of u is equal to the real part of v.
(3) The imaginary part of $\frac{1}{u}$ is equal to the imaginary part of $\frac{1}{v}$.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-34]

11. If k and $\frac{5}{2 - i} + ki$ are real numbers, then $k =$

A. -2 .
B. -1 .
C. 1 .
D. 2 .

[2017-DSE-MATHS 2-35]

12. The real part of $\frac{2i^{12}+3i^{13}+4i^{14}+5i^{15}+6i^{16}}{1-i}$ is

A. -8
B. 2
C. 6
D. 16

[2018-DSE-MATHS 2-36]

13. If a is a real number, then the real part of $\frac{4+i^5}{a+i} - i^6$ is

A. $\frac{4a+1}{a^2-1}$

B. $\frac{4a+1}{a^2+1}$

C. $\frac{a^2+4a+2}{a^2-1}$

D. $\frac{a^2+4a+2}{a^2+1}$

[2019-DSE-MATHS 2-34]

14. Define $z_1 = \frac{2+ki}{1+i}$ and $z_2 = \frac{k+5i}{2-i}$, where k is a real number. If the imaginary part of z_1 is equal to the imaginary part of z_2, then $z_1 - z_2 =$

A. -20
B. 0
C. 3
D. 10

[2020-DSE-MATHS 2-37]

Interest

1. It is agreed to repay a loan of \$1000, with interest at $8\frac{1}{2}\%$ per annum on the amount owing, in equal yearly instalments starting at the end of one year.

   If this instalment is \$75, how long will it take to repay the loan?

   A. Within 5 years
   B. Between 5 and 10 years
   C. Between 10 and 15 years
   D. Between 15 and 20 years
   E. Never

   [1972-CE-MATHS B1-4]

2. Mr. Wong puts \$10,000 into Bank X and he also puts \$10,000 into Bank Y. The simple interest per year from Bank X is \$50 more than that from Bank Y. If the interest rate of Bank Y is 5% per annum, what is the interest rate per annum of Bank X?

   A. 10%
   B. 7.5%
   C. 5.5%
   D. 5.05%
   E. 4.5%

   [1977-CE-MATHS 2-4]

3. If \$$p$ are deposited in a bank at r% compound interest per annum compounded half-yearly, the amount after n years is

   A. $\$p\,(1+\frac{r}{100})^n$.
   B. $\$p\,(1+\frac{r}{200})^n$.
   C. $\$p\,(1+\frac{r}{2})^{2n}$.
   D. $\$p\,(1+\frac{r}{100})^{2n}$.
   E. $\$p\,(1+\frac{r}{200})^{2n}$.

   [1977-CE-MATHS 2-17]

4. \$$P$ amounts to \$$Q$ in n years at simple interest. The rate per annum is

   A. $\frac{100n(Q-P)}{P}\%$.
   B. $\frac{100(Q-P)}{n}\%$.
   C. $\frac{100(Q-P)}{nP}\%$.
   D. $\frac{100(Q-P)}{nQ}\%$.
   E. $100[(\frac{Q}{P})^{\frac{1}{n}}-1]\%$.

   [1980-CE-MATHS 2-33]

5. What will \$$P$ amount to in 3 years' time if the interest is compounded monthly at 12% per annum?

   A. $\$P\,(1+\frac{36}{100})$
   B. $\$P\,(1+\frac{1}{100})^{36}$
   C. $\$P\,(1+\frac{12}{100})^{36}$
   D. $\$P\,(1+\frac{12}{100})^{3}$
   E. $\$P\,(1+\frac{1}{100})^{3}$

   [1982-CE-MATHS 2-9]

6. \$10 000 is invested for 2 years at 10% per annum, compounded half-yearly. The compound interest, correct to the nearest dollar, is

   A. \$12 155 .
   B. \$2 155 .
   C. \$2 100 .
   D. \$2 000 .
   E. \$1 025 .

   [1984-CE-MATHS 2-9]

7. If the compound interest on \$1000 for two years at 9% p.a., payable half-yearly is \$$x$, find x.

   A. $1000\times\frac{9}{100}\times 2$
   B. $1000\,(1+\frac{9}{100})^4$
   C. $1000\,(1+\frac{4.5}{100})^4$
   D. $1000\,(1+\frac{9}{100})^2-1000$
   E. $1000\,(1+\frac{4.5}{100})^4-1000$

   [1986-CE-MATHS 2-13]

8. Find, correct to the nearest dollar, the compound interest on \$10000 at 8% p.a. for 4 years, compound half-yearly.

   A. \$3 200
   B. \$3 605
   C. \$3 686
   D. \$13 200
   E. \$13 686

   [1987-CE-MATHS 2-15]

9. Find the difference between simple interest and compound interest (compounded annually) on a loan of $1000 for 4 years at 6% per annum. (The answer should be correct to the nearest dollar.)

A. $22
B. $196
C. $540
D. $760
E. $1022

[1988-CE-MATHS 2-12]

10. At the beginning of a year, a man borrows $1000 from a bank at 5% per annum, compounded yearly. He promises to repay $300 at the end of each year. How much will he still owe the bank just after the second repayment?

A. $402.5
B. $450
C. $487.5
D. $500
E. $502.5

[1989-CE-MATHS 2-14]

11. Find the amount (correct to the nearest dollar) of $10 000 at 12% p.a., compounded monthly, for 2 years.

A. 10 201
B. 12 400
C. 12 544
D. 12 697
E. 151 786

[1990-CE-MATHS 2-14]

12. A man borrows $10000 from a bank at 12% per annum compounded monthly. He repays the bank $2000 at the end of each month. How much does he still owe the bank just after the second repayment?

A. $6181
B. $6200
C. $6201
D. $8304
E. $8400

[1991-CE-MATHS 2-15]

13. A sum of $10 000 is deposited at 4% p.a., compounded yearly. Find the interest earned *in the second year.*

A. $16
B. $400
C. $416
D. $800
E. $816

[1992-CE-MATHS 2-12]

14. Which of the following gives the compound interest on $10 000 at 6% p.a. for one year, compounded monthly?

A. $\$10000 \times \frac{0.06}{12} \times 12$

B. $\$10000\,(1.06^{12} - 1)$

C. $\$10000\left(1 + \frac{0.06}{12}\right)^{12}$

D. $\$10000\left[\left(1 + \frac{0.06}{12}\right)^{12} - 1\right]$

E. $\$10000\left[\left(1 + \frac{0.6}{12}\right)^{12} - 1\right]$

[1993-CE-MATHS 2-43]

15. Find the interest on $\$P$ at $r\%$ p.a. for n years, compounded half-yearly.

A. $\$P(1 + 2r\%)^n - \$P$

B. $\$P(1 + r\%)^n - \$P$

C. $\$P(1 + r\%)^{2n} - \$P$

D. $\$P(1 + \frac{r}{2}\%)^n - \$P$

E. $\$P(1 + \frac{r}{2}\%)^{2n} - \$P$

[1995-CE-MATHS 2-13]

16. Find the interest on $10 000 at 16% per annum for 2 years, compounded half-yearly. Give the answer correct to the nearest dollar.

A. $1 664
B. $3 456
C. $3 605
D. $7 424
E. $8 106

[1997-CE-MATHS 2-38]

17. A bank offers loans at an interest rate of 18% per annum, compounded monthly. A man took a loan of $20 000 and repays the bank in monthly instalments of $4 000. Find the outstanding balance after his first instalment.

A. $16 000
B. $16 240
C. $16 300
D. $18 880
E. $19 600

[2001-CE-MATHS 2-16]

18. The simple interest on a sum of money at $r\%$ p.a. for 4 years is equal to the compound interest on the same amount at 4% p.a. for 4 years compounded half-yearly. The value of r, correct to 2 significant figures, is

A. 2.1 .
B. 4.2 .
C. 4.3 .
D. 9.2 .

[2002-CE-MATHS 2-12]

19. A sum of \$8 000 is deposited at 1% p.a., compounded yearly. Find the interest earned after 4 years. Give the answer correct to the nearest dollar.

A. \$303
B. \$320
C. \$324
D. \$325

[2003-CE-MATHS 2-12]

20. A sum of \$14 000 is deposited at 4% per annum for 5 years, compounded yearly. Find the interest correct to the nearest dollar.

A. \$2 378
B. \$2 800
C. \$3 033
D. \$3 034

[2006-CE-MATHS 2-11]

21. A sum of \$30 000 is deposited at an interest rate of 12% per annum for 4 years, compounded monthly. Find the amount correct to the nearest dollar.

A. \$44 400
B. \$47 206
C. \$48 141
D. \$48 367

[2007-CE-MATHS 2-11]

22. A sum of \$30 000 is deposited at an interest rate of 5% per annum for 2 years, compounded yearly. Find the interest correct to the nearest dollar.

A. \$3 000
B. \$3 075
C. \$3 114
D. \$3 122

[2009-CE-MATHS 2-11]

23. A sum of \$40 000 is deposited at an interest rate of 4% per annum for 3 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. \$44 800
B. \$44 995
C. \$45 046
D. \$45 073

[2010-CE-MATHS 2-14]

24. A sum of \$15 000 is deposited at an interest rate of 6% per annum for 10 years, compounded monthly. Find the interest correct to the nearest dollar.

A. \$9 000
B. \$11 863
C. \$12 291
D. \$27 291

[2011-CE-MATHS 2-10]

Price

25. A hawker sells eggs. The selling price of one dozen eggs is equal to the cost price of 20 eggs. What is his profit per cent?

A. 20%
B. $33\frac{1}{3}\%$
C. 40%
D. 60%
E. $66\frac{2}{3}\%$

[1978-CE-MATHS 2-36]

26. The cost price of tooth-brushes is \$18 per dozen. At what price must each one be sold in order that the profit made is 40% of the cost price?

A. \$2.40
B. \$2.10
C. \$1.90
D. \$1.50
E. \$1.30

[1979-CE-MATHS 2-20]

27. A man sold a car for \$35 000 at a loss of 30% on the cost price. What would have been the loss or gain percent if he had sold it for \$50 500?

A. A gain of 10%
B. A gain of 1%
C. No gain nor loss
D. A loss of 10%
E. A loss of 1%

[1980-CE-MATHS 2-12]

28. The marked price of a book is $x. 30% of this price is profit. If the book is sold at a discount of 20%, what will the profit then be?

A. $0.04x$
B. $0.06x$
C. $0.1x$
D. $0.24x$
E. $0.56x$

[1981-CE-MATHS 2-13]

29. A merchant sold 100 chairs. 80 of them were sold at a profit of 30% on each chair, while 20 of them were sold at a loss of 40% on each chair. What is his percentage gain or loss on the whole stock?

A. A loss of 80%
B. A loss of 10%
C. A gain of 8%
D. A gain of 16%
E. A gain of 24%

[1981-CE-MATHS 2-17]

30. The marked price of a book is $240. If the book is sold at a discount of 20%, the profit will be 20% of the cost price. What is the cost price of the book?

A. $153.6
B. $160
C. $192
D. $200
E. $240

[1982-CE-MATHS 2-13]

31. A man marks his goods at a price that will bring him a profit of 25% on the cost price. If he wants to sell his goods to a friend at the cost price, the percentage discount on the marked price should be

A. 25% .
B. 20% .
C. $16\frac{2}{3}\%$.
D. 15% .
E. 12% .

[1983-CE-MATHS 2-15]

32. A merchant sold 2 articles each at $1000. For the first article, he gained 25% on the cost price. For the second article, he lost 20% on the cost price. Altogether

A. he gained $100.
B. he gained $50.
C. he lost $100.
D. he lost $50.
E. he lost $48.

[1983-CE-MATHS 2-42]

33. The marked price of a book is 20% above the cost price. If the book is sold at a discount of 10% off the marked price, what is the gain per cent based on the cost price?

A. 8%
B. 10%
C. 12%
D. 18%
E. None of the above.

[1984-CE-MATHS 2-16]

34. A hawker bought 120 apples and the cost was $90. It was found that $\frac{1}{8}$ of the apples were rotten and could not be sold. He sold the rest at $1 each. What percentage of the cost was the profit?

A. $11\frac{1}{9}\%$
B. $14\frac{2}{7}\%$
C. $16\frac{2}{3}\%$
D. $28\frac{4}{7}\%$
E. $33\frac{1}{3}\%$

[1985-CE-MATHS 2-12]

35. The marked price of a book is double that of its cost. In a sale, what percentage discount was given if the profit made was 20% of the cost?

A. 10%
B. 20%
C. 30%
D. 40%
E. 50%

[1985-CE-MATHS 2-13]

36. The marked price of an article is originally P. The marked price is then increased so that when a discount of 10% is made on the new marked price, the selling price is still P. What is the new marked price?

A. $\frac{9}{10}P$
B. $\frac{109}{100}P$
C. $\frac{11}{10}P$
D. $\frac{111}{100}P$
E. $\frac{10}{9}P$

[1986-CE-MATHS 2-39]

37. If the selling price of 5 pens is the same as the cost price of 6 pens, the percentage profit in selling a pen will be

A. $16\frac{2}{3}\%$.
B. 20% .
C. 60% .
D. $116\frac{2}{3}\%$.
E. 120% .

[1987-CE-MATHS 2-16]

38. Peter bought an article for $\$x$. He sold it to Mary at a profit of 20%. Mary then sold it to John for \$90 at a loss of 25%. Find x.

A. 56.25
B. 81
C. 90
D. 100
E. 144

[1987-CE-MATHS 2-35]

39. If a flat is sold for \$720 000, the gain is 20%. Find the percentage loss if the flat is sold for \$540 000.

A. 5%
B. $6\frac{1}{4}\%$
C. 10%
D. $11\frac{1}{9}\%$
E. $33\frac{1}{3}\%$

[1990-CE-MATHS 2-15]

40. P sold an article to Q at a profit of 25%. Q sold it to R also at a profit of 25%. If Q gained \$500, how much did P gain?

A. \$250
B. \$320
C. \$333
D. \$400
E. \$500

[1991-CE-MATHS 2-43]

41. By selling an article at 10% discount off the marked price, a shop still makes 20% profit. If the cost price of the article is \$19 800, then the marked price is

A. \$21 600 .
B. \$26 136 .
C. \$26 400 .
D. \$27 225 .
E. \$27 500 .

[1992-CE-MATHS 2-44]

42. A merchant marks his goods 25% above the cost. He allows 10% discount on the marked price for a cash sale. Find the percentage profit the merchant makes for a cash sale.

A. 12.5%
B. 15%
C. 22.5%
D. 35%
E. 37.5%

[1993-CE-MATHS 2-18]

43. A wholesaler sells an article to a retailer at a profit of 20%. The retailer sells it to a customer for \$3 600 at a profit of \$720. Find the original cost of the article to the wholesaler.

A. \$2 304
B. \$2 400
C. \$2 880
D. \$3 000
E. \$3 456

[1994-CE-MATHS 2-10]

44. The marked price of a toy is \$120 and the percentage profit is 60%. If the toy is sold at a discount of 20%, the profit is

A. \$14.40 .
B. \$21.00 .
C. \$24.00 .
D. \$33.60 .
E. \$48.00 .

[1995-CE-MATHS 2-44]

45. Shop A offers a 10% discount on a book marked at $\$P$. Shop B offers a 15% discount on the same book marked at $\$Q$. If the selling price of the book is the same in both shops, express Q in terms of P.

A. $Q = P + 5$
B. $Q = \frac{17}{18}P$
C. $Q = \frac{20}{21}P$
D. $Q = \frac{21}{20}P$
E. $Q = \frac{18}{17}P$

[1996-CE-MATHS 2-14]

46. A man bought a box of 200 apples for \$500. 10 of the apples were rotten and the rest were sold at \$4 each. Find his percentage profit correct to 2 significant figures.

A. 34%
B. 38%
C. 52%
D. 57%
E. 60%

[1998-CE-MATHS 2-14]

47. A man bought two books at \$30 and \$70 respectively. He sold the first one at a profit of 20% and the second one at a loss of 10%. On the whole, he

A. lost 1%.
B. lost 10%.
C. gained 1%.
D. gained 10%.
E. gained 13%.

[2000-CE-MATHS 2-14]

48. The cost price of a toy is \$100 and the marked price is \$140. If the toy is sold at 10% discount of the marked price, the profit is

A. \$26 .
B. \$30 .
C. \$36 .
D. \$50 .

[2002-CE-MATHS 2-14]

49. The marked price of a book is 20% above the cost. If the book is sold at a 10% discount on the marked price, then the percentage profit is

A. 2% .
B. 8% .
C. 10% .
D. 18% .

[2004-CE-MATHS 2-12]

50. Peter sold two flats for \$999 999 each. He lost 10% on one and gained 10% on the other. After the two transactions, Peter

A. gained \$10 101 .
B. gained \$20 202 .
C. lost \$10 101 .
D. lost \$20 202 .

[2005-CE-MATHS 2-12]

51. The marked price of a car is 50% higher than the cost. If the car is sold at a 20% discount on the marked price, then the percentage profit is

A. 10% .
B. 20% .
C. 30% .
D. 40% .

[2006-CE-MATHS 2-10]

52. The marked price of a bag is \$900. If the bag is sold at the marked price, then the percentage profit is 50%. If the bag is sold at a 20% discount on the marked price, then the profit is

A. \$120 .
B. \$180 .
C. \$210 .
D. \$270 .

[2008-CE-MATHS 2-12]

53. If a dictionary is sold at its marked price, then the percentage profit is 30%. If the dictionary is sold at a 20% discount on its marked price, then the profit is \$5. Find the cost of the dictionary.

A. \$104
B. \$105
C. \$125
D. \$130

[2009-CE-MATHS 2-10]

54. If the price of a magazine is 60% higher than the price of a newspaper, then the price of the newspaper is

A. 37.5% lower than the price of the magazine.
B. 40% lower than the price of the magazine.
C. 60% lower than the price of the magazine.
D. 62.5% lower than the price of the magazine.

[2010-CE-MATHS 2-13]

Miscellaneous

55. A vessel contains 1,000 cm^3 of liquid A. 250 cm^3 of liquid B is added and the two liquids are thoroughly mixed. If 500 cm^3 of the mixture is now removed, how many percent of the remaining mixture is liquid B?

A. 20
B. 25
C. $33\frac{1}{3}$
D. 40
E. 50

[1977-CE-MATHS 2-3]

56. A new machine costs $10 000. Its value depreciates each year by 20% of the value at the beginning of that year. What is its value after it has been in use for 3 years?

A. $4 000
B. $5 000
C. $5 120
D. $6 000
E. $7 000

[1979-CE-MATHS 2-21]

57. A driver wishes to reduce his travelling time by 20%. By what percentage must he increase the speed of his car?

A. 20%
B. $22\frac{1}{2}\%$
C. 25%
D. 75%
E. 80%

[1979-CE-MATHS 2-39]

58. A group consists of n boys and n girls. If two of the girls are replaced by two other boys, then 51% of the group members will be boys. What is n?

A. 50
B. 51
C. 52
D. 100
E. 102

[1981-CE-MATHS 2-14]

59. A child spent $\frac{1}{10}$ of his savings on a shirt and $\frac{1}{5}$ of his savings on a pair of trousers. He then spent 30% of the rest of his savings on books. What percentage of his savings did he spend altogether?

A. 49.6%
B. 50.4%
C. 51%
D. 58%
E. 60%

[1982-CE-MATHS 2-10]

60. The rent of a flat is raised by 30% every two years beginning from a fixed date. Counting from that date, after how many years will the rent just exceed twice the original rent?

A. 4 years
B. 5 years
C. 6 years
D. 7 years
E. Over 7 years

[1982-CE-MATHS 2-11]

61. Coffee A and coffee B are mixed in the ratio $1:2$. A profit of 20% on the cost price is made by selling the mixture at $36/kg. If the cost price of A is $12/kg, what is the cost of B?

A. $18/kg
B. $24/kg
C. $39/kg
D. $48/kg
E. $66/kg

[1982-CE-MATHS 2-16]

62. It took Paul 40 minutes to walk from Town A to Town B. If the return journey took him 30 minutes, the percentage increase in his speed was

A. 10%.
B. $16\frac{2}{3}\%$.
C. 25%.
D. $33\frac{1}{3}\%$.
E. 40%.

[1983-CE-MATHS 2-41]

63. Last year, a man saved 10% of his income. By how much per cent must his income be increased if his expenditure increases by 20% and he wants to save 20% of his income?

A. 50%
B. 35%
C. 30%
D. 20%
E. 15%

[1984-CE-MATHS 2-40]

64. 60% of the students in a school are boys. 70% of the boys and 40% of the girls wear glasses. If 696 students wear glasses, how many students are there in the school?

A. 1200
B. 1050
C. 808
D. 849
E. 800

[1985-CE-MATHS 2-15]

65. A number is first reduced by $p\%$ and then increased by $x\%$. If the number so obtained is the same as the original number, then $x =$

A. p.
B. $\frac{p}{100}$.
C. $\frac{p}{1-p}$.
D. $\frac{100}{100-p}$.
E. $\frac{100p}{100-p}$.

[1985-CE-MATHS 2-41]

66. Ten litres of a mixture contain 60% of alcohol and 40% of water by volume. How many litres of water should be added so that it contains 30% of alcohol by volume?

A. 5
B. 10
C. 15
D. 20
E. 30

[1986-CE-MATHS 2-41]

67. Last year, the cost of a school magazine consisted of:

cost of paper $8
cost of printing $5
cost of binding $3

This year, the cost of paper will increase by 25% and the cost of printing will increase by 40% while the cost of binding will remain unchanged. The cost of a school magazine will increase by

A. 20%.
B. 25%.
C. 27.5%.
D. 32.5%.
E. 65%.

[1988-CE-MATHS 2-13]

68. X sells an article to Y at a profit. Y then sells it to Z for $60 at a profit of 20%. If X had sold the article directly to Z for $60 much MORE profit would be have made?

A. $10
B. $12
C. $48
D. $50
E. It cannot be found.

[1988-CE-MATHS 2-41]

69. A car travels from P to Q. If its speed is increased by $k\%$, then the time it takes to travel the same distance is reduced by

A. $k\%$.
B. $\frac{100}{k}\%$.
C. $\frac{100k}{100+k}\%$.
D. $\frac{k}{100+k}\%$.
E. $\frac{k}{100-k}\%$.

[1988-CE-MATHS 2-42]

70. A bag contains n balls of which 60% are red and 40% are white. After 10 red balls are taken out from the bag, the percentage of red balls becomes 50%. Find n.

A. 20
B. 40
C. 50
D. 60
E. 100

[1988-CE-MATHS 2-43]

71. If A is greater than B by 20% and B is smaller than C by 30%, then

A. A is smaller than C by 16%.
B. A is smaller than C by 6%.
C. A is greater than C by 6%.
D. A is greater than C by 10%.
E. A is greater than C by 16%.

[1989-CE-MATHS 2-13]

72. If A is 30% greater than B and B is 30% less than C, then

A. A is 9% less than C.
B. C is 9% less than A.
C. $A = C$.
D. A is 9% greater than C.
E. C is 9% greater than A.

[1990-CE-MATHS 2-42]

73. 3 kg of a solution contains 40% of alcohol by weight. How many alcohol should be added to contain a solution containing 50% of alcohol by weight?

A. 0.3 kg
B. 0.6 kg
C. 0.75 kg
D. 1.5 kg
E. 3.75 kg

[1991-CE-MATHS 2-42]

74. Originally $\frac{2}{3}$ of the students in a class failed in an examination. After taking a re-examination, 40% of the failed students passed. Find the total pass percentage of the class.

A. $26\frac{2}{3}\%$
B. $33\frac{1}{3}\%$
C. 40%
D. 60%
E. $73\frac{1}{3}\%$

[1993-CE-MATHS 2-44]

75. Mr Chan bought a car for $143 900. If the value goes down by 10% each year, find its value at the end of the third year. (Give your answer correct to the nearest hundred dollars.)

A. $94 400
B. $100 700
C. $104 900
D. $115 100
E. $116 600

[1994-CE-MATHS 2-9]

76. There are 1 200 students in a school, of which 640 are boys and 560 are girls. If 55% of the boys and 40% of the girls wear glasses, what percentage of students in the school wear glasses?

A. 47%
B. 47.5%
C. 48%
D. 52%
E. 53%

[1997-CE-MATHS 2-10]

77. In a class, students study either History or Geography, but not both. If the number of students studying Geography is 50% more than those studying History, what is the percentage of students studying History?

A. 25%
B. $33\frac{1}{3}\%$
C. 40%
D. 60%
E. $66\frac{2}{3}\%$

[1999-CE-MATHS 2-11]

78. 40% of the students in a class failed in a test. They had to sit for another test in which 70% of them failed again. Find the percentage of students who failed in both tests.

A. 10%
B. 12%
C. 18%
D. 28%
E. 30%

[2001-CE-MATHS 2-27]

79. John's daily working hours have increased from 8 hours to 10 hours but his hourly pay has decreased by 25%. Find the percentage change in John's daily income.

A. A decrease of 6.67%
B. A decrease of 6.25%
C. 0%
D. An increase of 6.67%

[2003-CE-MATHS 2-11]

80. If the bus fare is increased from $4 to $5, then the percentage increase of the fare is

A. 20% .
B. 25% .
C. 80% .
D. 125% .

[2007-CE-MATHS 2-10]

HKDSE Problems

81. Mary sold two bags for $240 each. She gained 20% on one and lost 20% on the other. After the two transactions, Mary

A. lost $20.
B. gained $10.
C. gained $60.
D. had no gain and no loss.

[SP-DSE-MATHS 2-10]

82. Peter invests $\$P$ at the beginning of each month in a year at an interest rate of 6% per annum, compounded monthly. If he gets $10 000 at the end of the year, find P correct to 2 decimal places.

A. 806.63
B. 829.19
C. 833.33
D. 882.18

[SP-DSE-MATHS 2-39]

83. John buys a vase for $1 600. He then sells the vase to Susan at a profit of 20%. At what price should Susan sell the vase in order to have a profit of 20%?

A. $2 240
B. $2 304
C. $2 400
D. $2 500

[PP-DSE-MATHS 2-10]

84. In a company, 37.5% of the employees are female. If 60% of the male employees and 80% of the female employees are married, then the percentage of married employees in the company is

A. 32.5% .
B. 45% .
C. 55% .
D. 67.5% .

[2012-DSE-MATHS 2-8]

85. Susan sells two cars for $80 080 each. She gains 30% on one and loses 30% on the other. After the two transactions, Susan

A. loses $15 840.
B. gains $5 544.
C. gains $10 296.
D. has no gain and no loss.

[2013-DSE-MATHS 2-10]

86. A sum of $50 000 is deposited at an interest rate of 8% per annum for 1 year, compounded monthly. Find the interest correct to the nearest dollar.

A. $4 000
B. $4 122
C. $4 143
D. $4 150

[2013-DSE-MATHS 2-11]

87. There are 792 workers in a factory. If the number of male workers is 20% less than that of female workers, then the number of male workers is

A. 352 .
B. 360 .
C. 432 .
D. 440 .

[2014-DSE-MATHS 2-9]

88. If the price of a souvenir is increased by 70% and then decreased by 60%, find the percentage change in the price of the souvenir.

A. –58%
B. –32%
C. 2%
D. 10%

[2015-DSE-MATHS 2-9]

89. A sum of $50 000 is deposited at an interest rate of 6% per annum for 3 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. $59 000
B. $59 551
C. $59 755
D. $59 781

[2015-DSE-MATHS 2-10]

90. The monthly salary of Donald is 25% higher than that of Peter while the monthly salary of Peter is 25% lower than that of Teresa. It is given that the monthly salary of Donald is $33 360. The monthly salary of Teresa is

A. $31 275 .
B. $33 360 .
C. $35 584 .
D. $52 125 .

[2016-DSE-MATHS 2-10]

91. A sum of $2000 is deposited at an interest rate of 5% per annum for 4 years, compounded half-yearly. Find the interest correct to the nearest dollar.

A. $400
B. $431
C. $437
D. $440

[2017-DSE-MATHS 2-10]

92. A sum of $100 000 is deposited at an interest rate of 2% per annum for 3 years, compounded monthly. Find the interest correct to the nearest dollar.

A. $ 6 000
B. $ 6 121
C. $ 6 176
D. $ 6 178

[2018-DSE-MATHS 2-9]

93. A sum of \$65 000 is deposited at an interest rate of 7% per annum for 8 years, compounded quarterly. Find the amount correct to the nearest dollar.

A. \$101 400
B. \$111 682
C. \$113 244
D. \$113 609

[2019-DSE-MATHS 2-11]

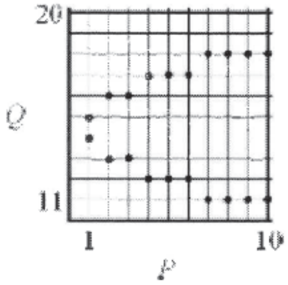
94. The cost of a toy is x% lower than its selling price. After selling the toy, the percentage profit is 25%. Find x.

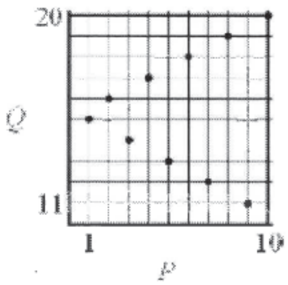
A. 20
B. 25
C. 75
D. 80

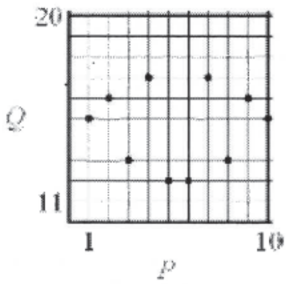
[2020-DSE-MATHS 2-9]

1. Given $P = \{1, 2, 3 \ldots 10\}$,
$Q = \{11, 12, 13 \ldots 20\}$,

Which of the following three relations from P to Q illustrated in the graphs are mappings?

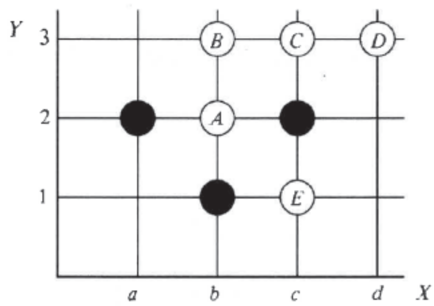
(1)


(2)


(3)


A. (2) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1972-CE-MATHS B1-10]

2.


$X = \{a, b, c, d\}$. $Y = \{1, 2, 3\}$.

In the above figure, which one of the lettered circles should be blackened so that the graph represents a map from X into Y?

A. A
B. B
C. C
D. D
E. E

[SP-CE-MATHS 2-56]

3. If $f(x) = \frac{1}{x+1}$, then $f(\frac{1}{x+1}) =$

A. x .
B. $x + 1$.
C. $\frac{1}{x}$.
D. $\frac{x}{x+1}$.
E. $\frac{x+1}{x+2}$.

[1978-CE-MATHS 2-37]

4. If $f(x) = x^2 + x + 1$, then $f(x+1) - f(x) =$

A. 1 .
B. 3 .
C. $2x + 1$.
D. $2x + 2$.
E. $x^2 + x + 1$.

[1981-CE-MATHS 2-7]

5. If $f(x) = 5^x + 1$, then $f(x+1) - f(x) =$

A. 1 .
B. 6 .
C. $4 \cdot 5^x$.
D. $5 \cdot 5^x$.
E. $4 \cdot 5^x + 1$.

[1982-CE-MATHS 2-29]

6. A function $f(x)$ is called an even function if $f(x) = f(-x)$. Which of the following functions is/are even functions?

(1) $f_1(x) = \frac{1}{x}$
(2) $f_2(x) = x^2$
(3) $f_3(x) = x^3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1983-CE-MATHS 2-37]

7. If $f(x) = (\log_{10} 2x) - x$, then $f(x+1) - f(x) =$

A. $\log_{10} 2 - 1$.
B. $\log_{10} \frac{x+1}{x}$.
C. $\log_{10} \frac{10(x+1)}{x}$.
D. $\log_{10} \frac{x+1}{10x}$.
E. $\log_{10} \frac{x+1}{x} - 2x$.

[1984-CE-MATHS 2-36]

8. If $f(2x) = 8x^3 + 4x$, then $f(3a) =$

A. $9a^3 + 6a$.
B. $12a^3 + 6a$.
C. $27a^3 + 6a$.
D. $108a^3 + 6a$.
E. $216a^3 + 12a$.

[1985-CE-MATHS 2-40]

9. If $f(x) = x^2 + 1$, then $f(x-1) =$

A. x^2 .
B. $x^2 - 1$.
C. $x^2 + 2$.
D. $x^2 - 2x$.
E. $x^2 - 2x + 2$.

[1987-CE-MATHS 2-10]

10. If $f(x) = 3 + 2^x$, then $f(2x) - f(x) =$

A. 2^x .
B. 2^{3x} .
C. $3 + 2^x$.
D. $2^x(2^x + 1)$.
E. $2^x(2^x - 1)$.

[1988-CE-MATHS 2-34]

11. If $f(x) = \frac{x}{1-x}$, then $f(\frac{1}{x}) =$

A. $\frac{1}{x-1}$.
B. $\frac{1}{1-x}$.
C. $\frac{x}{x-1}$.
D. $\frac{x}{1-x}$.
E. $\frac{1-x}{x}$.

[1989-CE-MATHS 2-4]

12. If $f(n) = \frac{1}{2}n(n-1)$, then $f(n+1) - f(n) =$

A. $f(1)$.
B. $f(n)$.
C. $\frac{n}{2}$.
D. 1 .
E. n .

[1990-CE-MATHS 2-4]

13. If $f(x) = x - \frac{1}{x}$, then $f(x) - f(\frac{1}{x}) =$

A. 0 .
B. $2x$.
C. $-\frac{2}{x}$.
D. $2(x - \frac{1}{x})$.
E. $2(\frac{1}{x} - x)$.

[1991-CE-MATHS 2-35]

14. If $f(x) = 10^{2x}$, then $f(4y) =$

A. 10^{4y} .
B. 10^{2+4y} .
C. 10^{8y} .
D. 40^y .
E. 40^{2y} .

[1993-CE-MATHS 2-1]

15. If $f(x) = x^2 + 2x$, then $f(x-1) =$

A. x^2 .
B. $x^2 - 1$.
C. $x^2 + 2x - 1$.
D. $x^2 + 2x - 3$.
E. $x^2 + 4x - 1$.

[1994-CE-MATHS 2-1]

16. If $f(x) = \frac{x}{1-x}$, then $f(\frac{1}{x})f(-x) =$

A. $-\frac{1}{2}$.
B. -1 .
C. $-\frac{1-x}{1+x}$.
D. $\frac{x}{1-x^2}$.
E. $\frac{x}{x^2-1}$.

[1995-CE-MATHS 2-35]

17. If $f(x) = 3x^2 + bx + 1$ and $f(x) = f(-x)$, then $f(-3) =$

A. -26 .
B. 0 .
C. 3 .
D. 25 .
E. 28 .

[1997-CE-MATHS 2-27]

18. If $f(x) = x^2 - 3x - 1$, then $f(a) + f(-a) =$

A. $2a^2$.
B. $2a^2 - 2$.
C. $6a$.
D. $-6a$.
E. -2 .

[1998-CE-MATHS 2-2]

19. If $f(x) = x^2 - 1$, then $f(a-1) =$

A. $a^2 - 2a$.
B. $a^2 - 3a$.
C. $a^2 - 3a - 2$.
D. $a^2 - 1$.
E. $a^2 - 2$.

[1999-CE-MATHS 2-1]

20. Let $f(x) = 3x^2 + ax - 7$. If $f(-1) = 0$, find $f(-2)$.

A. -27
B. -11
C. -3
D. 1
E. 13

[2000-CE-MATHS 2-4]

21. Let $f(x) = x^2 - x - 3$. If $f(k) = k$, then $k =$

A. 1 .
B. -1 or 3 .
C. -3 or 1 .
D. $-\sqrt{3}$ or $\sqrt{3}$.

[2002-CE-MATHS 2-2]

22. If $f(x) = 2x^2 + kx - 1$ and $f(-2) = f(\frac{1}{2})$, then $k =$

A. $\frac{-17}{3}$.
B. -5 .
C. 3 .
D. $\frac{31}{5}$.

[2003-CE-MATHS 2-1]

23. If $f(x) = x^2 - x + 1$, then $f(x+1) - f(x) =$

A. 0 .
B. 2 .
C. $2x$.
D. $4x$.

[2004-CE-MATHS 2-3]

24. If $f(x) = 2x^2 - 3x + 4$, then $f(1) - f(-1) =$

A. -6 .
B. -2 .
C. 2 .
D. 6 .

[2005-CE-MATHS 2-3]

25. If $f(x) = \frac{x}{1+x}$, then $f(3)f(\frac{1}{3}) =$

A. $\frac{3}{16}$.
B. $\frac{1}{2}$.
C. $\frac{3}{4}$.
D. 1 .

[2006-CE-MATHS 2-5]

26. Let $f(x) = x^2 - ax + 2a$, where a is a constant. If $f(-3) = 29$, then $a =$

A. -38 .
B. -20 .
C. -4 .
D. 4 .

[2007-CE-MATHS 2-8]

27. Let $f(x) = x^2 + kx + 7$, where k is a constant. If $f(4) - f(3) = 21$, then $k =$

A. 0 .
B. 4 .
C. 14 .
D. 28 .

[2008-CE-MATHS 2-6]

28. Let $f(x) = x^2 - 9x + c$, where c is a constant. If $f(-1) = 8$, then $c =$

A. -2 .
B. 0 .
C. 16 .
D. 18 .

[2009-CE-MATHS 2-6]

29. If $f(x) = x^2 - 3x + 17$, then $3f(2) - 1 =$

A. 27 .
B. 34 .
C. 44 .
D. 70 .

[2010-CE-MATHS 2-6]

30. Let $f(x) = x^2 + 2x + k$, where k is a constant. Find $f(5) - f(3)$.

A. 20
B. $k + 8$
C. $k + 35$
D. $2k + 50$

[2011-CE-MATHS 2-8]

HKDSE Problems

31. Let k be a constant. If $f(x) = 2x^2 - 5x + k$, then $f(2) - f(-2) =$

A. -20 .
B. 0 .
C. 16 .
D. $2k$.

[2017-DSE-MATHS 2-6]

32. If $f(x) = 3x^2 - 2x + 1$, then $f(2m - 1) =$

A. $6m^2 - 4m + 2$
B. $6m^2 - 4m + 6$
C. $12m^2 - 16m + 2$
D. $12m^2 - 16m + 6$

[2018-DSE-MATHS 2-7]

33. Let c be a constant. If $f(x) = x^3 + cx^2 + c$, then $f(c) + f(-c) =$

A. 0
B. $2c$
C. $2c^3 + 2c$
D. $-2c^3 + 2c$

[2019-DSE-MATHS 2-8]

34. Let $f(x) = 3x^2 - x - 2$. If β is a constant, $f(1 + \beta) - f(1 - \beta) =$

A. 2β
B. 10β
C. $6\beta^2 - 2$
D. $6\beta^2 - 26\beta^2 - 2$

[2020-DSE-MATHS 2-5]

Completing Squares

1. Which of the following functions has its minimum value of 3, when $x = 1$?

   A. $y = (x-1)^2 - 3$
   B. $y = 3 - (x-1)^2$
   C. $y = (x+1)^2 + 3$
   D. $y = 3 - (x+1)^2$
   E. $y = (x-1)^2 + 3$

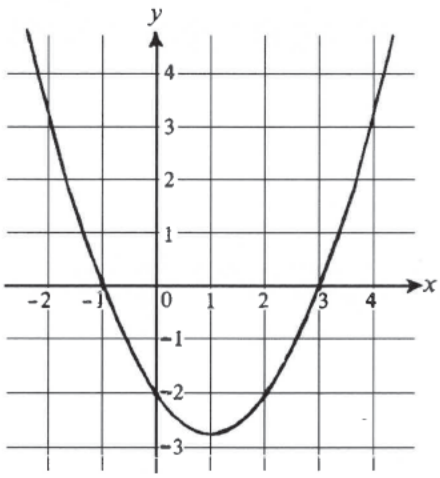
   [1972-CE-MATHS B1-18]

2. What number should be added to the expression $4x^2 + 12x + 2$ in order to make it a perfect square?

   A. 10
   B. 7
   C. 6
   D. 4
   E. 2

   [1979-CE-MATHS 2-48]

Properties of Quadratic Graphs

3. 

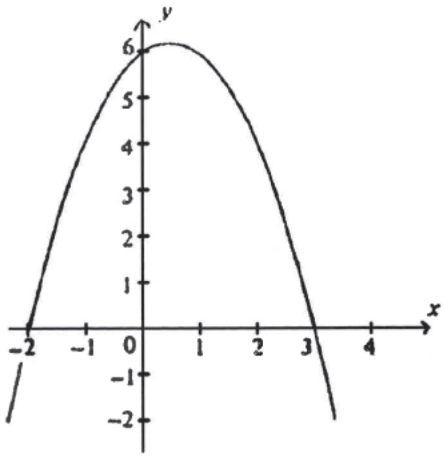
   The figure above shows the graph of

   $y = px^2 + qx + r$.

   The value of r is

   A. -2.
   B. -1.
   C. 0.
   D. 2.
   E. 3.

   [SP-CE-MATHS 2-13]

4. 

   The figure above shows the graph of

   A. $y = (x+2)(x-3)$.
   B. $y = (x-2)(x+3)$.
   C. $y = (x-2)(x-3)$.
   D. $y = -(x+2)(x-3)$.
   E. $y = -(x-2)(x+3)$.

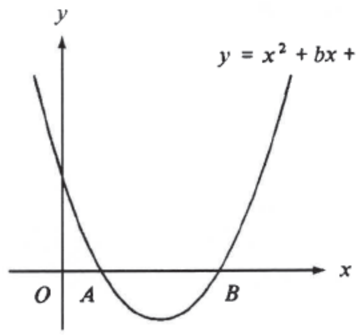
   [1979-CE-MATHS 2-36]

5. The graph of $y = x^2 + ax + b$ (a and b being constants) cuts the x-axis at $(2, 0)$ and $(h, 0)$, and cuts the y-axis at $(0, -2)$. $h =$

   A. -3.
   B. -2.
   C. -1.
   D. 0.
   E. 1.

   [1984-CE-MATHS 2-34]

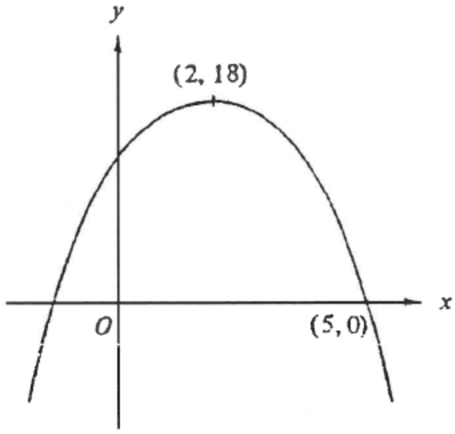
6. In the figure, the graph of $y = x^2 + bx + c$ cuts the x-axis at A and B. $OA + OB =$

   A. b.
   B. c.
   C. $-b$.
   D. $-c$.
   E. $-\frac{b}{c}$.

   [1987-CE-MATHS 2-9]

7. The figure shows the graph of a quadratic function $y = f(x)$. Given that the graph has vertex (2, 18) and it cuts the x-axis at (5, 0), find the quadratic function.

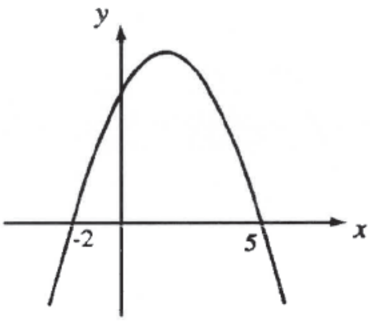


A. $y = (x-2)^2 + 18$
B. $y = -(x-2)^2 + 18$
C. $y = (x+1)(x-5)$
D. $y = -2(x+1)(x-5)$
E. $y = 2(x-1)(x+5)$

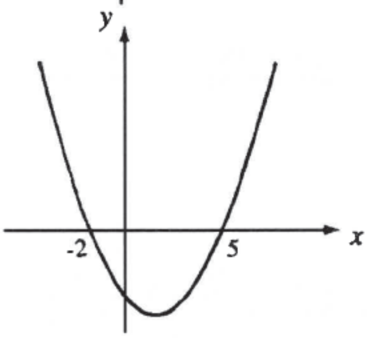
[1989-CE-MATHS 2-45]

8. Which of the following may represent the graph of $y = -x^2 + 3x + 10$?

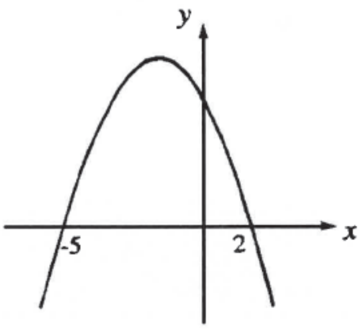
A.



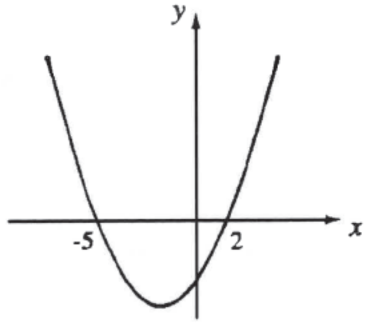
B.



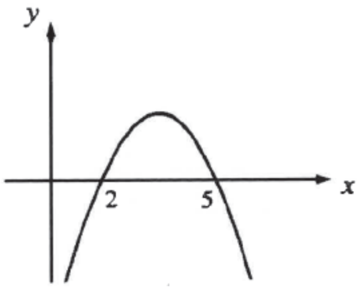
C.



D.

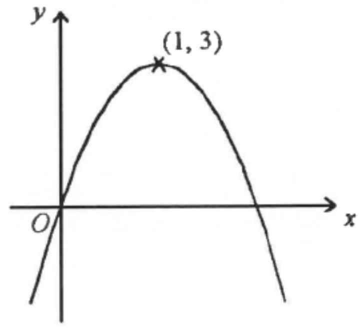


E.



[1995-CE-MATHS 2-41]

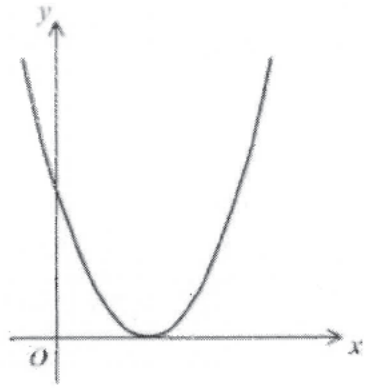
9. The figure shows the graph of a quadratic function f(x). If the vertex of the graph is (1, 3), then f(x) =



A. $-3(x-1)^2 + 3$.
B. $-3(x+1)^2 + 3$.
C. $-(x-1)^2 + 3$.
D. $-(x+1)^2 + 3$.
E. $3(x-1)^2 - 3$.

[1997-CE-MATHS 2-34]

10. In the figure, the graph of $y = x^2 - 6x + k$ touches the x-axis. Find k.



A. $k \geq 0$

B. $k \geq 9$

C. $k = -9$

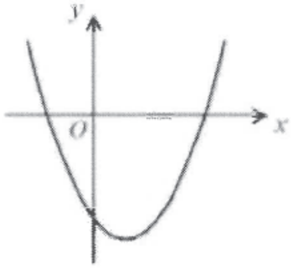
D. $k = 0$

E. $k = 9$

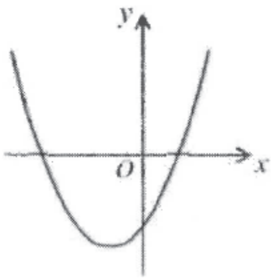
[1999-CE-MATHS 2-5]

11. Which of the following may represent the graph of $y = x^2 - 3x - 18$?

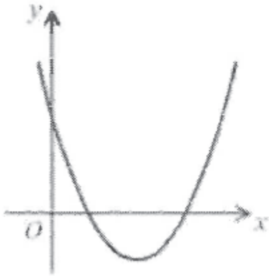
A.



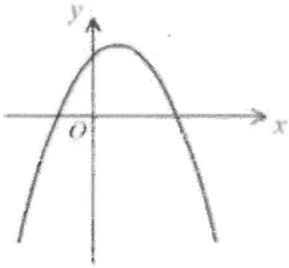
B.



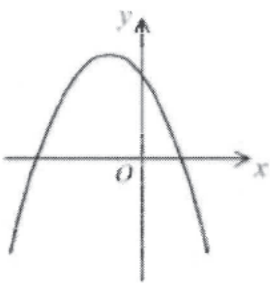
C.



D.



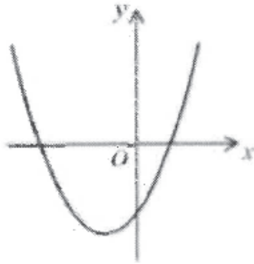
E.



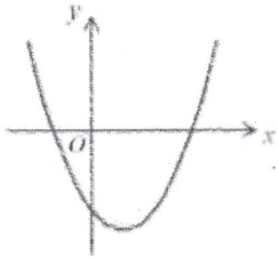
[1999-CE-MATHS 2-9]

12. Which of the following may represent the graph of $y = -x^2 + 2x - 3$?

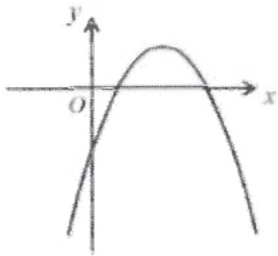
A.



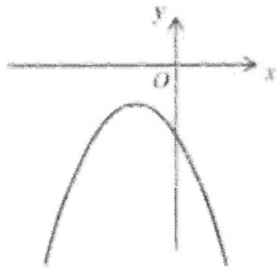
B.



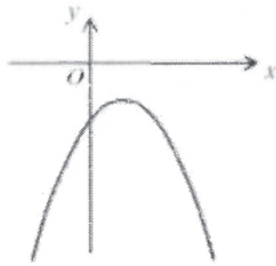
C.



D.

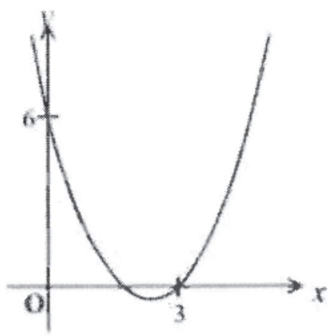


E.



[2000-CE-MATHS 2-39]

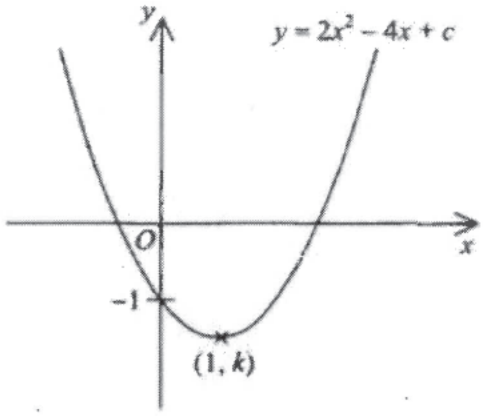
13. The figure shows the graph of $y = x^2 + bx + c$. Find b.



A. $\frac{-11}{2}$
B. -5
C. 5
D. $\frac{11}{2}$

[2002-CE-MATHS 2-5]

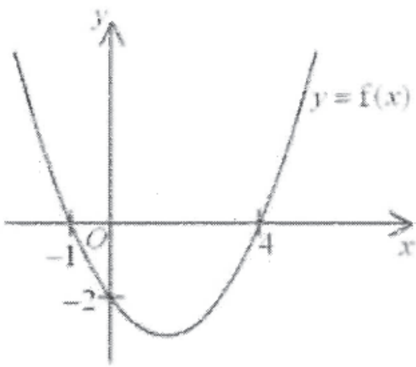
14. In the figure, the graph of $y = 2x^2 - 4x + c$ passes through the point $(1, k)$. Find the value of k.



A. -5
B. -4
C. -3
D. -2

[2004-CE-MATHS 2-5]

15. The figure shows the graph of $y = f(x)$. If $f(x)$ is a quadratic function, then $f(x) =$



A. $\frac{1}{2}(x+1)(x-4)$.
B. $2(x+1)(x-4)$.
C. $\frac{1}{2}(x-1)(x+4)$.
D. $2(x-1)(x+4)$.

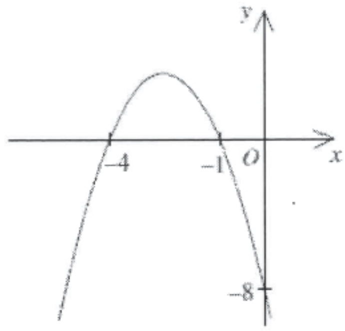
[2006-CE-MATHS 2-7]

16. Which of the following statements about the graph of $y = (x+1)^2 - 4$ is true?

A. The coordinates of the vertex of the graph are $(-1, 4)$.
B. The equation of the axis of symmetry of the graph is $x = 1$.
C. The x-intercepts of the graph are -1 and 3.
D. The y-intercept of the graph is -3.

[2007-CE-MATHS 2-5]

17. The equation of the quadratic graph shown in the figure is



A. $y = (x-1)(x-4)$.
B. $y = -(x+1)(x+4)$.
C. $y = -2(x+1)(x+4)$.
D. $y = -2(x-1)(x-4)$.

[2010-CE-MATHS 2-9]

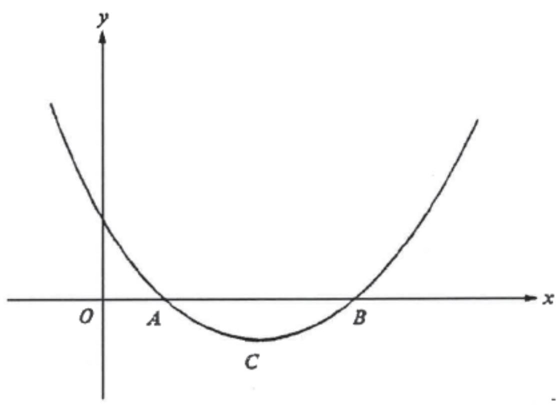
18. Which of the following statements about the graph of $y = 25 - (x-3)^2$ is true?

A. The x-intercepts of the graph are -2 and 8.
B. The y-intercept of the graph is 25.
C. The equation of the axis of symmetry of the graph is $x = -3$.
D. The y-coordinate of the vertex of the graph is 16.

[2011-CE-MATHS 2-7]

Areas in Quadratic Graphs

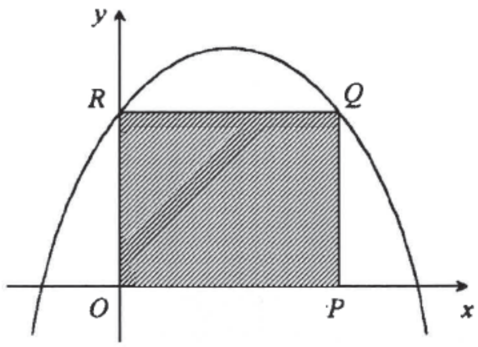
19. In the figure, the equation of the curve is $y = (x-2)^2 - 1$. The curve intersects the x-axis at A and B. C is the vertex of the curve. The area of ΔABC is



A. 1 .
B. 1.5 .
C. 2 .
D. 2.5 .
E. 3 .

[1985-CE-MATHS 2-35]

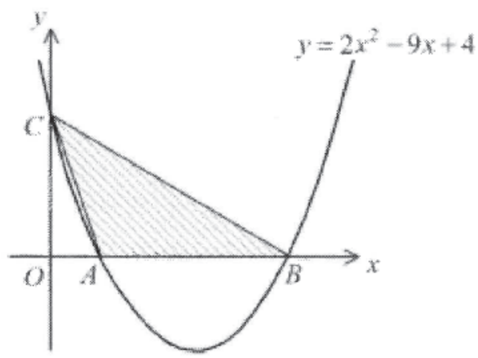
20. The curve in the figure is the graph of $y = -x^2 + bx + c$. Find the area of the rectangle *OPQR*.



A. bc
B. b^2
C. c^2
D. $b^2 - 4c$
E. $b^2 + 4c$

[1996-CE-MATHS 2-41]

21. In the figure, the graph of $y = 2x^2 - 9x + 4$ cuts the x-axis at A and B, and the y-axis at C. Find the area of ΔABC.

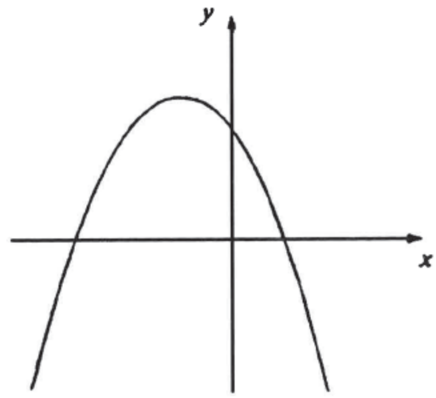


A. 4
B. 6
C. 7
D. 8
E. 14

[2001-CE-MATHS 2-23]

Sign of Coefficients in Quadratic Graphs

22.



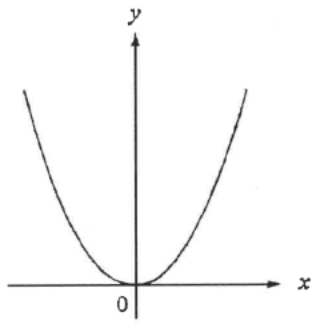
The figure above shows the graph of $y = ax^2 + bx + c$. Determine whether a and c are positive or negative.

A. $a > 0$ and $c > 0$
B. $a < 0$ and $c < 0$
C. $a > 0$ and $c < 0$
D. $a < 0$ and $c > 0$
E. it cannot be determined from the given data

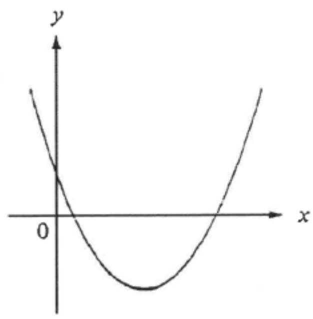
[1980-CE-MATHS 2-32]

23. If a, b and c are positive numbers, which of the following is a possible graphical representation of $y = ax^2 + bx + c$?

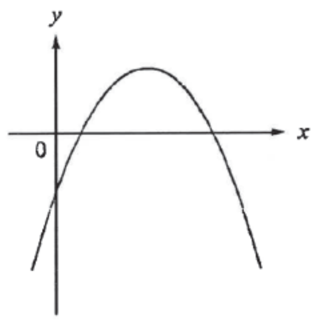
A.



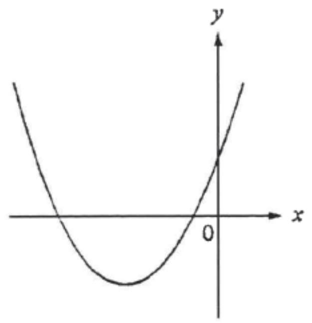
B.



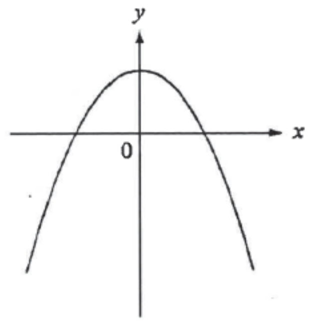
C.



D.

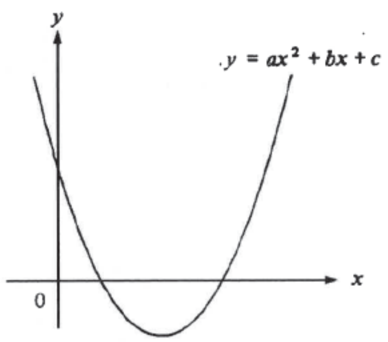


E.



[1986-CE-MATHS 2-35]

24.



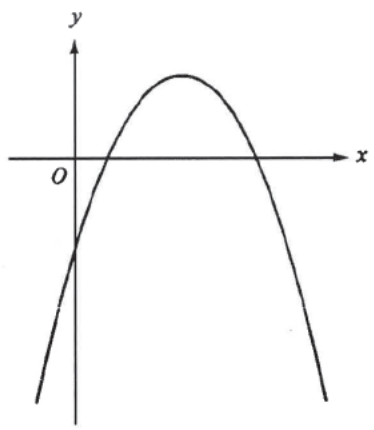
The figure shows the graph of $y = ax^2 + bx + c$. Which of the following is/are true?

(1) $a > 0$
(2) $b > 0$
(3) $c > 0$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1987-CE-MATHS 2-39]

25.



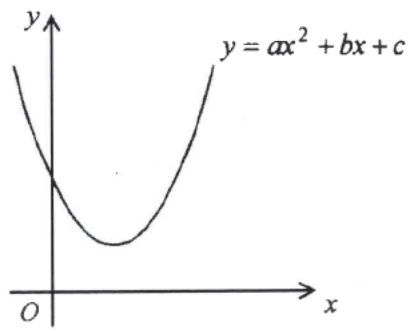
The graph of $y = ax^2 + bx + c$ is given as shown. Which of the following is/are true?

(1) $a < 0$
(2) $b < 0$
(3) $c < 0$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1990-CE-MATHS 2-31]

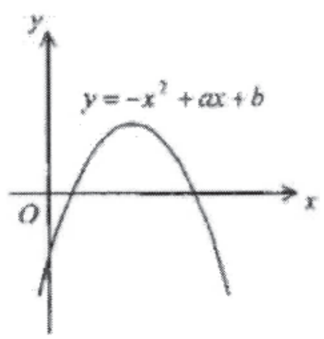
26. The figure shows the graph of $y = ax^2 + bx + c$. Which of the following is true?



A. $a > 0$, $c > 0$ and $b^2 - 4ac > 0$
B. $a > 0$, $c > 0$ and $b^2 - 4ac < 0$
C. $a > 0$, $c < 0$ and $b^2 - 4ac < 0$
D. $a < 0$, $c > 0$ and $b^2 - 4ac > 0$
E. $a < 0$, $c < 0$ and $b^2 - 4ac > 0$

[1998-CE-MATHS 2-12]

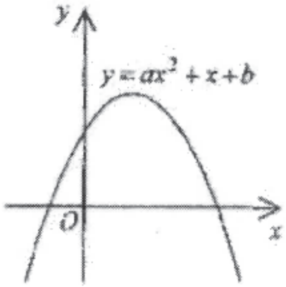
27. The figure shows the graph of $y = -x^2 + ax + b$. Which of the following is true?



A. $a < 0$ and $b < 0$
B. $a < 0$ and $b > 0$
C. $a > 0$ and $b < 0$
D. $a > 0$ and $b > 0$

[2003-CE-MATHS 2-42]

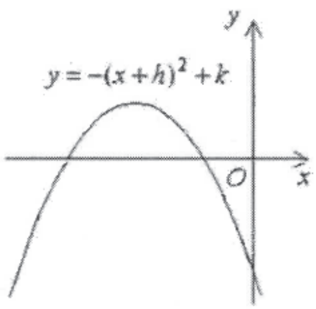
28. The figure shows the graph of $y = ax^2 + x + b$. Which of the following is true?



A. $a > 0$ and $b < 0$
B. $a > 0$ and $b > 0$
C. $a < 0$ and $b < 0$
D. $a < 0$ and $b > 0$

[2005-CE-MATHS 2-6]

29. The figure shows the graph of $y = -(x + h)^2 + k$. Which of the following must be true?

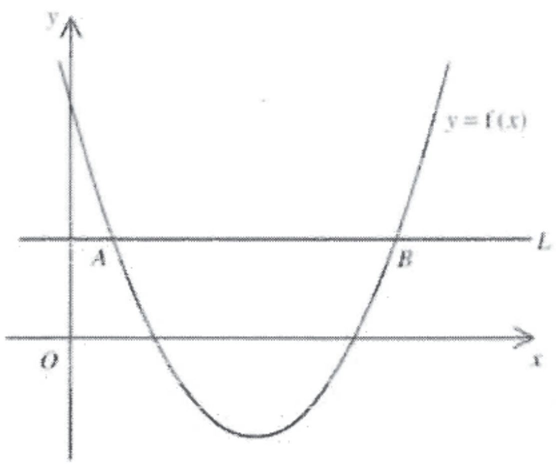


A. $h > 0$ and $k > 0$
B. $h > 0$ and $k < 0$
C. $h < 0$ and $k > 0$
D. $h < 0$ and $k < 0$

[2008-CE-MATHS 2-9]

HKDSE Problems

30.



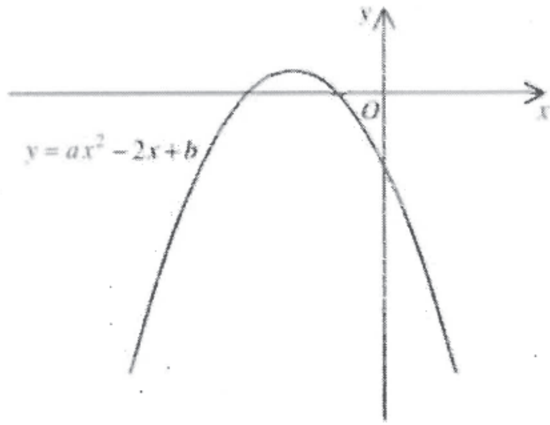
In the figure, the quadratic graph of $y = f(x)$ intersects the straight line L at $A(1, k)$ and $B(7, k)$. Which of the following are true?

(1) The solution of the inequality $f(x) > k$ is $x < 1$ or $x > 7$.
(2) The roots of the equation $f(x) = k$ are 1 and 7.
(3) The equation of the axis of symmetry of the quadratic graph of $y = f(x)$ is $x = 3$.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[SP-DSE-MATHS 2-8]

31.



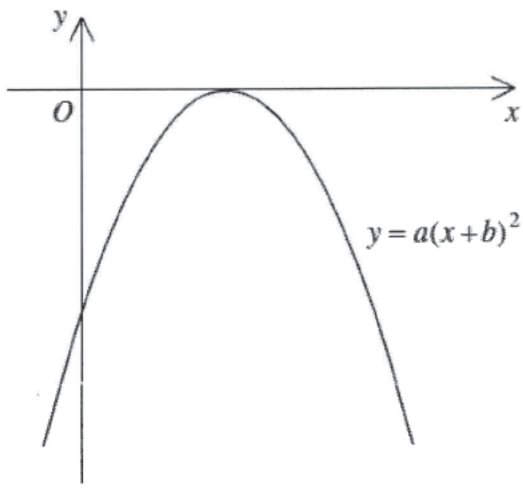
The figure shows the graph of $y = ax^2 - 2x + b$, where a and b are constants. Which of the following is/are true?

(1) $a > 0$
(2) $b < 0$
(3) $ab < 1$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[PP-DSE-MATHS 2-8]

32. The figure shows the graph of $y = a(x + b)^2$, where a and b are constants. Which of the following is true?



A. $a > 0$ and $b > 0$
B. $a > 0$ and $b < 0$
C. $a < 0$ and $b > 0$
D. $a < 0$ and $b < 0$

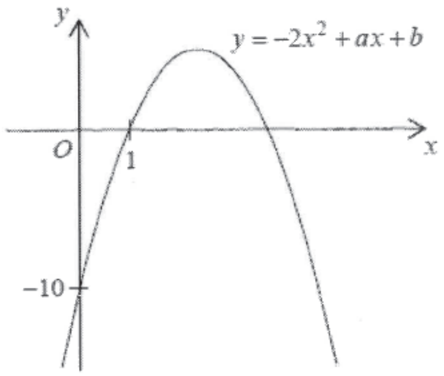
[2012-DSE-MATHS 2-6]

33. Let $f(x)$ be a quadratic function. If the coordinates of the vertex of the graph of $y = f(x)$ are $(3, -4)$, which of the following must be true?

A. The roots of the equation $f(x) = 0$ are integers.
B. The roots of the equation $f(x) - 3 = 0$ are rational numbers.
C. The roots of the equation $f(x) + 4 = 0$ are real numbers.
D. The roots of the equation $f(x) + 5 = 0$ are nonreal numbers.

[2012-DSE-MATHS 2-34]

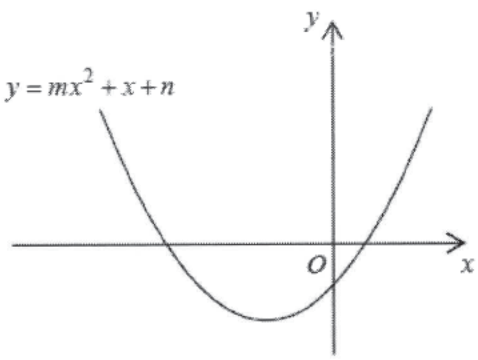
34. The figure shows the graph of $y = -2x^2 + ax + b$, where a and b are constants. The equation of the axis of symmetry of the graph is



A. $x = 2$.
B. $x = 3$.
C. $x = 5$.
D. $y = 8$.

[2013-DSE-MATHS 2-7]

35. The figure shows the graph of $y = mx^2 + x + n$, where m and n are constants. Which of the following is true?



A. $m < 0$ and $n < 0$
B. $m < 0$ and $n > 0$
C. $m > 0$ and $n < 0$
D. $m > 0$ and $n > 0$

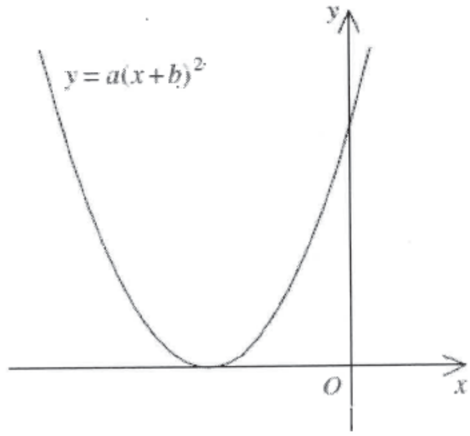
[2014-DSE-MATHS 2-5]

36. Let $f(x) = 3x^2 - 6x + k$, where k is a constant. If the y-coordinate of the vertex of the graph of $y = f(x)$ is 7, then $k =$

A. 1.
B. 3.
C. 4.
D. 10.

[2014-DSE-MATHS 2-35]

37. The figure shows the graph of $y = a(x + b)^2$, where a and b are constants. Which of the following is true?

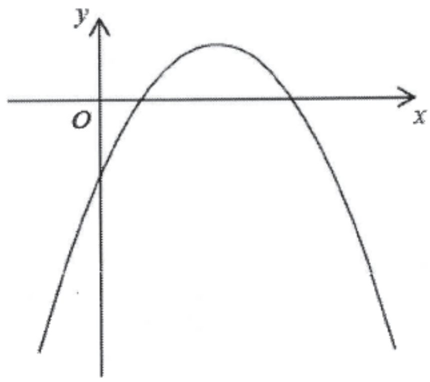


A. $a < 0$ and $b < 0$
B. $a < 0$ and $b > 0$
C. $a > 0$ and $b < 0$
D. $a > 0$ and $b > 0$

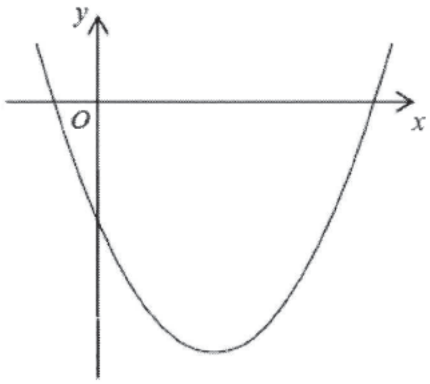
[2015-DSE-MATHS 2-8]

38. If $-1 < a < 0$, which of the following may represent the graph of $y = (ax + 1)^2 + a$?

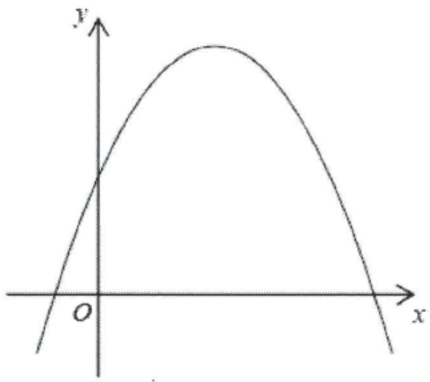
A.



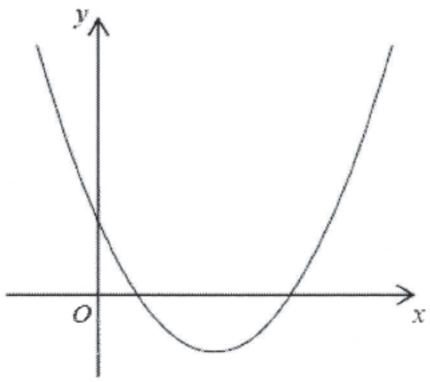
B.



C.

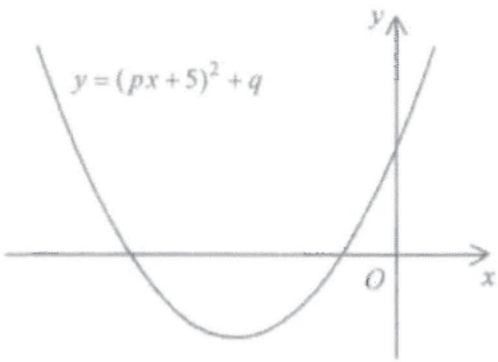


D.



[2016-DSE-MATHS 2-9]

39. The figure shows the graph of $y = (px + 5)^2 + q$, where p and q are constants. Which of the following is true?



A. $p < 0$ and $q < 0$
B. $p < 0$ and $q > 0$
C. $p > 0$ and $q < 0$
D. $p > 0$ and $q > 0$

[2017-DSE-MATHS 2-9]

40. Which of the following statements about the graph of $y = 16 - (x - 6)^2$ is true?

A. The graph cuts the x-axis.
B. The graph opens upwards.
C. The y-intercept of the graph is 16.
D. The graph passes through the origin.

[2018-DSE-MATHS 2-5]

41. Which of the following statements about the graph of $y = (3 - x)(x + 2) + 6$ is / are true?

I. The graph opens downwards.
II. The graph passes through the point (1,10).
III. The x-intercepts of the graph are -2 and 3.

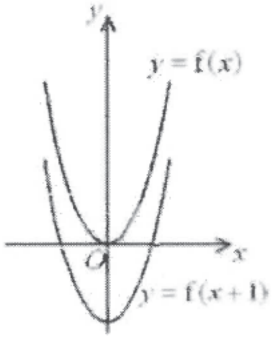
A. I only
B. II only
C. I and III only
D. II and III only

[2019-DSE-MATHS 2-10]

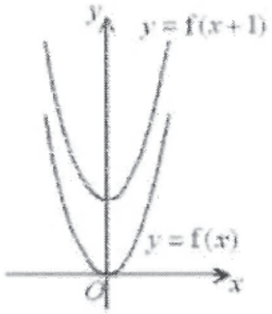
Transformations of Graphs

1. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(x+1)$ on the same rectangular coordinate system?

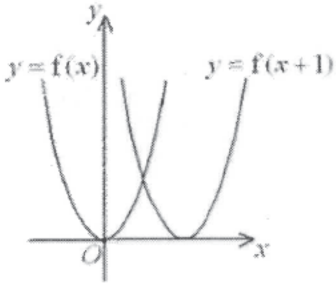
A.



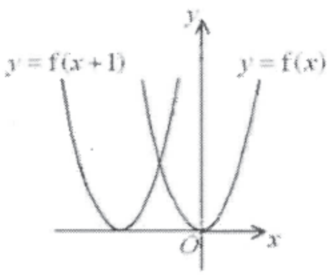
B.



C.



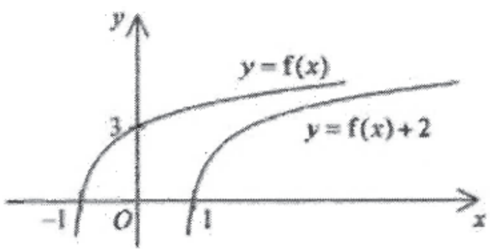
D.



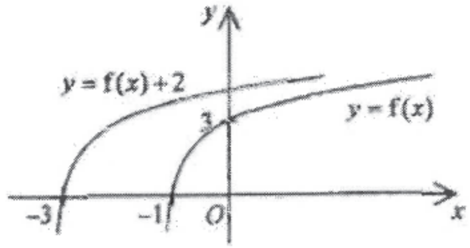
[2007-CE-MATHS 2-38]

2. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(x) + 2$ on the same rectangular coordinate system?

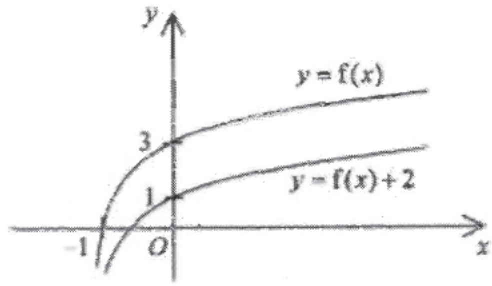
A.



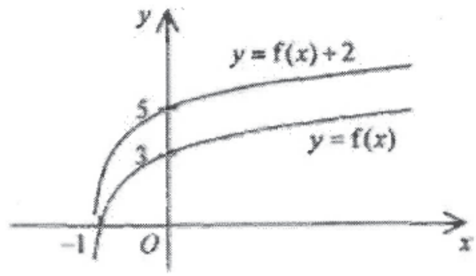
B.



C.

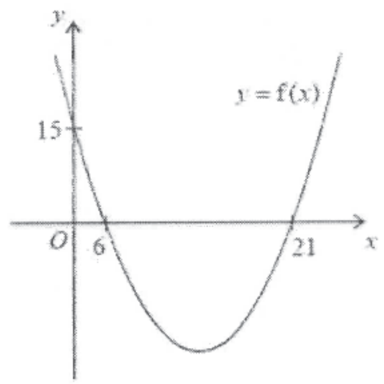


D.



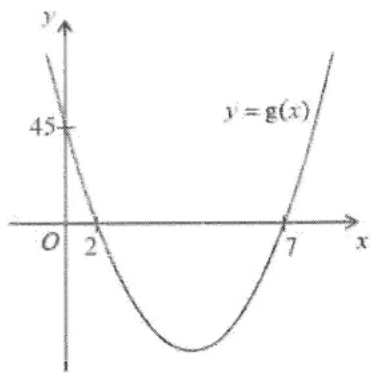
[2008-CE-MATHS 2-37]

3.

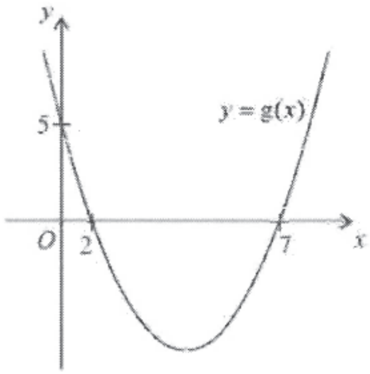


The figure above shows the graph of $y = f(x)$. If $f(x) = 3g(x)$, which of the following may represent the graph of $y = g(x)$?

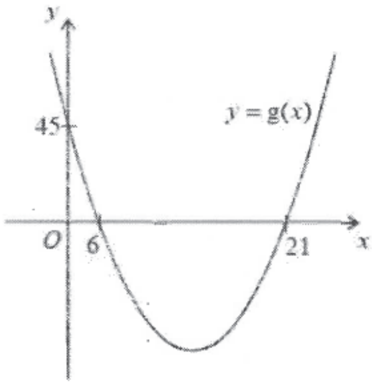
A.



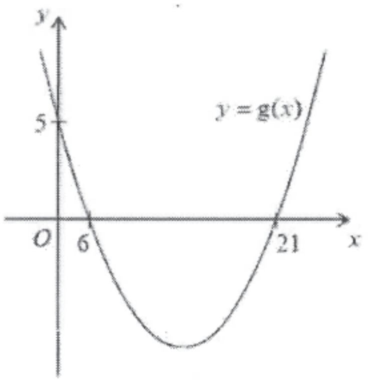
B.



C.

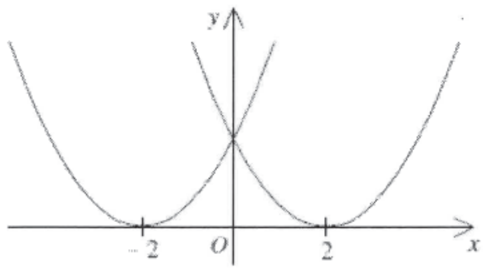


D.



[2009-CE-MATHS 2-37]

4.



Let f(x) be a quadratic function. The figure shows the graph of y = f(x) and

A. the graph of $y = \mathrm{f}(x-2)$.

B. the graph of $y = \mathrm{f}(x+2)$.

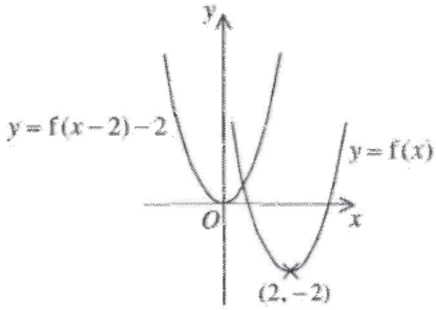
C. the graph of $y = \mathrm{f}(-x)$.

D. the graph of $y = -\mathrm{f}(x)$.

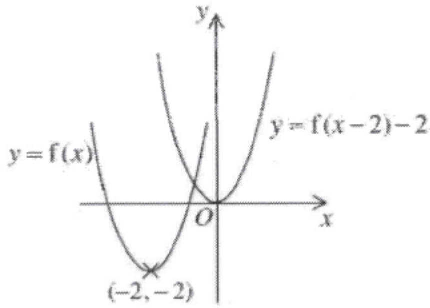
[2010-CE-MATHS 2-37]

5. Which of the following may represent the graph of $y = \mathrm{f}(x)$ and the graph of $y = \mathrm{f}(x-2) - 2$ on the same rectangular coordinate system?

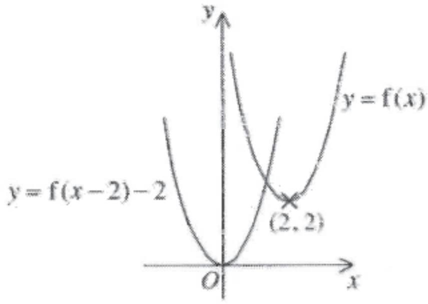
A.



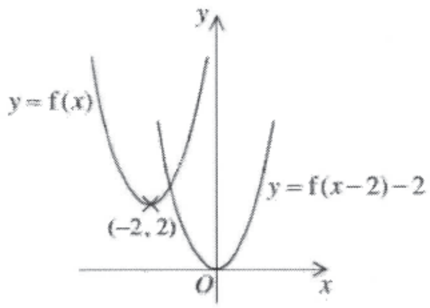
B.



C.



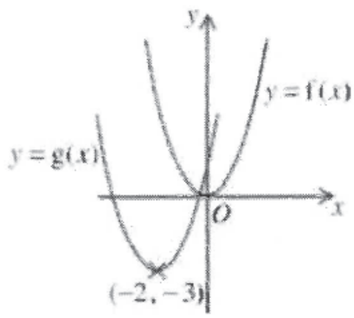
D.



[2011-CE-MATHS 2-37]

HKDSE Problems

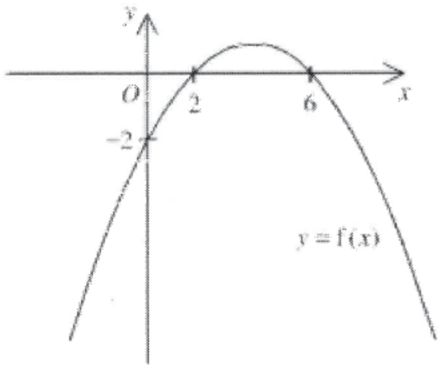
6.



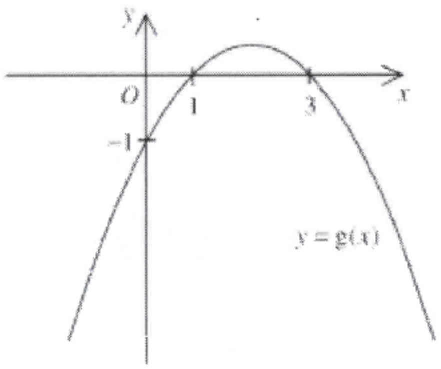
If the figure shows the graph of $y = f(x)$ and the graph of $y = g(x)$ on the same rectangular coordinate system, then

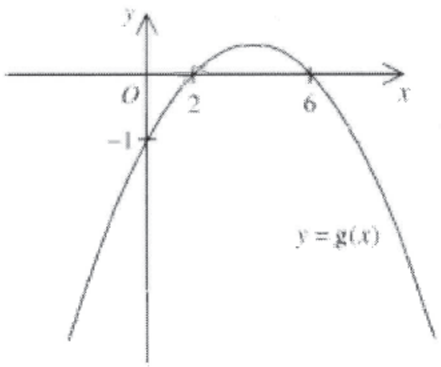
A. $g(x) = f(x-2) - 3$.
B. $g(x) = f(x-2) + 3$.
C. $g(x) = f(x+2) - 3$.
D. $g(x) = f(x+2) + 3$.

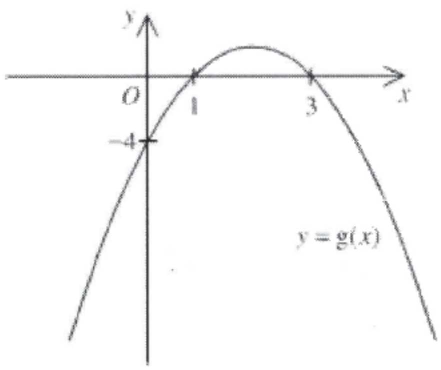
[SP-DSE-MATHS 2-37]

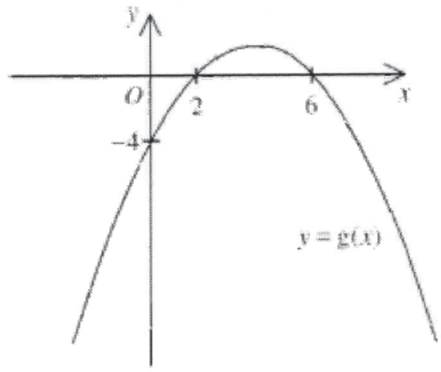
7. 

The figure above shows the graph of $y = f(x)$. If $2f(x) = g(x)$, which of the following may represent the graph of $y = g(x)$?

A. 

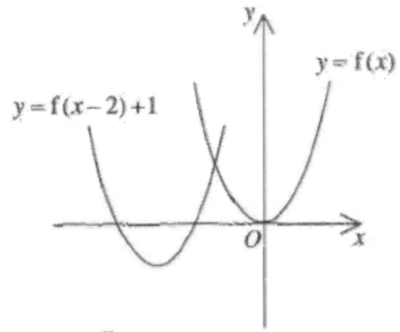
B. 

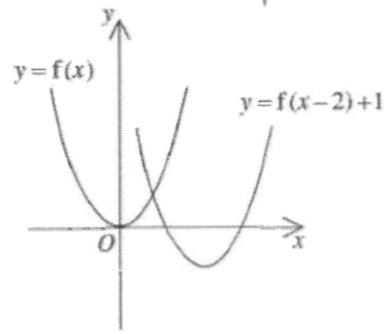
C. 

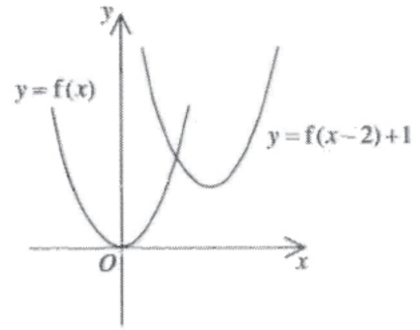
D. 

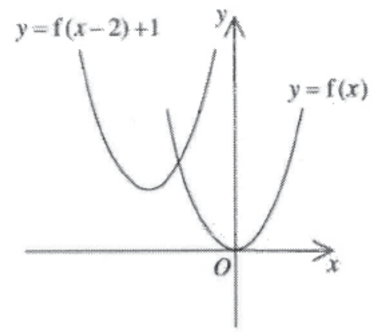
[PP-DSE-MATHS 2-31]

8. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = f(x-2) + 1$ on the same rectangular coordinate system?

A. 

B. 

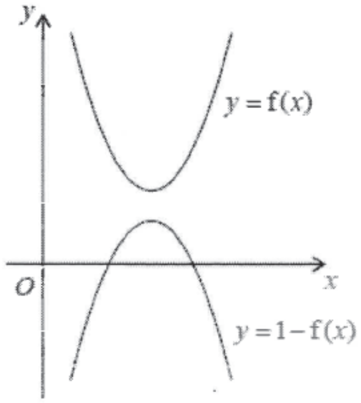
C. 

D. 

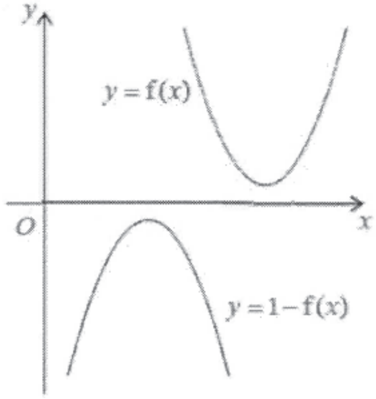
[2012-DSE-MATHS 2-38]

9. Which of the following may represent the graph of $y = f(x)$ and the graph of $y = 1 - f(x)$ on the same rectangular coordinate system?

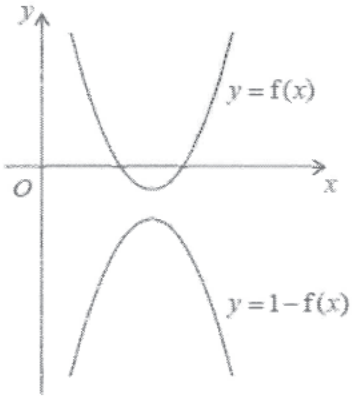
A.



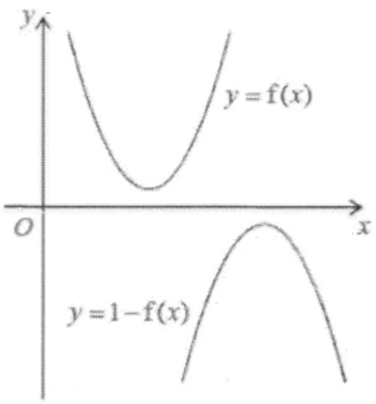
B.



C.

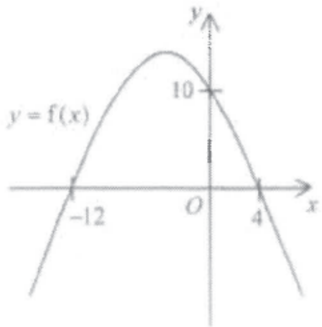


D.



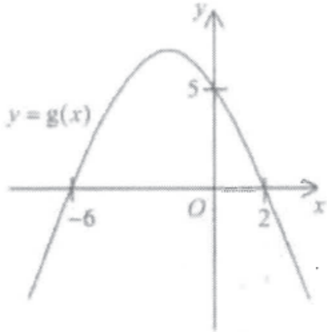
[2014-DSE-MATHS 2-38]

10.

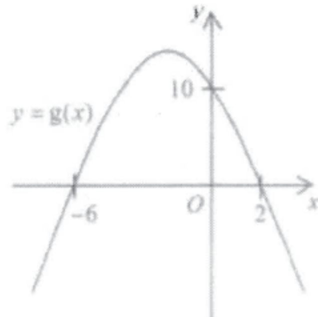


The figure above shows the graph of $y = f(x)$. If $g(x) = f(\frac{x}{2})$, which of the following may represent the graph of $y = g(x)$?

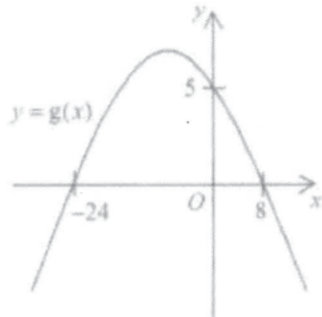
A.



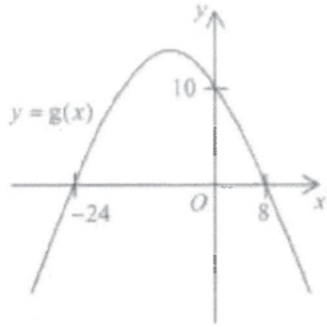
B.



C.

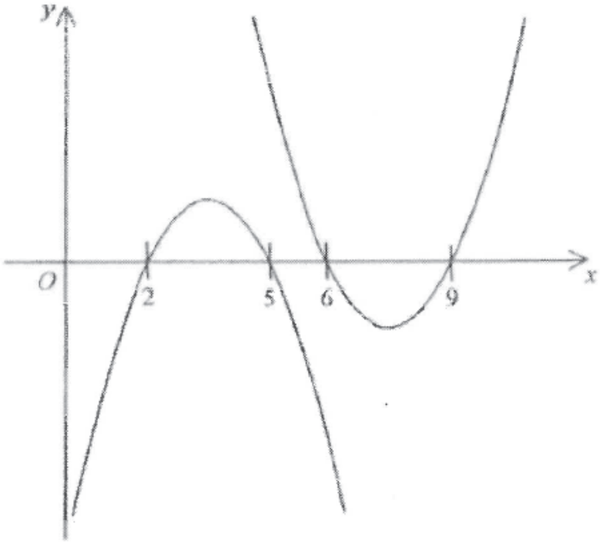


D.



[2017-DSE-MATHS 2-31]

11. Let $f(x)$ be a quadratic function. The figure below may represent the graph of $y = f(x)$ and

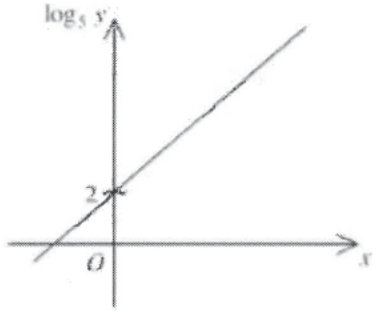


A. the graph of $y = -3f(x)$
B. the graph of $y = f(-3x)$
C. the graph of $y = -f(x+4)$
D. the graph of $y = f(-x+11)$

[2018-DSE-MATHS 2-31]

HKDSE Problems

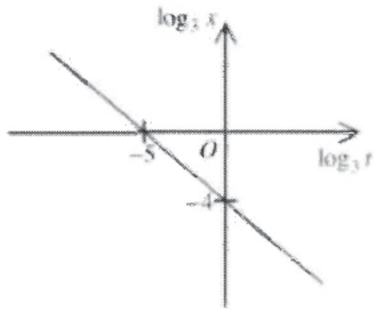
1. The graph in the figure shows the linear relation between x and $\log_5 y$. If $y = ab^x$, then $a =$



A. 1 .
B. 2 .
C. 5 .
D. 25 .

[SP-DSE-MATHS 2-32]

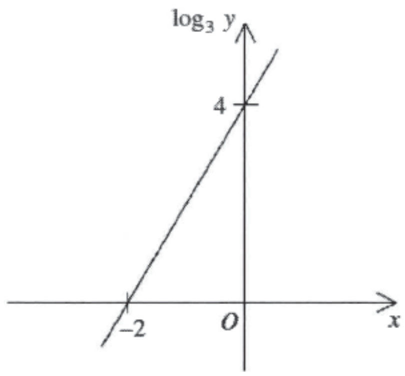
2. The graph in the figure shows the linear relation between $\log_3 t$ and $\log_3 x$. If $x = kt^a$, then $k =$



A. $\frac{1}{81}$.
B. 81 .
C. $\frac{-4}{5}$.
D. $\frac{-5}{4}$.

[PP-DSE-MATHS 2-37]

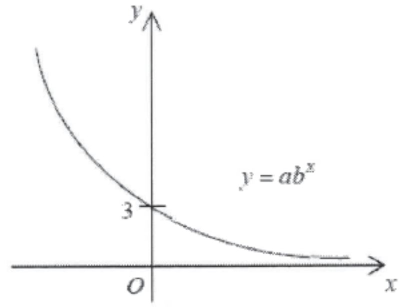
3. The graph in the figure shows the linear relation between x and $\log_3 y$. If $y = mn^x$, then $n =$



A. $\frac{1}{81}$.
B. $\frac{1}{9}$.
C. 9 .
D. 81 .

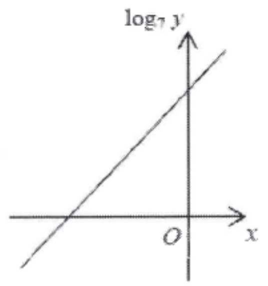
[2012-DSE-MATHS 2-32]

4.

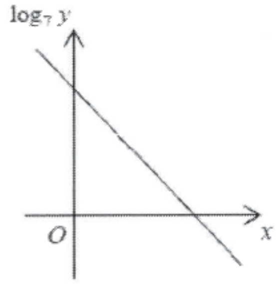


The figure above shows the graph of $y = ab^x$, where a and b are constants. Which of the following graphs may represent the relation between x and $\log_7 y$?

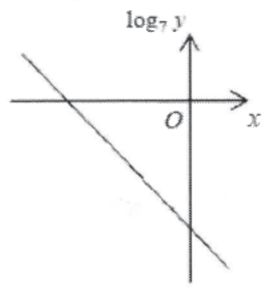
A.



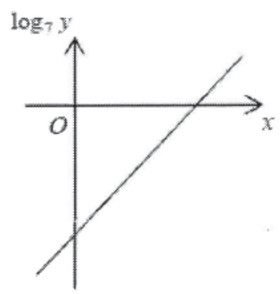
B.



C.

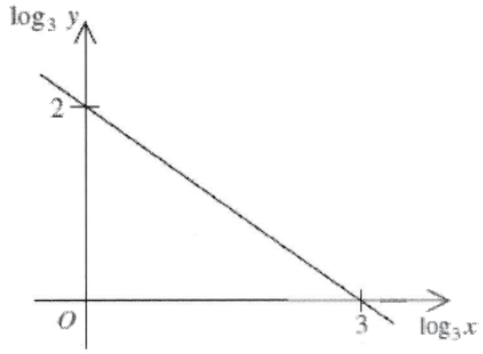


D.



[2013-DSE-MATHS 2-32]

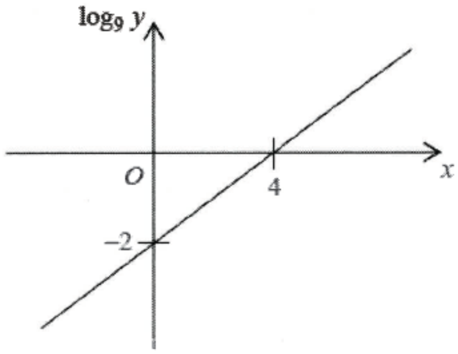
5. The graph in the figure shows the linear relation between $\log_3 x$ and $\log_3 y$. Which of the following must be true?



A. $x^2y^3 = 729$
B. $x^3y^2 = 729$
C. $x^2 + y^3 = 729$
D. $x^3 + y^2 = 729$

[2015-DSE-MATHS 2-32]

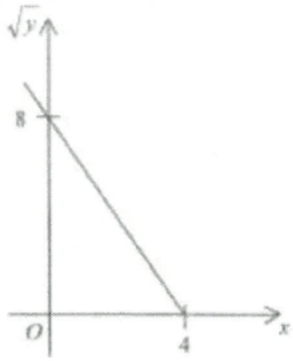
6. The graph in the figure shows the linear relation between x and $\log_9 y$. If $y = ab^x$, then $b =$



A. -2 .
B. $\frac{1}{81}$.
C. $\frac{1}{2}$.
D. 3 .

[2016-DSE-MATHS 2-32]

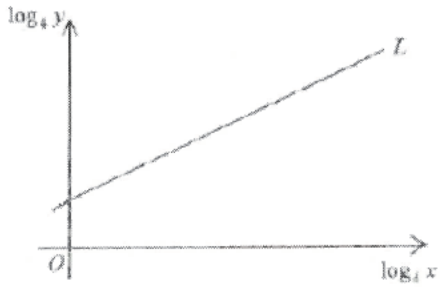
7. The graph in the figure shows the linear relation between x and $\sqrt{y}$. Which of the following must be true?



A. $y = x^2 - 4x + 8$
B. $y = x^2 + 4x + 8$
C. $y = 4x^2 - 32x + 64$
D. $y = 4x^2 + 32x + 64$

[2017-DSE-MATHS 2-33]

8. In the figure, the straight line L shows the relation between $\log_4 x$ and $\log_4 y$. It is given that L passes through the points $(1,2)$ and $(9,6)$. If $y = kx^a$, then $k =$



A. $\frac{1}{2}$
B. $\frac{3}{2}$
C. 2
D. 8

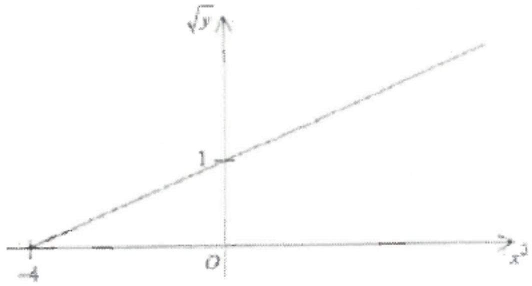
[2018-DSE-MATHS 2-33]

9. It is given that $\log_9 y$ is a linear function of $\log_3 x$. The intercepts on the vertical axis and on the horizontal axis of the graph of the linear function are 7 and 8 respectively. Which of the following must be true?

A. $x^4y^7 = 3^{56}$
B. $x^7y^4 = 3^{56}$
C. $x^7y^8 = 3^{56}$
D. $x^8y^7 = 3^{56}$

[2019-DSE-MATHS 2-31]

10. The graph in the figure shows the linear relation between x^3 and $\sqrt{y}$. If $x = 2$, $y =$



A. 3
B. 8
C. 9
D. 33

[2020-DSE-MATHS 2-34]

Surds

1. Which of the following is rational?

A. $\sqrt{12^3}$
B. $\sqrt{4} \times \sqrt{3}$
C. $\sqrt{8} \div \sqrt{2}$
D. $\sqrt{8} + \sqrt{8}$
E. $\sqrt{3} - \sqrt{2}$

[1972-CE-MATHS B1-2]

2. $\frac{\sqrt{3}-1}{\sqrt{3}+1} - \frac{\sqrt{3}+1}{\sqrt{3}-1} =$

A. $-2\sqrt{3}$.
B. $-\frac{1}{2}\sqrt{3}$.
C. $\frac{1}{2}\sqrt{3}$.
D. $2\sqrt{3}$.
E. 4 .

[1977-CE-MATHS 2-5]

3. One of the following expressions is different in value from the other four. Which one is it?

A. $.0234\sqrt{43200}$
B. $.234\sqrt{432}$
C. $2.34\sqrt{4.32}$
D. $23.4\sqrt{.432}$
E. $234\sqrt{.000432}$

[SP-CE-MATHS 2-36]

4. $\sqrt{4+4x^2} - \sqrt{1+x^2} =$

A. $1 + x$.
B. $\sqrt{1+x^2}$.
C. $3\sqrt{1+x^2}$.
D. $\sqrt{3+3x^2}$.
E. $\sqrt{3} + \sqrt{3}x$.

[SP-CE-MATHS 2-10]

5. If $(\sqrt{3}-\sqrt{2})x = 1$, then $x =$

A. $\sqrt{3} + \sqrt{2}$.
B. $\frac{1}{\sqrt{3}+\sqrt{2}}$.
C. $\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{2}}$.
D. $\frac{1}{\sqrt{3}} - \frac{1}{\sqrt{2}}$.
E. $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$.

[1984-CE-MATHS 2-6]

6. If $x + \frac{1}{x} = 1 + \sqrt{2}$, then $x^2 + \frac{1}{x^2} =$

A. 1 .
B. 3 .
C. $1 + 2\sqrt{2}$.
D. $2 + 2\sqrt{2}$.
E. $3 + 2\sqrt{2}$.

[1987-CE-MATHS 2-6]

7. If $x = \sqrt{a+1} - \sqrt{a}$, where $a > 0$, then $x + \frac{1}{x} =$

A. 2 .
B. $2\sqrt{a}$.
C. $2\sqrt{a+1}$.
D. $2\sqrt{a+1} - \sqrt{a}$.
E. $2(\sqrt{a+1} + \sqrt{a})$.

[1989-CE-MATHS 2-43]

8. $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}} =$

A. $\frac{1}{1-\sqrt{5}}$.
B. $\frac{1}{\sqrt{5}-1}$.
C. $1 + \sqrt{5}$.
D. $1 - \sqrt{5}$.
E. $-1 + \sqrt{5}$.

[1990-CE-MATHS 2-33]

9. If $(\sqrt{3}+1)\sqrt{x} = 2$, then $x =$

A. $2 - \sqrt{3}$.
B. $\sqrt{3} - 1$.
C. 1 .
D. $2(2-\sqrt{3})$.
E. $4 - \sqrt{3}$.

[1991-CE-MATHS 2-33]

10. $\frac{\sqrt{5}+1}{\sqrt{5}-1} - \frac{\sqrt{5}-1}{\sqrt{5}+1} =$

A. 0 .
B. $\frac{1}{2}$.
C. 3 .
D. $\sqrt{5}$.
E. $\frac{1}{2} + \sqrt{5}$.

[1992-CE-MATHS 2-4]

11. Simplify $\dfrac{\sqrt{b}}{\sqrt{a}-\sqrt{b}}+\dfrac{\sqrt{a}}{\sqrt{a}+\sqrt{b}}$.

A. $\dfrac{1}{\sqrt{a}-\sqrt{b}}$

B. $\dfrac{a+2\sqrt{ab}-b}{a-b}$

C. $\dfrac{\sqrt{b}+\sqrt{a}}{2\sqrt{a}}$

D. $\dfrac{b+2\sqrt{ab}-a}{a-b}$

E. $\dfrac{a+b}{a-b}$

[1993-CE-MATHS 2-4]

12. If $a=\sqrt{3}+\sqrt{2}$, then $a-\dfrac{1}{a}=$

A. 0 .

B. $2\sqrt{2}$.

C. $2\sqrt{3}$.

D. $\sqrt{3}-\sqrt{2}$.

E. $\dfrac{2\sqrt{3}}{3}+\dfrac{\sqrt{2}}{2}$.

[1994-CE-MATHS 2-4]

13. $\dfrac{1}{2+\sqrt{6}}-\dfrac{1}{2-\sqrt{6}}=$

A. $-\sqrt{6}$.

B. $-\dfrac{\sqrt{6}}{2}$.

C. 0 .

D. $\dfrac{\sqrt{6}}{2}$.

E. $\sqrt{6}$.

[1995-CE-MATHS 2-5]

14. If $(\dfrac{\sqrt{3}}{3}-\dfrac{1}{2})x=1$, then $x=$

A. $-\dfrac{\sqrt{3}}{3}+\dfrac{1}{2}$.

B. $\dfrac{\sqrt{3}}{3}+\dfrac{1}{2}$.

C. $-4\sqrt{3}-6$.

D. $4\sqrt{3}-6$.

E. $4\sqrt{3}+6$.

[1996-CE-MATHS 2-39]

15. $\dfrac{1}{\sqrt{2}-1}-\dfrac{1}{\sqrt{3}-\sqrt{2}}=$

A. $-1+\sqrt{3}$.

B. $1-\sqrt{3}$.

C. $-1+2\sqrt{2}-\sqrt{3}$.

D. $1-2\sqrt{2}+\sqrt{3}$.

E. $1+2\sqrt{2}-\sqrt{3}$.

[1997-CE-MATHS 2-29]

16. If $(\dfrac{\sqrt{5}}{2}+1)x=\sqrt{2}$, then $x=$

A. $2\sqrt{10}-2$.

B. $2\sqrt{10}-4\sqrt{2}$.

C. $2\sqrt{10}+4\sqrt{2}$.

D. $\dfrac{\sqrt{10}-1}{2}$.

E. $\dfrac{2\sqrt{10}-4\sqrt{2}}{3}$.

[2000-CE-MATHS 2-40]

17. If $(x+1)(\sqrt{3}-1)=4$, then $x=$

A. $2\sqrt{3}-3$.

B. $2\sqrt{3}+1$.

C. $2\sqrt{3}+2$.

D. $\dfrac{4\sqrt{3}-1}{2}$.

[2002-CE-MATHS 2-39]

18. $\sqrt{25a}-\sqrt{4a}=$

A. $3\sqrt{a}$.

B. $7\sqrt{a}$.

C. $21\sqrt{a}$.

D. $\sqrt{21a}$.

[2004-CE-MATHS 2-4]

19. If n is a positive integer, then $\dfrac{1}{1+2\sqrt{n}}-\dfrac{1}{1-2\sqrt{n}}=$

A. $\dfrac{4\sqrt{n}}{1-4n}$.

B. $\dfrac{-4\sqrt{n}}{1+4n}$.

C. $\dfrac{4\sqrt{n}}{4n+1}$.

D. $\dfrac{4\sqrt{n}}{4n-1}$.

[2005-CE-MATHS 2-37]

20. If $a > 0$, then $\frac{3\sqrt{a}}{2} - \frac{a}{\sqrt{4a}} =$

A. 1 .
B. $\frac{\sqrt{a}}{2}$.
C. $\sqrt{a}$.
D. $2\sqrt{a}$.

[2007-CE-MATHS 2-37]

21. If $a > 0$, then $\sqrt{49a} - \sqrt{25a} =$

A. $2\sqrt{a}$.
B. $12\sqrt{a}$.
C. $\sqrt{24a}$.
D. $\sqrt{74a}$.

[2008-CE-MATHS 2-39]

Basic Concepts

1. If a and b are greater than 1, which of the following statements is/are true?

(1) $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$
(2) $(a^{-1}+b^{-1})^{-1} = a + b$
(3) $a^2b^3 = (ab)^6$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. None of them

[1992-CE-MATHS 2-9]

Simplification of Indices

2. Which of the following is identical to $\dfrac{\left(\frac{p}{q}\right)^{-\frac{1}{3}}\left(\frac{q}{p}\right)^{2}}{p^{-\frac{2}{3}}q^{\frac{2}{3}}}$?

A. $\left(\dfrac{p}{q}\right)^{\frac{7}{3}}$
B. $(pq)^2$
C. $\left(\dfrac{q}{p}\right)^{\frac{5}{3}}$
D. $\left(\dfrac{p}{q}\right)^{\frac{2}{3}}$
E. 1

[1972-CE-MATHS B1-15]

3. $32^{-\frac{2}{5}} =$

A. -2 .
B. $\dfrac{1}{2}$.
C. $-\dfrac{1}{4}$.
D. $\dfrac{1}{4}$.
E. 4 .

[1974-CE-MATHS A1-1]

4. $\dfrac{(a-b)^{\frac{1}{2}}}{b^{\frac{1}{2}}} =$

A. $(ab-b^2)^{\frac{1}{2}}$.
B. $\left(\dfrac{a}{b}-1\right)^{\frac{1}{2}}$.
C. $\left(\dfrac{a}{b}\right)^{\frac{1}{2}} - 1$.
D. $-b^{\frac{1}{2}}(a-b)^{\frac{1}{2}}$.
E. $b^2(a-b)^{\frac{1}{2}}$.

[1977-CE-MATHS 2-13]

5. $\left(\dfrac{27}{64}\right)^{-\frac{2}{3}} =$

A. $\dfrac{3}{4}$.
B. $\dfrac{4}{3}$.
C. $\dfrac{9}{16}$.
D. $\dfrac{16}{9}$.
E. $-\dfrac{9}{16}$.

[SP-CE-MATHS A2-36]

6. $\dfrac{3^{n+2}}{9^n} =$

A. 3^2 .
B. 3^{2n} .
C. 3^{2-n} .
D. 3^{n-2} .
E. 3^{3n+2} .

[SP-CE-MATHS A2-37]

7. $\dfrac{(x^{n+1})^2}{x^{2n-1}} =$

A. x^2 .
B. x^3 .
C. x^4 .
D. x^{3-n} .
E. x^{n-3} .

[1978-CE-MATHS 2-6]

8. $(3^{a+b})^2 =$

A. 3^{a+b+2} .
B. $3^{a^2+b^2}$.
C. $3^{(a+b)^2}$.
D. 3^{2a+2b} .
E. $9^{a^2+b^2}$.

[1978-CE-MATHS A2-45]

9. $125^a \cdot 5^b =$

A. 625^{a+b} .
B. 625^{ab} .
C. 125^{a+3b} .
D. 5^{a+3b} .
E. 5^{3a+b} .

[1980-CE-MATHS 2-2]

10. $\dfrac{5^{n+2}-35(5^{n-1})}{18(5^{n+1})}=$

A. $\frac{1}{18}$.
B. $\frac{1}{15}$.
C. $\frac{1}{5}$.
D. 5.
E. 5^n.

[1980-CE-MATHS 2-8]

11. $\dfrac{(a^2b^{-3})^2}{a^{-2}b}=$

A. a^2b^{-7}.
B. a^2b^{-5}.
C. a^6b^{-2}.
D. a^6b^{-6}.
E. a^6b^{-7}.

[1981-CE-MATHS 2-1]

12. $(2^x)^x=$

A. $2^{(x^x)}$.
B. $2^x\cdot x^x$.
C. $2x^x$.
D. 2^{2x}.
E. $2^{(x^2)}$.

[1981-CE-MATHS 2-4]

13. $\dfrac{8^{2x}\cdot 4^{3x}}{2^x\cdot 16^{2x}}=$

A. 2^{3x}.
B. 2^{2x}.
C. 2^x.
D. 8.
E. 1.

[1982-CE-MATHS 2-2]

14. $(x^2y^{-1})\div(x^{\frac{1}{2}}y^{-1})^2=$

A. xy.
B. xy^{-1}.
C. xy^{-3}.
D. $x^2y^{\frac{1}{2}}$.
E. $x^{-\frac{1}{2}}y^{-2}$.

[1983-CE-MATHS 2-4]

15. $(2^{n+1})^2\times(2^{-2n-1})\div 4^n=$

A. 1.
B. 2^{2n-1}.
C. 2^{n^2+2n}.
D. 2^{n^2-2n}.
E. 2^{-2n+1}.

[1984-CE-MATHS 2-3]

16. $\dfrac{2^{n+4}-2(2^n)}{2(2^{n+3})}=$

A. $\frac{7}{8}$.
B. $\frac{7}{4}$.
C. $1-2^{n+1}$.
D. $2^{n+4}-\frac{1}{8}$.
E. 2^{n+1}.

[1988-CE-MATHS 2-1]

17. $3^{n-1}\times 3^{n+1}=$

A. 3^{n^2-1}.
B. 9^{n^2-1}.
C. 3^{2n}.
D. 6^{2n}.
E. 9^{2n}.

[1989-CE-MATHS 2-1]

18. $\sqrt{\dfrac{x}{\sqrt{x}}}=$

A. $x^{\frac{3}{4}}$.
B. $x^{\frac{1}{4}}$.
C. $x^{\frac{1}{2}}$.
D. $x^{-\frac{1}{4}}$.
E. $x^{-\frac{3}{4}}$.

[1989-CE-MATHS 2-3]

19. $(a^{2n})^3=$

A. a^{6n}.
B. a^{8n}.
C. a^{2n^3}.
D. a^{6n^3}.
E. a^{8n^3}.

[1990-CE-MATHS 2-1]

20. $(a^{2a})(3a^{4a}) =$

A. $3a^{6a}$.
B. $(3a)^{6a}$.
C. $3a^{8a}$.
D. $4a^{6a}$.
E. $(3^{4a})(a^{6a})$.

[1991-CE-MATHS 2-1]

21. Simplify $\dfrac{\overbrace{n \times n \times \ldots \times n}^{n \text{ times}}}{\underbrace{n + n + \ldots + n}_{n \text{ times}}}$.

A. n^{n-2}
B. $n^{\frac{n}{2}}$
C. $n - 2$
D. $\dfrac{n}{2}$
E. 1

[1992-CE-MATHS 2-8]

22. $(3^x)^2 =$

A. $3^{(x^2)}$.
B. 3^{x+2}.
C. 3^{2x}.
D. 6^x.
E. 9^{2x}.

[1994-CE-MATHS 2-33]

23. Simplify $\left(\dfrac{a^6}{b^{12}}\right)^{-\frac{2}{3}}$.

A. $\dfrac{b^8}{a^4}$
B. $\dfrac{b^{18}}{a^9}$
C. $\dfrac{a^4}{b^8}$
D. $\dfrac{a^9}{b^{18}}$
E. $\dfrac{1}{a^4b^{12}}$

[1995-CE-MATHS 2-4]

24. $\dfrac{27^x}{3^y} =$

A. $\dfrac{9x}{y}$.
B. $9^{\frac{x}{y}}$.
C. 9^{x-y}.
D. $3^{\frac{3x}{y}}$.
E. 3^{3x-y}.

[1996-CE-MATHS 2-2]

25. $\dfrac{(2^m)^2}{8^m} =$

A. $\dfrac{2}{3}$.
B. 2^{-m}.
C. 2^m.
D. 2^{m^2-3m}.
E. 2^{2m^2-3m}.

[1998-CE-MATHS 2-7]

26. $\dfrac{(a^3b^{-1})^{-2}}{(a^{-1}b^2)^4} =$

A. $\dfrac{1}{ab^3}$.
B. $\dfrac{1}{a^2b^3}$.
C. $\dfrac{1}{a^2b^6}$.
D. $\dfrac{1}{a^2b^9}$.
E. $\dfrac{a^4}{b^6}$.

[2000-CE-MATHS 2-3]

27. $\dfrac{a^{n-2} + a^{n-1}}{a^{n-2}} =$

A. a^{n-1}.
B. $a^{n-2}(1 + a)$.
C. $1 + a^{n-1}$.
D. $1 + \dfrac{1}{a}$.
E. $1 + a$.

[2001-CE-MATHS 2-10]

28. $2^x \cdot 8^y =$

A. 2^{x+3y}.
B. 2^{3xy}.
C. 16^{x+y}.
D. 16^{xy}.

[2002-CE-MATHS 2-3]

29. $3^x \cdot 9^y =$

A. 3^{x+2y}.
B. 3^{x+3y}.
C. 27^{x+y}.
D. 27^{xy}.

[2003-CE-MATHS 2-4]

30. $\dfrac{2^{2n} \cdot 9^n}{3^n} =$

A. 6^{2n}.
B. 6^{3n}.
C. 12^n.
D. 12^{2n}.

[2004-CE-MATHS 2-1]

31. $a \cdot a(a+a) =$

A. a^4 .
B. $2a^3$.
C. $a^3 + a$.
D. $3a^2 + a$.

[2005-CE-MATHS 2-1]

32. $(2x)^3 \cdot x^3 =$

A. $6x^6$.
B. $8x^6$.
C. $6x^9$.
D. $8x^9$.

[2006-CE-MATHS 2-1]

33. If n is a positive integer, then $3^{2n} \cdot 4^n =$

A. 6^{2n} .
B. 6^{3n} .
C. 12^{2n} .
D. 12^{3n} .

[2007-CE-MATHS 2-1]

34. $\left(\frac{1}{2}\right)^{888}(-2)^{887} =$

A. -2 .
B. -0.5 .
C. 0 .
D. 0.5 .

[2008-CE-MATHS 2-1]

35. $2^n \cdot 3^n =$

A. 5^n .
B. 6^n .
C. 8^n .
D. 9^n .

[2009-CE-MATHS 2-1]

36. $\left(\frac{1}{9}\right)^{500}(3^{500})^3 =$

A. 0 .
B. 3^{500} .
C. 6^{500} .
D. 18^{500} .

[2010-CE-MATHS 2-2]

37. If a and b are positive numbers, then $\frac{1}{\sqrt{a^3}} \div \frac{\sqrt{b}}{a} =$

A. $\frac{\sqrt{b}}{ab}$.
B. $\frac{\sqrt{ab}}{b}$.
C. $\frac{\sqrt{ab}}{ab}$.
D. $\frac{\sqrt{a^3 b}}{b}$.

[2010-CE-MATHS 2-39]

38. $5^{334}\left(\frac{-1}{5}\right)^{333} =$

A. -5 .
B. -0.2 .
C. 0 .
D. 5 .

[2011-CE-MATHS 2-1]

Equations with Indices

39. If $25^x = 125$, then $x =$

A. $\frac{5}{2}$.
B. $\frac{2}{5}$.
C. 5 .
D. $\frac{3}{2}$.
E. $\frac{2}{3}$.

[SP-CE-MATHS 2-2]

40. If $9^{2x} = 27$, then $x =$

A. $\frac{3}{2}$.
B. $\frac{1}{3}$.
C. $\frac{2}{3}$.
D. $\frac{4}{3}$.
E. $\frac{3}{4}$.

[1978-CE-MATHS 2-5]

41. If $10^{2y} = 25$, then $10^{-y} =$

A. $\frac{1}{5}$.
B. $-\frac{1}{5}$.
C. $\frac{1}{25}$.
D. $-\frac{1}{25}$.
E. $\frac{1}{125}$.

[1979-CE-MATHS 2-23]

42. If $(10^x)^y = (2^z)(5^z)$, then which of the following must be true?

A. $xy = z$
B. $xy = 2z$
C. $xy = z^2$
D. $x^y = z$
E. $x^y = 2z$

[1986-CE-MATHS 2-29]

43. If $3^{2k+1} = 3^{2k} + 6$, then $k =$

A. $-\frac{1}{4}$.
B. $-\frac{1}{2}$.
C. $\frac{1}{4}$.
D. $\frac{1}{2}$.
E. 3.

[1987-CE-MATHS 2-7]

44. If $9^{x+2} = 36$, then $3^x =$

A. $\frac{2}{3}$.
B. $\frac{4}{3}$.
C. 2.
D. $\sqrt{6}$.
E. 9.

[1993-CE-MATHS 2-34]

45. If $5^a = 2^b = 10^c$ and a, b, c are non-zero, then $\frac{c}{a} + \frac{c}{b} =$

A. $\frac{7}{10}$.
B. 1.
C. 7.
D. $\log 7$.
E. $\frac{1}{\log 2} + \frac{1}{\log 5}$.

[1995-CE-MATHS 2-38]

46. If $2^x \cdot 8^x = 64$, then $x =$

A. $\frac{3}{2}$.
B. $\frac{3}{4}$.
C. $\frac{6}{5}$.
D. 2.
E. 4.

[1997-CE-MATHS 2-2]

47. If $4^x = a$, then $16^x =$

A. $4a$.
B. a^2.
C. a^4.
D. 2^a.
E. 4^a.

[1999-CE-MATHS 2-4]

HKDSE Problems

48. $(3a)^2 \cdot a^3 =$

A. $3a^5$.
B. $6a^6$.
C. $9a^5$.
D. $9a^6$.

[SP-DSE-MATHS 2-1]

49. $\frac{(2x^4)^3}{2x^5} =$

A. $3x^2$.
B. $3x^7$.
C. $4x^7$.
D. $4x^{59}$.

[2012-DSE-MATHS 2-1]

50. $(27 \cdot 9^{n+1})^3 =$

A. 3^{6n+12}.
B. 3^{6n+15}.
C. 3^{9n+12}.
D. 6^{9n+18}.

[2013-DSE-MATHS 2-1]

51. $(2n^3)^{-5} =$

A. $\frac{1}{32n^2}$.
B. $\frac{1}{32n^{15}}$.
C. $\frac{1}{10n^{125}}$.
D. $\frac{1}{10n^{243}}$.

[2014-DSE-MATHS 2-1]

52. $\frac{(3y^6)^4}{3y^2} =$

A. $4y^5$.
B. $4y^8$.
C. $27y^{12}$.
D. $27y^{22}$.

[2015-DSE-MATHS 2-2]

53. $8^{222} \cdot 5^{666} =$

A. 10^{666} .
B. 10^{888} .
C. 40^{666} .
D. 40^{888} .

[2016-DSE-MATHS 2-1]

54. $\left(\frac{1}{9^{555}}\right) 3^{444} =$

A. 0 .
B. $\frac{1}{3^{111}}$.
C. $\frac{1}{3^{222}}$.
D. $\frac{1}{3^{666}}$.

[2017-DSE-MATHS 2-2]

55. $\frac{8^{2n+1}}{4^{3n+1}} =$

A. 1
B. 2
C. 2^n
D. 2^{-n}

[2018-DSE-MATHS 2-1]

56. $\frac{(6x^7)^2}{4x^5} =$

A. $3x^4$
B. $9x^4$
C. $3x^9$
D. $9x^9$

[2019-DSE-MATHS 2-2]

57. $\frac{6x}{(3x^{-5})^{-2}} =$

A. $54x^3$
B. $\frac{2x^3}{3}$
C. $\frac{54}{x^9}$
D. $\frac{2}{3x^9}$

[2020-DSE-MATHS 2-1]

Basic Concepts

1. If a and b are positive numbers, which of the following is/are true?

   (1) $\log_{10}(a+b) = \log_{10} a + \log_{10} b$

   (2) $\log_{10}\frac{a}{b} = \log_{10} a - \log_{10} b$

   (3) $\frac{\log_{10} a}{\log_{10} b} = \frac{a}{b}$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1983-CE-MATHS 2-36]

2. If $\log x^2 + \log y^2 = \log z^2$, where x, y and z are positive numbers, which of the following must be true?

   (1) $x^2 + y^2 = z^2$

   (2) $\log x + \log y = \log z$

   (3) $x^2y^2 = z^2$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (2) and (3) only

   [1986-CE-MATHS 2-33]

3. If $\log a > 0$ and $\log b < 0$, which of the following is/are true?

   (1) $\log\frac{a}{b} > 0$

   (2) $\log b^2 > 0$

   (3) $\log\frac{1}{a} > 0$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (2) and (3) only

   [1988-CE-MATHS 2-35]

Logarithmic Expressions

4. $10^{\log_{10} b} =$

   A. $(\log_{10} b)^2$.
   B. $\log_{10}(\log_{10} b)$.
   C. $\log_{10} b$.
   D. b.
   E. $10\log_{10} b$.

   [1974-CE-MATHS A1-16]

5. If $3^x = 8$, then $x =$

   A. $\frac{8}{3}$.
   B. $\frac{\log 8}{3}$.
   C. $\log\frac{8}{3}$.
   D. $\log 5$.
   E. $\frac{\log 8}{\log 3}$.

   [1977-CE-MATHS 2-15]

6. If $\log a = 0.0490$, then $\log\frac{1}{a} =$

   A. $\frac{1}{0.0490}$.
   B. -0.9510.
   C. -1.9510.
   D. -0.0490.
   E. -1.0490.

   [SP-CE-MATHS 2-12*]

7. $\log_{10}(0.1) =$

   A. -2.
   B. -1.
   C. 0.
   D. 1.
   E. 2.

   [SP-CE-MATHS A2-38]

8. If $\log a = 0.5678$, then $\log\sqrt{a} =$

   A. $\sqrt{0.5678}$.
   B. $0.5678 \div 2$.
   C. $0.5678 - 2$.
   D. $2 - 0.5678$.
   E. 2.5678.

   [1978-CE-MATHS 2-2]

9. What is $\frac{\log_{10} 5}{\log_{10} 3}$ equal to?

   A. $\frac{5}{3}$
   B. $\log_{10}(5-3)$
   C. $\log_{10} 5 - \log_{10} 3$
   D. $\log_{10}(\frac{5}{3})$
   E. None of the above

   [1979-CE-MATHS 2-14]

10. If $n = 10^a$, then $\log_{10} n =$

    A. 10^a.
    B. 10^n.
    C. n^a.
    D. a^n.
    E. a.

    [1980-CE-MATHS 2-4]

11. If $\log_{10} x + \log_{10} 4 = \log_{10}(x+4)$, what is the value of x?

A. 0
B. 1
C. $\frac{4}{3}$
D. 4
E. x may be any positive number

[1981-CE-MATHS 2-8]

12. $\log_{10}(x^{\log_{10} x}) =$

A. $(\log_{10} x)^2$.
B. $\log_{10}(x^2)$.
C. $x\log_{10} x$.
D. $\log_{10}(\log_{10} x)$.
E. 10^{-2}.

[1982-CE-MATHS 2-30]

13. $\log_{10}(a^2 - b^2) =$

A. $\frac{\log_{10} a}{\log_{10} b}$.
B. $2\log_{10}(a-b)$.
C. $2\log_{10} a - 2\log_{10} b$.
D. $\log_{10}(a+b) + \log_{10}(a-b)$.
E. $(\log_{10} a + \log_{10} b)(\log_{10} a - \log_{10} b)$.

[1985-CE-MATHS 2-8]

14. $\log_4 2\sqrt{2} =$

A. $\frac{3}{8}$.
B. $\frac{3}{4}$.
C. $\frac{1}{4}$.
D. $2^{\frac{3}{4}}$.
E. $2^{\frac{3}{8}}$.

[1989-CE-MATHS 2-42]

15. If $2 = 10^p$, $3 = 10^q$, express $\log\frac{1}{6}$ in terms of p and q.

A. $-p-q$
B. $\frac{1}{pq}$
C. $\frac{1}{p+q}$
D. pq
E. $p+q$

[1990-CE-MATHS 2-5]

16. If $\log x : \log y = m : n$, then $x =$

A. $\frac{my}{n}$.
B. $(m-n)y$.
C. $m-n+y$.
D. $y^{\frac{m}{n}}$.
E. $\frac{m\log y}{n}$.

[1991-CE-MATHS 2-34]

17. If $\log_{10} b = 1 + \frac{1}{2}\log_{10} a$, then $b =$

A. $10\sqrt{a}$.
B. $10+\sqrt{a}$.
C. $5a$.
D. $\frac{a}{2}$.
E. $1+\frac{a}{2}$.

[1992-CE-MATHS 2-5]

18. If $\log(p+q) = \log p + \log q$, then

A. $p = q = 1$.
B. $p = \frac{q}{q-1}$.
C. $p = \frac{q}{q+1}$.
D. $p = \frac{q+1}{q}$.
E. $p = \frac{q-1}{q}$.

[1993-CE-MATHS 2-8]

19. If $\log 2 = a$ and $\log 9 = b$, then $\log 12 =$

A. $2a + \frac{b}{3}$.
B. $2a + \frac{b}{2}$.
C. $\frac{2}{3}a + \frac{2}{3}b$.
D. $a^2 + b^{\frac{1}{2}}$.
E. $a^2 b^{\frac{1}{2}}$.

[1994-CE-MATHS 2-34]

20. Let $x > y > 0$. If $\log(x+y) = a$ and $\log(x-y) = b$, then $\log\sqrt{x^2-y^2} =$

A. $\frac{a+b}{2}$.
B. $\frac{ab}{2}$.
C. $\sqrt{a+b}$.
D. $\sqrt{ab}$.
E. $\sqrt{a}+\sqrt{b}$.

[1996-CE-MATHS 2-38]

21. If $\log(x+a) = 2$, then $x =$

A. $2 - a$.
B. $100 - a$.
C. $\frac{100}{a}$.
D. $2 - \log a$.
E. $100 - \log a$.

[1997-CE-MATHS 2-5]

22. Suppose $\log_{10} 2 = a$ and $\log_{10} 3 = b$. Express $\log_{10} 15$ in terms of a and b.

A. $-a + b + 1$
B. $-a + 10b$
C. $a + 2b$
D. $(a+b)b$
E. $\frac{10b}{a}$

[1998-CE-MATHS 2-40]

23. If $\frac{1}{2}\log y = 1 + \log x$, then

A. $y = \sqrt{10x}$.
B. $y = 100 + x^2$.
C. $y = (10+x)^2$.
D. $y = 10x^2$.
E. $y = 100x^2$.

[1999-CE-MATHS 2-39]

24. If $\log(x-a) = 3$, then $x =$

A. 3^{3+a}.
B. a^3.
C. $1000a$.
D. $1000 + a$.
E. $30 + a$.

[2000-CE-MATHS 2-38]

25. If $\log x^2 = (\log x)^2$, then $x =$

A. 1.
B. 10.
C. 100.
D. 1 or 10.
E. 1 or 100.

[2001-CE-MATHS 2-37]

26. If $\log x^2 = \log 3x + 1$, then $x =$

A. 2.
B. 5.
C. 30.
D. 0 or 30.

[2002-CE-MATHS 2-40]

27. If $10^{a+b} = c$, then $b =$

A. $\log c - a$.
B. $a - \log c$.
C. $\frac{c}{10} - a$.
D. $c - 10^a$.

[2003-CE-MATHS 2-40]

28. If $5 = 10^a$ and $7 = 10^b$, then $\log \frac{7}{50} =$

A. $b - a - 1$.
B. $b - a + 1$.
C. $\frac{b}{a}$.
D. $\frac{b}{a+1}$.

[2004-CE-MATHS 2-39]

29. If a and b are positive integers, then $\log(a^b b^a) =$

A. $ab\log(ab)$.
B. $ab(\log a)(\log b)$.
C. $(a+b)\log(a+b)$.
D. $b\log a + a\log b$.

[2005-CE-MATHS 2-39]

30. Let a and b be positive numbers. If $\log\frac{a}{10} = 2\log b$, then $a =$

A. $10b^2$.
B. $20b$.
C. $b^2 + 10$.
D. $2b + 10$.

[2006-CE-MATHS 2-38]

Application of Logarithm

31. Which of the following is the greatest?

A. 500^{3000}
B. $2\,000^{2500}$
C. $2\,500^{2000}$
D. $3\,000^{500}$

[2007-CE-MATHS 2-39]

32. Which of the following is the best estimate of 1234^{3235}?

A. 10^{4000}
B. 10^{5000}
C. 10^{10000}
D. 10^{20000}

[2009-CE-MATHS 2-38]

33. Which of the following is the least?

A. 1234^{1811}
B. 2345^{1711}
C. 3456^{1511}
D. 7890^{1411}

[2011-CE-MATHS 2-39]

HKDSE Problems

34. Let $b > 1$. If $a = \log_{12} b$, then $\frac{1}{a} =$

A. $\log_b \frac{1}{12}$.
B. $\log_b 12$.
C. $\log_{12} \frac{1}{b}$.
D. $\frac{1}{\log_b 12}$.

[PP-DSE-MATHS 2-36]

35. If $x - \log y = x^2 - \log y^2 - 10 = 2$, then $y =$

A. 100.
B. 2 or -4.
C. $\frac{1}{100}$ or $10\,000$.
D. $\frac{1}{10\,000}$ or 100.

[2013-DSE-MATHS 2-34]

36. Which of the following is the greatest?

A. 124^{241}
B. 241^{214}
C. 412^{142}
D. 421^{124}

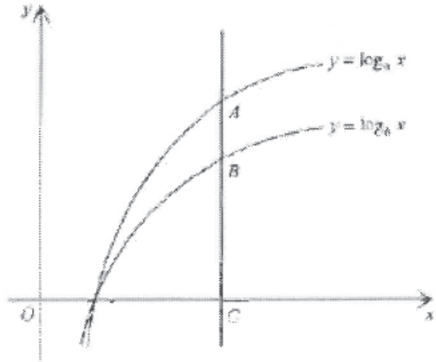
[2014-DSE-MATHS 2-33]

37. If $\begin{cases} \log_9 y = x - 3 \\ 2(\log_9 y)^2 = 4 - x \end{cases}$, then $y =$

A. -1 or $\frac{1}{2}$.
B. 1 or $\frac{1}{3}$.
C. 2 or $\frac{7}{2}$.
D. 3 or $\frac{1}{9}$.

[2017-DSE-MATHS 2-34]

38. The figure shows the graph of $y = \log_a x$ and the graph of $y = \log_b x$ on the same rectangular coordinate system, where a and b are positive constant. If a vertical line cuts the graph of $y = \log_a x$, the graph of $y = \log_b x$ and the x-axis at the points A, B and C respectively, which of the following is/are true?



I. $a > 1$
II. $a > b$
III. $\frac{AB}{BC} = \log_a \frac{b}{a}$

A. I only
B. II only
C. I and III only
D. II and III only

[2018-DSE-MATHS 2-32]

39. If $\frac{3}{3\log x - 2} + 7 = \frac{2}{2\log x + 1}$, then $\log \frac{1}{x} =$

A. -3 or 2
B. -2 or 3
C. $-\frac{1}{3}$ or $\frac{1}{2}$
D. $-\frac{1}{2}$ or $\frac{1}{3}$

[2019-DSE-MATHS 2-32]

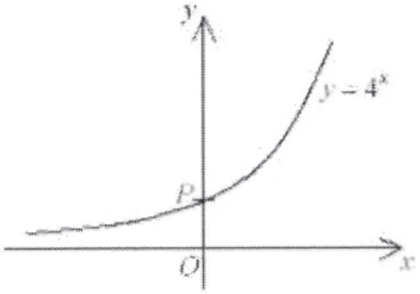
40. If the roots of the equation $(\log_\pi x)^2 - 10\log_\pi x + 24 = \log_\pi x$ are α and β, then $\alpha\beta =$

A. π^{10}
B. π^{11}
C. $\log_\pi 10$
D. $\log_\pi 11$

[2020-DSE-MATHS 2-32]

Exponential Graphs

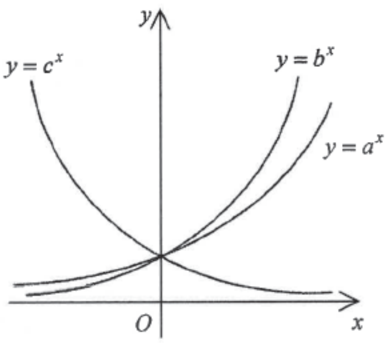
1. The figure shows the graph of $y = 4^x$. The coordinates of P are



A. (1, 0).
B. (0, 1).
C. (4, 0).
D. (0, 4).

[2006-CE-MATHS 2-37]

2.



The figure shows the graph of $y = a^x$, the graph of $y = b^x$ and the graph of $y = c^x$ on the same rectangular coordinate system, where a, b and c are positive constants. Which of the following must be true?

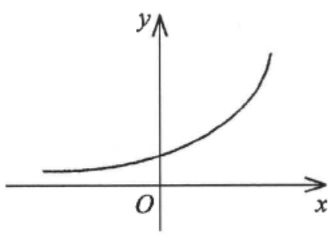
(1) $a > b$
(2) $b > c$
(3) $a > 1$
(4) $c > 1$

A. (1) and (3) only
B. (1) and (4) only
C. (2) and (3) only
D. (2) and (4) only

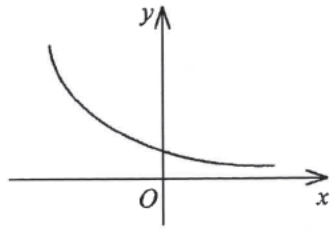
[2008-CE-MATHS 2-38]

3. Which of the following may represent the graph of $y = -3^{-x}$?

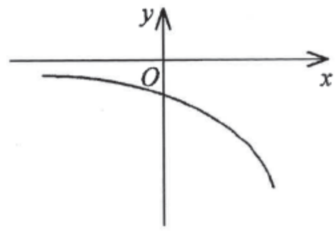
A.



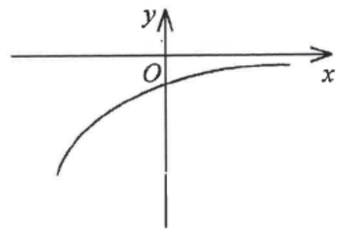
B.



C.

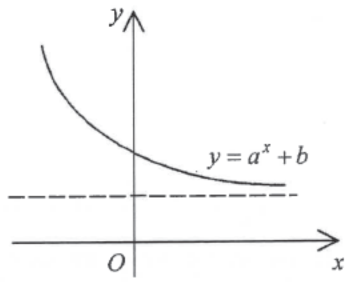


D.



[2009-CE-MATHS 2-39]

4.

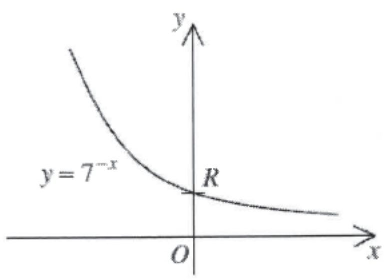


The figure shows the graph of $y = a^x + b$, where a and b are constants. Which of the following must be true?

A. $0 < a < 1$ and $b > 0$
B. $0 < a < 1$ and $b < 0$
C. $a > 1$ and $b > 0$
D. $a > 1$ and $b < 0$

[2010-CE-MATHS 2-38]

5. The figure shows the graph of $y = 7^{-x}$. The coordinates of R are

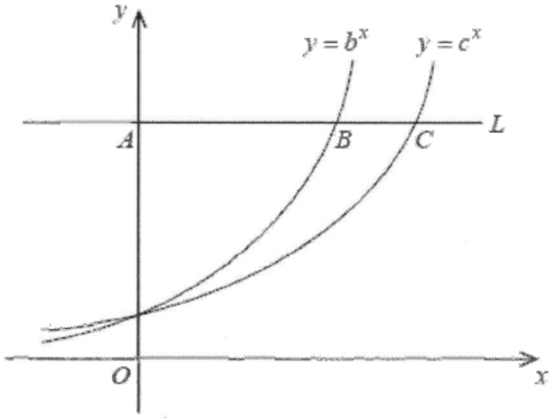


A. (1, 0).
B. (0, 1).
C. (7, 0).
D. (0, 7).

[2011-CE-MATHS 2-38]

HKDSE Problems

6. The figure shows the graph of $y = b^x$ and the graph of $y = c^x$ on the same rectangular coordinate system, where b and c are positive constants. If a horizontal line L cuts the y-axis, the graph of $y = b^x$ and the graph of $y = c^x$ at A, B and C respectively, which of the following are true?

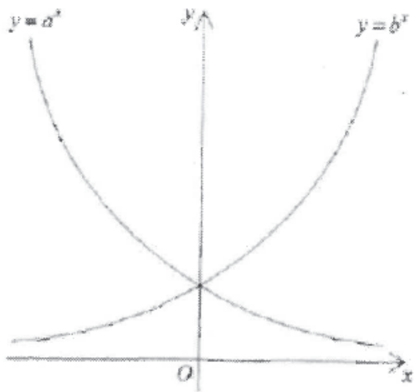


(1) $b < c$
(2) $bc > 1$
(3) $\frac{AB}{AC} = \log_b c$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2014-DSE-MATHS 2-32]

7. The figure shows the graph of $y = a^x$ and the graph of $y = b^x$ on the same rectangular coordinate system, where a and b are positive constants. If the graph of $y = a^x$ is the reflection image of the graph of $y = b^x$ with respect to the y-axis, which of the following are true?



I. $a < 1$
II. $b > 1$
III. $ab = 1$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III only

[2020-DSE-MATHS 2-33]

Change of Subjects

1. If $\frac{1}{p} = \frac{1}{q} - \frac{1}{\sqrt{r}}$, then r is equal to

A. $\left(\frac{pq}{p+q}\right)^2$.

B. $\left(\frac{pq}{p-q}\right)^2$.

C. $\left(\frac{p-q}{pq}\right)^2$.

D. $\sqrt{\frac{q-p}{pq}}$.

E. $\sqrt{\frac{pq}{p-q}}$.

[1972-CE-MATHS B1-14]

2. If $\frac{p}{mc} = \frac{v}{\sqrt{c^2 - v^2}}$, then $v =$

A. $\pm\frac{pc}{mc+p}$.

B. $\pm\frac{pc}{mc-p}$.

C. $\pm\frac{pc}{\sqrt{m^2c^2-p^2}}$.

D. $\pm\frac{pc}{\sqrt{m^2c^2+p^2}}$.

E. $\pm\frac{p^2c^2}{m^2c^2+p^2}$.

[1977-CE-MATHS 2-10]

3. If $y = \frac{a \pm \sqrt{bx-c}}{2}$, then $x =$

A. $\frac{4y^2 - a^2}{b} + c$.

B. $\frac{4y^2 - a^2 + c}{b}$.

C. $\frac{4(y-a)^2 + c}{b}$.

D. $\frac{(2y-a)^2 - c}{b}$.

E. $\frac{(2y-a)^2 + c}{b}$.

[SP-CE-MATHS 2-9]

4. If $d = \frac{-1 \pm \sqrt{1-4ac}}{2a}$, then $c =$

A. $4a^2d^2$.

B. $-ad^2$.

C. $ad^2 - d$.

D. $-ad^2 + d$.

E. $-ad^2 - d$.

[1978-CE-MATHS 2-17]

5. If $x = \frac{ab}{a-b}$, then $a =$

A. $\frac{x-b}{bx}$.

B. $\frac{bx}{x-b}$.

C. $\frac{bx}{b-x}$.

D. $\frac{bx}{b+x}$.

E. $\frac{b}{x-b}$.

[1979-CE-MATHS 2-4]

6. If $P(1+k)^n = Q$, then $k =$

A. $(\frac{Q}{P})^{\frac{1}{n}} - 1$.

B. $(\frac{P}{Q})^{-n} - 1$.

C. $(\frac{Q}{P})^{-n} - 1$.

D. $1 - (\frac{Q}{P})^{-n}$.

E. $1 - (\frac{Q}{P})^{\frac{1}{n}}$.

[1979-CE-MATHS 2-25]

7. If $x = \frac{y + (n-1)z}{n+1}$, then $n =$

A. $\frac{x-y+z}{z}$.

B. $\frac{x+y-z}{z}$.

C. $\frac{y-x-z}{x+z}$.

D. $\frac{y-x-z}{x-z}$.

E. $\frac{y+x-z}{x-z}$.

[1980-CE-MATHS 2-7]

8. If $x = \frac{-bx + ay - c}{a + by}$, then $y =$

A. $\frac{ax+bx+c}{a-bx}$.

B. $-\frac{ax+bx+c}{a-bx}$.

C. $\frac{ax+bx+c}{a+bx}$.

D. $-\frac{ax+bx+c}{a+bx}$.

E. $\frac{ax-bx-c}{a-bx}$.

[1981-CE-MATHS 2-3]

9. If $H = K + \dfrac{M}{4\pi(r^2+\ell^2)^n}$ and $r > 0$, then $r =$

A. $\left\{\left[\dfrac{M}{4\pi(H-K)}\right]^{-n} - \ell^2\right\}^{\frac{1}{2}}$.

B. $\left[\dfrac{M}{4\pi(H-K)}\right]^{-\frac{n}{2}} - \ell$.

C. $\left\{\left[\dfrac{M}{4\pi(H-K)}\right]^{\frac{1}{n}} - \ell^2\right\}^{\frac{1}{2}}$.

D. $\left[\dfrac{M}{4\pi(H-K)}\right]^{\frac{1}{2n}} - \ell$.

E. $\left\{\left[\dfrac{4\pi}{M(H-K)}\right]^{\frac{1}{n}} - \ell^2\right\}^{\frac{1}{2}}$.

[1981-CE-MATHS 2-6]

10. If $x = \dfrac{1}{\dfrac{1}{y} + \dfrac{2}{z}}$, then $y =$

A. $\dfrac{2x}{z}$.

B. $\dfrac{z}{xz - z}$.

C. $\dfrac{z-2x}{xz}$.

D. $\dfrac{xz}{2x+z}$.

E. $\dfrac{xz}{z-2x}$.

[1982-CE-MATHS 2-4]

11. If $10^{kx+a} = P$, then $x =$

A. $\dfrac{1}{k}(10^{P-a})$.

B. $\log_{10}\dfrac{P-a}{k}$.

C. $\dfrac{1}{k}\log_{10}P - a$.

D. $\dfrac{1}{k}(\log_{10}P - a)$.

E. $\dfrac{1}{k}(\log_{10}P + a)$.

[1982-CE-MATHS 2-5]

12. If $x = \dfrac{y^2}{\sqrt{a^2+bz}}$, then $z =$

A. $\dfrac{1}{b}(\dfrac{y^4}{x^2} - a^2)$.

B. $\dfrac{1}{b}(\dfrac{x^2}{y^4} - a^2)$.

C. $\dfrac{1}{b}(a^2 - \dfrac{x^2}{y^4})$.

D. $\dfrac{1}{b}(a^2 - \dfrac{y^4}{x^2})$.

E. $\dfrac{1}{b}(a^2 - \dfrac{x^2}{y^2})$.

[1983-CE-MATHS 2-3]

13. If $a = \dfrac{2b(2y-x)}{x-3y}$, then $y =$

A. $\dfrac{a+2b}{3a+4b}x$.

B. $\dfrac{a-2b}{-3a+4b}x$.

C. $-\dfrac{a+2b}{3a+4b}x$.

D. $\dfrac{3a+4b}{a+2b}x$.

E. $\dfrac{-3a+4b}{a-2b}x$.

[1984-CE-MATHS 2-2]

14. If $\dfrac{ab}{ka+b} = \dfrac{1}{k}$, then $b =$

A. $\dfrac{a}{a-k}$.

B. $\dfrac{ka}{ka-1}$.

C. $\dfrac{ka}{1-ka}$.

D. $\dfrac{k^2a}{a-k}$.

E. $\dfrac{k^2a}{k-a}$.

[1985-CE-MATHS 2-3]

15. If $a - \sqrt{b^2+c^2} = d$, then $c =$

A. $d - a + b$.
B. $a - d - b$.
C. $\pm\sqrt{d^2 - a^2 + b^2}$.
D. $\pm\sqrt{a^2 - d^2 - b^2}$.
E. $\pm\sqrt{(a-d)^2 - b^2}$.

[1985-CE-MATHS 2-5]

16. If $1 - \dfrac{x+y}{y-x} = a \quad (a \neq 0)$, then $y =$

A. x.

B. $\dfrac{x}{a}(a-2)$.

C. $\dfrac{x}{a}(a-1)$.

D. $\dfrac{x}{a}(2-a)$.

E. $\dfrac{x}{a}(1-a)$.

[1986-CE-MATHS 2-3]

17. If $a = \dfrac{b + 3cd}{b - 3cd}$, then $c =$

A. $\dfrac{a}{6d}$.

B. $\dfrac{b}{3d}$.

C. $\dfrac{b(a-1)}{6d}$.

D. $\dfrac{b(a+1)}{a-1}$.

E. $\dfrac{b(a-1)}{3d(a+1)}$.

[1987-CE-MATHS 2-3]

18. If $x = \dfrac{1+y}{1-y}$, then $y =$

A. $\dfrac{x-1}{x}$.

B. $\dfrac{1+x}{1-x}$.

C. $\dfrac{x+1}{x-1}$.

D. $\dfrac{x-1}{x+1}$.

E. $\dfrac{1-x}{1+x}$.

[1988-CE-MATHS 2-2]

19. If $x = \dfrac{ab+1}{a-b}$, then $b =$

A. $\dfrac{ax-1}{a+x}$.

B. $\dfrac{ax-1}{a-x}$.

C. $\dfrac{1-ax}{a+x}$.

D. $\dfrac{1-ax}{a-x}$.

E. $\dfrac{ax+1}{a-x}$.

[1990-CE-MATHS 2-3]

20. If $y = \sqrt{\dfrac{1+mx}{1-mx}}$, then $x =$

A. $\dfrac{m(y-1)}{y+1}$.

B. $\dfrac{y-1}{m(y+1)}$.

C. $\dfrac{1-y^2}{m(1+y^2)}$.

D. $\dfrac{m(y^2-1)}{y^2+1}$.

E. $\dfrac{y^2-1}{m(y^2+1)}$.

[1991-CE-MATHS 2-4]

21. If $a = 1 - \dfrac{1}{1-b}$, then $b =$

A. $1 - \dfrac{1}{1-a}$.

B. $1 - \dfrac{1}{1+a}$.

C. $1 + \dfrac{1}{1-a}$.

D. $1 + \dfrac{1}{1+a}$.

E. $-1 + \dfrac{1}{1-a}$.

[1992-CE-MATHS 2-2]

22. If $s = \dfrac{n}{2}[2a + (n-1)d]$, then $d =$

A. $\dfrac{2(s-an)}{n(n-1)}$.

B. $\dfrac{2(s-an)}{n-1}$.

C. $\dfrac{s}{n(n-1)}$.

D. $\dfrac{as-n}{a(n-1)}$.

E. $\dfrac{4(s-an)}{n(n-1)}$.

[1993-CE-MATHS 2-2]

23. If $y = \dfrac{2x-1}{x+2}$, then $x =$

A. $\dfrac{1+3y}{2}$.

B. $\dfrac{1+2y}{2+y}$.

C. $\dfrac{1+2y}{2-y}$.

D. $\dfrac{1-2y}{2+y}$.

E. $\dfrac{1-2y}{2-y}$.

[1994-CE-MATHS 2-2]

24. If $\dfrac{x+y}{xy} = 1$, then $y =$

A. $\dfrac{1-x}{x}$.

B. $\dfrac{x-1}{x}$.

C. $\dfrac{x}{1-x}$.

D. $\dfrac{x}{x-1}$.

E. $\dfrac{1-x}{1+x}$.

[1995-CE-MATHS 2-2]

25. If $A = 2\pi r^2 + 2\pi rh$, then $h =$

A. $A - r$.
B. $\frac{A}{r}$.
C. $\frac{A}{2\pi r} - r$.
D. $r - \frac{A}{2\pi r}$.
E. $\frac{A}{2\pi r} - 2\pi r^2$.

[1996-CE-MATHS 2-4]

26. If $\frac{a+x}{b+x} = \frac{c}{d}$ $(c \neq d)$, then $x =$

A. $\frac{c}{d} - \frac{a}{b}$.
B. $\frac{a-b}{c-d}$.
C. $\frac{b-a}{c-d}$.
D. $\frac{ad-bc}{c-d}$.
E. $\frac{bc-ad}{c-d}$.

[1997-CE-MATHS 2-3]

27. If $x = \frac{y(z-3)}{3z}$, then $z =$

A. $\frac{3}{3x-y}$.
B. $\frac{-3}{3x-y}$.
C. $\frac{3y}{3x-y}$.
D. $\frac{-3y}{3x-y}$.
E. $\frac{3x-y}{3y}$.

[1998-CE-MATHS 2-1]

28. If $a = \frac{1+b}{1-b}$, then $b =$

A. $\frac{a-1}{2}$.
B. $\frac{a-1}{2a}$.
C. $\frac{a+1}{a-1}$.
D. $\frac{a-1}{a+1}$.
E. $\frac{1-a}{a+1}$.

[1999-CE-MATHS 2-3]

29. If $A = \frac{h}{2}(a+b)$, then $b =$

A. $2A - ah$.
B. $\frac{2}{h}(A-a)$.
C. $\frac{2A-a}{h}$.
D. $a - \frac{2A}{h}$.
E. $\frac{2A}{h} - a$.

[2000-CE-MATHS 2-1]

30. If $a = 2 - \frac{1}{1+b}$, then $b =$

A. $\frac{1-a}{a-2}$.
B. $\frac{a-1}{a-2}$.
C. $\frac{a+1}{a-2}$.
D. $\frac{-a-3}{a-2}$.
E. $\frac{1-a}{a}$.

[2001-CE-MATHS 2-1]

31. If $\frac{x}{1+x} = \frac{a}{1-a}$, then $x =$

A. a.
B. $\frac{2a}{1-a}$.
C. $\frac{a}{1+2a}$.
D. $\frac{a}{1-2a}$.

[2002-CE-MATHS 2-1]

32. If $a = \frac{b-1}{b-2}$, then $b =$

A. $\frac{2a-1}{a-1}$.
B. $\frac{2a-1}{a+1}$.
C. $\frac{1}{a-1}$.
D. $\frac{1}{a+1}$.

[2003-CE-MATHS 2-3]

33. If $x = \dfrac{y-2x}{2y}$, then $y =$

A. $\dfrac{2x}{1-2x}$.

B. $\dfrac{2x}{2x-1}$.

C. $\dfrac{1-2x}{2x}$.

D. $\dfrac{2x-1}{2x}$.

[2004-CE-MATHS 2-2]

34. If $a = 1 - 2b$, then $b =$

A. $\dfrac{a-1}{2}$.

B. $\dfrac{a+1}{2}$.

C. $\dfrac{-1-a}{2}$.

D. $\dfrac{1-a}{2}$.

[2005-CE-MATHS 2-2]

35. If $2x - 5y = 7$, then $y =$

A. $\dfrac{5}{2x-7}$.

B. $\dfrac{5}{2x+7}$.

C. $\dfrac{2x-7}{5}$.

D. $\dfrac{2x+7}{5}$.

[2006-CE-MATHS 2-2]

36. If $m = 7 - 3n$, then $n =$

A. $\dfrac{7-m}{3}$.

B. $\dfrac{7+m}{3}$.

C. $\dfrac{3}{7-m}$.

D. $\dfrac{3}{7+m}$.

[2008-CE-MATHS 2-2]

37. If $P = \dfrac{VT}{R} - 2$, then $T =$

A. $\dfrac{P}{V} + 2R$.

B. $\dfrac{RP+2}{V}$.

C. $R\left(\dfrac{P}{V}+2\right)$.

D. $\dfrac{R(P+2)}{V}$.

[2009-CE-MATHS 2-2]

38. If $x = \dfrac{3a}{a+2b}$, then $a =$

A. $\dfrac{2b}{3-x}$.

B. $\dfrac{2b}{x-3}$.

C. $\dfrac{2bx}{3-x}$.

D. $\dfrac{2bx}{x-3}$.

[2010-CE-MATHS 2-1]

39. If $\dfrac{2+a}{a} = \dfrac{2-x}{x}$, then $x =$

A. $\dfrac{a}{1+a}$.

B. $\dfrac{2a}{1+a}$.

C. $\dfrac{a}{2+a}$.

D. $\dfrac{2a}{2+a}$.

[2011-CE-MATHS 2-2]

Manipulation of Formula

40. If $x^2 + y^2 = m$ and $x - y = n$, then $xy =$

A. $\dfrac{1}{2}(m-n^2)$.

B. $m - n^2$.

C. $\dfrac{1}{2}(n^2-m)$.

D. $n^2 - \dfrac{m}{2}$.

E. $m - \dfrac{n}{2}$.

[1977-CE-MATHS 2-16]

41. If $x^2 + x + 1 = 4$, then $-x^2 - x + 1 =$

A. 0.

B. -2.

C. -3.

D. -4.

E. -5.

[SP-CE-MATHS 2-1]

42. If $2a = 3b$, then $\frac{2a^2}{3b^2} =$

A. $\frac{9}{4}$.
B. $\frac{3}{2}$.
C. 1.
D. $\frac{2}{3}$.
E. $\frac{8}{27}$.

[SP-CE-MATHS 2-3]

43. If $x + y = a$ and $xy = b$, then $(x - y)^2 =$

A. $a^2 - 4b$.
B. $a^2 - 2b$.
C. $a^2 - b$.
D. $a^2 + 2b$.
E. $a^2 + b^2$.

[SP-CE-MATHS 2-11]

44. If $x + y = 2a$ and $x - y = 2b$, then $x^2 + y^2 =$

A. $4ab$.
B. $a^2 - b^2$.
C. $2(a^2 - b^2)$.
D. $2(a^2 + b^2)$.
E. $4(a^2 + b^2)$.

[1978-CE-MATHS 2-18]

45. If $4p = 9q$, then $\frac{4p^2}{9q^2} =$

A. 1.
B. $\frac{4}{9}$.
C. $\frac{9}{4}$.
D. $\left(\frac{9}{4}\right)^2$.
E. $\left(\frac{4}{9}\right)^3$.

[1980-CE-MATHS 2-3]

46. If $\frac{1}{x} = a + b$ and $\frac{1}{y} = a - b$, then $x + y =$

A. $\frac{2}{a}$.
B. $\frac{a^2 - b^2}{a}$.
C. $-\frac{a^2 - b^2}{b}$.
D. $\frac{2a}{a^2 - b^2}$.
E. $\frac{-2b}{a^2 - b^2}$.

[1980-CE-MATHS 2-6]

47. If the value of $y^2 + 3y + 7$ is 2, what is the value of $2y^2 + 6y - 3$?

A. -13
B. -7
C. 7
D. 14
E. it cannot be found from the information given

[1980-CE-MATHS 2-29]

48. If $\frac{1}{x} - \frac{1}{y} = \frac{1}{z}$, and $x = \frac{1}{2}$, $z = \frac{1}{3}$, then $y =$

A. -1.
B. 1.
C. 5.
D. 6.
E. $\frac{1}{6}$.

[1987-CE-MATHS 2-2]

49. If $x^2 + y^2 = 5$ and $x + y = 3$, then $x - y =$

A. 1.
B. -1.
C. 1 or -1.
D. 1 or -5.
E. -1 to 5.

[1987-CE-MATHS 2-38]

50. If $\frac{x + 3y}{2x + y} = 2$, find $\frac{3x + y}{x + 2y}$.

A. 2
B. 3
C. $\frac{1}{2}$
D. $\frac{1}{3}$
E. $\frac{6}{7}$

[1989-CE-MATHS 2-40]

51. If $9a^2 - b^2 = 0$ and $ab < 0$, then $\frac{a - b}{a + b} =$

A. -2.
B. $-\frac{1}{2}$.
C. 0.
D. $\frac{1}{2}$.
E. 2.

[2000-CE-MATHS 2-34]

52. If $\frac{x+3y}{2x-y} = \frac{2}{3}$, then $\frac{x-y}{x+y} =$

A. $-\frac{5}{6}$.
B. $-\frac{3}{5}$.
C. $\frac{3}{5}$.
D. $\frac{3}{4}$.
E. $\frac{5}{6}$.

[2001-CE-MATHS 2-28]

53. If $2x = 3y = 4z$, then $\frac{x+y-z}{x-y+z} =$

A. $\frac{1}{5}$.
B. $\frac{1}{3}$.
C. $\frac{5}{3}$.
D. $\frac{7}{5}$.

[2002-CE-MATHS 2-13]

HKDSE Problems

54. If $5 - 3m = 2n$, then $m =$

A. n.
B. $\frac{2n-5}{3}$.
C. $\frac{-2n+5}{3}$.
D. $\frac{-2n+15}{3}$.

[SP-DSE-MATHS 2-2]

55. If $3a + 1 = 3(b-2)$, then $b =$

A. $a + 1$.
B. $a + 3$.
C. $a + \frac{7}{3}$.
D. $a - \frac{5}{3}$.

[PP-DSE-MATHS 2-2]

56. If $\frac{y-1}{c} = \frac{y+1}{d}$, then $y =$

A. $\frac{c-d}{c+d}$.
B. $\frac{d-c}{c+d}$.
C. $\frac{c+d}{c-d}$.
D. $\frac{c+d}{d-c}$.

[2013-DSE-MATHS 2-2]

57. If $\frac{a}{x} + \frac{b}{y} = 3$, then $x =$

A. $\frac{ay}{3y-b}$.
B. $\frac{ay}{b-3y}$.
C. $\frac{by}{3y-a}$.
D. $\frac{by}{a-3y}$.

[2016-DSE-MATHS 2-2]

58. If $\frac{a+4b}{2a} = 2 + \frac{b}{a}$, then $a =$

A. $\frac{2b}{3}$.
B. $\frac{3b}{2}$.
C. $\frac{5b}{6}$.
D. $\frac{6b}{5}$.

[2017-DSE-MATHS 2-3]

59. If $\frac{\alpha}{1-x} = \frac{\beta}{x}$, then $x =$

A. $\frac{\alpha}{\alpha-\beta}$
B. $\frac{\alpha}{\alpha+\beta}$
C. $\frac{\beta}{\alpha-\beta}$
D. $\frac{\beta}{\alpha+\beta}$

[2018-DSE-MATHS 2-2]

60. If $h = 3 - \frac{5}{k+4}$, then $k =$

A. $\frac{4h-7}{3-h}$

B. $\frac{4h-17}{3-h}$

C. $\frac{4h-7}{3+h}$

D. $\frac{4h-17}{3+h}$

[2019-DSE-MATHS 2-5]

61. If $a(a+b) = 2(b-a)$, then $b =$

A. $\frac{a^2+a}{2+a}$

B. $\frac{a^2-2a}{2+a}$

C. $\frac{a^2+2a}{2+a}$

D. $\frac{a^2-a}{2+a}$

[2020-DSE-MATHS 2-2]

Basic Concepts

1. Which of the following is an identity / are identities?

(1) $(x+1)(x-1) = x^2 + 1$
(2) $x^2 - 2x + 1 = 0$
(3) $(x-2)^2 = (2-x)^2$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[1986-CE-MATHS 2-4]

2. Which of the following is an identity / are identities?

(1) $\frac{1}{x} - 1 = \frac{1-x}{x}$
(2) $(ax+b)(x-b) = ax^2 - b^2$
(3) $2x^2 - 3x + 1 = 0$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1), (2) and (3)

[1988-CE-MATHS 2-7]

3. Which of the following is / are an identity / identities?

(1) $(x+2)(x-2) = x^2 - 4$
(2) $(x+2)(x-2) = 0$
(3) $(x+2)^3 = x^3 + 8$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1994-CE-MATHS 2-7]

4. Which of the following is/are an identity/identities?

(1) $x^2 = 4$
(2) $(2x+3)^2 = 4x^2 + 12x + 9$
(3) $(x+1)^2 = x^2 + 1$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1997-CE-MATHS 2-7]

5. Which of the following is an identity / are identities?

(1) $x^2 + 2x + 1 = 0$
(2) $x^2 + 2x + 1 = (x+1)^2$
(3) $x^2 + 1 > 0$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[2001-CE-MATHS 2-11]

6. Which of the following is an identity / are identities?

(1) $x^2 - 4 = 0$
(2) $x^2 - 4 = (x-2)^2$
(3) $x^2 - 4 = (x+2)(x-2)$

A. (2) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only

[2006-CE-MATHS 2-6]

Determination of Values

7. $-3x^2 - 3x \equiv -3(x+a)^2 + b$ is an identity in x. What are the values of the constants a and b?

A. $a = 1,\ b = 0$
B. $a = \frac{1}{2},\ b = \frac{3}{4}$
C. $a = \frac{1}{2},\ b = -\frac{3}{4}$
D. $a = -\frac{1}{2},\ b = \frac{3}{4}$
E. $a = -\frac{1}{2},\ b = -\frac{3}{4}$

[1981-CE-MATHS 2-32]

8. Given the identity $\frac{2}{x-1} + \frac{x+1}{(x-1)^2} + \frac{a}{(1-x)^2} \equiv \frac{bx-2}{(x-1)^2}$, find the values of the constants a and b.

A. $a = 1,\ b = 3$
B. $a = 3,\ b = 1$
C. $a = 1,\ b = -3$
D. $a = 3,\ b = -1$
E. $a = -1,\ b = 3$

[1986-CE-MATHS 2-5]

9. If $p(x^2 - x) + q(x^2 + x) \equiv 4x^2 + 8x$, find p and q.

A. $p = 4$, $q = 8$
B. $p = -8$, $q = 4$
C. $p = -2$, $q = 6$
D. $p = 2$, $q = 6$
E. $p = 6$, $q = -2$

[1991-CE-MATHS 2-36]

10. If $3x^2 + ax - 5 \equiv (bx - 1)(2 - x) - 3$, then

A. $a = -5$, $b = -3$.
B. $a = -5$, $b = 3$.
C. $a = -3$, $b = -5$.
D. $a = 5$, $b = -3$.
E. $a = 3$, $b = 5$.

[1993-CE-MATHS 2-5]

11. If $3x^2 + 6x + 1 \equiv 3(x + b)^2 + c$, then $c =$

A. -8.
B. -2.
C. 0.
D. $\frac{1}{3}$.
E. 1.

[1995-CE-MATHS 2-10]

12. If $\frac{2}{x^2 - 1} \equiv \frac{a}{x + 1} + \frac{b}{x - 1}$, find a and b.

A. $a = 2$, $b = 1$
B. $a = 1$, $b = 2$
C. $a = 1$, $b = 1$
D. $a = 1$, $b = -1$
E. $a = -1$, $b = 1$

[1996-CE-MATHS 2-8]

13. If $(x + 3)^2 - (x + 1)(x - 3) \equiv P(x + 1) + Q$, find P and Q.

A. $P = 2$, $Q = 4$
B. $P = 2$, $Q = 10$
C. $P = 4$, $Q = 2$
D. $P = 4$, $Q = 8$
E. $P = 8$, $Q = 4$

[1998-CE-MATHS 2-5]

14. If $(3x - 1)(x - a) \equiv 3x^2 + bx - 2$, then

A. $a = 2$, $b = -1$.
B. $a = 2$, $b = -7$.
C. $a = -2$, $b = 5$.
D. $a = -2$, $b = -5$.
E. $a = -2$, $b = -7$.

[1999-CE-MATHS 2-6]

15. If $3x^2 + ax + 7 \equiv 3(x - 2)^2 + b$, then

A. $a = -12$, $b = -5$.
B. $a = -12$, $b = 7$.
C. $a = -4$, $b = 3$.
D. $a = 0$, $b = -5$.
E. $a = 0$, $b = 19$.

[2000-CE-MATHS 2-10]

16. If $(x + 1)^2 + P(x + 1) \equiv x^2 + Q$, then

A. $P = -2$, $Q = -1$.
B. $P = -2$, $Q = 1$.
C. $P = 2$, $Q = -1$.
D. $P = 2$, $Q = 1$.

[2002-CE-MATHS 2-6]

17. If $(2x + 3)(x - a) \equiv 2x^2 + b(x + 1)$, then

A. $a = -3$ and $b = 9$.
B. $a = \frac{-1}{3}$ and $b = \frac{11}{3}$.
C. $a = \frac{1}{3}$ and $b = \frac{7}{3}$.
D. $a = 3$ and $b = -9$.

[2003-CE-MATHS 2-6]

18. If $a(2x - x^2) + b(2x^2 - x) \equiv -5x^2 + 4x$, then $a =$

A. -1.
B. 1.
C. -2.
D. 2.

[2004-CE-MATHS 2-10]

19. If $x^2 + 2ax + 8 \equiv (x + a)^2 + b$, then $b =$

A. 8.
B. $a^2 + 8$.
C. $a^2 - 8$.
D. $8 - a^2$.

[2005-CE-MATHS 2-10]

20. If a and b are constants such that $a(x^2 - x) + b(x^2 + x) \equiv 2x^2 + 4x$, then $a =$

A. -1.
B. 1.
C. 2.
D. 3.

[2009-CE-MATHS 2-5]

21. If h and k are constants such that $hx + (x - 3)^2 \equiv x^2 + 10x + k$, then

A. $h = 10$ and $k = -9$.
B. $h = 10$ and $k = 9$.
C. $h = 16$ and $k = -9$.
D. $h = 16$ and $k = 9$.

[2010-CE-MATHS 2-5]

HKDSE Problems

22. Let p and q be constants. If $x^2 + p(x+5) + q \equiv (x-2)(x+5)$, then $q =$

    A. -25.
    B. -10.
    C. 3.
    D. 5.

    [SP-DSE-MATHS 2-4]

23. Let m and n be constants. If $m(x-3)^2 + n(x+1)^2 \equiv x^2 - 38x + 41$, then $m =$

    A. -4.
    B. -1.
    C. 3.
    D. 5.

    [PP-DSE-MATHS 2-4]

24. If p and q are constants such that $x^2 + p \equiv (x+2)(x+q) + 10$, then $p =$

    A. -4.
    B. -2.
    C. 6.
    D. 10.

    [2012-DSE-MATHS 2-3]

25. If a, b and c are non-zero constants such that $x(x+3a) + a \equiv x^2 + 2(bx+c)$, then $a:b:c =$

    A. $2:3:1$.
    B. $2:3:4$.
    C. $3:2:6$.
    D. $6:4:3$.

    [2013-DSE-MATHS 2-8]

26. If p and q are constants such that $px(x-1) + x^2 \equiv qx(x-2) + 4x$, then $p =$

    A. 1.
    B. 2.
    C. 3.
    D. 4.

    [2014-DSE-MATHS 2-3]

27. If m and n are constants such that $x^2 + mx + n \equiv (x+4)(x-m) + 6$, then $n =$

    A. -8.
    B. -2.
    C. 2.
    D. 6.

    [2015-DSE-MATHS 2-5]

28. If m and n are constants such that $4x^2 + m(x+1) + 28 = mx(x+3) + n(x-4)$, then $n =$

    A. -8.
    B. -7.
    C. 4.
    D. 16.

    [2017-DSE-MATHS 2-8]

29. If α and β are constants such that $(x-8)(x+\alpha) - 6 \equiv (x-9)^2 + \beta$, then $\beta =$

    A. -26
    B. -10
    C. -7
    D. -6

    [2019-DSE-MATHS 2-4]

30. If h and k are constants such that $(x+h)(x+6) \equiv (x+4)^2 + k$, then $k =$

    A. -28
    B. -16
    C. -4
    D. 2

    [2020-DSE-MATHS 2-7]

Expansion

1. $(x-1)^2-(x+1)^2=$

A. 2 .
B. -2 .
C. $4x$.
D. $-4x$.
E. $2(x^2+1)$.

[1977-CE-MATHS 2-2]

2. $(x-\frac{1}{x})^2-(x+\frac{1}{x})^2=$

A. -4 .
B. 0 .
C. 4 .
D. $-\frac{2}{x^2}$.
E. $2(x^2+\frac{1}{x^2})$.

[SP-CE-MATHS 2-5]

3. $(-x+x^2)^2=$

A. $-x^2+x^4$.
B. x^2+x^4 .
C. $-x^2+2x^3+x^4$.
D. $-x^2+2x^3-x^4$.
E. $x^2-2x^3+x^4$.

[SP-CE-MATHS A2-33]

4. Simplify $(x^2-\sqrt{3}x+1)(x^2+\sqrt{3}x+1)$.

A. x^4+1
B. x^4-x^2+1
C. x^4+x^2+1
D. $x^4-3x^2-2\sqrt{3}x-1$
E. $x^4+\sqrt{3}x^3-2\sqrt{3}x^2+\sqrt{3}x+1$

[1993-CE-MATHS 2-3]

5. $(2x^2-3x+1)(2-3x)=$

A. $6x^3-5x^2-3x+2$.
B. $6x^3-13x^2-9x-2$.
C. $-6x^3+13x^2-9x+2$.
D. $-6x^3-5x^2-3x+2$.
E. $-6x^3-5x^2-9x+2$.

[2001-CE-MATHS 2-2]

6. $(2x-3)(x^2+3x-2)=$

A. $2x^3+3x^2+5x-6$.
B. $2x^3+3x^2+5x+6$.
C. $2x^3+3x^2-13x-6$.
D. $2x^3+3x^2-13x+6$.

[2005-CE-MATHS 2-4]

7. $(x+x)(y+y+y)=$

A. $6xy$.
B. $2x+3y$.
C. x^2y^3 .
D. $6x^2y^3$.

[2007-CE-MATHS 2-3]

8. $(2x^2-3x+1)-2(x^2+2x-1)=$

A. $x-1$.
B. $-7x+3$.
C. $4x^2+x-1$.
D. $4x^2-7x+3$.

[2008-CE-MATHS 2-4]

9. $(3x-5)(2x^2+5x-3)=$

A. $6x^3+5x^2-34x+15$.
B. $6x^3-5x^2+34x+15$.
C. $6x^3+25x^2+16x+15$.
D. $6x^3-25x^2-16x+15$.

[2009-CE-MATHS 2-4]

10. $(x-2y)(x+2y-2)=$

A. $x^2+2y^2+2x+4y$.
B. $x^2+2y^2-2x+4y$.
C. $x^2-4y^2+2x+4y$.
D. $x^2-4y^2-2x+4y$.

[2011-CE-MATHS 2-3]

Factorisation

11. If $x^2+5x-6=(x-\alpha)(x-\beta)$ and $\alpha>\beta$, then $\alpha=$

A. -1 .
B. 1 .
C. 2 .
D. 3 .
E. 6 .

[SP-CE-MATHS 2-4]

12. Which one of the following is a factor of $8a^3+b^3$?

A. $2a-b$
B. $4a^2+b^2$
C. $4a^2-2ab+b^2$
D. $4a^2+2ab+b^2$
E. $4a^2+4ab+b^2$

[SP-CE-MATHS A2-34]

13. $a^2 - b^2 - c^2 + 2bc =$

A. $(a-b-c)^2$.
B. $(a+b-c)^2$.
C. $(a+b+c)(a-b-c)$.
D. $(a+b-c)(a-b-c)$.
E. $(a+b-c)(a-b+c)$.

[1978-CE-MATHS 2-15]

14. $2ab - a^2 - b^2 =$

A. $(a-b)^2$.
B. $(-a-b)^2$.
C. $(-a+b)^2$.
D. $-(a+b)^2$.
E. $-(a-b)^2$.

[1980-CE-MATHS 2-1]

15. Which of the following expressions **cannot** be factorized?

A. $x^3 - 125$
B. $4x^2 - 9y^2$
C. $x^3 + 125$
D. $4x^2 + 9y^2$
E. $3x^2 + 6xy + 3y^2$

[1988-CE-MATHS 2-33]

16. $a^3 + 8a^{-3} =$

A. $(a - \frac{2}{a})(a^2 + 2 + \frac{4}{a^2})$.

B. $(a - \frac{1}{2a})(a^2 + 1 + \frac{1}{4a^2})$.

C. $(a + \frac{1}{2a})(a^2 - \frac{1}{2} + \frac{1}{4a^2})$.

D. $(a + \frac{2}{a})(a^2 - 4 + \frac{4}{a^2})$.

E. $(a + \frac{2}{a})(a^2 - 2 + \frac{4}{a^2})$.

[1990-CE-MATHS 2-7]

17. Which of the following is a factor of $4(a+b)^2 - 9(a-b)^2$?

A. $5b - a$
B. $5a + b$
C. $-a - b$
D. $13b - 5a$
E. $13a - 5b$

[1992-CE-MATHS 2-6]

18. In factorizing the expression $a^4 + a^2b^2 + b^4$, we find that

A. $(a^2 - b^2)$ is a factor.
B. $(a^2 + b^2)$ is a factor.
C. $(a^2 - ab - b^2)$ is a factor.
D. $(a^2 - ab + b^2)$ is a factor.
E. it cannot be factorized.

[1993-CE-MATHS 2-39]

19. Factorize $a^2 - 2ab + b^2 - a + b$.

A. $(a-b)(a-b-1)$
B. $(a-b)(a-b+1)$
C. $(a-b)(a+b-1)$
D. $(a+b)(a-b+1)$
E. $(a-b-1)^2$

[1994-CE-MATHS 2-35]

20. Factorize $2a^{n+1} - 7a^n - 30a^{n-1}$.

A. $(a^n - 6)(2a+5)$
B. $a^n(a+6)(2a-5)$
C. $a^n(a-6)(2a+5)$
D. $a^{n-1}(a+6)(2a-5)$
E. $a^{n-1}(a-6)(2a+5)$

[1995-CE-MATHS 2-36]

21. Which of the following expressions has/have $b - c$ as a factor?

(1) $ab - ac$
(2) $a(b-c) - b + c$
(3) $a(b-c) - b - c$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1996-CE-MATHS 2-6]

22. $9 - a^2 - b^2 + 2ab =$

A. $(3-a-b)(3-a+b)$.
B. $(3-a-b)(3+a-b)$.
C. $(3-a-b)(3+a+b)$.
D. $(3-a+b)(3+a-b)$.
E. $(3-a+b)(3+a+b)$.

[1997-CE-MATHS 2-4]

23. Factorize $x^2 - y^2 + 2x + 1$.

A. $(x+y+1)(x+y-1)$
B. $(x+y+1)(x-y+1)$
C. $(x+y-1)(x-y+1)$
D. $(x+y-1)(x-y-1)$
E. $(x-y+1)(x-y-1)$

[1998-CE-MATHS 2-8]

24. $x^2 - y^2 - x + y =$

A. $(x-y)(x-y-1)$.
B. $(x-y)(x+y-1)$.
C. $(x-y)(x+y+1)$.
D. $(x+y)(x-y-1)$.
E. $(x+y)(x-y+1)$.

[1999-CE-MATHS 2-2]

25. Factorize $x^2 - x - xy + y$.

A. $(x-y)(x-1)$
B. $(x-y)(x+1)$
C. $(x+y)(x-1)$
D. $(1-x)(x+y)$
E. $(1+x)(y-x)$

[2000-CE-MATHS 2-2]

26. Which of the following is a factor of $2(a-b)^2 - a^2 + b^2$?

A. $a - 3b$
B. $a - 2b$
C. $a + b$
D. $a + 3b$
E. $3a - b$

[2001-CE-MATHS 2-22]

27. $x^3 - \dfrac{27}{x^3} =$

A. $(x+\dfrac{3}{x})(x^2-6+\dfrac{9}{x^2})$.
B. $(x+\dfrac{3}{x})(x^2-3+\dfrac{9}{x^2})$.
C. $(x-\dfrac{3}{x})(x^2+6+\dfrac{9}{x^2})$.
D. $(x-\dfrac{3}{x})(x^2+3+\dfrac{9}{x^2})$.

[2003-CE-MATHS 2-39]

28. $pr + qr - ps - qs =$

A. $(p+q)(r-s)$.
B. $(p+q)(s-r)$.
C. $(p-q)(r-s)$.
D. $(p-q)(s-r)$.

[2006-CE-MATHS 2-4]

29. Which of the following must have $x + y$ as a factor?

(1) $x^2 - y^2$
(2) $x^2 + y^2$
(3) $x(x+y) - x - y$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2008-CE-MATHS 2-5]

30. $ab + ac - a^2 - bc =$

A. $(a-b)(b+c)$.
B. $(a-b)(c-a)$.
C. $(a-c)(b+c)$.
D. $(a+b)(c-a)$.

[2010-CE-MATHS 2-4]

HKDSE Problems

31. $a^2 - b^2 + 2b - 1 =$

A. $(a-b-1)(a+b-1)$.
B. $(a-b-1)(a+b+1)$.
C. $(a-b+1)(a+b-1)$.
D. $(a-b+1)(a-b-1)$.

[SP-DSE-MATHS 2-3]

32. $x^3(2x+x) =$

A. $3x^4$.
B. $2x^5$.
C. $3x^5$.
D. $2x^6$.

[PP-DSE-MATHS 2-1]

33. $p^2 - q^2 - p - q =$

A. $(p+q)(p-q-1)$.
B. $(p+q)(p+q-1)$.
C. $(p-q)(p-q+1)$.
D. $(p-q)(p+q-1)$.

[PP-DSE-MATHS 2-3]

34. $(4x+y)^2 - (4x-y)^2 =$

A. 0 .
B. $2y^2$.
C. $8xy$.
D. $16xy$.

[2012-DSE-MATHS 2-2]

35. $h\ell - k\ell + hm - km - hn + kn =$

A. $(h+k)(\ell-m+n)$.
B. $(h+k)(\ell+m-n)$.
C. $(h-k)(\ell-m+n)$.
D. $(h-k)(\ell+m-n)$.

[2013-DSE-MATHS 2-3]

36. $u^2 - v^2 - 5u + 5v =$

A. $(u-v)(u+v-5)$.
B. $(u-v)(u+v+5)$.
C. $(u+v)(u-v-5)$.
D. $(u+v)(u-v+5)$.

[2014-DSE-MATHS 2-2]

37. $(x+1)(x^2+x+1) =$

A. x^3+1 .
B. $(x+1)^3$.
C. x^3+x^2+x+1 .
D. x^3+2x^2+2x+1 .

[2015-DSE-MATHS 2-1]

38. $16-(2x-3y)^2 =$

A. $(4-2x-3y)(4+2x+3y)$.
B. $(4-2x-3y)(4+2x-3y)$.
C. $(4-2x+3y)(4+2x+3y)$.
D. $(4-2x+3y)(4+2x-3y)$.

[2016-DSE-MATHS 2-3]

39. $3m^2-5mn+2n^2+m-n =$

A. $(m-n)(3m-2n+1)$.
B. $(m-n)(3m+2n+1)$.
C. $(m+n)(3m-2n-1)$.
D. $(m+n)(3m+2n-1)$.

[2017-DSE-MATHS 2-1]

40. $h^2-6h-4k^2-12k =$

A. $(h-2k)(h-2k+6)$
B. $(h-2k)(h+2k+6)$
C. $(h+2k)(h-2k-6)$
D. $(h+2k)(h+2k-6)$

[2018-DSE-MATHS 2-3]

41. $(a-b)(a^2+ab-b^2) =$

A. $(a-b)^3$
B. a^3-b^3
C. $a^3-2ab^2+b^3$
D. $a^3-2a^2b+2ab^2+b^3$

[2019-DSE-MATHS 2-1]

42. $(3a+2b)(4a-5b)-a(6a+4b) =$

A. $(3a+2b)(2a-5b)$
B. $(3a+2b)(6a-5b)$
C. $(3a-2b)(2a+5b)$
D. $(3a-2b)(6a+5b)$

[2020-DSE-MATHS 2-4]

Remainder Theorem

1. What is the remainder if $ax^{25} - x^2 + x + 7$ is divided by $x + 1$?

   A. $a + 5$
   B. $a + 7$
   C. $5 - a$
   D. $7 - a$
   E. $9 - a$

[SP-CE-MATHS A2-39]

2. When $f(x)$ is divided by $(2x + 1)$, the remainder is

   A. $f(2)$.
   B. $f(1)$.
   C. $f(-1)$.
   D. $f(\frac{1}{2})$.
   E. $f(-\frac{1}{2})$.

[1983-CE-MATHS 2-6]

3. When the expression $x^2 + px + q$ is divided by $x + 1$, the remainder is 4. Find the value of $2p - 2q + 1$.

   A. -3
   B. -5
   C. -7
   D. -9
   E. It cannot be determined.

[1987-CE-MATHS 2-8]

4. Let $f(x) = ax^2 + bx + c$. When $f(x)$ is divided by $(x - 1)$, the remainder is 10. When $f(x)$ is divided by $(x + 1)$, the remainder is 6. Find the value of b.

   A. -4
   B. -2
   C. 2
   D. 4
   E. It cannot be found.

[1988-CE-MATHS 2-5]

5. Let $f(x) = ax^2 - 5$ and $g(x) = 27x^3 - 18x + 4$. If both expressions leave the same remainder when divided by $3x + 1$, then $a =$

   A. -74.
   B. 0.
   C. 36.
   D. 76.
   E. 126.

[1989-CE-MATHS 2-6]

6. $P(x)$ is a polynomial. When $P(x)$ is divided by $(5x - 2)$, the remainder is R. When $P(x)$ is divided by $(2 - 5x)$, then the remainder is

   A. R.
   B. $-R$.
   C. $\frac{2}{5}R$.
   D. $\frac{2}{5}$.
   E. $-\frac{2}{5}$.

[1994-CE-MATHS 2-37]

7. Find the remainder when $x^3 - x^2 + 1$ is divided by $2x + 1$.

   A. -11
   B. $\frac{5}{8}$
   C. $\frac{7}{8}$
   D. $\frac{9}{8}$
   E. 5.

[1996-CE-MATHS 2-5]

8. Let $f(x) = (2x - 1)(x + 1) + 2x + 1$. Find the remainder when $f(x)$ is divided by $2x + 1$.

   A. -1
   B. $-\frac{1}{2}$
   C. 0
   D. 1
   E. 2

[2001-CE-MATHS 2-3]

9. The remainder when $x^2 + ax + b$ is divided by $x + 2$ is -4. The remainder when $ax^2 + bx + 1$ is divided by $x - 2$ is 9. The value of a is

   A. -3.
   B. -1.
   C. 1.
   D. 3.

[2002-CE-MATHS 2-38]

10. Let k be a positive integer. When $x^{2k+1} + kx + k$ is divided by $x + 1$, the remainder is

   A. -1.
   B. 1.
   C. $2k - 1$.
   D. $2k + 1$.

[2005-CE-MATHS 2-40]

11. Let k be a non-zero constant. When $x^3 + kx^2 + 2kx + 3k$ is divided by $x + k$, the remainder is k. Find k.

A. -1
B. 1
C. -2
D. 2

[2006-CE-MATHS 2-40]

12. When $x^{2009} + x^{2008} + x^{2007} + \dots + x$ is divided by $x+1$, the remainder is

A. -1 .
B. 0 .
C. 1 .
D. 2009 .

[2009-CE-MATHS 2-41]

Factor Theorem

13. If $f(x) = ax^2 + bx + c$ and $f(\frac{-3}{5}) = 0$, then which of the following is a factor of $ax^2 + bx + c$?

A. $x + 3$
B. $3x + 5$
C. $3x - 5$
D. $5x + 3$
E. $5x - 3$

[1978-CE-MATHS A2-49]

14. If $x + 2$ is a factor of $x^2 + ax + b$, then $2a - b + 3 =$

A. -7 .
B. -1 .
C. 0 .
D. 1 .
E. 7 .

[1984-CE-MATHS 2-4]

15. Let a and b be constants. If $3x^3 - ax^2 + 5x - 3b$ is divisible by $x + 3$, then $3a + b =$?

A. -32
B. -22
C. 22
D. 32
E. it cannot be determined

[1985-CE-MATHS 2-7]

16. Let $F(x) = 2x^3 + 3x^2 - 11x - 6$. Given that $F(2) = 0$ and $F(-3) = 0$, then $F(x)$ can be factorized as

A. $(x+2)(x-3)(2x+1)$.
B. $(x+2)(x-3)(2x-1)$.
C. $(x-2)(x+3)(2x+1)$.
D. $(x-2)(x-3)(2x+1)$.
E. $(x-2)(x+3)(2x-1)$.

[1986-CE-MATHS 2-34]

17. Which one of the following is a factor of $x^3 - 4x^2 + x + 6$?

A. $(x+1)(x-2)$
B. $(x+1)(x+2)$
C. $(x-1)(x+2)$
D. $(x-1)(x-3)$
E. $(x-1)(x+3)$

[1991-CE-MATHS 2-3]

18. If a polynomial $f(x)$ is divisible by $x - 1$, then $f(x-1)$ is divisible by

A. $x - 2$.
B. $x + 2$.
C. $x - 1$.
D. $x + 1$.
E. x .

[1992-CE-MATHS 2-41]

19. If $f(x) = x^{99} + 99x + k$ is divisible by $x + 1$, then $k =$

A. -100 .
B. -98 .
C. 98 .
D. 100 .
E. 198 .

[1995-CE-MATHS 2-3]

20. If $2x^2 + x + m$ is divisible by $x - 2$, then it is also divisible by

A. $x + 3$.
B. $2x - 3$.
C. $2x + 3$.
D. $2x - 5$.
E. $2x + 5$.

[1997-CE-MATHS 2-6]

21. Let $f(x) = 2x^3 - x^2 - 7x + 6$. It is known that $f(-2) = 0$ and $f(1) = 0$. $f(x)$ can be factorized as

A. $(x+1)(x+2)(2x-3)$.
B. $(x+1)(x-2)(2x+3)$.
C. $(x-1)(x+2)(2x+3)$.
D. $(x-1)(x+2)(2x-3)$.
E. $(x-1)(x-2)(2x+3)$.

[1998-CE-MATHS 2-6]

22. Let $f(x) = x^3 - 2x^2 - 5x + 6$. It is known that $f(1) = 0$. $f(x)$ can be factorized as

A. $(x-1)^2(x+6)$.
B. $(x-1)(x+1)(x+6)$.
C. $(x-1)(x-2)(x+3)$.
D. $(x-1)(x+2)(x-3)$.
E. $(x+1)(x-2)(x-3)$.

[2000-CE-MATHS 2-9]

23. Let $f(x) = x^3 + 2x^2 + ax + b$. If $f(x)$ is divisible by $x+1$ and $x-2$, $f(x)$ can be factorized as

A. $(x-1)(x+1)(x-2)$.
B. $(x+1)^2(x-2)$.
C. $(x-3)(x+1)(x-2)$.
D. $(x+3)(x+1)(x-2)$.
E. $x(x+1)(x-2)$.

[2001-CE-MATHS 2-48]

24. If $f(x) = x^3 - 7x + 6$ is divisible by $x^2 - 3x + k$, then $k =$

A. -2.
B. 2.
C. -3.
D. 3.

[2004-CE-MATHS 2-40]

25. Let $f(x)$ be a polynomial. If $f(x)$ is divisible by $x-1$, which of the following must be a factor of $f(2x+1)$?

A. x
B. $x-3$
C. $2x-1$
D. $2x+1$

[2007-CE-MATHS 2-40]

26. Let k be a constant. If $x^3 + 5x^2 + 3kx - k$ is divisible by $x-1$, find the value of k.

A. -3
B. -1
C. 0
D. 1

[2010-CE-MATHS 2-41]

Miscellaneous

27. Let $f(x) = 3x^3 - 4x + k$. If $f(x)$ is divisible by $x-k$, find the remainder when $f(x)$ is divided by $x+k$.

A. $2k$
B. k
C. 0
D. $-k$
E. $-k-1$

[1990-CE-MATHS 2-34]

28. The expression $x^2 - 2x + k$ is divisible by $(x+1)$. Find the remainder when it is divided by $(x+3)$.

A. 1
B. 4
C. 12
D. 16
E. 18

[1993-CE-MATHS 2-9]

29. It is given that $F(x) = x^3 - 4x^2 + ax + b$. $F(x)$ is divisible by $x-1$. When it is divided by $x+1$, the remainder is 12. Find a and b.

A. $a = 5$, $b = 10$
B. $a = 1$, $b = 2$
C. $a = -3$, $b = 6$
D. $a = -4$, $b = 7$
E. $a = -7$, $b = 10$

[1999-CE-MATHS 2-38]

30. Let $f(x) = x^3 + 2x^2 + k$, where k is a constant. If $f(-1) = 0$, find the remainder when $f(x)$ is divided by $x-1$.

A. -1
B. 0
C. 2
D. 6

[2003-CE-MATHS 2-2]

31. Let $f(x) = 2x^2 + ax - 3$, where a is a constant. If $f(x)$ is divisible by $2x+1$, find the remainder when $f(x)$ is divided by $x-a$.

A. -52
B. 22
C. 46
D. 72

[2011-CE-MATHS 2-40]

HKDSE Problems

32. Let $f(x) = x^3 + 2x^2 - 7x + 3$. When $f(x)$ is divided by $x+2$, the remainder is

A. 3 .
B. 5 .
C. 17 .
D. 33 .

[SP-DSE-MATHS 2-5]

33. Let $f(x) = x^4 - x^3 + x^2 - x + 1$. When $f(x)$ is divided by $x+2$, the remainder is

A. –2 .
B. 0 .
C. 11 .
D. 31 .

[PP-DSE-MATHS 2-5]

34. If k is a constant such that $x^3 + 4x^2 + kx - 12$ is divisible by $x+3$, then $k =$

A. –25 .
B. –1 .
C. 1 .
D. 17 .

[2012-DSE-MATHS 2-4]

35. Let $f(x) = x^{13} - 2x + k$, where k is a constant. If $f(x)$ is divisible by $x+1$, find the remainder when $f(x)$ is divided by $x-1$.

A. 0
B. –1
C. 2
D. –2

[2013-DSE-MATHS 2-9]

36. Let $f(x) = 4x^3 + kx + 3$, where k is a constant. If $f(x)$ is divisible by $2x+1$, find the remainder when $f(x)$ is divided by $x+1$.

A. –7
B. –6
C. 0
D. 5

[2016-DSE-MATHS 2-6]

37. Let $p(x) = 2x^2 - 11x + c$, where c is a constant. If $p(x)$ is divisible by $x-7$, find the remainder when $p(x)$ is divided by $2x+1$.

A. –26
B. –15
C. 15
D. 26

[2017-DSE-MATHS 2-7]

38. Let $g(x) = x^8 + ax^7 + b$, where a and b are constants. If $g(x)$ is divisible by $x - 1$, find the remainder when $g(x)$ is divided by $x + 1$.

A. 0
B. $2a$
C. $-2a$
D. $-2a + 2$

[2018-DSE-MATHS 2-8]

39. Let k be a constant such that $2x^4 + kx^3 - 4x - 16$ is divisible by $2x + k$. Find k.

A. −2
B. 2
C. 4
D. 8

[2019-DSE-MATHS 2-9]

40. Let $g(x) = ax^3 + 4ax^2 - 24$, where a is a constant. If $x + 2$ is a factor of $g(x)$, then $g(2) =$

A. −96
B. 0
C. 3
D. 48

[2020-DSE-MATHS 2-6]

H.C.F. & L.C.M.

1. $8abc^3$ is the H.C.F. of $24ab^2c^3$ and

A. $12a^2bc^4$.
B. $30a^2bc^3$.
C. $32a^2bc^5$.
D. $40ab^2c^3$.
E. $48a^3bc^5$.

[1978-CE-MATHS 2-11]

2. The H.C.F. and L.C.M. of three expressions are a^2b^2c and $a^4b^6c^4$ respectively. Two of the expressions are $a^2b^3c^4$ and $a^3b^2c^2$. The third expression is

A. a^3b^3c .
B. $a^3b^6c^4$.
C. a^4b^2c .
D. a^4b^6c .
E. $a^4b^6c^2$.

[1981-CE-MATHS 2-33]

3. The L.C.M. of $12a^2b$ and $18ab^3c$ is

A. $6ab$.
B. $6a^2b^3c$.
C. $36ab$.
D. $36a^2b^3c$.
E. $216a^3b^4c$.

[1986-CE-MATHS 2-31]

4. $8abc^3$ is the H.C.F. of $24ab^2c^3$ and

A. $12a^2bc^4$.
B. $30a^2bc^3$.
C. $32a^2bc^5$.
D. $40ab^2c^3$.
E. $48a^3bc^5$.

[1988-CE-MATHS 2-40]

5. The H.C.F. and L.C.M. of three expressions are xyz^2 and $x^3y^5z^4$ respectively. If two of the expressions are $x^2y^3z^3$ and x^3yz^2, find the third expression.

A. $x^2y^3z^3$
B. $x^2y^5z^3$
C. xy^3z^3
D. xy^5z^4
E. xy^3z^4

[1990-CE-MATHS 2-37]

6. The L.C.M. of x, $2x^2$, $3x^3$, $4x^4$, $5x^5$ is

A. x .
B. $5x^5$.
C. $60x^5$.
D. $120x^5$.
E. $120x^{15}$.

[1991-CE-MATHS 2-6]

7. The L.C.M. of P and Q is $12ab^3c^2$. The L.C.M. of X, Y and Z is $30a^2b^3c$. What is the L.C.M. of P, Q, X, Y and Z?

A. $360a^3b^6c^3$
B. $60a^2b^3c^2$
C. $60ab^3c^2$
D. $6a^2b^3c$
E. $6ab^3c$

[1992-CE-MATHS 2-40]

8. Find the H.C.F. and L.C.M. of ab^2c and abc^3.

	H.C.F.	L.C.M.
A.	a	$a^2b^3c^4$
B.	abc	ab^2c^3
C.	abc	$a^2b^3c^4$
D.	ab^2c^3	abc
E.	$a^2b^3c^4$	abc

[1993-CE-MATHS 2-11]

9. Find the L.C.M. of $4x^2yz$ and $6xy^3$.

A. $2xy$
B. $12x^2y^3$
C. $12x^2y^3z$
D. $24x^2y^3z$
E. $24x^3y^4z$

[1996-CE-MATHS 2-3]

10. The L.C.M. of $210xy^2$ and $30x^2yz$ is

A. $30xy$.
B. $70xyz$.
C. $210x^2y^2z$.
D. $630x^3y^3z$.

[2003-CE-MATHS 2-38]

H.C.F. & L.C.M. with Factorisation

11. The H.C.F. of $a^3 - 1$ and $a^4 - 1$ is

A. 1 .
B. $a + 1$.
C. $a - 1$.
D. $a^2 + 1$.
E. $a^2 - 1$.

[1983-CE-MATHS 2-5]

12. The L.C.M. of $2a^2 - 2b^2$ and $a^3 - 2a^2b + ab^2$ is

A. $a - b$.
B. $a(a - b)(a + b)$.
C. $2a(a - b)(a + b)$.
D. $2a(a - b)^2(a + b)$.
E. $2a(a - b)^3(a + b)$.

[1985-CE-MATHS 2-6]

13. Find the H.C.F. of $(2x - 1)(x^2 - 6x + 9)$ and $(x^2 - 3x)(4x^2 - 1)$.

A. $(x - 3)$
B. $(2x - 1)$
C. $(x - 3)(2x - 1)$
D. $x(x - 3)^2(2x - 1)(2x + 1)$
E. there is no H.C.F.

[1987-CE-MATHS 2-40]

14. The L.C.M. of $(x - 1)^2$, $x^2 - 1$ and $x^3 - 1$ is

A. $x - 1$.
B. $(x - 1)^4(x + 1)(x^2 + x + 1)$.
C. $(x - 1)^2(x + 1)(x^2 + x + 1)$.
D. $(x - 1)^2(x + 1)(x^2 - x + 1)$.
E. $(x - 1)(x + 1)(x^2 + x + 1)$.

[1994-CE-MATHS 2-3]

15. The L.C.M. of $x^3 - x$ and $x^4 - 1$ is

A. $x - 1$.
B. $(x - 1)(x + 1)$.
C. $x(x - 1)(x + 1)(x^2 + 1)$.
D. $(x - 1)(x + 1)(x^2 + 1)(x^2 + x + 1)$.
E. $x(x - 1)^2(x + 1)^2(x^2 + 1)$.

[1995-CE-MATHS 2-6]

16. The L.C.M. of $2 - b$, $4 - b^2$ and $8 - b^3$ is

A. $(2 - b)(2 + b)(4 - 4b + b^2)$.
B. $(2 - b)(2 + b)(4 + 4b + b^2)$.
C. $(2 - b)(2 + b)(4 - 2b + b^2)$.
D. $(2 - b)(2 + b)(4 + 2b + b^2)$.

[2004-CE-MATHS 2-38]

17. The H.C.F. of $x^2(x + 1)(x + 2)$ and $x(x + 1)^3$ is

A. $x(x + 1)$.
B. $x(x + 1)(x + 2)$.
C. $x^2(x + 1)^3$.
D. $x^2(x + 1)^3(x + 2)$.

[2005-CE-MATHS 2-38]

HKDSE Problems

18. The H.C.F. and the L.C.M. of three expressions are ab^2 and $4a^4b^5c^6$ respectively. If the first expression and the second expression are $2a^2b^4c$ and $4a^4b^2c^6$ respectively, then the third expression is

A. ab^2 .
B. ab^5 .
C. $2ab^2c$.
D. $2ab^5c$.

[2012-DSE-MATHS 2-31]

19. The L.C.M. of $a^2 + 4a + 4$, $a^2 - 4$ and $a^3 + 8$ is

A. $a + 2$.
B. $(a - 2)(a + 2)^2(a^2 - 2a + 4)$.
C. $(a - 2)(a + 2)^2(a^2 + 2a + 4)$.
D. $(a - 2)(a + 2)^4(a^2 - 2a + 4)$.

[2013-DSE-MATHS 2-31]

20. The H.C.F. of $3x^4y^2z$, $4xy^5z$ and $6x^2y^3$ is

A. xy^2 .
B. xy^2z .
C. $12x^4y^5z$.
D. $12x^7y^9z^2$.

[2014-DSE-MATHS 2-31]

21. The L.C.M. of $9a^2b$, $12a^4b^3$ and $15a^6$ is

A. $3a^2$.
B. $3a^2b$.
C. $180a^6b^3$.
D. $180a^{12}b^4$.

[2016-DSE-MATHS 2-31]

Algebraic Fractions

1. $\frac{2}{x^2-1}-\frac{1}{x+1}+\frac{1}{1-x}=$

A. $\frac{2}{x-1}$.
B. $\frac{2}{x+1}$.
C. $\frac{-2}{x-1}$.
D. $\frac{-2}{x+1}$.
E. $\frac{4}{x^2-1}$.

[1977-CE-MATHS 2-1]

2. $\frac{a+b}{a-b}-\frac{a-b}{a+b}=$

A. $4ab$.
B. $\frac{2ab}{a^2-b^2}$.
C. $\frac{4ab}{a^2-b^2}$.
D. $\frac{2b^2}{a^2-b^2}$.
E. $\frac{2(a^2+b^2)}{a^2-b^2}$.

[1979-CE-MATHS 2-24]

3. $\frac{x^{-2}-y^{-2}}{x^{-1}-y^{-1}}=$

A. $x^{-1}+y^{-1}$.
B. $x^{-1}-y^{-1}$.
C. $x^{-3}-y^{-3}$.
D. $\frac{1}{x-y}$.
E. $\frac{1}{x+y}$.

[1980-CE-MATHS 2-5]

4. $\frac{1}{x+1}+\frac{1}{x-1}+\frac{x+\frac{1}{x}}{x-\frac{1}{x}}=$

A. $\frac{1}{x+1}$.
B. $\frac{1}{x-1}$.
C. $\frac{x+1}{x-1}$.
D. $\frac{1}{(x+1)(x-1)}$.
E. $\frac{x^2+4x+1}{(x+1)(x-1)}$.

[1981-CE-MATHS 2-2]

5. $\left(\frac{\frac{x}{y}+\frac{y}{x}+2}{\frac{x}{y}-\frac{y}{x}}\right)^{-1}=$

A. $\frac{x-y}{x+y}$.
B. $\frac{x+y}{x-y}$.
C. $-\frac{x+y}{x-y}$.
D. $\frac{x^2+y^2}{x^2-y^2}$.
E. $\frac{x^2-y^2}{x^2+y^2}$.

[1981-CE-MATHS 2-5]

6. $\frac{2a}{a^2-4b^2}+\frac{1}{2b-a}=$

A. $\frac{1}{a+2b}$.
B. $\frac{2a-1}{(a+2b)(a-2b)}$.
C. $\frac{2a+1}{(a+2b)(a-2b)}$.
D. $\frac{3a+2b}{(a+2b)(a-2b)}$.
E. $\frac{a+2b}{(a+2b)(a-2b)}$.

[1982-CE-MATHS 2-1]

7. $(a^{-2}-3b^{-1})^{-1}=$

A. $\frac{3a^2+b}{a^2b}$.
B. $\frac{3a^2-b}{a^2b}$.
C. $\frac{3b-a^2}{a^2b}$.
D. $\frac{a^2b}{b-3a^2}$.
E. $\frac{3a^2b}{3b-a^2}$.

[1982-CE-MATHS 2-3]

8. $\frac{6}{x^2-9}-\frac{5}{x^2+x-6}=$

A. $\frac{1}{(x-2)(x-3)}$.
B. $\frac{1}{(x+2)(x+3)}$.
C. $\frac{1}{(x+2)(x-3)}$.
D. $\frac{1}{(x-2)(x+3)}$.
E. $\frac{x-27}{(x-2)(x+3)(x-3)}$.

[1983-CE-MATHS 2-1]

9. $\dfrac{\dfrac{1}{a^3}+\dfrac{1}{b^3}}{\dfrac{1}{a}+\dfrac{1}{b}} =$

A. $\dfrac{1}{a^2}+\dfrac{1}{b^2}$.
B. $\dfrac{1}{a^2}+\dfrac{1}{ab}+\dfrac{1}{b^2}$.
C. $\dfrac{1}{a^2}-\dfrac{1}{ab}+\dfrac{1}{b^2}$.
D. a^2-ab+b^2.
E. a^2+ab+b^2.

[1983-CE-MATHS 2-2]

10. $\dfrac{4}{(x-2)(x+1)}-\dfrac{3}{x^2-1} =$

A. $\dfrac{1}{(x-1)^2(x+1)}$.
B. $\dfrac{x+2}{(x-2)(x+1)(x-1)}$.
C. $\dfrac{x+10}{(x-2)(x+1)(x-1)}$.
D. $\dfrac{x-10}{(x-2)(x+1)(x-1)}$.
E. $\dfrac{x^2-3x-10}{(x-2)(x+1)(x-1)^2}$.

[1984-CE-MATHS 2-1]

11. $\dfrac{2}{1+x}-\dfrac{1}{1-x}-\dfrac{4x}{x^2-1} =$

A. $\dfrac{1}{1-x}$.
B. $\dfrac{1}{x-1}$.
C. $\dfrac{1-7x}{x^2-1}$.
D. $\dfrac{1-7x}{1-x^2}$.
E. $\dfrac{3x+1}{1-x^2}$.

[1985-CE-MATHS 2-1]

12. $\dfrac{\dfrac{b}{a}-\dfrac{a}{b}}{\dfrac{1}{a}-\dfrac{1}{b}} =$

A. $a+b$.
B. $a-b$.
C. $-a+b$.
D. $-a-b$.
E. $\dfrac{1}{a}+\dfrac{1}{b}$.

[1985-CE-MATHS 2-2]

13. $(x+y)^{-1}(x^{-2}-y^{-2}) =$

A. $\dfrac{1}{x^3}-\dfrac{1}{y^3}$.
B. $\dfrac{1}{x^2y}-\dfrac{1}{xy^2}$.
C. $\dfrac{1}{xy^2}-\dfrac{1}{x^2y}$.
D. $\dfrac{1}{x^2}-\dfrac{1}{y^2}$.
E. $\dfrac{1}{x^2y}+\dfrac{1}{xy^2}$.

[1985-CE-MATHS 2-4]

14. $\dfrac{\dfrac{x^2}{3}-3y^2}{\dfrac{3}{2}(x-3y)} =$

A. $\dfrac{1}{2}(x-3y)$.
B. $\dfrac{2}{9}(x-3y)$.
C. $2(x+3y)$.
D. $\dfrac{1}{2}(x+3y)$.
E. $\dfrac{2}{9}(x+3y)$.

[1986-CE-MATHS 2-2]

15. $\left(\sqrt{\dfrac{x}{y}}+\sqrt{\dfrac{y}{x}}\right)^2 =$

A. $\dfrac{(x+y)^2}{xy}$.
B. $\dfrac{x^2+y^2}{xy}$.
C. $\dfrac{x+y+2}{xy}$.
D. $\dfrac{x+y}{xy}$.
E. 1.

[1986-CE-MATHS 2-30]

16. $\left(\dfrac{x+1}{x}\right)^2-\left(\dfrac{x-1}{x}\right)^2 =$

A. $\dfrac{2}{x}$.
B. $\dfrac{4}{x}$.
C. $\dfrac{2}{x^2}$.
D. $\dfrac{4}{x^2}$.
E. 0.

[1987-CE-MATHS 2-1]

17. $\dfrac{x^2-2x}{x^3-25x}\times\dfrac{x^2-2x-15}{x^2+x-6}=$

A. $\dfrac{1}{x-5}$.
B. $\dfrac{x-2}{(x+2)(x-5)}$.
C. $\dfrac{1}{x+5}$.
D. $\dfrac{1}{x}$.
E. $\dfrac{x-3}{(x+3)(x-5)}$.

[1988-CE-MATHS 2-3]

18. $\dfrac{1}{2x-x^2}+\dfrac{1}{x^2+x-6}=$

A. $\dfrac{3}{x(2-x)(x+3)}$.
B. $\dfrac{-3}{x(x+2)(x-3)}$.
C. $\dfrac{6-x}{x(2-x)(x+2)(x-3)}$.
D. $\dfrac{x-6}{x(2-x)(x+2)(x-3)}$.
E. $\dfrac{2x+3}{x(2-x)(x+3)}$.

[1988-CE-MATHS 2-6]

19. $\dfrac{27x^3-8}{3x-2}=$

A. $(3x-2)^2$.
B. $9x^2-4$.
C. $9x^2+4$.
D. $9x^2-6x+4$.
E. $9x^2+6x+4$.

[1989-CE-MATHS 2-2]

20. $\dfrac{(1-x^2)^n+(1-x)^n}{(1-x)^{2n}}=$

A. $\dfrac{(1+x)^n+1}{(1-x)^n}$.
B. $\dfrac{2-x-x^2}{(1-x)^2}$.
C. $\dfrac{(1+x)^n+1}{(1-x)^2}$.
D. $\dfrac{(1-x)^n+1}{(1+x)^n}$.
E. $\dfrac{2-x^n-x^{2n}}{1-x^{2n}}$.

[1989-CE-MATHS 2-41]

21. $\dfrac{1-\dfrac{x-y}{x+y}}{1-\dfrac{x+y}{x-y}}=$

A. $\dfrac{y-x}{x+y}$.
B. $\dfrac{x-y}{x+y}$.
C. $\dfrac{x}{y}$.
D. $x+y$.
E. $x-y$.

[1990-CE-MATHS 2-2]

22. $\dfrac{1}{1-x^2}-\dfrac{1}{(1+x)^2}=$

A. $\dfrac{2}{(1-x^2)(1+x^2)}$.
B. $\dfrac{2x^2}{(1-x^2)(1+x^2)}$.
C. $\dfrac{2x^2}{(1-x^2)(1+x)^2}$.
D. $\dfrac{2}{(1-x)(1+x)^2}$.
E. $\dfrac{2x}{(1-x)(1+x)^2}$.

[1991-CE-MATHS 2-2]

23. $\dfrac{\dfrac{1}{x^3}+\dfrac{1}{y^3}}{\dfrac{1}{x}+\dfrac{1}{y}}=$

A. $\dfrac{1}{x^2}+\dfrac{1}{y^2}$.
B. $\dfrac{1}{x^2}+\dfrac{1}{xy}+\dfrac{1}{y^2}$.
C. $\dfrac{1}{x^2}+\dfrac{2}{xy}+\dfrac{1}{y^2}$.
D. $\dfrac{1}{x^2}-\dfrac{2}{xy}+\dfrac{1}{y^2}$.
E. $\dfrac{1}{x^2}-\dfrac{1}{xy}+\dfrac{1}{y^2}$.

[1991-CE-MATHS 2-5]

24. $\dfrac{1}{a}+\dfrac{1}{b}=$

A. $\dfrac{a+b}{ab}$.
B. $\dfrac{ab}{a+b}$.
C. $\dfrac{1}{ab}$.
D. $\dfrac{2}{a+b}$.
E. $\dfrac{1}{a+b}$.

[1992-CE-MATHS 2-1]

25. $\dfrac{\frac{2}{x}-\frac{1}{y}}{\frac{4y}{x}-\frac{x}{y}} =$

A. $2y - x$.
B. $2y + x$.
C. $\dfrac{1}{2y-x}$.
D. $\dfrac{1}{2y+x}$.
E. $\dfrac{1}{4y-x}$.

[1994-CE-MATHS 2-36]

26. Simplify $\dfrac{(\frac{y}{x}-1)(1-\frac{x}{y})}{\frac{x}{y}-\frac{y}{x}}$.

A. $\dfrac{x-y}{x+y}$
B. $-\dfrac{x-y}{x+y}$
C. $\dfrac{x+y}{x-y}$
D. $-\dfrac{x+y}{x-y}$
E. -1

[1995-CE-MATHS 2-37]

27. Simplify $\dfrac{1}{x-1}+\dfrac{1}{x+1}+\dfrac{3x-1}{1-x^2}$.

A. $\dfrac{1}{1-x}$
B. $\dfrac{1}{1+x}$
C. $-\dfrac{1}{1+x}$
D. $\dfrac{3x+1}{1-x^2}$
E. $\dfrac{1-5x}{1-x^2}$

[1996-CE-MATHS 2-36]

28. Simplify $\dfrac{4}{x^2-4}-\dfrac{3}{x^2-x-2}$.

A. $\dfrac{1}{(x+1)(x+2)}$
B. $\dfrac{1}{(x+1)(x-2)}$
C. $\dfrac{1}{(x-1)(x-2)}$
D. $\dfrac{x+10}{(x+1)(x-2)(x+2)}$
E. $\dfrac{x-10}{(x-1)(x-2)(x+2)}$

[1997-CE-MATHS 2-28]

29. $\dfrac{2}{x^2-1}-\dfrac{3}{x^2-x-2} =$

A. $\dfrac{-1}{(x-1)(x-2)}$.
B. $\dfrac{-1}{(x+1)(x-2)}$.
C. $\dfrac{-1}{(x+1)(x+2)}$.
D. $\dfrac{-1}{(x-1)(x+1)(x-2)}$.
E. $\dfrac{-x-7}{(x-1)(x+1)(x-2)}$.

[1998-CE-MATHS 2-39]

30. $\dfrac{2}{x^2-1}-\dfrac{x-1}{x^2-2x-3} =$

A. $\dfrac{-x^2+2x+5}{(x-1)(x+1)(x+3)}$.
B. $\dfrac{-x^2+2x+7}{(x-1)(x+1)(x+3)}$.
C. $\dfrac{-x^2-5}{(x-3)(x-1)(x+1)}$.
D. $\dfrac{x^2-5}{(x-3)(x-1)(x+1)}$.
E. $\dfrac{-x^2+4x-7}{(x-3)(x-1)(x+1)}$.

[1999-CE-MATHS 2-40]

31. Simplify $\dfrac{a}{a+b}+\dfrac{b}{b-a}+\dfrac{2ab}{a^2-b^2}$.

A. $\dfrac{a+b}{a-b}$
B. $-\dfrac{a-b}{a+b}$
C. $\dfrac{-a^2+b^2+4ab}{a^2-b^2}$
D. $\dfrac{a^2+b^2}{a^2-b^2}$
E. 1

[2000-CE-MATHS 2-37]

32. $\dfrac{1-x}{x^2+4x-5}+\dfrac{x-1}{x+1} =$

A. $\dfrac{x^2+3x-6}{(x+1)(x+5)}$.
B. $\dfrac{x^2+5x-4}{(x+1)(x+5)}$.
C. $\dfrac{(x+4)(x-1)}{(x+1)(x+5)}$.
D. $\dfrac{(x-1)(x-4)}{(x+1)(x-5)}$.
E. $\dfrac{(x-1)(x-6)}{(x+1)(x-5)}$.

[2001-CE-MATHS 2-47]

33. $1-\dfrac{2x}{x-\dfrac{1}{x}}=$

A. $\dfrac{x-3}{x-1}$.

B. $\dfrac{x^2-3}{x^2-1}$.

C. $\dfrac{x^2+1}{x^2-1}$.

D. $-\dfrac{x^2+1}{x^2-1}$.

[2002-CE-MATHS 2-37]

34. $\dfrac{10}{x^2+x-6}-\dfrac{2}{x-2}=$

A. $\dfrac{2}{x+3}$.

B. $\dfrac{-2}{x+3}$.

C. $\dfrac{13-2x}{(x+3)(x-2)}$.

D. $\dfrac{16-2x}{(x+3)(x-2)}$.

[2003-CE-MATHS 2-37]

35. $\dfrac{\dfrac{3}{x}-\dfrac{2}{y}}{\dfrac{4x}{y}-\dfrac{9y}{x}}=$

A. $\dfrac{1}{2x-3y}$.

B. $\dfrac{1}{2x+3y}$.

C. $\dfrac{-1}{2x-3y}$.

D. $\dfrac{-1}{2x+3y}$.

[2004-CE-MATHS 2-37]

36. $\dfrac{1}{x+1}-\dfrac{1}{x-1}=$

A. $\dfrac{2}{1-x^2}$.

B. $\dfrac{2}{x^2-1}$.

C. $\dfrac{2x}{1-x^2}$.

D. $\dfrac{2x}{x^2-1}$.

[2006-CE-MATHS 2-3]

37. $\dfrac{1}{n+3}-\dfrac{1}{3-n}=$

A. $\dfrac{6}{9-n^2}$.

B. $\dfrac{6}{n^2-9}$.

C. $\dfrac{2n}{9-n^2}$.

D. $\dfrac{2n}{n^2-9}$.

[2007-CE-MATHS 2-2]

38. $\dfrac{-k}{1-k}-\dfrac{1}{k-1}=$

A. 1.

B. $\dfrac{k+1}{k-1}$.

C. $\dfrac{k+1}{1-k}$.

D. $\dfrac{k^2+1}{k^2-1}$.

[2008-CE-MATHS 2-3]

39. $\dfrac{1}{a-2}-\dfrac{2}{1-a}=$

A. $\dfrac{3}{(a-1)(a-2)}$.

B. $\dfrac{a-3}{(a-1)(a-2)}$.

C. $\dfrac{3a-1}{(a-1)(a-2)}$.

D. $\dfrac{3a-5}{(a-1)(a-2)}$.

[2009-CE-MATHS 2-3]

40. $\dfrac{1}{2x-3}+\dfrac{1}{2x+3}=$

A. $\dfrac{6}{2x^2-3}$.

B. $\dfrac{4x}{2x^2-3}$.

C. $\dfrac{6}{4x^2-9}$.

D. $\dfrac{4x}{4x^2-9}$.

[2010-CE-MATHS 2-3]

HKDSE Problems

41. $\frac{1}{2-x}+\frac{x-1}{(x-2)^2}=$

A. $\frac{-3}{(2-x)^2}$.

B. $\frac{1}{(2-x)^2}$.

C. $\frac{-2x+3}{(2-x)^2}$.

D. $\frac{2x-3}{(2-x)^2}$.

[SP-DSE-MATHS 2-31]

42. $\frac{1}{x^2-2x+1}-\frac{1}{x^2+x-2}=$

A. $\frac{1}{(x-1)(x+2)}$.

B. $\frac{1}{(x-1)^2(x+2)}$.

C. $\frac{3}{(x-1)^2(x+2)}$.

D. $\frac{2x+1}{(x-1)^2(x+2)}$.

[2015-DSE-MATHS 2-31]

43. $\frac{1}{3x+7}-\frac{1}{3x-7}=$

A. $\frac{14}{49-9x^2}$

B. $\frac{14}{9x^2-49}$

C. $\frac{6x}{49-9x^2}$

D. $\frac{6x}{9x^2-49}$

[2018-DSE-MATHS 2-4]

44. $\frac{5}{4k+3}-\frac{2}{4k-3}=$

A. $\frac{12k-21}{16k^2-9}$

B. $\frac{12k+9}{16k^2-9}$

C. $\frac{14k-21}{16k^2-9}$

D. $\frac{14k+9}{16k^2-9}$

[2020-DSE-MATHS 2-3]

Quadratic Equations

1. If $x(x+1) = 2(x+1)$, then x is equal to

   A. 1 only
   B. 1 or 2
   C. 1 or -2
   D. -1 or 2
   E. -1 or -2

   [SP-CE-MATHS A2-35]

2. The solution of the equation $(x-a) = (x-a)(x-b)$ is

   A. $x = a$ only
   B. $x = b$ only
   C. $x = b+1$ only
   D. $x = a$ or $x = b$
   E. $x = a$ or $x = b+1$

   [1978-CE-MATHS 2-33]

3. It is given that $x(2x+3) = x(3x-4)$. $x = ?$

   A. 0 only
   B. 7 only
   C. 0 or 7
   D. $-\frac{3}{2}$ or $\frac{4}{3}$ only
   E. 0, $-\frac{3}{2}$ or $\frac{4}{3}$

   [1981-CE-MATHS 2-9]

4. If $x + \frac{1}{x} = 2 + \frac{1}{2}$, then $x =$

   A. 2 only.
   B. -2 only.
   C. $\frac{1}{2}$ only.
   D. -2 or 2.
   E. $\frac{1}{2}$ or 2.

   [1983-CE-MATHS 2-33]

5. If $(x-2)(x-3) = (a-2)(a-3)$, solve for x.

   A. $x = 0$ or 5
   B. $x = 2$ or 3
   C. $x = a$ or 2
   D. $x = a$ or 3
   E. $x = a$ or $5-a$

   [1991-CE-MATHS 2-39]

6. Solve $(x-1)(x-3) = x-3$.

   A. $x = 1$
   B. $x = 2$
   C. $x = 0$ or 3
   D. $x = 1$ or 3
   E. $x = 2$ or 3

   [1998-CE-MATHS 2-10]

7. Solve $x(x-6) = x$.

   A. $x = 6$
   B. $x = 7$
   C. $x = 0$ or $x = 6$
   D. $x = 0$ or $x = 7$

   [2004-CE-MATHS 2-7]

8. Solve $3x^2 = 21x$.

   A. $x = 3$
   B. $x = 7$
   C. $x = 0$ or $x = 3$
   D. $x = 0$ or $x = 7$

   [2006-CE-MATHS 2-8]

Other Equations

9. What is / are the root(s) of the equation $\sqrt{5x+1} - \sqrt{x} = 1$?

   A. $x = 0$ only
   B. $x = \frac{1}{4}$ only
   C. $x = 4$ only
   D. $x = 0$ or $x = \frac{1}{4}$
   E. $x = 0$ or $x = 4$

   [1978-CE-MATHS A2-50]

10. What are the roots of the equation $(x-3)^2(x+1) = -(x+1)^2(x-3)$?

    A. 1 only
    B. 1, -3 only
    C. -1, 3 only
    D. 1, -1, -3
    E. 1, -1, 3

    [1982-CE-MATHS 2-7]

11. What is/are the root(s) of $\sqrt{5-x} = x-3$?

    A. 4 only
    B. 1 and 4 only
    C. -1 and -4 only
    D. -4 and 4 only
    E. -4, -1, 1 and 4

    [1984-CE-MATHS 2-7]

12. For what value(s) of x does the equality $\frac{(x+1)(x-2)}{x-2} = x+1$ hold?

    A. -1 only
    B. 2 only
    C. Any value
    D. Any value except -1
    E. Any value except 2

    [1992-CE-MATHS 2-3]

Coefficients of Equations

13. If $3 \in \{x \in \mathbf{R} : 2x^2 - x + k = 0\}$, then $k =$

A. -24 .
B. -21 .
C. -15 .
D. -12 .
E. -6 .

[SP-CE-MATHS 2-48]

Practical Problems

14. $\$M$ is to be divided between Tom and Mary. Tom gets $\$x$, which is c times what Mary gets. Find x in terms of c and M.

A. $\frac{M}{c+1}$
B. $\frac{cM}{c+1}$
C. $\frac{cM}{c-1}$
D. $\frac{c+1}{cM}$
E. $\frac{(c+1)M}{c}$

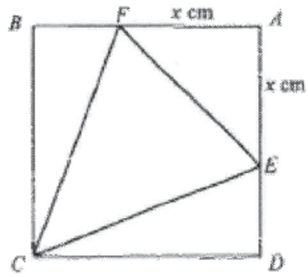
[1977-CE-MATHS 2-6]

15. If the price of an orange rises by \$1, then 5 fewer oranges could be bought for \$100. Which of the following equations gives the original price $\$x$ of an orange?

A. $\frac{100}{x+1} = 5$
B. $\frac{100}{x+1} - \frac{100}{x} = 5$
C. $\frac{100}{x} - \frac{100}{x+1} = 5$
D. $\frac{100}{x-1} - \frac{100}{x} = 5$
E. $\frac{100}{x} - \frac{100}{x-1} = 5$

[1992-CE-MATHS 2-43]

16. In the figure, $ABCD$ is a square of side 10 cm. If $AE = AF$ and the area of ΔCEF is 20 cm^2, which of the following equations can be used to find AF?



A. $x^2 + 10(10-x) + 20 = 100$
B. $x^2 + 20(10-x) + 20 = 100$
C. $\frac{1}{2}x^2 + 10x + 20 = 100$
D. $\frac{1}{2}x^2 + 10(10-x) + 20 = 100$
E. $\frac{1}{2}x^2 + \frac{10(10-x)}{2} + 20 = 100$

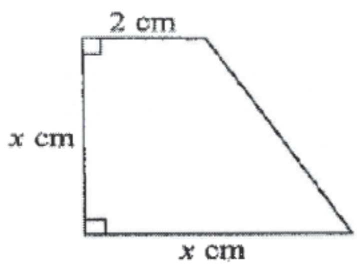
[1998-CE-MATHS 2-11]

17. A piece of wire of length 36 cm is cut into two parts. One part, x cm long, is bent into a square and the other part is bent into a circle. If the length of a side of the square is equal to the radius of the circle, which of the following equations can be used to find x?

A. $x = \frac{36-4x}{2\pi}$
B. $x = \frac{36-x}{2\pi}$
C. $\frac{x}{4} = \frac{36-4x}{2\pi}$
D. $\frac{x}{4} = \frac{36-x}{\pi}$
E. $\frac{x}{4} = \frac{36-x}{2\pi}$

[2001-CE-MATHS 2-13]

18. In the figure, the area of the trapezium is 12 cm^2. Which of the following equations can be used to find x?



A. $x(x+2) = 12$
B. $x(x+2) = 24$
C. $x^2 - x(x-2) = 12$
D. $x^2 - x(x-2) = 24$

[2005-CE-MATHS 2-5]

19. Let x be the smaller one of two consecutive integers. If the sum of the squares of the two integers is less than three times the product of the two integers by 1, then

A. $x^2 + (x+1)^2 = 3x(x+1) - 1$.
B. $x^2 + (x+1)^2 = 3x(x+1) + 1$.
C. $3(x^2 + (x+1)^2) = x(x+1) - 1$.
D. $3(x^2 + (x+1)^2) = x(x+1) + 1$.

[2007-CE-MATHS 2-4]

20. Let x be the larger one of two consecutive odd numbers. If the sum of the squares of the two odd numbers is less than four times the product of the two odd numbers by 2, then

A. $x^2 + (x-1)^2 = 4x(x-1) + 2$.
B. $x^2 + (x-1)^2 = 4x(x-1) - 2$.
C. $x^2 + (x-2)^2 = 4x(x-2) + 2$.
D. $x^2 + (x-2)^2 = 4x(x-2) - 2$.

[2010-CE-MATHS 2-7]

HKDSE Problems

21. Let a be a constant. Solve the equation $(x-a)(x-a-1) = (x-a)$.

A. $x = a+1$
B. $x = a+2$
C. $x = a$ or $x = a+1$
D. $x = a$ or $x = a+2$

[SP-DSE-MATHS 2-6]

22. Let k be a constant. Solve the equation $(x-k)^2 = 4k^2$.

A. $x = 3k$
B. $x = 5k$
C. $x = -k$ or $x = 3k$
D. $x = -3k$ or $x = 5k$

[2013-DSE-MATHS 2-6]

Nature of Quadratic Roots

1. The equation $x^2 + kx + k = 0$ has equal roots (k being a constant). $k =$

   A. 4 only.
   B. –4 only.
   C. 0 or 4.
   D. 0 or –4.
   E. 4 or –4.

   [1984-CE-MATHS 2-10]

2. If the equation $x^2 - 6x + k = 0$ has real roots, find all possible values of k.

   A. $k \geq 9$
   B. $k \geq -9$
   C. $k = 9$
   D. $k \leq 9$
   E. $k \leq -9$

   [1998-CE-MATHS 2-9]

3. Which of the following equations has/have equal roots?

   (1) $x^2 = x$
   (2) $x^2 + 2x + 1 = 0$
   (3) $(x + 3)^2 = 1$

   A. (2) only
   B. (3) only
   C. (1) and (2) only
   D. (1) and (3) only

   [2002-CE-MATHS 2-7]

4. If the equation $x^2 - 4x + k = 1$ has no real roots, then the range of values of k is

   A. $k > 4$.
   B. $k \geq 4$.
   C. $k > 5$.
   D. $k \geq 5$.

   [2003-CE-MATHS 2-5]

5. If the equation $4x^2 + kx + 9 = 0$ has equal positive roots, then $k =$

   A. –6 .
   B. 6 .
   C. –12 .
   D. 12 .

   [2004-CE-MATHS 2-6]

6. If the quadratic equation $kx^2 + 6x + (6 - k) = 0$ has equal roots, then $k =$

   A. –6 .
   B. –3 .
   C. 3 .
   D. 6 .

   [2005-CE-MATHS 2-8]

7. Find the range of values of k such that the quadratic equation $x^2 + 2x - k = 2$ has two distinct real roots.

   A. $k > -3$
   B. $k \geq -3$
   C. $k > -1$
   D. $k \geq -1$

   [2006-CE-MATHS 2-9]

8. If the quadratic equation $x^2 + bx + 4b = 0$ has equal roots, then $b =$

   A. 4 .
   B. 16 .
   C. 0 or 4 .
   D. 0 or 16 .

   [2009-CE-MATHS 2-8]

9. Let k be a constant. Find the range of values of k such that the quadratic equation $x^2 + 6x + k = 3$ has no real roots.

   A. $k < 9$
   B. $k > 9$
   C. $k < 12$
   D. $k > 12$

   [2010-CE-MATHS 2-10]

HKDSE Problems

10. Find the range of values of k such that the quadratic equation $x^2 - 6x = 2 - k$ has no real roots.

    A. $k < -7$
    B. $k > -7$
    C. $k < 11$
    D. $k > 11$

    [SP-DSE-MATHS 2-7]

11. Let k be a constant. If the quadratic equation $3x^2 + 2kx - k = 0$ has equal roots, then $k =$

    A. –3 .
    B. 3 .
    C. –3 or 0 .
    D. 0 or 3 .

    [PP-DSE-MATHS 2-6]

12. Let a be a constant. If the quadratic equation $x^2 + ax + a = 1$ has equal roots, then $a =$

    A. –1 .
    B. 2 .
    C. 0 or –4 .
    D. 0 or 4 .

    [2014-DSE-MATHS 2-4]

13. If k is a constant such that the quadratic equation $x^2 + kx + 8k + 36 = 0$ has equal roots, then $k =$

A. -6 .
B. 12 .
C. -4 or 36 .
D. -18 or 2 .

[2016-DSE-MATHS 2-8]

Relations between Quadratic Roots

1. If α and β are the roots of equation $x^2 + 3x + 7 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta} =$

A. $\frac{10}{21}$.
B. $\frac{3}{7}$.
C. $\frac{7}{3}$.
D. $-\frac{3}{7}$.
E. $-\frac{7}{3}$.

[1978-CE-MATHS 2-12]

2. One of the roots of the quadratic equation $3x^2 + kx + 2 = 0$ is 2. The other root is

A. 1.
B. $\frac{2}{3}$.
C. $\frac{1}{3}$.
D. $-\frac{1}{3}$.
E. $-\frac{2}{3}$.

[1978-CE-MATHS 2-32]

3. $6x^2 + kx + 6 = 0$ is a quadratic equation in which k is a constant. Its roots α and β are positive. $\log_{10}\alpha + \log_{10}\beta =$

A. 0.
B. 1.
C. $\log_{10} 6$.
D. $\log_{10}(-k)$.
E. $\log_{10}(-\frac{k}{6})$.

[1981-CE-MATHS 2-31]

4. If α and β are the roots of $2x^2 - 3x - 4 = 0$, then $\alpha^2 + 3\alpha\beta + \beta^2 =$

A. $\frac{1}{4}$.
B. $4\frac{1}{4}$.
C. 5.
D. $8\frac{1}{4}$.
E. 13.

[1983-CE-MATHS 2-7]

5. If α and β are the roots of $3x^2 - x - 1 = 0$, then $\frac{1}{\alpha^2} + \frac{1}{\beta^2} =$

A. 7.
B. 3.
C. 1.
D. -1.
E. -5.

[1984-CE-MATHS 2-5]

6. If α and β are the roots of $x^2 + 2x - 4 = 0$, then $2^\alpha \cdot 2^\beta =$

A. $\frac{1}{16}$.
B. $\frac{1}{4}$.
C. 2.
D. 4.
E. 16.

[1985-CE-MATHS 2-9]

7. If α and β are the roots of the equation $2x^2 + x + 3 = 0$, find the value of $\alpha - \frac{\alpha^2}{\alpha + \beta}$.

A. -3
B. -2
C. 2
D. 3
E. It cannot be determined.

[1986-CE-MATHS 2-6]

8. If α and β are the two roots of $x^2 - 8x - 4 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

A. -2.
B. $-\frac{1}{2}$.
C. $-\frac{1}{4}$.
D. $\frac{1}{2}$.
E. 2.

[1988-CE-MATHS 2-4]

9. If p and q are the roots of the equation $x^2 - x + 3 = 0$, then $(2^{p-2})(2^{q-2}) =$

A. $\frac{1}{32}$.
B. $\frac{1}{8}$.
C. $\frac{1}{2}$.
D. 8.
E. 32.

[1990-CE-MATHS 2-8]

10. If α and β are the roots of the quadratic equation $x^2 - 3x - 1 = 0$, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

A. -3
B. -1
C. $-\frac{1}{3}$
D. $\frac{2}{3}$
E. 3

[1993-CE-MATHS 2-12]

11. If $\alpha \neq \beta$ and $\begin{cases} 3\alpha^2 - h\alpha - b = 0 \\ 3\beta^2 - h\beta - b = 0 \end{cases}$, then $\alpha + \beta =$

A. $-\frac{b}{3}$.
B. $\frac{b}{3}$.
C. h.
D. $-\frac{h}{3}$.
E. $\frac{h}{3}$.

[1994-CE-MATHS 2-8]

12. If α, β are the roots of the equation $x^2 - 4x - 3 = 0$, then $\alpha^2 + \alpha\beta + \beta^2 =$

A. -13.
B. 5.
C. 13.
D. 16.
E. 19.

[1995-CE-MATHS 2-39]

13. If α and β are the roots of the equation $2x^2 + 4x - 3 = 0$, find $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

A. $-\frac{22}{3}$
B. $-\frac{16}{3}$
C. $-\frac{14}{3}$
D. $-\frac{8}{3}$
E. $\frac{2}{3}$

[1996-CE-MATHS 2-11]

14. The difference of the roots of the equation $2x^2 - 5x + k = 0$ is $\frac{7}{2}$. Find k.

A. -6
B. -3
C. $-\frac{3}{2}$
D. 3
E. $\frac{51}{16}$

[1997-CE-MATHS 2-30]

15. If a, b are distinct real numbers and $\begin{cases} a^2 + 4a + 1 = 0 \\ b^2 + 4b + 1 = 0 \end{cases}$, find $a^2 + b^2$.

A. 1
B. 9
C. 14
D. 16
E. 18

[2001-CE-MATHS 2-39]

16. Let k be a constant. If α and β are the roots of the equation $x^2 - 3x + k = 0$, then $\alpha^2 + 3\beta =$

A. $3 - k$.
B. $3 + k$.
C. $9 - k$.
D. $9 + k$.

[2003-CE-MATHS 2-41]

17. If $\alpha \neq \beta$ and $\begin{cases} \alpha^2 = 4\alpha + 3 \\ \beta^2 = 4\beta + 3 \end{cases}$, then $(\alpha + 1)(\beta + 1) =$

A. -6.
B. 0.
C. 2.
D. 8.

[2004-CE-MATHS 2-42]

18. If the sum and the product of two numbers are 34 and 120 respectively, then the difference between the two numbers is

A. 24.
B. 26.
C. 28.
D. 30.

[2008-CE-MATHS 2-41]

Quadratic Equations of Given Roots

19. If the roots of $ax^2 + bx + c = 0$ are p and q, then the roots of $4ax^2 + 2bx + c = 0$ are

A. p and q.
B. $2p$ and $2q$.
C. $4p$ and $4q$.
D. $\frac{1}{2}p$ and $\frac{1}{2}q$.
E. $\frac{1}{4}p$ and $\frac{1}{4}q$.

[1977-CE-MATHS 2-18]

20. α and β are the roots of the equation $x^2 - 5x - 7 = 0$. What is the equation whose roots are $\alpha + 1$ and $\beta + 1$?

A. $x^2 - 3x + 3 = 0$
B. $x^2 - 3x - 11 = 0$
C. $x^2 - 5x + 1 = 0$
D. $x^2 - 7x - 1 = 0$
E. $x^2 - 7x - 7 = 0$

[1982-CE-MATHS 2-6]

21. If the roots of a quadratic equation are $a+\sqrt{b}$ and $a-\sqrt{b}$, then the equation is

A. $x^2 - (a^2 - b)x + a = 0$.
B. $x^2 + (a^2 - b)x + 2a = 0$.
C. $x^2 + 2ax - a^2 + b = 0$.
D. $x^2 + 2ax + a^2 - b = 0$.
E. $x^2 - 2ax + a^2 - b = 0$.

[1988-CE-MATHS 2-8]

22. If p is a root of $ax^2 + bx + c = 0$, which of the following is a root of $a(\frac{x-3}{2})^2 + b(\frac{x-3}{2}) + c = 0$?

A. $2p + 3$
B. $2p - 3$
C. $3 - 2p$
D. $\frac{p+3}{2}$
E. $\frac{p-3}{2}$

[1989-CE-MATHS 2-44]

HKDSE Problems

23. If the roots of the quadratic equation $x^2 - kx + 3 = 0$ are α and β, then $\alpha^3 + \beta^3 =$

A. k^3 .
B. $k^3 - 3k$.
C. $k^3 - 9k$.
D. $k^3 - 12k$.

[PP-DSE-MATHS 2-33]

24. If $\alpha \neq \beta$ and $\begin{cases} 3\alpha = \alpha^2 - 5 \\ 3\beta = \beta^2 - 5 \end{cases}$, then $\alpha\beta =$

A. 3 .
B. −3 .
C. 5 .
D. −5 .

[2013-DSE-MATHS 2-35]

25. If β is a root of the equation $4x^2 - 5x - 1 = 0$, then $7 + 10\beta - 8\beta^2 =$

A. 5 .
B. 7 .
C. 9 .
D. 11 .

[2015-DSE-MATHS 2-7]

26. Let k be a constant. If the roots of the quadratic equation $x^2 + kx - 2 = 0$ are α and β, then $\alpha^2 + \beta^2 =$

A. k^2 .
B. $k^2 + 4$.
C. $k^2 - 4$.
D. $k^2 - 8$.

[2015-DSE-MATHS 2-34]

27. If $m \neq n$ and $2m^2 + 5m = 2n^2 + 5n = 14$, then $(m + 2)(n + 2) =$

A. −8
B. 2
C. 6
D. 16

[2018-DSE-MATHS 2-36]

Simultaneous Linear Equations

1. If $\begin{cases} 3x + 4y = 2 \\ 2x + 3y = 1 \end{cases}$, then $x + y =$

   A. -3 .
   B. -1 .
   C. 0 .
   D. 1 .
   E. 3 .

   [1977-CE-MATHS 2-8]

2. Solve the following equations:

   $$x - 1 = y + 2 = x + y - 5$$

   A. $x = 1,\ y = -2$
   B. $x = 1,\ y = 4$
   C. $x = 4,\ y = 1$
   D. $x = 7,\ y = -2$
   E. $x = 7,\ y = 4$

   [1991-CE-MATHS 2-8]

3. If $x = 3$, $y = 2$ satisfy the simultaneous equations $\begin{cases} ax + by = 2 \\ bx - ay = 3 \end{cases}$, find the values of a and b.

   A. $a = 0,\ b = 1$
   B. $a = 0,\ b = -1$
   C. $a = \frac{5}{6},\ b = -\frac{1}{4}$
   D. $a = -\frac{1}{13},\ b = \frac{37}{39}$
   E. $a = -\frac{12}{13},\ b = \frac{5}{13}$

   [1994-CE-MATHS 2-39]

4. Solve the simultaneous equations:

   $$\begin{cases} 4x - \frac{y}{3} = 6 \\ 2x + \frac{y}{6} = -1 \end{cases}.$$

   A. $x = -\frac{1}{2},\ y = -12$
   B. $x = -\frac{1}{2},\ y = 12$
   C. $x = \frac{1}{2},\ y = -12$
   D. $x = \frac{1}{2},\ y = 12$
   E. $x = \frac{5}{24},\ y = -\frac{7}{2}$

   [1995-CE-MATHS 2-7]

5. Solve $\begin{cases} \frac{3}{x} - y = 1 \\ 2y - \frac{1}{2x} = 1 \end{cases}$.

   A. $x = \frac{5}{4},\ y = \frac{7}{4}$
   B. $x = \frac{11}{4},\ y = \frac{1}{11}$
   C. $x = \frac{11}{4},\ y = \frac{13}{22}$
   D. $x = \frac{11}{6},\ y = \frac{7}{11}$
   E. $x = \frac{6}{11},\ y = \frac{7}{11}$

   [1997-CE-MATHS 2-8]

6. Solve the simultaneous equations:

   $$\begin{cases} 2x + \frac{3}{y} = -1 \\ x - \frac{1}{y} = 7 \end{cases}.$$

   A. $(0, -3)$
   B. $(1, -1)$
   C. $(4, -\frac{1}{3})$
   D. $(4, -3)$
   E. $(22, -\frac{1}{15})$

   [1998-CE-MATHS 2-4]

7. If $(x, y) = (-2, 1)$ is a solution of the simultaneous equations $\begin{cases} ax - by + 8 = 0 \\ bx + ay + 1 = 0 \end{cases}$, then $a =$

   A. -3 .
   B. 2 .
   C. $\frac{9}{4}$.
   D. 3 .

   [2002-CE-MATHS 2-8]

8. If $m + 2 = n - 1 = 3m + n - 46$, then $n =$

   A. 15 .
   B. 16 .
   C. 17 .
   D. 18 .

   [2008-CE-MATHS 2-8]

9. If $2p + q = p - q = 3$, then $q =$

   A. -1 .
   B. 1 .
   C. 2 .
   D. 3 .

   [2010-CE-MATHS 2-8]

Simultaneous Quadratic Equations

10. Find the real value of x such that $\begin{cases} x^2 + x + 1 = k \\ x - 1 = \dfrac{7}{k} \end{cases}$, where k is a constant.

A. 3
B. 2
C. 1
D. −1
E. −3

[1986-CE-MATHS 2-8]

11. Let m be a constant. Find the value of x such that $\begin{cases} x^2 + x + 1 = m \\ x - 1 = \dfrac{26}{m} \end{cases}$.

A. 1
B. 2
C. 3
D. 4
E. 5

[1990-CE-MATHS 2-35]

12. If the simultaneous equations $\begin{cases} y = x^2 - k \\ y = x \end{cases}$ have only one solution, find k.

A. −1
B. $-\dfrac{1}{4}$
C. −4
D. $\dfrac{1}{4}$
E. 1

[1993-CE-MATHS 2-13]

13. Solve $\begin{cases} x^2 + y^2 = 13 \\ x + y = 1 \end{cases}$.

A. $\begin{cases} x = -2 \\ y = 3 \end{cases}$
B. $\begin{cases} x = -6 \\ y = 7 \end{cases}$
C. $\begin{cases} x = 2 \\ y = -1 \end{cases}$ or $\begin{cases} x = -3 \\ y = 4 \end{cases}$
D. $\begin{cases} x = -2 \\ y = 3 \end{cases}$ or $\begin{cases} x = 3 \\ y = -2 \end{cases}$
E. $\begin{cases} x = -6 \\ y = 7 \end{cases}$ or $\begin{cases} x = 7 \\ y = -6 \end{cases}$

[1996-CE-MATHS 2-10]

14. If $\begin{cases} y = x^2 + 3x - 2 \\ y = -x + 3 \end{cases}$, then

A. $x = -1$.
B. $x = -1$ or 5 .
C. $x = -2$ or 1 .
D. $x = -5$ or 1 .
E. $x = -5$ or 8 .

[1999-CE-MATHS 2-8]

15. If $\begin{cases} y = x^2 - 1 \\ y = 2x - 2 \end{cases}$, then $y =$

A. −4 .
B. 0 .
C. 1 .
D. 0 or 8 .
E. −4 or 4 .

[2000-CE-MATHS 2-5]

16. If $\begin{cases} y = x^2 - 4x - 44 \\ y = -2x + 4 \end{cases}$, then $y =$

A. −32 or 52 .
B. −12 or 16 .
C. −12 or 96 .
D. −8 or 20 .
E. 12 or 24 .

[2001-CE-MATHS 2-12]

17. If $\begin{cases} y = x^2 + 4 \\ y = -3x + 4 \end{cases}$, then $y =$

A. 0 .
B. 13 .
C. 0 or −3 .
D. 4 or 13 .

[2003-CE-MATHS 2-7]

18. If $\begin{cases} pq + 2q = 10 \\ 4p + q = 14 \end{cases}$, then $q =$

A. 2 .
B. 3 .
C. $\dfrac{-3}{2}$ or 3 .
D. 2 or 20 .

[2004-CE-MATHS 2-8]

19. If $\begin{cases} \beta = \alpha^2 - 3 \\ \beta = 4\alpha - 3 \end{cases}$, then $\beta =$

A. 4 .
B. 13 .
C. 0 or 4 .
D. −3 or 13 .

[2005-CE-MATHS 2-7]

20. If $p = q^2 - 12q + 6 = 2q - 7$, then $p =$

A. 1 or 13 .
B. -1 or -13 .
C. -5 or 19 .
D. -9 or -33 .

[2007-CE-MATHS 2-42]

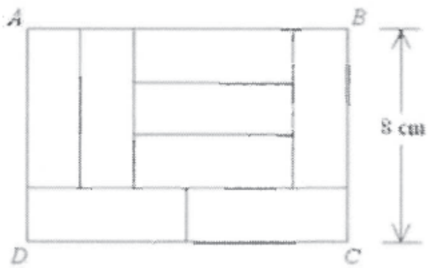
Practical Problems

21. The price of 6 oranges and 3 apples is \$42 while the price of 8 oranges and 5 apples is \$60. Find the price of an apple.

A. \$3
B. \$4
C. \$5
D. \$6

[2007-CE-MATHS 2-7]

22. In the figure, the rectangle *ABCD* is divided into eight identical rectangles. Find the area of the rectangle *ABCD*.



A. 40 cm^2
B. 80 cm^2
C. 96 cm^2
D. 112 cm^2

[2008-CE-MATHS 2-7]

23. The price of 5 pens and 4 pencils is \$46 while the price of 2 pens and 3 pencils is \$24. Find the price of 3 pens and 2 pencils.

A. \$20
B. \$24
C. \$26
D. \$30

[2011-CE-MATHS 2-6]

HKDSE Problems

24. If $m + 2n + 6 = 2m - n = 7$, then $n =$

A. -4 .
B. -1 .
C. 3 .
D. 11 .

[2012-DSE-MATHS 2-5]

25. The price of 2 bowls and 3 cups is \$506. If the price of 5 bowls and the price of 4 cups are the same, then the price of a bowl is

A. \$88 .
B. \$92 .
C. \$110 .
D. \$115 .

[2014-DSE-MATHS 2-8]

26. If $p + 3q = 4$ and $5p + 9q = 2$, then $p =$

A. -5 .
B. -3 .
C. 3 .
D. 5 .

[2015-DSE-MATHS 2-3]

27. If $4\alpha + \beta = 7\alpha + 3\beta = 5$, then $\beta =$

A. -3 .
B. -2 .
C. 2 .
D. 3 .

[2016-DSE-MATHS 2-5]

28. If $6x - 7y = 40 = 2x + 11y$, then $y =$

A. -4
B. 2
C. 4
D. 9

[2019-DSE-MATHS 2-3]

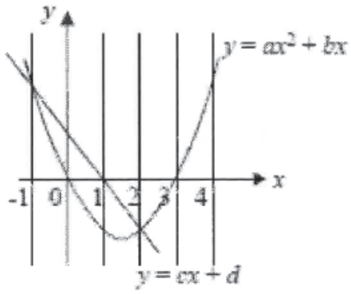
Graphical Methods

1. The graphs of $y = \frac{x^2}{2}$ and $y = x + 2$ intersect at the points (x_1, y_1) and (x_2, y_2). Which of the following equations has roots x_1 and x_2?

A. $x^2 - x - 2 = 0$
B. $x^2 + x + 2 = 0$
C. $x^2 - 2x - 4 = 0$
D. $x^2 - 4x - 8 = 0$
E. $2x^2 - x - 2 = 0$

[1982-CE-MATHS 2-31]

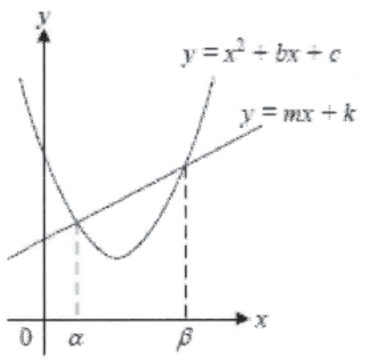
2. The diagram shows the graphs of $y = ax^2 + bx$ and $y = cx + d$. The solutions of the equation $ax^2 + bx = cx + d$ are



A. –1, 1
B. –1, 2
C. 0, 1
D. 0, 3
E. 1, 3

[1993-CE-MATHS 2-7]

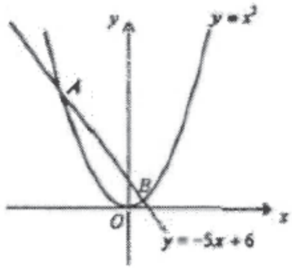
3. In the figure, the line $y = mx + k$ cuts the curve $y = x^2 + bx + c$ at $x = \alpha$ and $x = \beta$. Find the value of $\alpha\beta$.



A. $-b$
B. c
C. $m - b$
D. $k - c$
E. $c - k$

[1994-CE-MATHS 2-38]

4. In the figure, find the coordinates of the mid-point of AB.



A. $(-\frac{7}{2}, \frac{35}{2})$
B. $(-\frac{5}{2}, \frac{25}{4})$
C. $(-\frac{5}{2}, \frac{37}{2})$
D. $(\frac{5}{2}, \frac{13}{2})$
E. $(\frac{7}{2}, \frac{35}{2})$

[1997-CE-MATHS 2-31]

5. Suppose the graph of $y = x^2 - 2x - 3$ is given. In order to solve the quadratic equation $2x^2 - 6x - 3 = 0$, which of the following straight lines should be added to the given graph?

A. $y = 4x$
B. $y = x - \frac{3}{2}$
C. $y = -x + \frac{3}{2}$
D. $y = 2x - 3$
E. $y = -2x + 3$

[2001-CE-MATHS 2-40]

Location of Roots

6. Given that r is the only real root of $x^5 + x - 1 = 0$, which of the following ranges contains r?

A. $-2 < r < -1$
B. $-1 < r < 0$
C. $0 < r < 1$
D. $1 < r < 2$
E. $2 < r < 3$

[1989-CE-MATHS 2-8]

7.

x	Sign of $f(x)$
1.22	+
1.23	+
1.24	+
1.25	–
1.245	+

From the table, a root of the equation $f(x) = 0$ must be

A. 1.20, correct to 2 decimal places.
B. 1.24, correct to 2 decimal places.
C. 1.25, correct to 2 decimal places.
D. 1.245, correct to 3 decimal places.
E. 1.2475, correct to 4 decimal places.

[1990-CE-MATHS 2-32]

8. Which of the following intervals **must** contain a root of $2x^3 - x^2 - x - 3 = 0$?

(1) $-1 < x < 1$
(2) $0 < x < 2$
(3) $1 < x < 3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1992-CE-MATHS 2-36]

9.

x	Sign of $f(x)$
3.56	+
3.58	–
3.57	+
3.575	+

From the table, a root of the equation $f(x) = 0$ is

A. 3.57 (correct to 3 sig. fig.).
B. 3.575 (correct to 4 sig. fig.).
C. 3.5775 (correct to 5 sig. fig.).
D. 3.5725 (correct to 4 sig. fig.).
E. 3.58 (correct to 3 sig. fig.).

[1993-CE-MATHS 2-36]

10. From the table, which of the following intervals must contain a root of $f(x) - x = 0$?

x	$f(x)$
–2	1.2
–1	0.8
0	0.7
1	0.2
2	–0.1
3	0.8

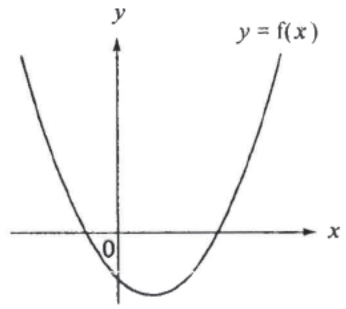
A. $-2 < x < -1$
B. $-1 < x < 0$
C. $0 < x < 1$
D. $1 < x < 2$
E. $2 < x < 3$

[1994-CE-MATHS 2-40]

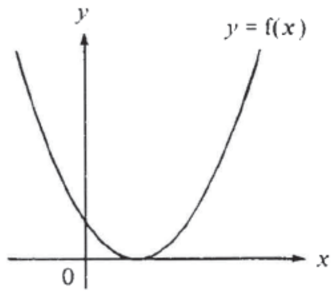
Method of Bisection (Out of Syllabus)

11. In which of the following cases the equation $f(x) = 0$ **cannot** be solved by the method of bisection?

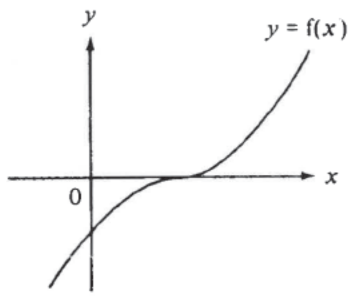
A.



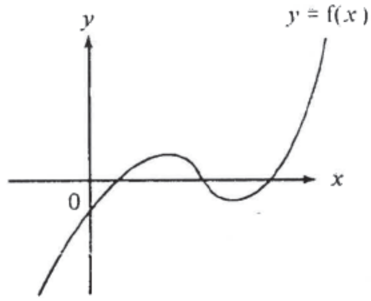
B.



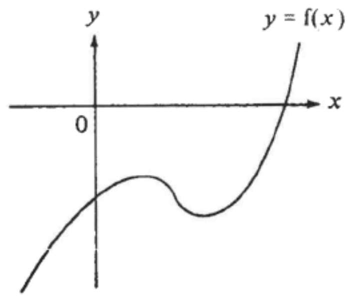
C.



D.



E.

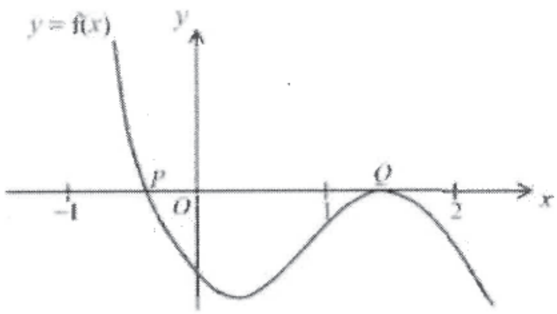


[1991-CE-MATHS 2-7]

12. The method of bisection is used to find the root of $\sin x + x - 1 = 0$ starting with the interval [0, 2]. After the first approximation, the interval which contains the root becomes [0, 1]. Find the interval which contains the root after the third approximation.

A. [0, 0.25]
B. [0.25, 0.75]
C. [0.5, 0.75]
D. [0.5, 1]
E. [0.75, 1]

[1999-CE-MATHS 2-41]

13. 

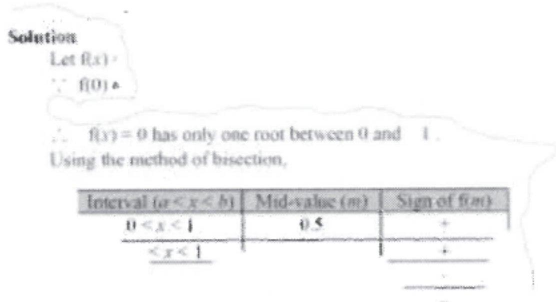
In the figure, the graph of $y = f(x)$ intersects the x-axis at P and Q only. In order to find a root of $f(x) = 0$ using the method of bisection, which of the following intervals can you start with?

(1) $-1 < x < 0$
(2) $-1 < x < 1$
(3) $1 < x < 2$

A. (1) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[2000-CE-MATHS 2-41]

14. The figure shows part of a page torn off from a mathematics book. According to the information shown, which of the following is a root of the equation $f(x) = 0$?


Solution
Let $f(x)$ =
∵ $f(0)$ =

∴ $f(x) = 0$ has only one root between 0 and 1.
Using the method of bisection,

Interval ($a < x < b$)	Mid-value (m)	Sign of $f(m)$
$0 < x < 1$	0.5	+
$< x < 1$		+
[illegible]	[illegible]	[illegible]

A. 0.6 (correct to 1 decimal place)
B. 0.7 (correct to 1 decimal place)
C. 0.8 (correct to 1 decimal place)
D. 0.9 (correct to 1 decimal place)

[2002-CE-MATHS 2-41]

15. It is known that the equation $2x^3 = 12x - 9$ has only one root in the interval $-3 \le x \le -2$. The method of bisection is used to find the root starting with the interval $-3 \le x \le -2$. After the first approximation, the interval which contains the root becomes $-3 \le x \le -2.5$. Find the interval which contains the root after the third approximation.

A. $-2.625 \le x \le -2.5$
B. $-2.75 \le x \le -2.625$
C. $-2.875 \le x \le -2.75$
D. $-3 \le x \le -2.875$

[2004-CE-MATHS 2-41]

Rate

1. The distance between P and Q is d metres. A man ran from P to Q in x seconds, and back from Q to P in y seconds. What was the average speed of the man in metres per second for the whole journey?

   A. $\frac{x+y}{2d}$
   B. $\frac{xd+yd}{2}$
   C. $\frac{1}{2}(\frac{d}{x}+\frac{d}{y})$
   D. $\frac{d}{x+y}$
   E. $\frac{2d}{x+y}$

   [1977-CE-MATHS 2-7]

2. If Mr. Chan walks x miles in y hours, then how many miles can he walk in w minutes at the same speed?

   A. $\frac{xw}{y}$ miles
   B. $\frac{xy}{w}$ miles
   C. $\frac{wy}{x}$ miles
   D. $\frac{xy}{60w}$ miles
   E. $\frac{xw}{60y}$ miles

   [SP-CE-MATHS A2-40]

3. A train travelled a journey of d km at a speed of x km/h. How many hours would have been saved if its speed had been 10 km/h faster?

   A. $\frac{x(x+10)}{d}$
   B. $\frac{d}{x(x+10)}$
   C. $(\frac{x+10}{d}-\frac{x}{d})$
   D. $(\frac{1}{x}-\frac{1}{x+10})$
   E. $(\frac{d}{x}-\frac{d}{x+10})$

   [1978-CE-MATHS 2-43]

4. A piece of work can be completed by A alone in x days, or by B alone in y days. If A and B work together, how many days will they take to complete the work?

   A. $x+y$
   B. $\frac{x+y}{2}$
   C. $\frac{1}{x}+\frac{1}{y}$
   D. $\frac{2}{x}+\frac{2}{y}$
   E. $\frac{xy}{x+y}$

   [1979-CE-MATHS 2-35]

5. A certain sum of money is just sufficient to pay the wages of one man for m days or the wages of one boy for n days. For how many days will this sum be just sufficient to pay the wages of one man and one boy together?

   A. $m+n$
   B. $\frac{m+n}{2}$
   C. $\frac{1}{m}+\frac{1}{n}$
   D. $\frac{m+n}{mn}$
   E. $\frac{mn}{m+n}$

   [1980-CE-MATHS 2-28]

6. A factory employs x workers each working n hours a day. The whole factory produces k watches per day. If y workers go on leave, then how many hours a day should the remaining workers work in order to produce the same number of watches per day?

   A. $\frac{nx}{y}$
   B. $\frac{ny}{x}$
   C. $\frac{nx}{ky}$
   D. $\frac{nx}{x-y}$
   E. $\frac{n(x-y)}{x}$

   [1981-CE-MATHS 2-38]

7. A man drives 20 km at 40 km/h. At what speed must he drive on his return journey so that the average speed for the double journey is 60 km/h?

   A. 50 km/h
   B. 80 km/h
   C. 100 km/h
   D. 120 km/h
   E. 160 km/h

   [1982-CE-MATHS 2-12]

8. Two men cycle round a circular track which is 3 km long. If they start at the same time and at the same spot but go in opposite directions with speeds 6 km/h and 9 km/h

respectively, for how long must they cycle before they meet for the first time?

A. 12 minutes
B. 15 minutes
C. 18 minutes
D. 24 minutes
E. 60 minutes

[1983-CE-MATHS 2-14]

9. A man drives a car at 30 km/h for 3 hours and then at 40 km/h for 2 hours. His average speed for the whole journey is

A. 14 km/h .
B. 30 km/h .
C. 34 km/h .
D. 35 km/h .
E. 70 km/h .

[1984-CE-MATHS 2-14]

10. A alone can complete a job in 8 hours. B alone takes 12 hours and C alone takes 6 hours. After A and B have worked together on the job for 3 hours, C joins them. How much longer will they take to complete the job?

A. 1 hour
B. $1\frac{1}{2}$ hour
C. 2 hours
D. $2\frac{1}{2}$ hours
E. 3 hours

[1984-CE-MATHS 2-15]

11. It takes John 40 minutes to walk from his home to school. If he increases his walking speed by 2 km/h, then it takes only 30 minutes. What is the distance between John's home and his school?

A. 1 km
B. 4 km
C. 6 km
D. 8 km
E. 12 km

[1985-CE-MATHS 2-14]

12. A man drives a car at 45 km/h for 3 hours and then at 50 km/h for 2 hours. His average speed for the whole journey is

A. 47 km/h .
B. 47.5 km/h .
C. 48 km/h .
D. 48.5 km/h .
E. 49 km/h .

[1986-CE-MATHS 2-11]

13. A man walks from place A to place B at a speed of 3 km/h and cycles immediately back to place A along the same road at a speed of 15 km/h. The average speed for the whole trip is

A. 5 km/h .
B. 6 km/h .
C. 9 km/h .
D. 10 km/h .
E. 12 km/h .

[1987-CE-MATHS 2-43]

14. John goes to school and returns home at speeds x km/h and $(x+1)$ km/h respectively. The school is 2 km from John's home and the total time for the two journeys is 54 minutes. Which of the following equations can be used to find x?

A. $\frac{x}{2} + \frac{x+1}{2} = \frac{54}{60}$

B. $\frac{2}{x} + \frac{2}{x+1} = \frac{54}{60}$

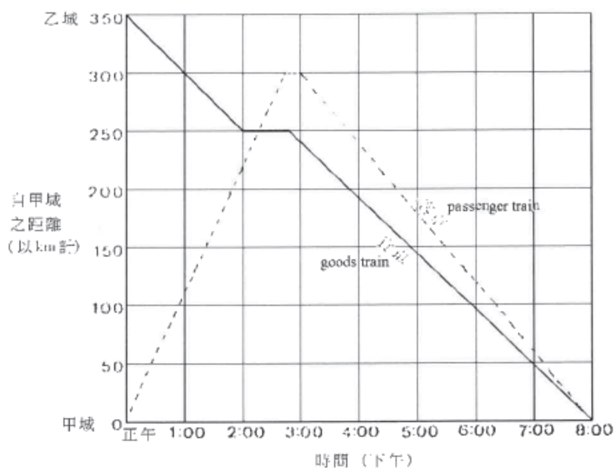
C. $\frac{\frac{1}{2}[x+(x+1)]}{4} = \frac{54}{60}$

D. $\frac{4}{\frac{1}{2}[x+(x+1)]} = \frac{54}{60}$

E. $2x + 2(x+1) = \frac{54}{60}$

[1999-CE-MATHS 2-42]

Travel Graphs



The figure above shows the travel graph of a passenger train and a goods train travelling on the railway line between town A and town B which are 350 km apart. Study the graph and answer the following <u>two</u> questions.

15. Which of the following statements are correct?

    (1) The goods train travelled from town B to town A.
    (2) When the 2 trains met, the goods train was not in motion.
    (3) Between noon and 8:00 p.m., the goods train travelled a greater distance than the passenger train.

    A. (1) only
    B. (2) only
    C. (1) and (2) only
    D. (2) and (3) only
    E. (1), (2) and (3)

    [1978-CE-MATHS 2-28]

16. What is the average speed of the passenger train on its return journey?

    A. 3.75 km/h
    B. 40 km/h
    C. 60 km/h
    D. 75 km/h
    E. 80 km/h

    [1978-CE-MATHS 2-29]

HKDSE Problems

17. Mary performs a typing task for 7 hours. Her average typing speeds for the first 3 hours and the last 4 hours are 63 words per minute and 56 words per minute respectively. Find her average typing speed for the 7 hours.

    A. 17 words per minute
    B. 35 words per minute
    C. 59 words per minute
    D. 60 words per minute

    [2012-DSE-MATHS 2-11]

Ratio

1. If $a:b = 2:3$ and $b:c = 4:3$, then $a:b:c =$

A. $2:3:4$.
B. $2:4:3$.
C. $4:6:3$.
D. $8:9:12$.
E. $8:12:9$.

[1979-CE-MATHS 2-13]

2. If $3x - 2y = x + 3y$, then $x^2 : y^2 =$

A. $2:5$.
B. $5:2$.
C. $4:25$.
D. $25:4$.
E. $1:4$.

[1981-CE-MATHS 2-12]

3. If $2x = 3y = 5z$, then $x:y:z =$

A. $2:3:5$.
B. $5:3:2$.
C. $6:10:15$.
D. $15:10:6$.
E. $25:9:4$.

[1983-CE-MATHS 2-10]

4. Three numbers are in the ratio $2:3:5$. The ratio of their average to the largest of the three numbers is

A. $1:3$.
B. $1:2$.
C. $3:5$.
D. $2:3$.
E. $2:1$.

[1983-CE-MATHS 2-43]

5. If $\dfrac{3x+2y}{x+5y} = 1$, then $\sqrt{x+y} : \sqrt{x-y} =$

A. $1:\sqrt{5}$.
B. $3:2$.
C. $\sqrt{5}:\sqrt{6}$.
D. $\sqrt{5}:1$.
E. $\sqrt{7}:2$.

[1984-CE-MATHS 2-11]

6. If $a:b = 1:2$ and $b:c = 1:3$, then $a+b : b+c =$

A. $1:5$.
B. $2:3$.
C. $3:4$.
D. $3:5$.
E. $3:8$.

[1985-CE-MATHS 2-11]

7. If $r = \sqrt[3]{h^3 - 7r^3}$, then the ratio $r:h$ is

A. $1:8$.
B. $1:2\sqrt{2}$.
C. $1:2$.
D. $1:\sqrt{2}$.
E. $1:\sqrt[3]{2}$.

[1986-CE-MATHS 2-1]

8. If $a:b = 3:2$, $b:c = 4:3$, then $a+b : b+c =$

A. $7:10$.
B. $5:7$.
C. $1:1$.
D. $7:5$.
E. $10:7$.

[1987-CE-MATHS 2-34]

9. If $3a = 2b = 5c$, then $\dfrac{1}{a} : \dfrac{1}{b} : \dfrac{1}{c} =$

A. $3:2:5$.
B. $5:2:3$.
C. $\dfrac{1}{3}:\dfrac{1}{2}:\dfrac{1}{5}$.
D. $\dfrac{1}{5}:\dfrac{1}{2}:\dfrac{1}{3}$.
E. $\dfrac{1}{2}:\dfrac{1}{3}:\dfrac{1}{5}$.

[1987-CE-MATHS 2-42]

10. If $a:b = 3:4$ and $b:c = 2:5$, then $a^2 : c^2 =$

A. $3:10$.
B. $9:25$.
C. $9:100$.
D. $36:25$.
E. $36:100$.

[1990-CE-MATHS 2-9]

11. If $\dfrac{1}{a} : \dfrac{1}{b} = 2:3$ and $a:c = 4:1$, then $a:b:c =$

A. $12:8:3$.
B. $8:3:2$.
C. $4:6:1$.
D. $2:3:8$.
E. $2:3:4$.

[1991-CE-MATHS 2-10]

12. If $a : b = 2 : 3$, $a : c = 3 : 4$ and $b : d = 5 : 2$, find $c : d$.

A. 1 : 5
B. 16 : 45
C. 10 : 3
D. 20 : 9
E. 5 : 1

[1992-CE-MATHS 2-10]

13. If $a : b = 2 : 3$ and $b : c = 5 : 3$, then $\frac{a+b+c}{a-b+c} =$

A. -2 .
B. $\frac{5}{2}$.
C. 4 .
D. $\frac{17}{2}$.
E. 31 .

[1993-CE-MATHS 2-35]

14. If $a : b = 2 : 3$, $a : c = 3 : 4$ and $a : d = 4 : 5$, then $b : c : d =$

A. 2 : 3 : 4 .
B. 3 : 4 : 5 .
C. 3 : 6 : 10 .
D. 18 : 16 : 15 .
E. 40 : 45 : 48 .

[1994-CE-MATHS 2-42]

15. If $125^x = 25^y$ and x, y are non-zero, find $x : y$.

A. 1 : 25
B. 1 : 5
C. 2 : 3
D. 3 : 2
E. 5 : 1

[1995-CE-MATHS 2-12]

16. If $\frac{x+2y}{3x-4y} = 5$, then $x : y =$

A. 3 : 7 .
B. 7 : 3 .
C. 7 : 11 .
D. 9 : 7 .
E. 11 : 7 .

[1998-CE-MATHS 2-15]

17. If $x : y = 3 : 4$ and $2x + 5y = 598$, find x.

A. 23
B. 26
C. 69
D. 78
E. 104

[1999-CE-MATHS 2-12]

18. If $81^x = 27^{2y}$ and x, y are non-zero integers, then $x : y =$

A. 2 : 3 .
B. 3 : 4 .
C. 4 : 3 .
D. 3 : 2 .

[2003-CE-MATHS 2-13]

19. If $(a-b) : (b-2a) = 2 : 3$, then $a : b =$

A. 3 : 5 .
B. 5 : 3 .
C. 5 : 7 .
D. 7 : 5 .

[2004-CE-MATHS 2-13]

20. Let x and y be non-zero numbers. If $2x - 3y = 0$, then $(x+3y) : (x+2y) =$

A. 3 : 2 .
B. 4 : 3 .
C. 9 : 7 .
D. 11 : 8 .

[2005-CE-MATHS 2-13]

21. Let x, y and z be non-zero numbers. If $x : y = 1 : 2$ and $y : z = 3 : 1$, then $(x+y) : (y+z) =$

A. 3 : 4 .
B. 4 : 3 .
C. 8 : 9 .
D. 9 : 8 .

[2006-CE-MATHS 2-13]

22. Let a and b be non-zero numbers. If $7a + 5b = 3a + 8b$, then $a : b =$

A. 3 : 4 .
B. 4 : 3 .
C. 10 : 13 .
D. 13 : 10 .

[2007-CE-MATHS 2-13]

23. Let m and n be non-zero numbers. If $\frac{2m-n}{m-2n} = 3$, then $m : n =$

A. 1 : 5 .
B. 5 : 1 .
C. 5 : 7 .
D. 7 : 5 .

[2011-CE-MATHS 2-12]

Applications of Ratio

24. On a plan, 1 cm represents 50 cm. On the plan, the area of a classroom is 100 cm^2. What is the actual area of the classroom in m^2?

A. 25
B. 50
C. 500
D. 2500
E. 5000

[1978-CE-MATHS 2-38]

25. The running speeds of three boys A, B and C are in the ratios $a:b:c$. The time that A, B and C takes to complete a 1500 m race are in the ratios

A. $a:b:c$.
B. $c:b:a$.
C. $b+c:a+c:a+b$.
D. $\frac{1}{a}:\frac{1}{b}:\frac{1}{c}$.
E. $\frac{a}{b}:\frac{b}{c}:\frac{c}{a}$.

[1981-CE-MATHS 2-36]

26. The daily wages of a man and a boy are in the ratio $2:1$. In a day a man has to work 8 hours but a boy only 6 hours. The hourly wages of a man and a boy are in the ratio

A. $8:3$.
B. $2:1$.
C. $3:2$.
D. $4:3$.
E. $1:1$.

[1981-CE-MATHS 2-39]

27. The scale of a map is $1:20000$. On the map, the area of a farm is 2 cm^2. The actual area of the farm is

A. 400 m^2.
B. 800 m^2.
C. 40 000 m^2.
D. 80 000 m^2.
E. 8 000 000 m^2.

[1983-CE-MATHS 2-40]

28. A is 25% taller than B. B is 25% shorter than C. A's height : C's height =

A. $1:1$.
B. $5:4$.
C. $3:4$.
D. $5:3$.
E. $15:16$.

[1984-CE-MATHS 2-12]

29. If A, B and C can finish running the same distance 3, 4 and 5 minutes respectively, then A's speed : B's speed : C's speed =

A. $3:4:5$.
B. $5:4:3$.
C. $9:8:7$.
D. $20:15:12$.
E. $25:16:9$.

[1986-CE-MATHS 2-42]

30. The radii of two solid spheres made of the same material are in the ratio $2:3$. If the smaller sphere weighs 16 kg, then the larger one weighs

A. 24 kg.
B. 36 kg.
C. 48 kg.
D. 54 kg.
E. 60 kg.

[1987-CE-MATHS 2-4]

31. If a is 10% less than b and b is 10% greater than c, then $a:c=$

A. $1:1$.
B. $9:10$.
C. $10:9$.
D. $99:100$.
E. $100:99$.

[1987-CE-MATHS 2-41]

32. The weight of a gold coin of a given thickness varies as the square of its diameter. If the weights of two such coins are in the ratio $1:4$, then their diameters are in the ratio

A. $1:2$.
B. $2:1$.
C. $1:4$.
D. $4:1$.
E. $1:16$.

[1988-CE-MATHS 2-44]

33. The costs of two kinds of coffee A and B are \$12/kg and \$20/kg respectively. In what ratio by weight should A and B be mixed so that the mixture will cost \$15/kg?

A. $4:3$
B. $5:2$
C. $5:3$
D. $3:2$
E. $5:4$

[1989-CE-MATHS 2-36]

34. If 1 U. S. dollar is equivalent to 7.8 H. K. dollars and 1000 Japanese yen are equivalent to 53.3 H. K. dollars, how many Japanese yen are equivalent to 50 U. S. dollars?

A. 1 463
B. 3 417
C. 7 317
D. 8 315
E. 20 787

[1990-CE-MATHS 2-10]

35. Coffee A and coffee B are mixed in the ratio $x : y$ by weight. A costs \$50/kg and B costs \$40/kg. If the cost of A is increased by 10% while that of B is decreased by 15%, the cost of the mixture per kg remains unchanged. Find $x : y$.

A. 2 : 3
B. 5 : 6
C. 6 : 5
D. 3 : 2
E. 55 : 34

[1992-CE-MATHS 2-45]

36. The following table shows the compositions of Tea A and Tea B which are mixtures of Chinese tea and Indian tea:

	Ratio of Chinese tea and Indian tea by weight
Tea A	3 : 1
Tea B	2 : 3

If 4 kg of tea A and 10 kg of tea B are mixed, find the ratio of Chinese tea and Indian tea in the mixture.

A. 2 : 5
B. 16 : 17
C. 1 : 1
D. 5 : 4
E. 23 : 17

[1996-CE-MATHS 2-44]

37. In a map of scale 1 : 500, the length and breath of a rectangular field are 2 cm and 3 cm respectively. Find the actual area of this field.

A. 30 m^2
B. 150 m^2
C. 1500 m^2
D. 3000 m^2
E. 15000 m^2

[1997-CE-MATHS 2-11]

38. If 1 Australian dollar is equivalent to 4.69 H.K. dollars and 100 Japanese yen are equivalent to 5.35 H.K. dollars, how many Japanese yen are equivalent to 1 Australian dollar? Give your answer correct to the nearest Japanese yen.

A. 4
B. 25
C. 88
D. 114
E. 2509

[1999-CE-MATHS 2-13]

39. Tea A and tea B are mixed in the ratio $x : y$ by weight. A costs \$80/kg and B costs \$100/kg. If the cost of A is increased by 10% and that of B is decreased by 12%, the cost of the mixture per kg remains unchanged. Find $x : y$.

A. 1 : 1
B. 2 : 3
C. 3 : 2
D. 5 : 6
E. 6 : 5

[2000-CE-MATHS 2-36]

40. If 1 Euro is equivalent to 6.94 H. K. dollars and 1 U. S. dollar is equivalent to 7.78 H. K. dollars, how many Euros are equivalent to 100 U. S. dollars? Give your answer correct to the nearest Euro.

A. 89
B. 112
C. 129
D. 144

[2002-CE-MATHS 2-10]

41. The scale of a map is 1 : 4 000. If the actual area of a sports field is 8 000 m^2, find its area on the map.

A. 0.02 cm^2
B. 0.05 cm^2
C. 2 cm^2
D. 5 cm^2

[2003-CE-MATHS 2-15]

42. A box contains two kinds of coins: \$5 and \$2. The ratio of the number of \$5 coins to the number of \$2 coins is 4 : 5. If the total value of the coins is \$90, then the total number of coins in the box is

A. 9 .
B. 18 .
C. 27 .
D. 36 .

[2004-CE-MATHS 2-14]

43. The scale of a map is $1:20\,000$. If two buildings are 3.8 cm apart on the map, then the actual distance between the two buildings is

A. 0.076 km.
B. 0.76 km.
C. 7.6 km.
D. 76 km.

[2004-CE-MATHS 2-15]

44. The scale of a map is $1:8000$. If the area of a park on the map is 2 cm^2, then the actual area of the park is

A. 4000 m^2.
B. 6400 m^2.
C. $12\,800\text{ m}^2$.
D. $16\,000\text{ m}^2$.

[2006-CE-MATHS 2-15]

45. The costs of rice of brand A and rice of brand B are \$8/kg and \$4/kg respectively. If x kg of rice of brand A and y kg of rice of brand B are mixed so that the cost of the mixture is \$5/kg, find $x:y$.

A. 1 : 2
B. 2 : 1
C. 1 : 3
D. 3 : 1

[2008-CE-MATHS 2-13]

46. The scale of a map is $1:5000$. If the area of a garden on the map is 4 cm^2, then the actual area of the garden is

A. 100 m^2.
B. 200 m^2.
C. $10\,000\text{ m}^2$.
D. $20\,000\text{ m}^2$.

[2009-CE-MATHS 2-13]

47. If tea of brand A costs \$80/kg and tea of brand B costs \$40/kg, then a mixture of 4 kg of tea of brand A and 6 kg of tea of brand B costs

A. \$52/kg.
B. \$56/kg.
C. \$60/kg.
D. \$64/kg.

[2010-CE-MATHS 2-15]

Proportion

48. a, b, c are positive numbers such that $\frac{a}{b} = \frac{b}{c} = k$ (k being a constant), which of the following must be true?

(1) $b^2 = k^2$
(2) $\frac{a+b}{b+c} = k$
(3) $\frac{a}{c} = k^2$

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1984-CE-MATHS 2-39]

49. If $\frac{a}{b} = \frac{c}{d} = k$ and a, b, c, d are positive, then which of the following *must* be true?

A. $\frac{a+c}{b+d} = k$
B. $ab = cd = k$
C. $ac = bd = k$
D. $a = c = k$
E. $\frac{ac}{bd} = k$

[1992-CE-MATHS 2-7]

50. If $\frac{a}{b} = \frac{c}{d}$, which of the following must be true?

(1) $\frac{a}{c} = \frac{b}{d}$
(2) $\frac{a+b}{b} = \frac{c+d}{d}$
(3) $\frac{a-b}{b} = \frac{c-d}{d}$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-16]

HKDSE Problems

51. If x, y and z are non-zero numbers such that $2x = 3y$ and $x = 2z$, then $(x+z):(x+y) =$

A. 3 : 5.
B. 6 : 7.
C. 9 : 7.
D. 9 : 10.

[SP-DSE-MATHS 2-13]

52. Let α and β be non-zero constants. If $(\alpha+\beta):(3\alpha-\beta) = 7:3$, then $\alpha:\beta =$

A. $5:9$.
B. $9:5$.
C. $19:29$.
D. $29:19$.

[PP-DSE-MATHS 2-12]

53. If x and y are non-zero numbers such that $\frac{6x+5y}{3y-2x} = 7$, then $x:y =$

A. $4:5$.
B. $4:13$.
C. $5:4$.
D. $13:4$.

[2012-DSE-MATHS 2-9]

54. The actual area of a playground is 900 m^2. If the area of the playground on a map is 36 cm^2, then the scale of the map is

A. $1:25$.
B. $1:50$.
C. $1:500$.
D. $1:250\,000$.

[2013-DSE-MATHS 2-12]

55. It is given that $\frac{4}{5a} = \frac{5}{7b} = \frac{7}{9c}$, where a, b and c are positive numbers. Which of the following is true?

A. $a<b<c$
B. $a<c<b$
C. $b<a<c$
D. $b<c<a$

[2014-DSE-MATHS 2-12]

56. Let a, b and c be non-zero numbers. If $a:c = 5:3$ and $b:c = 3:2$, then $(a+c):(b+c) =$

A. $7:5$.
B. $8:5$.
C. $16:15$.
D. $19:15$.

[2015-DSE-MATHS 2-11]

57. If x and y are non-zero numbers such that $(3y-4x):(2x+y) = 5:6$, then $x:y =$

A. $7:8$.
B. $8:29$.
C. $9:32$.
D. $13:34$.

[2016-DSE-MATHS 2-11]

58. The cost of flour of brand X is $42/kg. If 3 kg of flour of brand X and 2 kg of flour of brand Y are mixed so that the cost of the mixture is $36/kg, find the cost of flour of brand Y.

A. $27/kg
B. $30/kg
C. $32/kg
D. $39/kg

[2016-DSE-MATHS 2-13]

59. The scale of a map is $1:20\,000$. If the area of a zoo on the map is 4 cm^2, then the actual area of the zoo is

A. $8\times10^4\text{ m}^2$.
B. $1.6\times10^5\text{ m}^2$.
C. $3.2\times10^5\text{ m}^2$.
D. $1\times10^6\text{ m}^2$.

[2017-DSE-MATHS 2-11]

60. Let a, b and c be non-zero numbers. If $3a = 4b$ and $a:c = 2:5$, then $\frac{a+3b}{b+3c} =$

A. $\frac{5}{3}$
B. $\frac{13}{33}$
C. $\frac{30}{53}$
D. $\frac{75}{38}$

[2018-DSE-MATHS 2-10]

61. The costs of tea of brand A and brand B are $140/kg and $315/kg respectively. If x kg of tea of brand A and y kg of brand B are mixed so that the cost of the mixture is $210/kg, then $x:y =$

A. $2:3$
B. $3:2$
C. $4:9$
D. $9:4$

[2019-DSE-MATHS 2-12]

62. The actual area of a golf courses is $0.75km^2$. If the area of the course on a map is $300\ cm^2$, then the scale of the map is

A. $1:250$
B. $1:5\,000$
C. $1:62\,500$
D. $1:25\,000\,000$

[2020-DSE-MATHS 2-10]

Direct & Inverse Variations

1. It is given that $x \propto \frac{1}{y}$. If y increases by 100%, then

   A. x increases by 50%.
   B. x increases by 75%.
   C. x decreases by 50%.
   D. x decreases by 75%.
   E. x decreases by 100%.

   [1979-CE-MATHS 2-49]

2. y varies inversely as x^2. If x is increased by 100%, then y is

   A. increased by 100%.
   B. increased by 300%.
   C. decreased by 25%.
   D. decreased by 75%.
   E. decreased by 100%.

   [1988-CE-MATHS 2-39]

3. Given that $y \propto \frac{1}{x}$. If x is increased by 25%, find the percentage change in y.

   A. Decreased by 20%
   B. Decreased by 25%
   C. Decreased by 80%
   D. Increased by 20%
   E. Increased by 25%

   [1989-CE-MATHS 2-35]

4. Let x vary inversely as $\sqrt{y}$. If y is increased by 69%, then x will be

   A. increased by 23.1% (3 sig. fig.).
   B. increased by 30%.
   C. decreased by 23.1% (3 sig. fig.).
   D. decreased by 30%.
   E. decreased by 76.9% (3 sig. fig.).

   [1994-CE-MATHS 2-43]

5. x and y are two variables. The table below shows some values of x and their corresponding values of y.

x	2	3	6	12
y	36	16	4	1

   Which of the following may be a relation between x and y?

   A. $x \propto \sqrt{y}$
   B. $x \propto y$
   C. $x \propto \frac{1}{\sqrt{y}}$
   D. $x \propto \frac{1}{y}$
   E. $x \propto \frac{1}{y^2}$

   [1995-CE-MATHS 2-11]

6. It is given that y varies inversely as x^3. If x is increased by 100%, then y is

   A. increased by 800%.
   B. increased by 700%.
   C. decreased by 300%.
   D. decreased by 87.5%.
   E. decreased by 12.5%.

   [1999-CE-MATHS 2-45]

7. It is given that y varies inversely as x. If x is increased by 50%, then y is decreased by

   A. $33\frac{1}{3}\%$.
   B. 50%.
   C. $66\frac{2}{3}\%$.
   D. 100%.

   [2002-CE-MATHS 2-15]

Joint Variation

8. If x varies inversely as y^2 and y varies as $\sqrt{z}$, then x varies as

   A. z.
   B. z^2.
   C. z^4.
   D. $\frac{1}{z}$.
   E. $\frac{1}{z^2}$.

   [SP-CE-MATHS 2-18]

9. If z varies directly as x and inversely as y, then

   A. $\frac{xz}{y}$ = a constant.
   B. $\frac{yz}{x}$ = a constant.
   C. $\frac{z^2}{xy}$ = a constant.
   D. $\frac{z^2y}{x}$ = a constant.
   E. xyz = a constant.

   [1978-CE-MATHS 2-31]

10. If z varies inversely as x and directly as y, then

A. xyz is a constant.

B. $\frac{xz}{y}$ is a constant.

C. $\frac{yz}{x}$ is a constant.

D. $\frac{xz^2}{y}$ is a constant.

E. $\frac{z^2}{xy}$ is a constant.

[1989-CE-MATHS 2-9]

11. Suppose x varies directly as y^2 and inversely as z. Find the percentage increase of x when y is increased by 20% and z is decreased by 20%.

A. 15.2%
B. 20%
C. 50%
D. 72.8%
E. 80%

[1992-CE-MATHS 2-11]

12. The price of a cylindrical cake of radius r and height h varies directly as the volume. If $r = 5$ cm and $h = 4$ cm, the price is \$30. Find the price when $r = 4$ cm and $h = 6$ cm.

A. \$25
B. \$28.80
C. \$31.50
D. \$36
E. \$54

[1993-CE-MATHS 2-14]

13. Suppose x varies directly as y and inversely as z. When $y = 2$ and $z = 3$, $x = 7$. When $y = 6$ and $z = 7$, $x =$

A. 1.

B. $\frac{49}{9}$.

C. 9.

D. $\frac{49}{4}$.

E. 49.

[1997-CE-MATHS 2-39]

14. If x varies inversely as y and directly as z^2, then

A. $\frac{x}{yz^2}$ is a constant.

B. $\frac{xy}{z^2}$ is a constant.

C. $\frac{xz^2}{y}$ is a constant.

D. $\frac{z^2}{y}$ is a constant.

E. $\frac{1}{y} + z^2$ is a constant.

[1998-CE-MATHS 2-17]

15. y varies directly as x^2 and inversely as $\sqrt{z}$. If $y = 1$ when $x = 2$ and $z = 9$, find y when $x = 1$ and $z = 4$.

A. $\frac{2}{3}$

B. $\frac{8}{3}$

C. $\frac{1}{6}$

D. $\frac{3}{8}$

E. $\frac{9}{26}$

[2000-CE-MATHS 2-35]

16. Suppose z varies directly as x^2 and inversely as y. When $x = 4$ and $y = 3$, $z = 2$. When $x = 2$ and $z = 3$, $y =$

A. $\frac{1}{2}$.

B. 1.

C. 2.

D. 18.

[2003-CE-MATHS 2-14]

17. If z varies directly as y^2 and inversely as x, which of the following must be constant?

A. xy^2z

B. $\frac{y^2z}{x}$

C. $\frac{xz}{y^2}$

D. $\frac{z}{xy^2}$

[2005-CE-MATHS 2-14]

18. It is given that x varies directly as y and inversely as z^2. If y is decreased by 10% and z is increased by 20%, then x is decreased by

A. 10% .
B. 23.6% .
C. 25% .
D. 37.5% .

[2006-CE-MATHS 2-14]

19. Suppose that y varies directly as x and inversely as z^2. If x and z are both decreased by 20%, then y

A. is decreased by 17%.
B. is decreased by 20%.
C. is increased by 20%.
D. is increased by 25%.

[2008-CE-MATHS 2-14]

20. It is given that z varies directly as x and directly as y^2. If x is decreased by 20% and y is increased by 15%, then z

A. is increased by 5.8%.
B. is decreased by 5.8%.
C. is increased by 8%.
D. is decreased by 8%.

[2010-CE-MATHS 2-16]

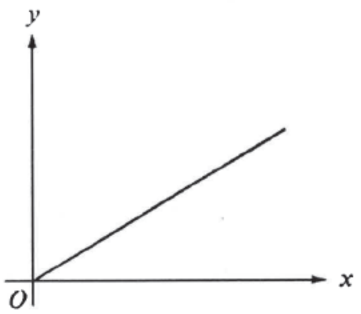
21. It is given that a varies directly as b and inversely as c^2. When $b = 6$ and $c = 3$, $a = -2$. When $a = -9$ and $c = 4$, $b =$

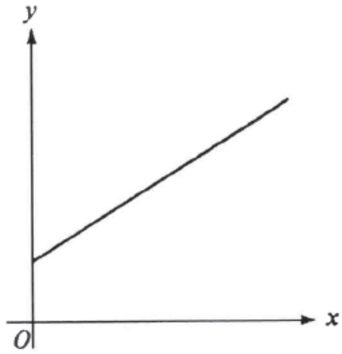
A. 5 .
B. 36 .
C. 48 .
D. 576 .

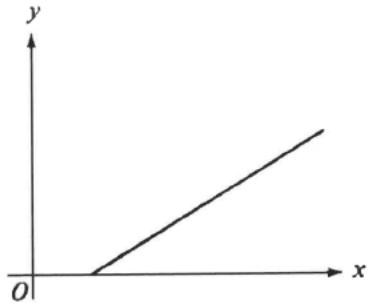
[2011-CE-MATHS 2-13]

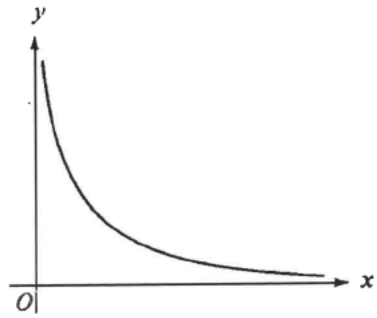
Partial Variation

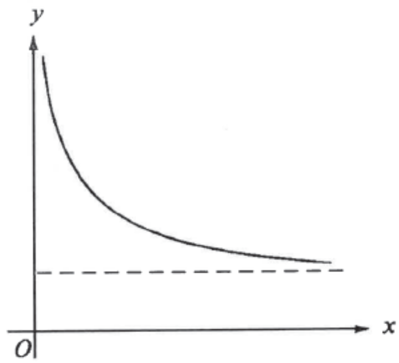
22. Which of the following graphs shows that y is partly constant and partly varies inversely as x?

A.


B.


C.


D.


E.


[1990-CE-MATHS 2-43]

23. Let y vary partly as $\frac{1}{x}$ and partly as x. When $x = 1$, $y = 5$ and when $x = 4$, $y = \frac{25}{2}$. Find y when $x = 2$.

A. $\frac{5}{2}$
B. 4
C. $\frac{25}{4}$
D. 7
E. $\frac{17}{2}$

[1991-CE-MATHS 2-9]

24. Suppose y is partly constant and partly varies inversely as x. When $x = 1$, $y = 7$ and when $x = 3$, $y = 3$. Find y when $x = 2$.

A. 2.5
B. 3.5
C. 4
D. 5
E. 6.5

[2001-CE-MATHS 2-29]

25. It is known that y varies partly as x and partly as $\sqrt{x}$. When $x = 1$, $y = 4$ and when $x = 4$, $y = 10$. Find y when $x = 16$.

A. 28
B. 52
C. 80
D. 256

[2004-CE-MATHS 2-16]

26. It is given that y is partly constant and partly varies directly as x. When $x = 2$, $y = 17$ and when $x = 4$, $y = 11$. Find the value of x when $y = 5$.

A. -3
B. 6
C. 8
D. 112

[2007-CE-MATHS 2-14]

27. It is known that $f(x)$ varies partly as x and partly as x^2. If $f(1) = 5$ and $f(2) = 16$, then $f(3) =$

A. 21 .
B. 27 .
C. 33 .
D. 57 .

[2008-CE-MATHS 2-15]

28. It is given that y is partly constant and partly varies inversely as x. When $x = 1$, $y = -1$ and when $x = 2$, $y = 1$. Find the value of x when $y = 2$.

A. -4
B. 1
C. 2.5
D. 4

[2009-CE-MATHS 2-14]

HKDSE Problems

29. It is given that z varies directly as x and inversely as y. When $x = 3$ and $y = 4$, $z = 18$. When $x = 2$ and $z = 8$, $y =$

A. 1 .
B. 3 .
C. 6 .
D. 9 .

[SP-DSE-MATHS 2-14]

30. If z varies directly as x and inversely as y^2, which of the following must be constant?

A. $\frac{x}{y^2 z}$
B. $\frac{z}{xy^2}$
C. $\frac{yz}{x^2}$
D. $\frac{xz}{y^2}$

[PP-DSE-MATHS 2-13]

31. It is given that y partly varies directly as x^2 and partly varies inversely as x. When $x = 1$, $y = -4$ and when $x = 2$, $y = 5$. When $x = -2$, $y =$

A. -11 .
B. -5 .
C. 5 .
D. 11 .

[2012-DSE-MATHS 2-10]

32. It is given that z varies directly as x and inversely as $\sqrt{y}$. If y is decreased by 64% and z is increased by 25%, then x

A. is increased by 20%.
B. is increased by 80%.
C. is decreased by 25%.
D. is decreased by 75%.

[2013-DSE-MATHS 2-13]

33. If z varies inversely as x and directly as the cube of y, which of the following must be constant?

A. xy^3z
B. x^3yz^3
C. $\frac{y^3}{xz}$
D. $\frac{y}{x^3z^3}$

[2014-DSE-MATHS 2-13]

34. It is given that z varies as x^3 and y^2. When $x = 2$ and $y = 1$, $z = 14$. When $x = 3$ and $y = -2$, $z =$

A. -189 .
B. -126 .
C. 126 .
D. 189 .

[2015-DSE-MATHS 2-12]

35. It is given that z varies directly as $\sqrt{x}$ and inversely as y. If x is decreased by 36% and y is increased by 60%, then z

A. is increased by 24%.
B. is increased by 28%.
C. is decreased by 40%.
D. is decreased by 50%.

[2016-DSE-MATHS 2-12]

36. It is given that y is the sum of two parts, one part is a constant and the other part varies as x^2. When $x = 1$, $y = 7$ and when $x = 2$, $y = 13$. If $x = 3$, then $y =$

A. 19 .
B. 20 .
C. 23 .
D. 47 .

[2017-DSE-MATHS 2-12]

37. If w varies directly as the square root of u and inversely as the square of v, which of the following must be constant?

A. u^4vw^2
B. uv^4w^2
C. $\frac{vw^2}{u^4}$
D. $\frac{v^4w^2}{u}$

[2018-DSE-MATHS 2-11]

38. It is given that z varies directly as the square of x and inversely as the square root of y. If x is decreased by 40% and y is increased by 44%, then z

A. is decreased by 70%
B. is increased by 70%
C. is decreased by 76%
D. is increased by 76%

[2019-DSE-MATHS 2-13]

39. It is given that w varies as the cube of u and the square root of v. When $u = 2$ and $v = 4$, $w = 8$. When $u = 4$ and $v = 9$, $w =$

A. 96
B. 324
C. 384
D. 729

[2020-DSE-MATHS 2-11]

General Sequences

1. If the nth term of a series is $\dfrac{n(n+1)}{n+2}$, what is the ratio of the $(n-1)$th term to the $(n+1)$th term?

   A. $n(n-1)(n+3) : (n+1)^2(n+2)$
   B. $n(n-1)(n+2) : (n+3)$
   C. $(n+1)^2(n+2) : n(n-1)(n+3)$
   D. $(n+3) : n(n-1)(n+2)$
   E. None of the above

   [1972-CE-MATHS B1-16]

2. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+3)$ dots to the nth pattern. Find the number of dots in the 6th pattern.

   A. 35
   B. 37
   C. 48
   D. 50

   [2006-CE-MATHS 2-12]

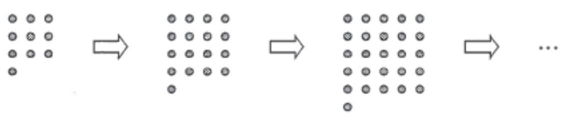
3. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 9th pattern.

   A. 36
   B. 40
   C. 81
   D. 100

   [2007-CE-MATHS 2-9]

4. In the figure, the 1st pattern consists of 10 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+5)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

   A. 50
   B. 65
   C. 82
   D. 101

   [2008-CE-MATHS 2-11]

5. In the following sequence, the 1st term, the 2nd term and the 3rd term are 1, 2 and 3 respectively. For any positive integer n, the $(n+3)$th term is the sum of the $(n+2)$th term, the $(n+1)$th term and the nth term. Find the 9th term of the sequence.

   1, 2, 3, 6, 11, ...

   A. 51
   B. 68
   C. 125
   D. 230

   [2009-CE-MATHS 2-12]

6. If the sum of the first n terms of a sequence is n^2+2n, then the 5th term of the sequence is

   A. 9 .
   B. 11 .
   C. 13 .
   D. 35 .

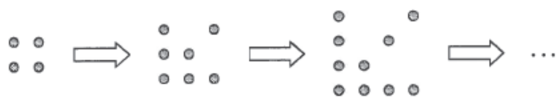
   [2009-CE-MATHS 2-42]

7. Which of the following may represent the nth term of the sequence $0, \dfrac{-1}{4}, \dfrac{2}{5}, \dfrac{-3}{6}, \dfrac{4}{7}, \ldots$?

   A. $(-1)^n \dfrac{n-1}{n+1}$
   B. $(-1)^n \dfrac{n-1}{n+2}$
   C. $(-1)^{n+1} \dfrac{n}{n+3}$
   D. $(-1)^{n+1} \dfrac{n-1}{n+2}$

   [2010-CE-MATHS 2-12]

8. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 3 dots to the nth pattern. Find the number of dots in the 8th pattern.

   A. 22
   B. 25
   C. 28
   D. 31

   [2011-CE-MATHS 2-9]

HKDSE Problems

9. Let a_n be the nth term of a sequence. If $a_1 = 4$, $a_2 = 5$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, then $a_{10} =$

A. 13 .
B. 157 .
C. 254 .
D. 411 .

[SP-DSE-MATHS 2-11]

10. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n+1)$th pattern is formed by adding n dots to the nth pattern. Find the number of dots in the 8th pattern.

A. 22
B. 29
C. 36
D. 37

[2012-DSE-MATHS 2-12]

11. Let a_n be the nth term of a sequence. If $a_2 = 7$, $a_4 = 63$ and $a_{n+2} = a_{n+1} + a_n$ for any positive integer n, then $a_5 =$

A. 56 .
B. 70 .
C. 91 .
D. 119 .

[2014-DSE-MATHS 2-14]

12. In the figure, the 1st pattern consists of 5 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 6th pattern.

A. 21
B. 25
C. 29
D. 33

[2015-DSE-MATHS 2-13]

13. In the figure, the 1st pattern consists of 9 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 5 dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 29
B. 34
C. 39
D. 44

[2016-DSE-MATHS 2-14]

14. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+2)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 29
B. 34
C. 39
D. 44

[2017-DSE-MATHS 2-13]

15. Let a_n be the nth term of a sequence. If $a_3 = 21$, $a_6 = 89$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, then $a_1 =$

A. 8
B. 13
C. 34
D. 55

[2018-DSE-MATHS 2-12]

16. In the figure, the 1st pattern consists of 6 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 9th pattern.

A. 30
B. 34
C. 38
D. 42

[2019-DSE-MATHS 2-14]

17. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+1)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 15
B. 27
C. 38
D. 51

[2020-DSE-MATHS 2-12]

Basic Concepts

1. Which of the following is/are in arithmetic progression?

   (1) 0.2, 0.22, 0.222, 0.2222
   (2) $1, 1\frac{1}{3}, 1\frac{2}{3}, 2$
   (3) 1, –2, 3, –4

   A. (2) only
   B. (3) only
   C. (1) and (2) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [SP-CE-MATHS 2-17]

2. Three distinct numbers x, y and z are in arithmetic progression. Which of the following is/are also in arithmetic progression?

   (1) $x + 10, y + 10, z + 10$
   (2) $10x, 10y, 10z$
   (3) x^2, y^2, z^2

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)
   E. None of (1), (2) and (3)

   [1985-CE-MATHS 2-39]

3. If the common difference of the A.P. $a_1, a_2, a_3, \ldots$ is d, then the common difference of the A.P. $2a_1 + 3, 2a_2 + 3, 2a_3 + 3, \ldots$ is

   A. 2 .
   B. 3 .
   C. d .
   D. $2d$.
   E. $2d + 3$.

   [1996-CE-MATHS 2-42]

4. If a, b, c, d are consecutive terms of an arithmetic sequence, which of the following **must** be true?

   (1) $b - a = d - c$
   (2) d, c, b, a are consecutive terms of an arithmetic sequence
   (3) $a < b < c < d$

   A. (1) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1998-CE-MATHS 2-13]

5. Let a, b and c be positive integers. Which of the following **must** be arithmetic sequences?

   (1) $a + 10, 2a + 7, 3a + 4, 4a + 1$
   (2) $8^b - 1, 8^{2b} - 2, 8^{3b} - 3, 8^{4b} - 4$
   (3) $\log c^3, \log c^8, \log c^{13}, \log c^{18}$

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2008-CE-MATHS 2-43]

General Term of Arithmetic Sequences

6. The nth term of an arithmetic progression is given by $(3n + c)$ where c is a constant. If the 1st term of the progression is –4, what is the 5th term?

   A. 22
   B. 16
   C. 14
   D. 11
   E. 8

   [1977-CE-MATHS 2-19]

7. The first and the second terms of an arithmetic progression are $(13a - 2b)$ and $(11a + b)$ respectively. What is the eighth term?

   A. $-a + 19b$
   B. $-3a + 22b$
   C. $a + 16b$
   D. $8a + 8b$
   E. None of the above

   [1979-CE-MATHS 2-50]

8. The first term of an arithmetic progression is 6 and its tenth term is three times its second term. The common difference is

   A. 18 .
   B. 4 .
   C. 3 .
   D. 2 .
   E. 1 .

   [1980-CE-MATHS 2-11]

9. The n-th term of the arithmetic progression

$2, 6, 10, 14, \ldots$

is

A. $2n^2$.
B. $4n$.
C. $4n-2$.
D. $4n+2$.
E. $6-4n$.

[1981-CE-MATHS 2-11]

10. The sixth term and the eleventh term of an arithmetic progression are 10 and 30 respectively. The first term is

A. -14 .
B. -10 .
C. 10 .
D. 50 .
E. 54 .

[1983-CE-MATHS 2-9]

11. p, q, r, s are in A.P. If $p+q=8$ and $r+s=20$, then the common difference is

A. 3 .
B. 4 .
C. 6 .
D. 7 .
E. 12 .

[1988-CE-MATHS 2-38]

12. Find the n-th term of the A.P. $4, 2, 0, -2, \ldots$.

A. $2+2n$
B. $4-2n$
C. $4+2n$
D. $6-2n$
E. $(5-n)n$

[1996-CE-MATHS 2-12]

13. The 1st and 10th terms of an arithmetic sequence are 2 and 29 respectively. The 20th term of the sequence is

A. 56 .
B. 58 .
C. 59 .
D. 60 .
E. 62 .

[2000-CE-MATHS 2-15]

14. The first negative term in the arithmetic sequence 2006, 1998, 1990, ... is

A. -8 .
B. -6 .
C. -4 .
D. -2 .

[2006-CE-MATHS 2-42]

Arithmetic Mean

15. If $\log_{10}x$, $\log_{10}y$, $\log_{10}z$ are in A.P., then

A. $y=10^{\frac{x+z}{2}}$.
B. $y=\frac{x+z}{2}$.
C. $y^2=x+z$.
D. $y^2=xz$.
E. $y=10^{\sqrt{xz}}$.

[1987-CE-MATHS 2-11]

16. If 10 arithmetic means are inserted between a and b, then the last one is

A. $\frac{10a+b}{11}$.
B. $\frac{9a+b}{10}$.
C. $\frac{10(b-a)}{11}$.
D. $\frac{a+9b}{10}$.
E. $\frac{a+10b}{11}$.

[1989-CE-MATHS 2-34]

17. Let a, x_1, x_2, b and a, y_1, y_2, y_3, b be two arithmetic progressions. $\frac{x_2-x_1}{y_3-y_2}=$

A. $\frac{3}{4}$.
B. $\frac{4}{3}$.
C. 1 .
D. $\frac{4}{5}$.
E. $\frac{5}{4}$.

[1990-CE-MATHS 2-38]

18. If $3, a, b, c, 23$ are in A.P., then $a+b+c=$

A. 13 .
B. 26 .
C. 33 .
D. 39 .
E. 65 .

[1993-CE-MATHS 2-10]

19. If four arithmetic means are inserted between 12 and 27, then the sum of the four arithmetic means is

A. 78 .
B. 90 .
C. 105 .
D. 117 .

[2005-CE-MATHS 2-42]

Summation of Arithmetic Sequences

20. An arithmetic progression consists of 10 terms. The first term is 4. The sum of the 10 terms is 130. What is the last term?

A. 13
B. 14
C. 17
D. 22
E. 23

[1978-CE-MATHS 2-24]

21. The sum of the first n terms of the arithmetic progression

$$3,\ 5,\ 7,\ \dots$$

is

A. n^2 .
B. $n^2 - 1$.
C. $n^2 + n$.
D. $n^2 + 2n$.
E. $\frac{1}{2}(n^2 + n)$.

[1979-CE-MATHS 2-11]

22. The sum of the first five terms of an arithmetic progression is 15. If the fourth term is 7, the first term is

A. –5 .
B. –3 .
C. –1 .
D. 1 .
E. 10 .

[1981-CE-MATHS 2-34]

23. \$9000 is divided among A, B and C. A's share, B's share and C's share, in that order, form an arithmetic progression. If B's share is three times A's share, how much does C get?

A. \$1500
B. \$3000
C. \$4500
D. \$5000
E. \$6000

[1982-CE-MATHS 2-35]

24. In an arithmetic progression, the first term is 3 and the common difference is 2. If the sum of the first n terms of the arithmetic progression is 143, then $n =$

A. 10 .
B. 11 .
C. 12 .
D. 13 .
E. 14 .

[1983-CE-MATHS 2-38]

25. The sum of the first ten terms of an arithmetic progression is 120. If the common difference is 4, then the first term is

A. –12 .
B. –6 .
C. –2 .
D. 2 .
E. 6 .

[1984-CE-MATHS 2-8]

26. If the five interior angles of a convex pentagon form an A.P. with a common difference of 10°, then the smallest interior angle of the pentagon is

A. 52° .
B. 72° .
C. 88° .
D. 98° .
E. 108° .

[1986-CE-MATHS 2-43]

27. If the sum to n terms of an A.P. is $n^2 + 3n$, find the 7th term of the A.P.

A. 16
B. 18
C. 54
D. 70
E. It cannot be found.

[1991-CE-MATHS 2-40]

28. If the product of the first n terms of the sequence

$$10,\ 10^2,\ 10^3,\ \dots,\ 10^n,\ \dots$$

exceeds 10^{55}, find the minimum value of n.

A. 9
B. 10
C. 11
D. 12
E. 56

[1994-CE-MATHS 2-41]

29. In an A.P., the sum of the first 2 terms is 3 and the sum of the first 3 terms is 2. The common difference is

A. $-\frac{5}{3}$.
B. –1 .
C. 1 .
D. $\frac{5}{3}$.
E. $\frac{7}{3}$.

[1995-CE-MATHS 2-42]

30. The n-th term of an arithmetic sequence is $3 + 2n$. Find the sum of the first 50 terms of the sequence.

A. 103
B. 2575
C. 2700
D. 2750
E. 5400

[1997-CE-MATHS 2-35]

31. The n-th term of an arithmetic sequence is $2 + 5n$. Find the sum of the first 100 terms of the sequence.

A. 502
B. 12 450
C. 25 200
D. 25 450
E. 25 700

[1999-CE-MATHS 2-10]

32. The sum of the first n terms of an arithmetic sequence is n^2. Find the 10th term of the sequence.

A. 19
B. 21
C. 28
D. 31
E. 100

[2001-CE-MATHS 2-14]

33. The 10th term of an arithmetic sequence is 29 and the sum of the first 10 terms is 155. The 2nd term of the sequence is

A. 2 .
B. 4.7 .
C. 5 .
D. 43 .

[2002-CE-MATHS 2-11]

34. Let a_n be the nth term of an arithmetic sequence. If $a_1 = 10$ and $a_2 = 13$, then $a_{21} + a_{22} + ... + a_{30} =$

A. 765 .
B. 835 .
C. 865 .
D. 1605 .

[2004-CE-MATHS 2-11]

35. Let a_n be the nth term of an arithmetic sequence. If $a_1 = a_2 - 6$ and $a_1 + a_2 + ... + a_{28} = 1624$, then $a_1 =$

A. –52 .
B. –26 .
C. –23 .
D. 139 .

[2007-CE-MATHS 2-44]

36. If the 3rd term and the 12th term of an arithmetic sequence are 42 and 6 respectively, then the sum of the first n terms of the sequence is

A. $28n + 2n^2$.
B. $32n + 2n^2$.
C. $52n - 2n^2$.
D. $56n - 2n^2$.

[2011-CE-MATHS 2-44]

HKDSE Problems

37. If the 3rd term and the 6th term of an arithmetic sequence are 18 and –6 respectively, then the 2nd term of the sequence is

A. –8 .
B. 10 .
C. 26 .
D. 34 .

[SP-DSE-MATHS 2-36]

38. The nth term of a sequence is $2n + 3$. If the sum of the first m terms of the sequence is less than 3000, then the greatest value of m is

A. 52 .
B. 53 .
C. 56 .
D. 57 .

[PP-DSE-MATHS 2-35]

39. Let a_n be the nth term of an arithmetic sequence. If $a_{18} = 26$ and $a_{23} = 61$, which of the following are true?

(1) $a_{14} < 0$
(2) $a_1 - a_2 < 0$
(3) $a_1 + a_2 + a_3 + ... + a_{27} > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-37]

40. The nth term of a sequence is $2n - 19$. Which of the following is/are true?

(1) 25 is a term of the sequence.
(2) The sequence has 10 negative terms.
(3) The sum of the first n terms of the sequence is $n^2 - 18n$.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2013-DSE-MATHS 2-38]

41. Which of the following are arithmetic sequences?

(1) π^{30}, π^{45}, π^{60}
(2) 30π, 45π, 60π
(3) $\pi - 30$, $\pi - 45$, $\pi - 60$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2017-DSE-MATHS 2-36]

42. If the sum of the first n terms of a sequence is $6n^2 - n$, which of the following is/are true?

I. 22 is a term of the sequence.
II. The 1st term of the sequence is 5.
III. The sequence is a geometric sequence.

A. I only
B. II only
C. I and III only
D. II and III only

[2018-DSE-MATHS 2-35]

43. If $a > 0$, which of the following are arithmetic sequence?

I. $\log a^{-3}, \log a, \log a^5$
II. $8 - 4a, 9 - 5a, 10 - 6a$
III. $\cos(90 - a)°, \cos 90°, \cos(90 + a)°$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2020-DSE-MATHS 2-35]

Basic Concepts

1. If $x \neq 0$, which of the following is / are geometric progressions?

   (1) x, x^2, x^3, x^4
   (2) $x, 2x, 3x, 4x$
   (3) $x, -x^2, x^3, -x^4$

   A. (1) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1982-CE-MATHS 2-37]

2. Which of the following **must** be geometric progression(s)?

   (1) $\log_{10} 3, \log_{10} 9, \log_{10} 27, \log_{10} 81$
   (2) 0.9, 0.99, 0.999, 0.9999
   (3) 1, −3, 9, −27

   A. (1) only
   B. (3) only
   C. (1) and (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1984-CE-MATHS 2-38]

3. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in geometric progression, then which of the following is true?

   A. $b^2 = ac$
   B. $b^2 = \frac{1}{ac}$
   C. $b = \frac{a+c}{2}$
   D. $b = \frac{a+c}{2ac}$
   E. $b = \frac{2ac}{a+c}$

   [1985-CE-MATHS 2-38]

4. Which of the following is a G.P. / are G.P.s?

   (1) 5, 0.5, 0.05, 0.005, 0.0005
   (2) log 5, log 50, log 500, log 5000, log 50 000
   (3) $5, 5\sin 70^\circ, 5(\sin 70^\circ)^2, 5(\sin 70^\circ)^3, 5(\sin 70^\circ)^4$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (3) only
   E. (1), (2) and (3)

   [1988-CE-MATHS 2-9]

5. Let x, y, z are in G.P., which of the following **must** be true?

   (1) $x+3, y+3, z+3$ are in G.P.
   (2) $3x, 3y, 3z$ are in G.P.
   (3) x^2, y^2, z^2 are in G.P.

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (2) and (3) only

   [1991-CE-MATHS 2-41]

6. a, b, c, d are 4 consecutive terms of a geometric sequence. Which of the following **must** be true?

   (1) $b^2 = ac$
   (2) $\frac{b}{a} = \frac{d}{c}$
   (3) $\frac{d}{a} = (\frac{c}{b})^3$

   A. (2) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1997-CE-MATHS 2-37]

7. Which of the following could be a geometric sequence / geometric sequences?

   (1) $3, 3^3, 3^5, 3^7, \ldots$
   (2) 9, 99, 999, 9999, …
   (3) 10, −100, 1000, −10000, …

   A. (3) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [2000-CE-MATHS 2-16]

General Term of Geometric Sequences

8. If $1, 1+2k, 1+k$ are in geometric progression and $k \neq 0$, then the common ratio of the progression is

   A. $-\frac{3}{2}$.
   B. $-\frac{3}{4}$.
   C. $-\frac{1}{2}$.
   D. $\frac{1}{2}$.
   E. $\frac{5}{2}$.

   [1977-CE-MATHS 2-35]

9. The n-th term of the geometric progression

   3, 6, 12, 24, ...

   is

   A. $3 \times 2n$.
   B. $3 \times 2(n-1)$.
   C. 3×2^n .
   D. $3 \times 2^{n-1}$.
   E. $\frac{3}{n-1}$.

[1979-CE-MATHS 2-12]

10. The $2n$-th term of the geometric progression, 8, −4, 2, −1, ... , is

   A. $\frac{1}{2^{2n+2}}$.
   B. $\frac{-1}{2^{2n+2}}$.
   C. $\frac{1}{2^{2n-3}}$.
   D. $\frac{1}{2^{2n-4}}$.
   E. $\frac{-1}{2^{2n-4}}$.

[1980-CE-MATHS 2-31]

11. The second term and the fifth term of a geometric progression are −12 and $40\frac{1}{2}$ respectively. The first term is

   A. $1\frac{1}{2}$.
   B. 6 .
   C. 8 .
   D. 15 .
   E. 18 .

[1985-CE-MATHS 2-10]

12. Given that $x \neq 0$ and $-x$, x, $3x^2$ are in G.P., find x.

   A. −1
   B. $-\frac{1}{3}$
   C. $\sqrt{3}$
   D. $\frac{1}{3}$
   E. 1

[1987-CE-MATHS 2-5]

13. Find the $(2n)$th term of the G.P. $-\frac{1}{2}$, 1, −2, 4, ...

   A. 2^{2n}
   B. -2^{2n}
   C. -2^{2n-3}
   D. 2^{2n-2}
   E. -2^{2n-2}

[1992-CE-MATHS 2-42]

14. The nth term of a geometric sequence is $-\frac{1}{2^n}$. Find the first term and the common ratio.

	first term	common ratio
A.	−1	$\frac{1}{2}$
B.	$-\frac{1}{2}$	$-\frac{1}{2}$
C.	$-\frac{1}{2}$	$\frac{1}{2}$
D.	$-\frac{1}{2}$	1
E.	1	$-\frac{1}{2}$

[2001-CE-MATHS 2-15]

15. If the 2nd term and the 5th term of a geometric sequence are −3 and 192 respectively, then the common ratio of the sequence is

   A. −8 .
   B. −4 .
   C. 4 .
   D. 8 .

[2005-CE-MATHS 2-11]

16. If $a-6$, a, $a+5$ is a geometric sequence, then the common ratio of the sequence is

   A. −30 .
   B. $\frac{5}{6}$.
   C. $\frac{6}{5}$.
   D. 6 .

[2008-CE-MATHS 2-44]

17. The product of the 1st term and the 2nd term of a geometric sequence is 18 while the product of the 3rd term and the 4th term of the sequence is 288. The product of the 4th term and the 5th term of the sequence is

   A. 576 .
   B. 864 .
   C. 1152 .
   D. 5184 .

[2011-CE-MATHS 2-45]

Geometric Mean

18. The geometric mean of two numbers is 2. If one number is –16, then the other number is

A. 4 .
B. 8 .
C. –32 .
D. $-\frac{1}{4}$.
E. $-\frac{1}{8}$.

[SP-CE-MATHS 2-15]

19. If the geometric mean of two positive numbers a and b is 10, then $\log a + \log b =$

A. $\frac{1}{2}$.
B. 1 .
C. 2 .
D. 10 .
E. 100 .

[1995-CE-MATHS 2-43]

20. If the geometric mean of two positive numbers a and b is 100, then the arithmetic mean of $\log a$ and $\log b$ is

A. $\frac{1}{2}$.
B. 1 .
C. 2 .
D. 10 .

[2002-CE-MATHS 2-43]

21. If 81, a, b, 3 is a geometric sequence, then $b - a =$

A. –18 .
B. 18 .
C. –26 .
D. 26 .

[2004-CE-MATHS 2-44]

Summation of Geometric Sequences

22. If $a \neq \pm 1$, then $1 + a^2 + a^4 + \dots + a^{2n} =$

A. $\frac{1-a^{2n}}{1-a}$.
B. $\frac{1-a^{2n}}{1-a^2}$.
C. $\frac{1-a^{2n+1}}{1-a}$.
D. $\frac{1-a^{2n+1}}{1-a^2}$.
E. $\frac{1-a^{2n+2}}{1-a^2}$.

[1984-CE-MATHS 2-37]

23. The sum of the 4th term and the 5th term of a geometric sequence is –4. If the sum of the first two terms is 32, find the first term of the sequence.

A. –6
B. $\frac{-1}{2}$
C. 19
D. 64

[2003-CE-MATHS 2-10]

24. Let a_n be the nth term of a geometric sequence. If $a_7 = 32$ and $a_9 = 8$, which of the following **must** be true?

(1) $a_1 > 0$
(2) $a_1 - a_2 > 0$
(3) $a_2 + a_3 + a_4 + \dots + a_{100} > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2009-CE-MATHS 2-43]

25. The sum of the first 2 terms of a geometric sequence is 8 and the 3rd term of the sequence is 18. Find the 1st term of the sequence.

A. 2
B. 3
C. 2 or 32
D. 3 or 32

[2010-CE-MATHS 2-44]

Summation to Infinity

26. The first term of an infinite geometric progression is –15 and the second term is 10. What is the sum of all the positive terms?

A. 6
B. 9
C. 18
D. 30
E. 45

[1978-CE-MATHS 2-44]

27. The common ratio of a geometric progression is r. If the progression could be summed to infinity, then

A. $r > 0$.
B. $r > 1$.
C. $r > -1$.
D. $-1 < r < 1$.
E. $-1 \leq r \leq 1$.

[1979-CE-MATHS 2-51]

28. Which of the following can be summed to infinity?

(1) The arithmetic progression 4, 3, 2, 1, ...
(2) The geometric progression 27, 9, 3, 1, ...
(3) The geometric progression 16, –8, 4, –2, ...

A. (2) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

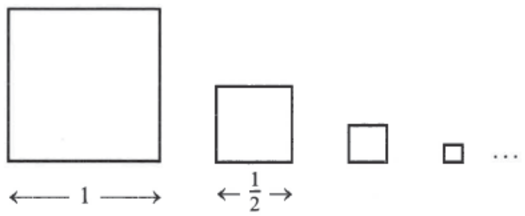
[1981-CE-MATHS 2-35]

29. 1, –0.1, 0.01, –0.001, ... is a geometric progression. What is its sum to infinity?

A. 0
B. 1
C. 0.99
D. $\frac{10}{11}$
E. $\frac{10}{9}$

[1982-CE-MATHS 2-36]

30.



The figure shows an infinite number of squares. The length of a side of the first square is 1. The side of each subsequent square is equal to half of the side of the preceding one. Find the sum of the areas of the infinite number of squares.

A. 4
B. 2
C. $\frac{5}{3}$
D. $\frac{3}{2}$
E. $\frac{4}{3}$

[1986-CE-MATHS 2-7]

31. If the sum to infinity of the G.P. 1, $-t$, t^2, $-t^3$, ... is $\frac{2}{3}$, find the fourth term.

A. $-\frac{1}{16}$
B. $-\frac{1}{8}$
C. $\frac{1}{16}$
D. $\frac{1}{8}$
E. $\frac{5}{8}$

[1989-CE-MATHS 2-39]

32. Let $a > b > 0$. If a and b are respectively the 1st and 2nd terms of a geometric progression, the sum to infinity of the progression is

A. $\frac{1}{a-b}$.
B. $\frac{a}{1-b}$.
C. $\frac{ab}{b-a}$.
D. $\frac{a^2}{a+b}$.
E. $\frac{a^2}{a-b}$.

[1990-CE-MATHS 2-6]

33. If the sum to infinity of a G.P. is $\frac{81}{4}$ and its second term is –9, the common ratio is

A. $-\frac{1}{3}$.
B. $\frac{1}{3}$.
C. $-\frac{4}{3}$.
D. $\frac{4}{3}$.
E. $-\frac{4}{9}$.

[1994-CE-MATHS 2-12]

34. The sum to infinity of a G.P. is 2. If the first term is $\frac{3}{2}$, find the common ratio.

A. $-\frac{1}{2}$
B. $-\frac{1}{4}$
C. $\frac{1}{4}$
D. $\frac{1}{2}$
E. $\frac{3}{2}$

[1996-CE-MATHS 2-13]

35. The first term of a geometric sequence is a. If the sum to infinity of the sequence is $\frac{3}{4}a$, then its common ratio is

A. $-\frac{1}{3}$.
B. $-\frac{1}{4}$.
C. $\frac{1}{4}$.
D. $\frac{1}{3}$.
E. $\frac{3}{4}$.

[1997-CE-MATHS 2-36]

36. Find the sum to infinity of the geometric sequence $-1, \frac{1}{x}, -\frac{1}{x^2}, \frac{1}{x^3}, \ldots$, where $x > 1$.

A. $\frac{-1}{x-1}$
B. $\frac{-1}{x+1}$
C. $\frac{-x}{x-1}$
D. $\frac{-x}{x+1}$
E. $\frac{x}{x+1}$

[1998-CE-MATHS 2-43]

37. The sum of the first two terms of a geometric sequence is 3 and the sum to infinity of the sequence is 4. Find the common ratio of the sequence.

A. $-\frac{1}{7}$
B. $\frac{1}{7}$
C. $\frac{1}{4}$
D. $-\frac{1}{2}$
E. $-\frac{1}{2}$ or $\frac{1}{2}$

[1999-CE-MATHS 2-44]

38. The sum of all the positive terms in the geometric sequence 4, –2, 1, ... is

A. 8 .
B. $\frac{8}{3}$.
C. $\frac{16}{3}$.
D. $\frac{16}{5}$.

[2007-CE-MATHS 2-45]

Relationships with Arithmetic Sequences

39. Three positive numbers a, b and c are in geometric progression. Which of the following are true?

(1) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in geometric progression.
(2) a^2, b^2, c^2 are in geometric progression.
(3) $\log_{10} a, \log_{10} b, \log_{10} c$ are in arithmetic progression.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)
E. None of them

[1983-CE-MATHS 2-39]

40. If the quadratic equation $ax^2 - 2bx + c = 0$ has two equal roots, which of the following is /are true?

(1) a, b, c form an arithmetic progression.
(2) a, b, c form a geometric progression.
(3) Both roots are $\frac{b}{a}$.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1992-CE-MATHS 2-35]

41. Given that the positive numbers p, q, r, s are in G.P., which of the following **must** be true?

(1) kp, kq, kr, ks are in G.P., where k is a non-zero constant.
(2) a^p, a^q, a^r, a^s are in G.P., where a is a positive constant.
(3) $\log p, \log q, \log r, \log s$ are in A.P.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1993-CE-MATHS 2-37]

42. Let a, b and c be positive integers. If $b = \sqrt{ac}$, which of the following **must** be true?

(1) $\log a^2$, $\log b^2$, $\log c^2$ is an arithmetic sequence.
(2) a^3, b^3, c^3 is a geometric sequence.
(3) 4^a, 4^b, 4^c is a geometric sequence.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2006-CE-MATHS 2-43]

43. If h, 5, k are the first 3 terms of an arithmetic sequence and h, 4, k are the first 3 terms of a geometric sequence, then $h^2 + k^2 =$

A. 36 .
B. 68 .
C. 84 .
D. 100 .

[2010-CE-MATHS 2-43]

HKDSE Problems

44. If $m > 1$, which of the following are geometric sequences?

(1) 2^m, 2^{2m}, 2^{3m}, 2^{4m}
(2) m, $2m^2$, $3m^4$, $4m^8$
(3) $\log m$, $\log m^2$, $\log m^4$, $\log m^8$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2014-DSE-MATHS 2-37]

45. Let x_n be the nth term of a geometric sequence. If $x_6 = 216$ and $x_8 = 96$, which of the following must be true?

(1) $x_3 = 729$
(2) $\frac{x_5}{x_7} > 1$
(3) $x_2 + x_4 + x_6 + \ldots + x_{2n} < 2015$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2015-DSE-MATHS 2-37]

46. Let a_n be the nth term of a geometric sequence. If $a_3 = 21$ and $a_7 = 189$, which of the following must be true?

(1) The common ratio of the sequence is less than 1.
(2) Some of the terms of the sequence are irrational numbers.
(3) The sum of the first 99 terms of the sequence is greater than 3×10^{24}.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-36]

47. The sum of the 2nd term and the 5th term of a geometric sequence is 9 while the sum of the 7th term and the 10th term of the sequence is 288. Find the 20th term of the sequence.

A. 65 536
B. 131 072
C. 262 144
D. 524 288

[2019-DSE-MATHS 2-36]

Basic Concepts

1. If $p, q, r \in \mathbf{N}$, which of the following statements is true?

A. If $p > q$ and $q > r$, then $r = p$.
B. If $p > q$ and $q = r$, then $r < p$.
C. If $p = q$ and $q < r$, then $r < p$.
D. If $p < q$ and $q < r$, then $r < p$.
E. If $p < q$ and $q = r$, then $r < p$.

[1972-CE-MATHS B1-13]

2. If $0 < x < 1$, then of the four numbers x, x^2, $\frac{1}{x}$ and $\sqrt{x}$, which is the largest and which is the smallest?

A. x largest, x^2 smallest
B. $\frac{1}{x}$ largest, $\sqrt{x}$ smallest
C. $\frac{1}{x}$ largest, x^2 smallest
D. $\sqrt{x}$ largest, x smallest
E. $\sqrt{x}$ largest, x^2 smallest

[1977-CE-MATHS 2-9]

3. If $0 < x < 1$, which of x, x^2, $\frac{1}{x}$, $\sqrt{x}$ is the smallest? Which is the largest?

A. $\sqrt{x}$ is the smallest, x^2 is the largest
B. $\frac{1}{x}$ is the smallest, x is the largest
C. x is the smallest, $\frac{1}{x}$ is the largest
D. x^2 is the smallest, $\frac{1}{x}$ is the largest
E. x^2 is the smallest, $\sqrt{x}$ is the largest

[1980-CE-MATHS 2-34]

4. If x and y are real numbers, what is the minimum value of the expression $(x+y)^2 - 1$?

A. -5
B. -1
C. 0
D. 3
E. It cannot be determined

[1980-CE-MATHS 2-38]

5. a, b and k are real numbers. If $k > 0$ and $a > b$, which of the following **must** be true?

(1) $a^2 > b^2$
(2) $-a < -b$
(3) $ka > kb$

A. (2) only
B. (3) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1982-CE-MATHS 2-34]

6. If a and b are non-zero real numbers and $a > b$, which of the following **must** be true?

(1) $a^2 > b^2$
(2) $\frac{1}{a} > \frac{1}{b}$
(3) $a^3 > b^3$

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1) and (3) only

[1984-CE-MATHS 2-35]

7. If $a > 0$ and $b < 0$, which of the following is / are negative?

(1) $\frac{1}{a} - \frac{1}{b}$
(2) $\frac{a}{b} + \frac{b}{a}$
(3) $\frac{a^2}{b} - \frac{b^2}{a}$

A. (1) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only
E. (2) and (3) only

[1986-CE-MATHS 2-36]

8. If $2 < x < 3$ and $3 < y < 4$, then the range of values of $\frac{x}{y}$ is

A. $\frac{1}{2} < \frac{x}{y} < \frac{3}{4}$.
B. $\frac{1}{2} < \frac{x}{y} < 1$.
C. $\frac{2}{3} < \frac{x}{y} < \frac{3}{4}$.
D. $\frac{2}{3} < \frac{x}{y} < 1$.
E. $\frac{4}{3} < \frac{x}{y} < \frac{3}{2}$.

[1986-CE-MATHS 2-37]

9. If x and y are integers with $x > y$, which of the following is / are true?

(1) $x^2 > y^2$

(2) $\frac{1}{x} < \frac{1}{y}$

(3) $10^x > 10^y$

A. (3) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1987-CE-MATHS 2-36]

10. If $3x > -2y$ and $y < 0$, then

A. $\frac{x}{y} > -\frac{3}{2}$.
B. $\frac{x}{y} > \frac{2}{3}$.
C. $\frac{x}{y} < \frac{2}{3}$.
D. $\frac{x}{y} > -\frac{2}{3}$.
E. $\frac{x}{y} < -\frac{2}{3}$.

[1989-CE-MATHS 2-7]

11. If $a < b < 0$, which of the following **must** be true?

A. $-a < -b$
B. $\frac{a}{b} < 1$
C. $a^2 < b^2$
D. $10^a < 10^b$
E. $a^{-1} < b^{-1}$

[1990-CE-MATHS 2-36]

12. If $x < 0 < y$, then which one of the following **must** be positive?

A. $x + y$
B. $x - y$
C. $y - x$
D. xy
E. $\frac{y}{x}$

[1991-CE-MATHS 2-37]

13. If $a < b < 0$, then which of the following **must** be true?

(1) $a^2 < b^2$

(2) $ab < a^2$

(3) $\frac{1}{a} < \frac{1}{b}$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[1997-CE-MATHS 2-33]

14. If $a > b$, which of the following **must** be true?

(1) $-a < -b$

(2) $a + b > b$

(3) $a^2 > b^2$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1), (2) and (3)

[2001-CE-MATHS 2-38]

15. If a and b are real numbers such that $ab > 0$, which of the following **must** be true?

(1) $\frac{a}{b} > 0$

(2) $a + b > 0$

(3) $a^2 + b^2 > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2010-CE-MATHS 2-11]

16. If x and y are non-zero numbers with $x < y$, which of the following **must** be true?

(1) $-x > -y$

(2) $\frac{1}{x^2} > \frac{1}{y^2}$

(3) $x^3 < y^3$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2011-CE-MATHS 2-4]

Linear Inequalities

17. Which of the following inequalities is equivalent to $2m - 5n < 9$?

A. $n < \frac{9-2m}{5}$

B. $n < \frac{2m-9}{5}$

C. $n < \frac{2m+9}{5}$

D. $n > \frac{2m-9}{5}$

E. $n > \frac{2m+9}{5}$

[1977-CE-MATHS 2-33]

18. If $a - 3b < 5$, then

A. $b < \frac{5-a}{3}$.

B. $b < \frac{a-5}{3}$.

C. $b < \frac{a+5}{3}$.

D. $b > \frac{a-5}{3}$.

E. $b > \frac{a+5}{3}$.

[SP-CE-MATHS 2-8]

19. $3x - 2y > 6$ is equivalent to

A. $y > \frac{3}{2}x + 3$.

B. $y > \frac{3}{2}x - 3$.

C. $y < \frac{3}{2}x + 3$.

D. $y < \frac{3}{2}x - 3$.

E. $y < 3 - \frac{3}{2}x$.

[1978-CE-MATHS 2-16]

20. Which of the following is equivalent to $y > 2 + 5x + 4y$?

A. $y > \frac{2+5x}{3}$

B. $y < \frac{2+5x}{3}$

C. $y > -\frac{2+5x}{3}$

D. $y < -\frac{2+5x}{3}$

E. $y > \frac{2+5x}{5}$

[1979-CE-MATHS 2-22]

21. $2y - 3 > 4y + 2x + 5$ is equivalent to

A. $y > x + 4$.

B. $y < x + 4$.

C. $y > -x - 4$.

D. $y < -x - 4$.

E. $y > x + 1$.

[1981-CE-MATHS 2-10]

22. Let $a > 2$. The inequality $2x - 2a < ax + 5a$ is equivalent to

A. $x > \frac{7a}{2-a}$.

B. $x < \frac{7a}{2-a}$.

C. $x > \frac{-3a}{2-a}$.

D. $x < \frac{-3a}{2-a}$.

E. $x > \frac{-7a}{2-a}$.

[1982-CE-MATHS 2-32]

23. $2x - 3a - 4 > 3x + 5a + 6$ is equivalent to

A. $x > -8a - 10$.

B. $x > 2a - 10$.

C. $x < -8a - 10$.

D. $x < \frac{1}{5}(2a+2)$.

E. $x > \frac{1}{5}(2a+2)$.

[1983-CE-MATHS 2-8]

24. Solve the inequality $x \log_{10} 0.1 > \log_{10} 10$.

A. $x > -1$

B. $x > 1$

C. $x > 100$

D. $x < 1$

E. $x < -1$

[1987-CE-MATHS 2-37]

25. The solution of $2(3-x) > -4$ is

A. $x < 5$.

B. $x > 5$.

C. $x < 10$.

D. $x > 10$.

[2005-CE-MATHS 2-9]

26. The solution of $15 \geq 4(x+2) - 1$ is

A. $x \leq -2$.

B. $x \leq 2$.

C. $x \geq -2$.

D. $x \geq 2$.

[2007-CE-MATHS 2-6]

27. If x is a positive integer satisfying the inequality $x - 5 \le 1 - x$, then the least value of x is

A. 0 .
B. 1 .
C. 2 .
D. 3 .

[2009-CE-MATHS 2-9]

28. The solution of $2(1 - x) + 5 \ge 17$ is

A. $x \le -5$.
B. $x \ge -5$.
C. $x \le -12$.
D. $x \ge -12$.

[2011-CE-MATHS 2-5]

Compound Linear Inequalities

29. Find the values of x which satisfy both $-x < 4$ and $\frac{2x - 16}{3} > -2$.

A. $-4 < x < 5$
B. $x < -4$
C. $x > -4$
D. $x < 5$
E. $x > 5$

[1995-CE-MATHS 2-9]

30. Solve $1 < -3x + 4 < 10$.

A. $-2 < x < 1$
B. $-1 < x < 2$
C. $x < -2$ or $x > 1$
D. $x < -1$ or $x > 2$
E. no solution

[1996-CE-MATHS 2-7]

31. Find the values of x which satisfy both $x + 3 > 0$ and $-2x < 1$.

A. $x > -3$
B. $x > -\frac{1}{2}$
C. $x > \frac{1}{2}$
D. $-3 < x < -\frac{1}{2}$
E. $-3 < x < \frac{1}{2}$

[2000-CE-MATHS 2-6]

32. The solution of $x > 1$ and $13 < 3x - 2 < 25$ is

A. $x > 1$.
B. $1 < x < 5$.
C. $1 < x < 9$.
D. $5 < x < 9$.

[2003-CE-MATHS 2-8]

33. The solution of $-2x < 3 - x$ or $3x + 3 > 0$ is

A. $x > -3$.
B. $x > -1$.
C. $-3 < x < -1$.
D. $x < -3$ or $x > -1$.

[2004-CE-MATHS 2-9]

HKDSE Problems

34. The solution of $5 - 2x < 3$ and $4x + 8 > 0$ is

A. $x > -2$.
B. $x > -1$.
C. $x > 1$.
D. $-2 < x < 1$.

[SP-DSE-MATHS 2-9]

35. The solution of $4x > x - 3$ or $3 - x < x + 7$ is

A. $x > -2$.
B. $x < -2$.
C. $x > -1$.
D. $x < -2$ or $x > -1$.

[PP-DSE-MATHS 2-9]

36. The solution of $15 + 4x < 3$ or $9 - 2x > 1$ is

A. $x < -3$.
B. $x > -3$.
C. $x < 4$.
D. $x > 4$.

[2012-DSE-MATHS 2-7]

37. The solution of $x - \frac{x-1}{2} > 5$ or $1 < x - 11$ is

A. $x > 9$.
B. $x > 10$.
C. $x > 11$.
D. $x > 12$.

[2013-DSE-MATHS 2-5]

38. If $a > b$ and $k < 0$, which of the following **must** be true?

(1) $a^2 > b^2$
(2) $a + k > b + k$
(3) $\frac{a}{k^2} > \frac{b}{k^2}$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2014-DSE-MATHS 2-6]

39. The solution of $-3x < 6 < 2x$ is

A. $x > -2$.
B. $x > 0$.
C. $x > 3$.
D. $-2 < x < 3$.

[2014-DSE-MATHS 2-7]

40. The solution of $18 + 7x > 4$ or $5 - 2x < 3$ is

A. $x > -2$.
B. $x > -1$.
C. $x > 1$.
D. $-2 < x < 1$.

[2015-DSE-MATHS 2-6]

41. The solution of $-5x > 21 - 2x$ and $6x - 18 < 0$ is

A. $x < -7$.
B. $x < 3$.
C. $-7 < x < 3$.
D. $x < -7$ or $x > 3$.

[2016-DSE-MATHS 2-7]

42. The solution of $6 - x < 2x - 3$ or $7 - 3x > 1$ is

A. $x < 2$.
B. $x > 3$.
C. $2 < x < 3$.
D. $x < 2$ or $x > 3$.

[2017-DSE-MATHS 2-5]

43. The solution of $\frac{1-2x}{3} \geq x - 3$ or $4x + 9 < 1$ is

A. $x < -2$
B. $x > -2$
C. $x \leq 2$
D. $x \geq 2$

[2018-DSE-MATHS 2-13]

44. The least integer satisfying the compound inequality $-2(x-5) + 5 < 21$ or $\frac{3x-5}{7} > 1$ is

A. -3
B. -2
C. 4
D. 5

[2019-DSE-MATHS 2-7]

45. The solution of $5 - 4x < 9$ and $\frac{2x-3}{7} > 1$ is

A. $x < -1$
B. $x > -1$
C. $x < 5$
D. $x > 5$

[2020-DSE-MATHS 2-13]

Quadratic Inequalities

1. For all $x \in \mathbf{R}$ such that $P = \{x : x(3x+2) > 0\}$ and $Q = \{x : 3x^2 - x - 2 < 0\}$, what is $P \cap Q$?

   A. $\{x : x > 1\}$
   B. $\{x : x < -\frac{2}{3}\}$
   C. $\{x : x < -\frac{2}{3} \text{ or } x > 1\}$
   D. $\{x : -\frac{2}{3} < x < 0\}$
   E. $\{x : 0 < x < 1\}$

   [1972-CE-MATHS B1-20]

2. Solve the inequality $(4x+3)(x-4) > 0$.

   A. $x > 4$
   B. $4 > x > -\frac{3}{4}$
   C. $-\frac{3}{4} > x$
   D. $-\frac{3}{4} > x$ or $x > 4$
   E. $x > -\frac{3}{4}$

   [1980-CE-MATHS 2-9]

3. $2x^2 - 2 \leq 0$ is equivalent to

   A. $x \leq 1$.
   B. $x \geq -1$.
   C. $-1 \leq x \leq 1$.
   D. $x \geq 1$ or $x \leq -1$.
   E. $x \leq 1$ or $x \geq -1$.

   [1981-CE-MATHS 2-29]

4. $5 - 9x - 2x^2 > 0$ is equivalent to

   A. $x > \frac{1}{2}$.
   B. $x < -5$.
   C. $-5 < x < \frac{1}{2}$.
   D. $x < -5$ or $x > \frac{1}{2}$.
   E. $x > -5$ or $x < \frac{1}{2}$.

   [1982-CE-MATHS 2-8]

5. $12 - x - x^2 < 0$ is equivalent to

   A. $x < -4$.
   B. $x > 3$.
   C. $-4 < x < 3$.
   D. $x < -3$ or $x > 4$.
   E. $x < -4$ or $x > 3$.

   [1983-CE-MATHS 2-34]

6. $4x^2 - 9 \geq 0$ is equivalent to

   A. $x \geq \frac{3}{2}$ or $x \geq -\frac{3}{2}$.
   B. $\frac{3}{2} \leq x \leq -\frac{3}{2}$.
   C. $-\frac{3}{2} \leq x \leq \frac{3}{2}$.
   D. $x \geq -\frac{3}{2}$ or $x \leq \frac{3}{2}$.
   E. $x \leq -\frac{3}{2}$ or $x \geq \frac{3}{2}$.

   [1984-CE-MATHS 2-33]

7. What is the following is the solution of $(x-1)(x-3) \leq 0$ and $x - 2 \leq 0$?

   A. $x \leq 2$
   B. $x \leq 3$
   C. $2 \leq x \leq 3$
   D. $1 \leq x \leq 2$
   E. $1 \leq x \leq 3$

   [1985-CE-MATHS 2-36]

8. How many integers x satisfy the inequality $6x^2 - 7x - 20 \leq 0$?

   A. 0
   B. 1
   C. 2
   D. 3
   E. 4

   [1992-CE-MATHS 2-37]

9. If the solution of the inequality $x^2 - ax + 6 \leq 0$ is $c \leq x \leq 3$, then

   A. $a = 5$, $c = 2$.
   B. $a = -5$, $c = 2$.
   C. $a = 5$, $c = -2$.
   D. $a = 1$, $c = -2$.
   E. $a = -1$, $c = 2$.

   [1993-CE-MATHS 2-40]

10. If $x(x+1) < 5(x+1)$, then

    A. $x < 5$.
    B. $x < -5$ or $x > 1$.
    C. $x < -1$ or $x > 5$.
    D. $-5 < x < 1$.
    E. $-1 < x < 5$.

    [1994-CE-MATHS 2-6]

11. If 3 is a root of the equation $x^2 - x + c = 0$, solve $x^2 - x + c > 0$.

    A. $x < -2$ or $x > 3$
    B. $x < 2$ or $x > 3$
    C. $x > -6$
    D. $-2 < x < 3$
    E. $2 < x < 3$

    [1996-CE-MATHS 2-40]

12. Find the values of x which satisfy both $-2x < 3$ and $(x+3)(x-2) < 0$.

A. $x < -3$
B. $x > 2$
C. $-3 < x < -\frac{3}{2}$
D. $-\frac{3}{2} < x < 2$
E. $x < -3$ or $x > -\frac{3}{2}$

[1997-CE-MATHS 2-32]

13. Solve $x^2 + 5x - 6 \le 0$.

A. $-6 \le x \le 1$
B. $-3 \le x \le -2$
C. $-1 \le x \le 6$
D. $x \le -6$ or $x \ge 1$
E. $x \le -1$ or $x \ge 6$

[1998-CE-MATHS 2-3]

14. Solve $x^2 + 10x - 24 > 0$.

A. $x < -12$ or $x > 2$
B. $x < -6$ or $x > -4$
C. $x < -2$ or $x > 12$
D. $-12 < x < 2$
E. $-2 < x < 12$

[1999-CE-MATHS 2-7]

15. Solve $(2x-1)^2 + 2(2x-1) - 3 > 0$.

A. $0 < x < 2$
B. $-1 < x < 1$
C. $x < 0$ or $x > 2$
D. $x < -1$ or $x > 1$

[2002-CE-MATHS 2-9]

Nature of Quadratic Roots

16. If the roots of the equation $x^2 + x + m = 0$ are real; and the roots of the equation $-mx^2 + x + 1 = 0$ are imaginary, which of the following is the condition on m that satisfies both statements?

A. $m < -\frac{1}{4}$
B. $m \le \frac{1}{4}$
C. $-\frac{1}{4} < m < \frac{1}{4}$
D. $-\frac{1}{4} \le m < \frac{1}{4}$
E. $-\frac{1}{4} < m \le \frac{1}{4}$

[1972-CE-MATHS B1-19]

17. If $x^2 - kx + 9 \ge 0$ for all real values of x, what is the value of k?

A. $k = -6$ only
B. $k = 6$ only
C. $-6 \le k \le 6$
D. $k = 6$ or -6 only
E. $k \le -6$ or $k \ge 6$

[1980-CE-MATHS 2-37]

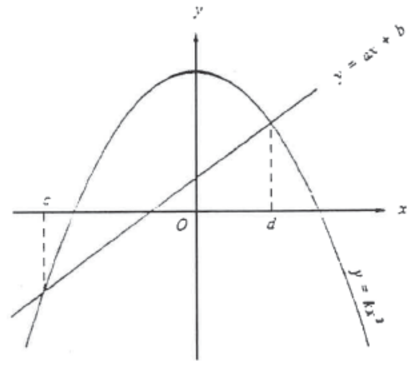
18. Find the range of values of k such that the equation $x^2 + (k-2)x + 1 = 0$ has real roots.

A. $k = 4$
B. $0 < k < 4$
C. $0 \le k \le 4$
D. $k < 0$ or $k > 4$
E. $k \le 0$ or $k \ge 4$

[1995-CE-MATHS 2-40]

Graphical Method

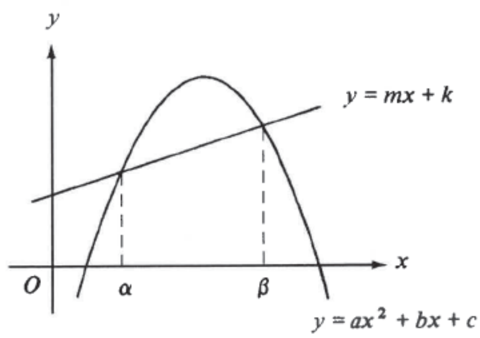
19. In the figure, the line $y = ax + b$ cuts the curve $y = kx^2$ at $x = c$ and $x = d$. Find the range of values of x for which $kx^2 < ax + b$.



A. $c < x < d$
B. $c < x < 0$
C. $x < c$ or $x > d$
D. $x < c$
E. $x > d$

[1988-CE-MATHS 2-37]

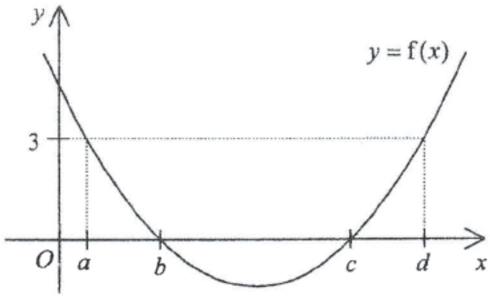
20. From the figure, if $\alpha \le x \le \beta$, then



A. $ax^2 + (b-m)x + (c-k) \leq 0$.
B. $ax^2 + (b-m)x + (c-k) < 0$.
C. $ax^2 + (b-m)x + (c-k) = 0$.
D. $ax^2 + (b-m)x + (c-k) > 0$.
E. $ax^2 + (b-m)x + (c-k) \geq 0$.

[1992-CE-MATHS 2-38]

21. The figure shows the graph of $y = f(x)$, where $f(x)$ is a quadratic function. The solution of $f(x) < 3$ is



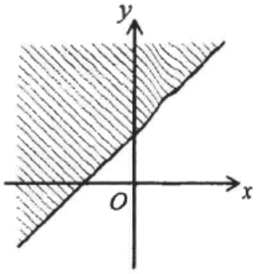
A. $a < x < d$.
B. $b < x < c$.
C. $x < a$ or $x > d$.
D. $x < b$ or $x > c$.

[2008-CE-MATHS 2-10]

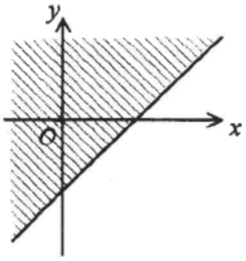
Linear Inequalities

1. If $b < 0$ and $c < 0$, which of the following shaded regions may represent the solution of $x + by + c \geq 0$?

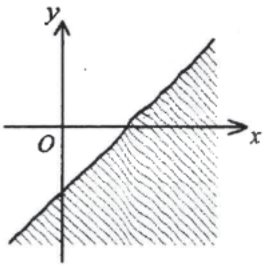
A.



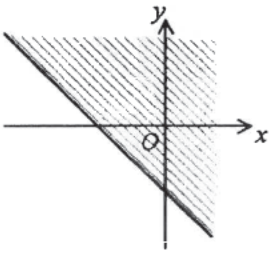
B.



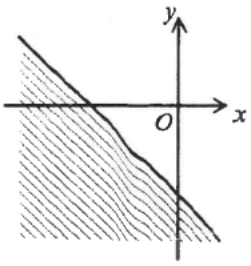
C.



D.



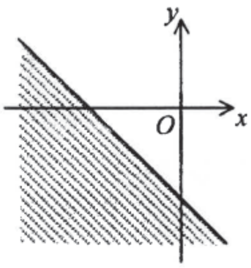
E.



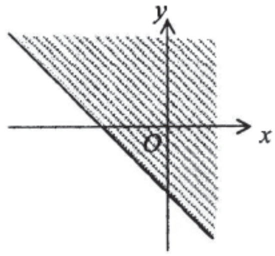
[1998-CE-MATHS 2-41]

2. Which of the following shaded regions may represent the solution of $x \leq y - 2$?

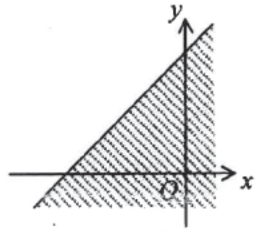
A.



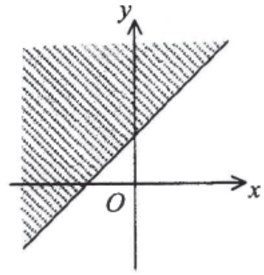
B.



C.



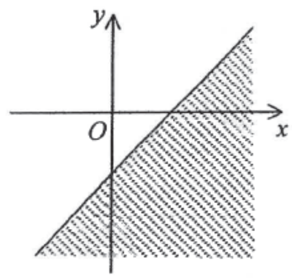
D.



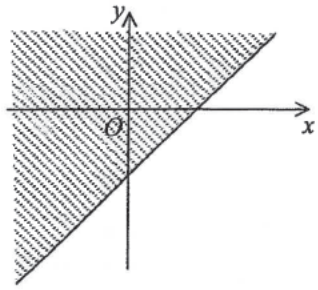
[2004-CE-MATHS 2-43]

3. Which of the following shaded regions may represent the solution of $y \leq x - 9$?

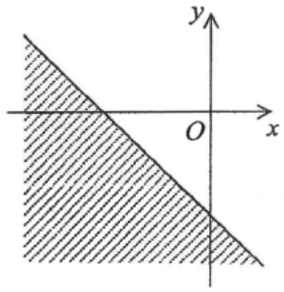
A.



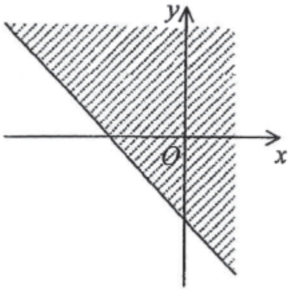
B.



C.

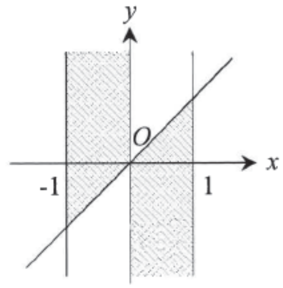


D.



[2009-CE-MATHS 2-44]

E.

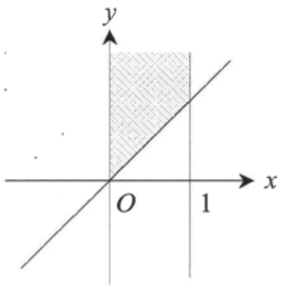


[1977-CE-MATHS 2-37]

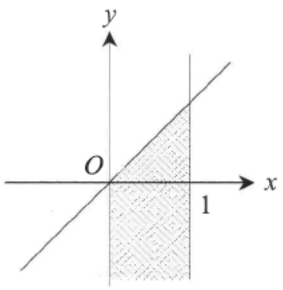
Feasible Regions

4. Which of the following shaded regions represents the solution set of $x - y \geq 0$ and $x^2 \leq 1$?

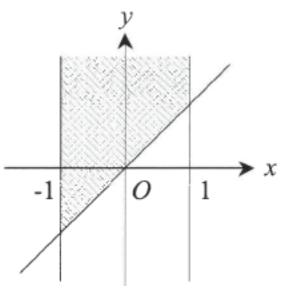
A.



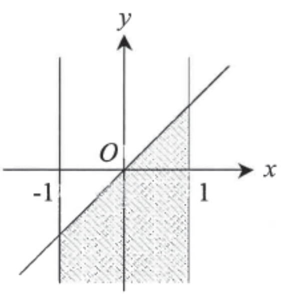
B.



C.

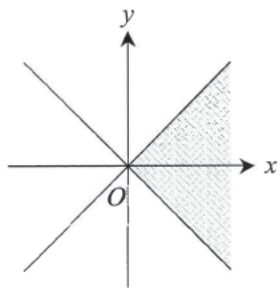


D.

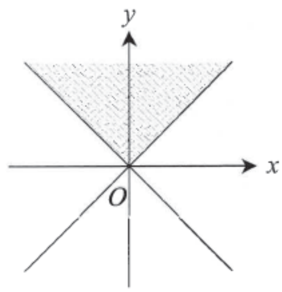


5. Which of the following shaded regions represents the solution set of $x + y \geq 0$ and $x - y \geq 0$?

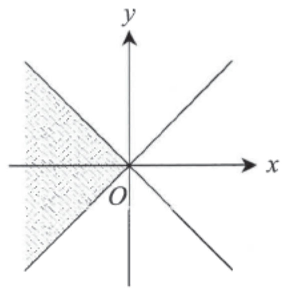
A.



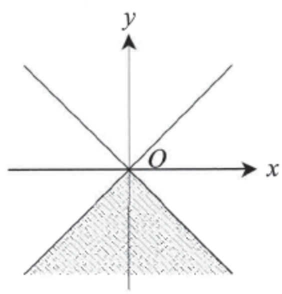
B.



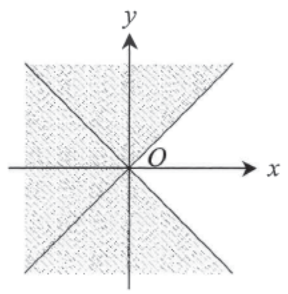
C.



D.



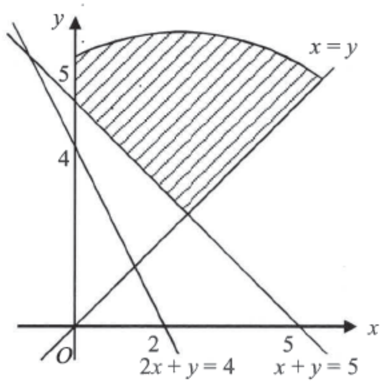
E.



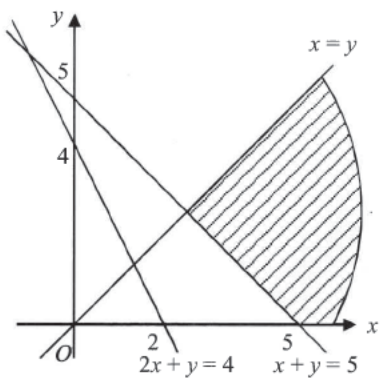
[1978-CE-MATHS 2-49]

6. If $\begin{cases} x \geq 0, \\ y \geq 0, \\ x + y \leq 5, \\ 2x + y \geq 4, \\ x \geq y, \end{cases}$ in which of the following shaded regions do all the points satisfy the above inequalities?

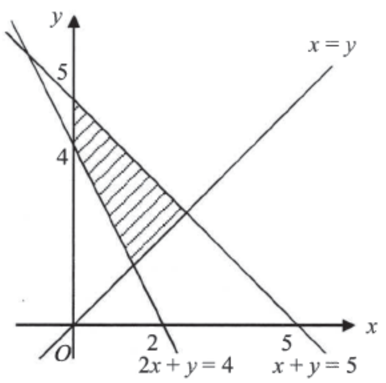
A.



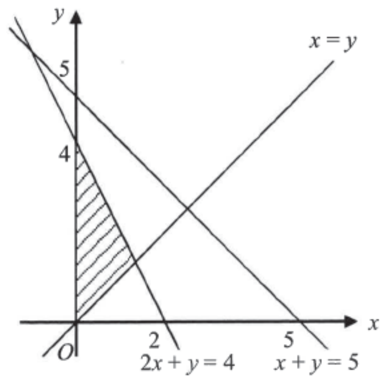
B.



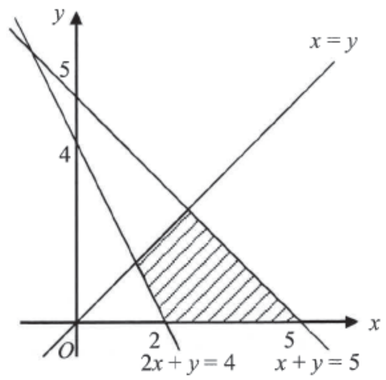
C.



D.

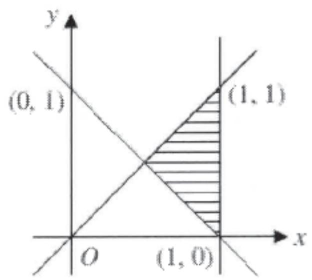


E.



[1982-CE-MATHS 2-33]

7.



Which of the following systems of inequalities determine the shaded region in the figure?

A. $\begin{cases} x \geq 1 \\ x + y \geq 1 \\ x \geq y \end{cases}$

B. $\begin{cases} x \geq 1 \\ x + y \leq 1 \\ x \geq y \end{cases}$

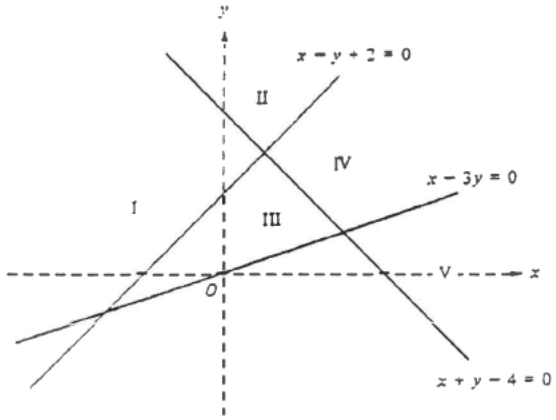
C. $\begin{cases} x \leq 1 \\ x + y \leq 1 \\ x \leq y \end{cases}$

D. $\begin{cases} x \leq 1 \\ x + y \leq 1 \\ x \geq y \end{cases}$

E. $\begin{cases} x \leq 1 \\ x + y \geq 1 \\ x \geq y \end{cases}$

[1985-CE-MATHS 2-37]

8.



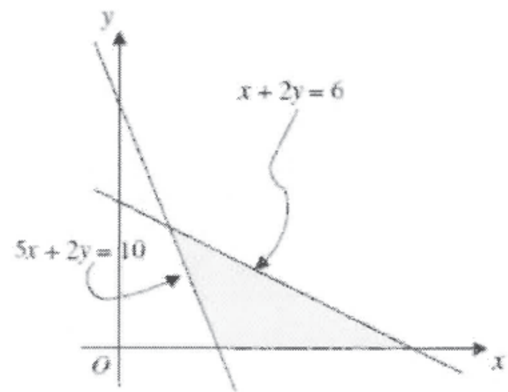
In the figure, which region represents the solution to the following inequalities?

$$\begin{cases} x - 3y \le 0 \\ x - y + 2 \ge 0 \\ x + y - 4 \ge 0 \end{cases}$$

A. I
B. II
C. III
D. IV
E. V

[1988-CE-MATHS 2-36]

9.



Which of the following systems of inequalities is represented by the shaded region in the figure?

A. $\begin{cases} x + 2y \ge 6 \\ 5x + 2y \ge 10 \\ y \ge 0 \end{cases}$

B. $\begin{cases} x + 2y \le 6 \\ 5x + 2y \le 10 \\ x \ge 0 \end{cases}$

C. $\begin{cases} x + 2y \ge 6 \\ 5x + 2y \le 10 \\ x \ge 0 \end{cases}$

D. $\begin{cases} x + 2y \le 6 \\ 5x + 2y \ge 10 \\ y \ge 0 \end{cases}$

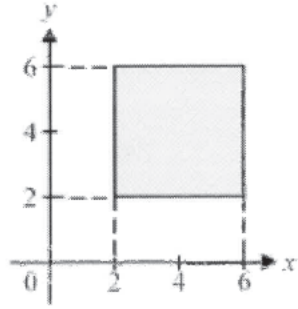
E. $\begin{cases} x + 2y \ge 6 \\ 5x + 2y \le 10 \\ y \ge 0 \end{cases}$

[1989-CE-MATHS 2-5]

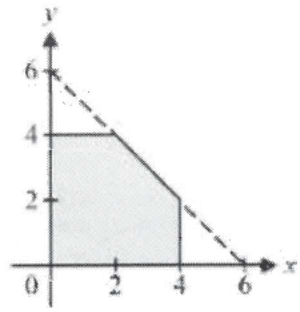
10. Which one of the following shaded regions represents the solution of

$$\begin{cases} 2 \le x + y \le 6 \\ 0 \le x \le 4 \\ 0 \le y \le 4 \end{cases} \quad ?$$

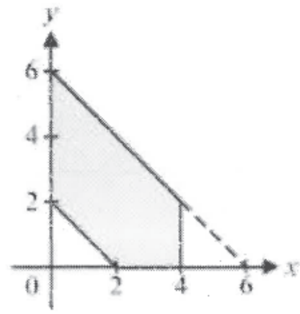
A.



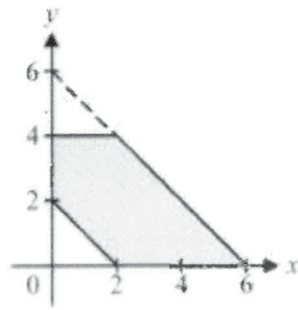
B.



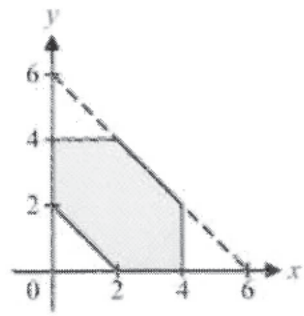
C.



D.

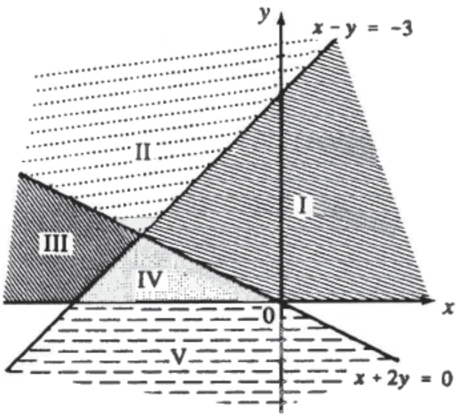


E.



[1991-CE-MATHS 2-38]

11.



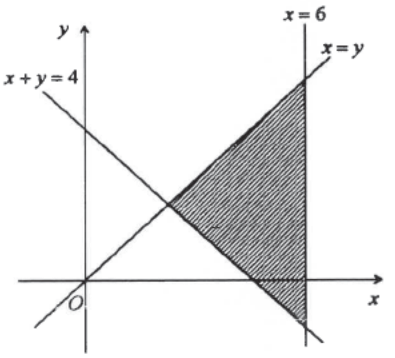
Which of the following shaded regions represents the solution of

$$\begin{cases} y \ge 0 \\ x - y \ge -3 \\ x + 2y \le 0 \end{cases} ?$$

A. I
B. II
C. III
D. IV
E. V

[1995-CE-MATHS 2-8]

12.



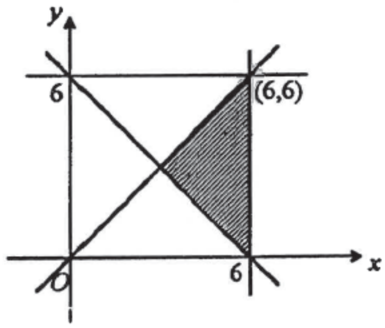
In the figure, (x, y) is any point in the shaded region (including the boundary). Which of the following is/are true?

(1) $x \le y$
(2) $x + y \le 4$
(3) $x \le 6$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1996-CE-MATHS 2-9]

13.



Which of the following systems of inequalities has its solution represented by the shaded region in the figure?

A. $\begin{cases} x + y \ge 6 \\ x \ge y \\ x \le 6 \end{cases}$

B. $\begin{cases} x + y \ge 6 \\ x \ge y \\ y \le 6 \end{cases}$

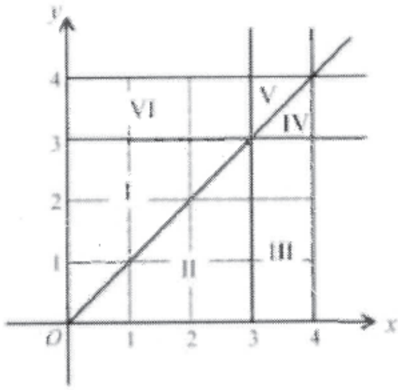
C. $\begin{cases} x + y \ge 6 \\ x \le y \\ x \le 6 \end{cases}$

D. $\begin{cases} x + y \ge 6 \\ x \le y \\ y \le 6 \end{cases}$

E. $\begin{cases} x + y \le 6 \\ x \ge y \\ x \le 6 \end{cases}$

[1997-CE-MATHS 2-9]

14.



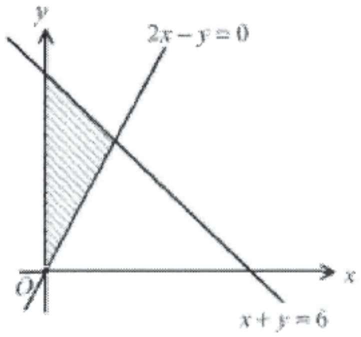
According to the figure, which of the following represents the solution of

$$\begin{cases} 0 \le x \le 4 \\ x \ge y \\ 0 \le y \le 3 \end{cases} ?$$

A. Region I
B. Region II
C. Regions I and VI
D. Regions II and III
E. Regions II, III, IV

[2000-CE-MATHS 2-42]

15.



The shaded region in the figure represents the solution of one of the following systems of inequalities. Which is it?

A. $\begin{cases} 2x - y \le 0 \\ x + y \le 6 \\ x \ge 0 \end{cases}$

B. $\begin{cases} 2x - y \le 0 \\ x + y \le 6 \\ y \ge 0 \end{cases}$

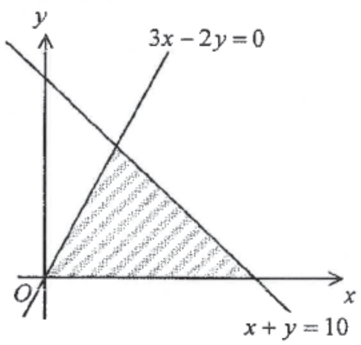
C. $\begin{cases} 2x - y \le 0 \\ x + y \ge 6 \\ y \ge 0 \end{cases}$

D. $\begin{cases} 2x - y \ge 0 \\ x + y \le 6 \\ y \ge 0 \end{cases}$

E. $\begin{cases} 2x - y \ge 0 \\ x + y \ge 6 \\ x \ge 0 \end{cases}$

[2001-CE-MATHS 2-49]

16.



Which of the following systems of inequalities has its solution represented by the shaded region in the figure?

A. $\begin{cases} 3x - 2y \le 0 \\ x + y \ge 10 \\ x \ge 0 \end{cases}$

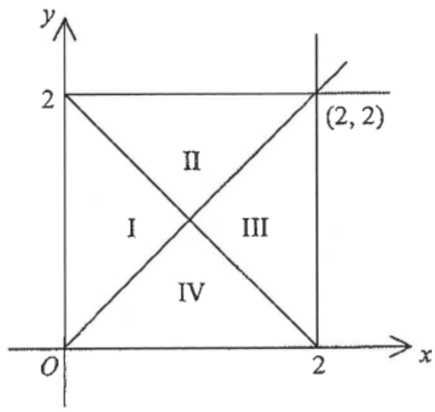
B. $\begin{cases} 3x - 2y \ge 0 \\ x + y \le 10 \\ x \ge 0 \end{cases}$

C. $\begin{cases} 3x - 2y \le 0 \\ x + y \ge 10 \\ y \ge 0 \end{cases}$

D. $\begin{cases} 3x - 2y \ge 0 \\ x + y \le 10 \\ y \ge 0 \end{cases}$

[2003-CE-MATHS 2-43]

17.



Which of the regions in the figure may represent the solution of

$\begin{cases} x \le 2 \\ x + y \ge 2 \\ x - y \ge 0 \end{cases}$?

A. Region I

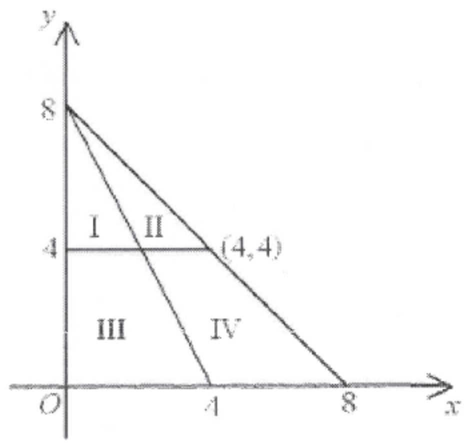
B. Region II

C. Region III

D. Region IV

[2005-CE-MATHS 2-41]

18.



Which of the regions in the figure may represent the solution of

$\begin{cases} y \ge 4 \\ x + y \le 8 \\ 2x + y \ge 8 \end{cases}$?

A. Region I

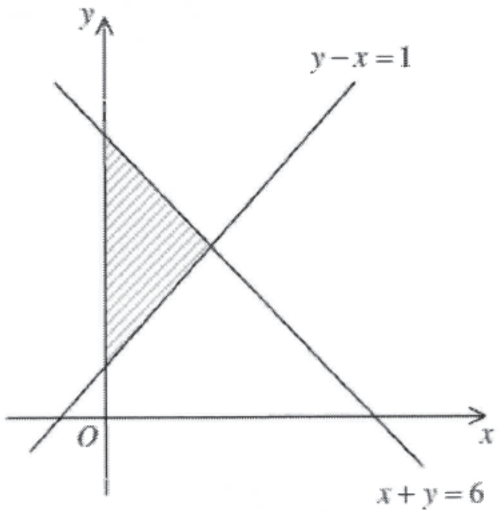
B. Region II

C. Region III

D. Region IV

[2007-CE-MATHS 2-43]

19.



Which of the following systems of inequalities has its solution represented by the shaded region in the figure?

A. $\begin{cases} y - x \geq 1 \\ x + y \geq 6 \\ x \geq 0 \end{cases}$

B. $\begin{cases} y - x \geq 1 \\ x + y \leq 6 \\ x \geq 0 \end{cases}$

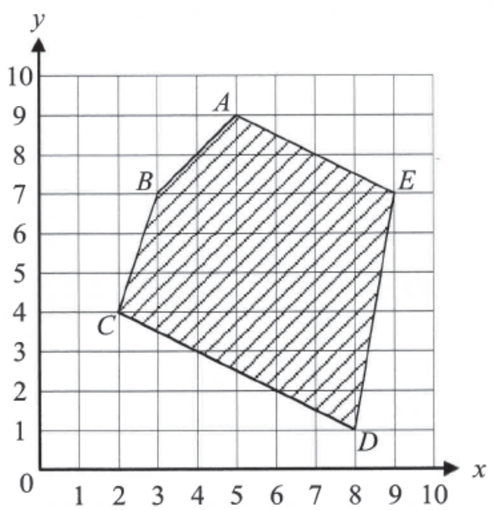
C. $\begin{cases} y - x \leq 1 \\ x + y \geq 6 \\ y \geq 0 \end{cases}$

D. $\begin{cases} y - x \leq 1 \\ x + y \leq 6 \\ y \geq 0 \end{cases}$

[2011-CE-MATHS 2-43]

Optimal Solutions

20.

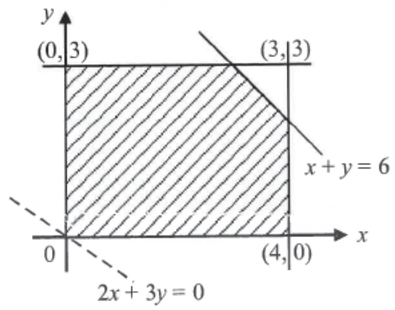


In the figure, which point in the shaded region will make the value of $x - 2y$ a minimum?

A. A
B. B
C. C
D. D
E. E

[1981-CE-MATHS 2-30]

21.



Let $p = 2x + 3y$. Under the following constraints

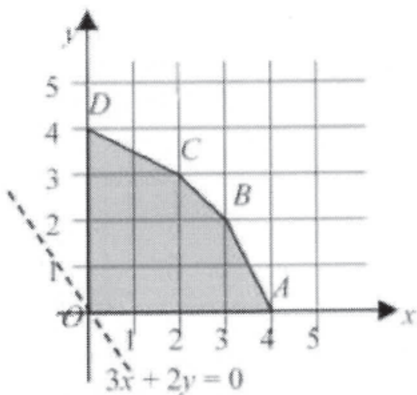
$$\begin{cases} x \geq 0 \\ y \geq 0 \\ x \leq 4 \\ y \leq 3 \\ x + y \leq 6 \end{cases},$$

what is the greatest value of p?

A. 8
B. 14
C. 15
D. 16
E. 17

[1986-CE-MATHS 2-32]

22.

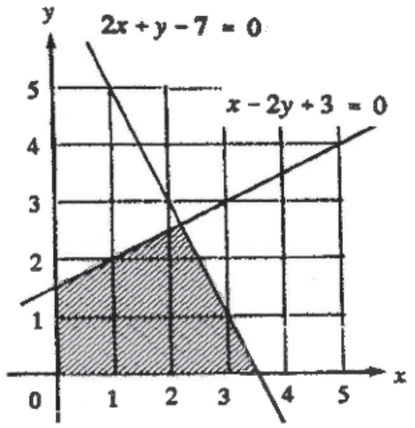


Find the greatest value of $3x + 2y$ if (x, y) is a point lying in the region $OABCD$ (including the boundary).

A. 15
B. 13
C. 12
D. 9
E. 8

[1993-CE-MATHS 2-6]

23.

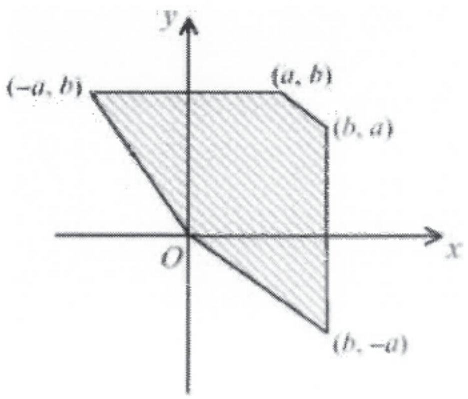


In the figure, (x, y) is a point in the shaded region (including the boundary) and x, y are integers. Find the greatest value of $3x + y$.

A. 7
B. 8
C. 9.2
D. 10
E. 10.5

[1994-CE-MATHS 2-5]

24.

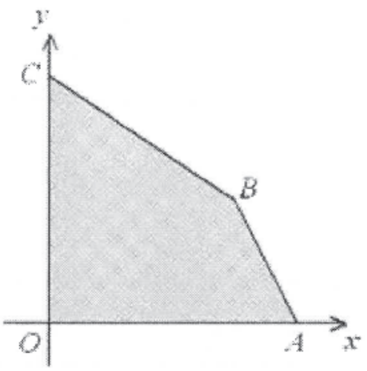


In the figure, find the point (x, y) in the shaded region (including the boundary) at which $bx - ay + 3$ attains its greatest value.

A. (0, 0)
B. $(-a, b)$
C. (a, b)
D. $(b, -a)$
E. (b, a)

[1999-CE-MATHS 2-43]

25.

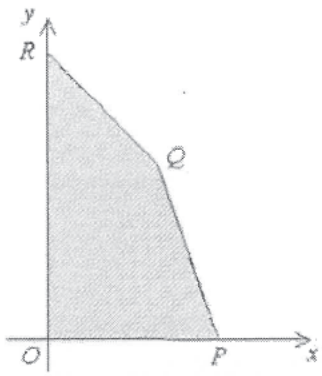


In the figure, O is the origin. The equation of AB is $2x + y - 8 = 0$ and the equation of BC is $2x + 3y - 12 = 0$. If (x, y) is a point lying in the shaded region $OABC$ (including the boundary), then the greatest value of $x + 3y + 4$ is

A. 8 .
B. 13 .
C. 16 .
D. 28 .

[2006-CE-MATHS 2-41]

26.

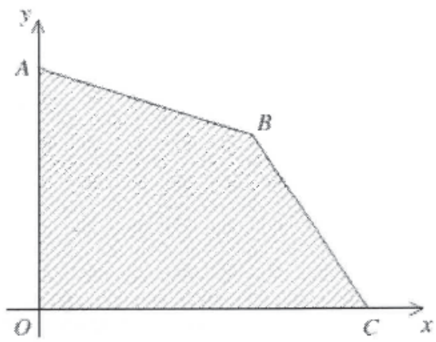


In the figure, the equations of PQ and QR are $3x + y = 36$ and $x + y = 20$ respectively. If (x, y) is a point lying in the shaded region $OPQR$ (including the boundary), then the least value of $2x - 3y + 180$ is

A. 72 .
B. 120 .
C. 160 .
D. 204 .

[2008-CE-MATHS 2-42]

27.

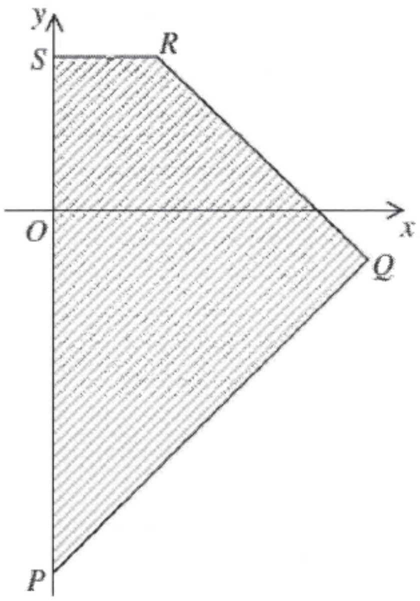


In the figure, the equations of AB and BC are $x + 3y = 18$ and $2x + y = 16$ respectively. If (x, y) is a point lying in the shaded region $OABC$ (including the boundary), then the greatest value of $3x - y + 16$ is

A. 10 .
B. 30 .
C. 40 .
D. 70 .

[2010-CE-MATHS 2-42]

28.



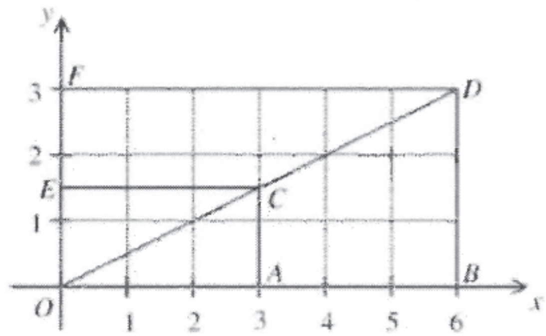
In the figure, the equations of PQ, QR and RS are $x - y = 7$, $x + y = 5$ and $y = 3$ respectively. If (x, y) is a point lying in the shaded region $PQRS$ (including the boundary), at which point does $2x - 3y + 35$ attain its greatest value?

A. P
B. Q
C. R
D. S

[2011-CE-MATHS 2-42]

HKDSE Problems

29.



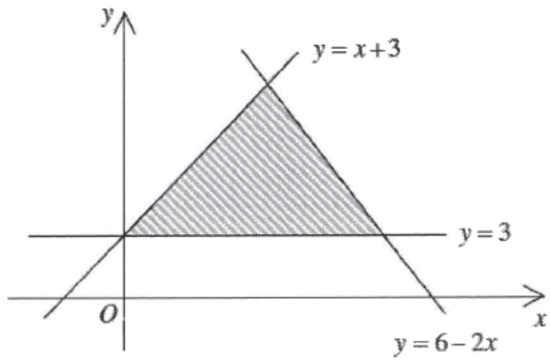
Which of the triangular regions in the figure may represent the solution of

$$\begin{cases} 0 \le x \le 6 \\ 0 \le y \le 3\,? \\ x \le 2y \end{cases}$$

A. ΔOAC
B. ΔOBD
C. ΔOCE
D. ΔODF

[SP-DSE-MATHS 2-35]

30.



The figure shows a shaded region (including the boundary). If (h, k) is a point lying in the shaded region, which of the following are true?

(1) $k \ge 3$
(2) $h - k \ge -3$
(3) $2h + k \le 6$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-36]

31. Consider the following system of inequalities:

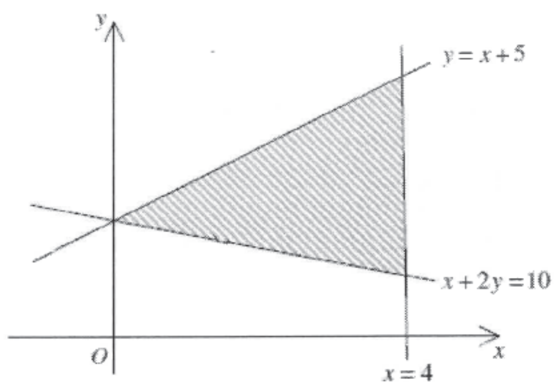
$$\begin{cases} x \ge 2 \\ y \ge 0 \\ x + 4y \le 22 \\ 4x - y \le 20 \end{cases}$$

Let D be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in D, then the greatest value of $3y - 4x + 15$ is

A. 3 .
B. 17 .
C. 22 .
D. 30 .

[2013-DSE-MATHS 2-37]

32.



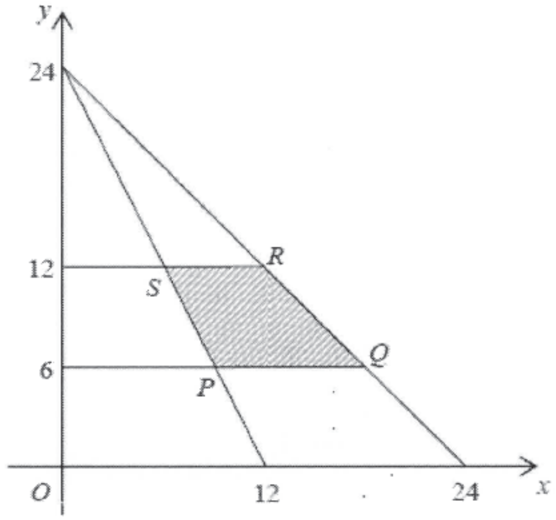
The figure shows a shaded region (including the boundary). If (a, b) is a point lying in the shaded region, which of the following are true?

(1) $a \leq 4$
(2) $a \geq b - 5$
(3) $a \geq 10 - 2b$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2015-DSE-MATHS 2-36]

33.



In the figure, PQ and SR are parallel to the x-axis. If (x, y) is a point lying in the shaded region $PQRS$ (including the boundary), at which point does $7y - 5x + 3$ attain its greatest value?

A. P
B. Q
C. R
D. S

[2016-DSE-MATHS 2-35]

34. Consider the following system of inequalities:

$$\begin{cases} y \leq 9 \\ x - y - 9 \leq 0 \\ x + y - 9 \geq 0 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R, then the greatest value of $x - 2y + 43$ is

A. 25 .
B. 43 .
C. 52 .
D. 61 .

[2017-DSE-MATHS 2-37]

35. Consider the following system of inequalities:

$$\begin{cases} x - 21 \leq 0 \\ x - y - 35 \leq 0 \\ x + 5y - 91 \leq 0 \\ 3x + 2y \geq 0 \end{cases}$$

Let D be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in D, then the least value of $5x + 6y + 234$ is

A. 45
B. 150
C. 178
D. 423

[2018-DSE-MATHS 2-34]

36. Consider the following system of inequalities:

$$\begin{cases} x + 2y \leq 20 \\ 7x - 6y \leq 20 \\ 13x + 6y \geq 20 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R, then the greatest value of $7x + 8y + 9$ is

A. 15
B. 77
C. 113
D. 115

[2019-DSE-MATHS 2-35]

37. Consider the following system of inequalities:

$$\begin{cases} 0 \leq x \leq 2 \\ 2x + y + 3 \geq 0 \\ x + y + 1 \leq 0 \end{cases}$$

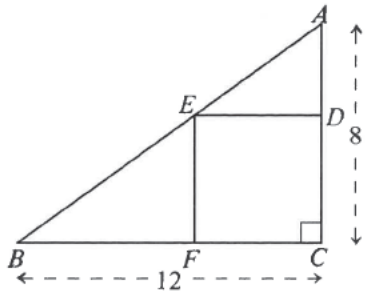
Let D be the region which represents the solution of the above system of inequalities. Find the constant k such that the least value of $4x + 3y + k$ is 24, where (x, y) is a point lying in D.

A. 25
B. 27
C. 37
D. 53

[2020-DSE-MATHS 2-36]

Lengths in Rectilinear Figures

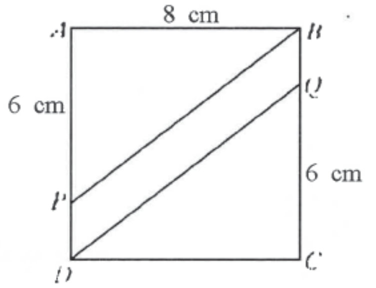
1. ABC is a triangle right-angled at C. $AC = 8$; $BC = 12$. If $CDEF$ is a square, then $ED =$



A. 3.6
B. 4
C. 4.8
D. 6
E. 6.4

[SP-CE-MATHS A2-51]

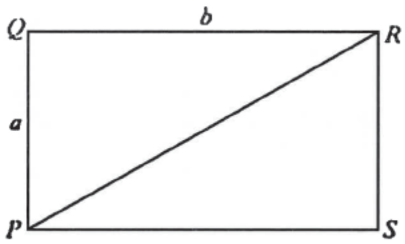
2. In the figure, $ABCD$ is a square of side 8 cm. If $AP = CQ = 6$ cm, what is the distance between the parallel lines PB and DQ?



A. 2.0 cm
B. 1.8 cm
C. 1.6 cm
D. 1.5 cm
E. 1.2 cm

[1978-CE-MATHS 2-26]

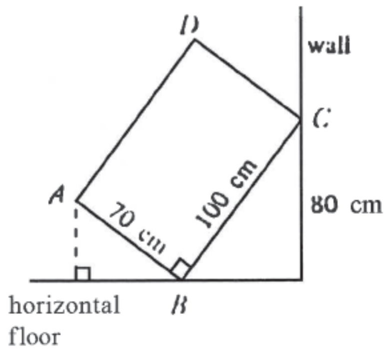
3. In the figure, $PQRS$ is a rectangle. $PQ = a$, $QR = b$. What is the distance between Q and PR?



A. $\dfrac{a^2+b^2}{ab}$
B. $\dfrac{\sqrt{a^2+b^2}}{ab}$
C. $\sqrt{\dfrac{a^2+b^2}{ab}}$
D. $\sqrt{\dfrac{ab}{a^2+b^2}}$
E. $\dfrac{ab}{\sqrt{a^2+b^2}}$

[1978-CE-MATHS A2-53]

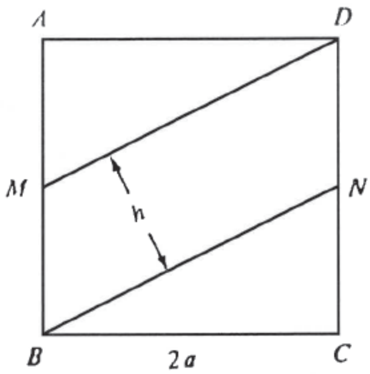
4. In the figure, $ABCD$ represents the cross-section of a rectangular box leaning against a vertical wall. $AB = 70$ cm, $BC = 100$ cm. If C is 80 cm above the floor, how high is A above the floor?



A. 38 cm
B. 40 cm
C. 42 cm
D. 45 cm
E. 56 cm

[1979-CE-MATHS 2-18]

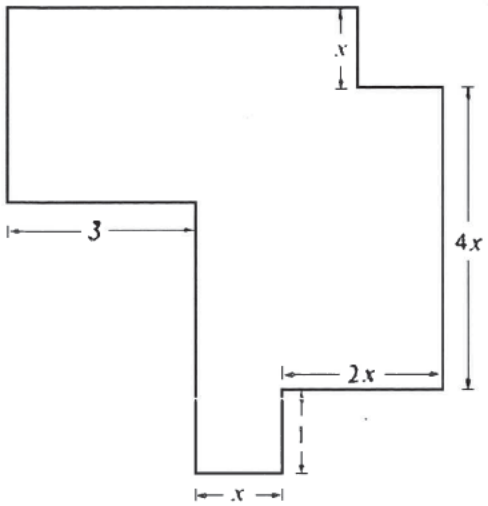
5. In the figure, $ABCD$ is a square of side $2a$. M and N are the mid-points of AB and CD respectively. h is the height of the parallelogram $MBND$. $h =$



A. $\frac{1}{2}a$.
B. $\frac{2}{\sqrt{5}}a$.
C. $\frac{\sqrt{5}}{2}a$.
D. $\frac{2}{\sqrt{3}}a$.
E. $\frac{\sqrt{2}}{4}a$.

[1982-CE-MATHS 2-50]

6. In the figure, all the corners are right-angled. If the perimeter of the figure is 40, then $x =$



A. 0.25

B. 2

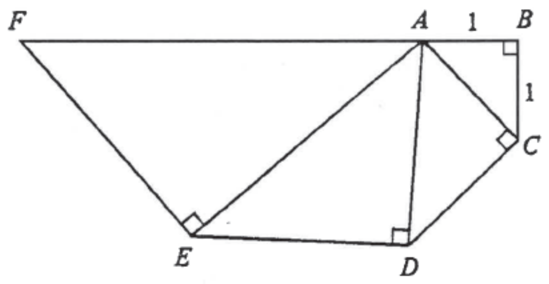
C. 2.5

D. 4

E. 4.5

[1983-CE-MATHS 2-11]

7. In the figure, ABC, ACD, ADE and AEF are right angled isosceles triangles. If $AB = BC = 1$, how long is AF?



A. $2\sqrt{5}$

B. 4

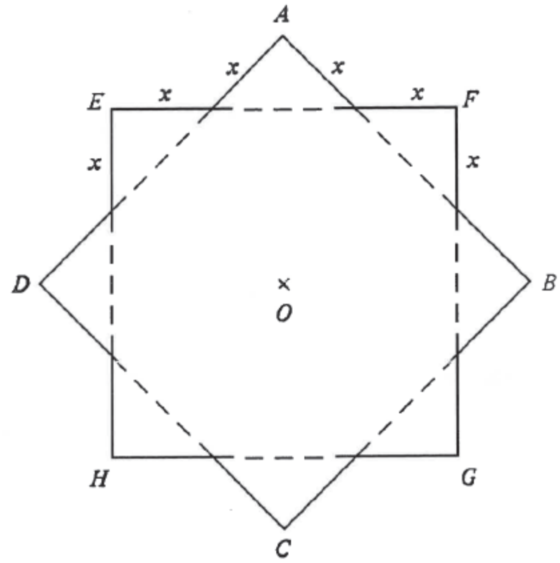
C. $2\sqrt{3}$

D. 3

E. $\sqrt{5}$

[1986-CE-MATHS 2-24]

8. In the figure, $ABCD$ and $EFGH$ are two squares of side 1. They are placed one upon the other with their centres both at O to form a star with 16 sides, each of length x. Find x.



A. $\frac{2}{7}$

B. $\frac{1}{3}$

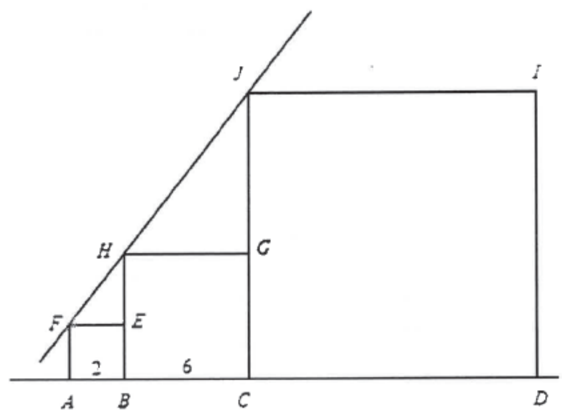
C. $\frac{2}{5}$

D. $\frac{1}{2+\sqrt{2}}$

E. $\frac{1}{1+\sqrt{2}}$

[1986-CE-MATHS 2-48]

9. In the figure, $ABEF$, $BCGH$ and $CDIJ$ are three squares. If $AB = 2$ and $BC = 6$ and F, H, J lie on a straight line, then $CD =$



A. 8 .

B. 10 .

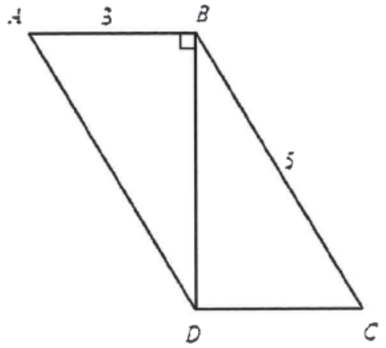
C. 12 .

D. 16 .

E. 18 .

[1988-CE-MATHS 2-25]

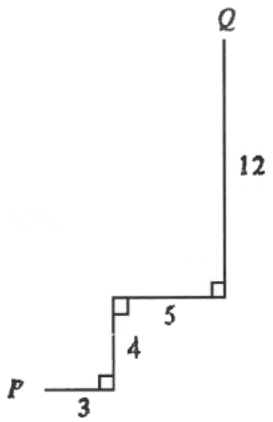
10. In the figure, $ABCD$ is a parallelogram. $AB \perp BD$, $AB = 3$ and $BC = 5$. $AC =$



A. 10 .
B. 12 .
C. $\sqrt{13}$.
D. $\sqrt{26}$.
E. $2\sqrt{13}$.

[1988-CE-MATHS 2-53]

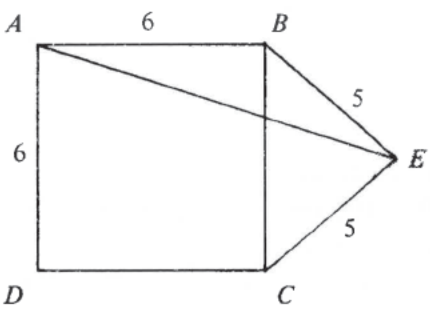
11. Referring to the figure, find the length of the line segment joining P and Q.



A. 25
B. $10\sqrt{5}$
C. 18
D. $8\sqrt{5}$
E. $\sqrt{194}$

[1989-CE-MATHS 2-22]

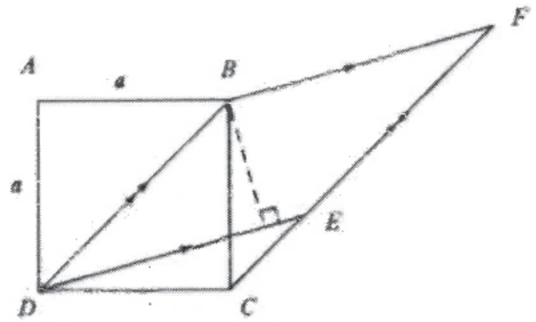
12. In the figure, $ABCD$ is a square with side 6. If $BE = CE = 5$, find AE.



A. $\sqrt{61}$
B. 9
C. 10
D. $6\sqrt{3}$
E. $\sqrt{109}$

[1992-CE-MATHS 2-25]

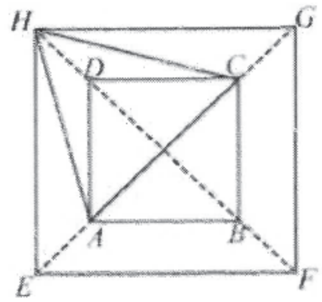
13. In the figure, $ABCD$ is a square of side a and $BDEF$ is a rhombus. CEF is a straight line. Find the length of the perpendicular from B to DE.



A. $\frac{1}{2}a$
B. $\frac{2a}{\sqrt{3}}$
C. $\frac{a}{\sqrt{2}}$
D. $\frac{\sqrt{3}}{2}a$
E. a

[1992-CE-MATHS 2-54]

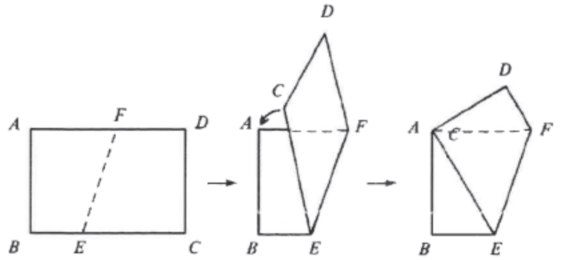
14. In the figure, $ABCD$ and $EFGH$ are two squares and ACH is an equilateral triangle. Find $AB : EF$.



A. $1:2$
B. $1:3$
C. $1:\sqrt{2}$
D. $1:\sqrt{3}$
E. $\sqrt{2}:\sqrt{3}$

[1993-CE-MATHS 2-52]

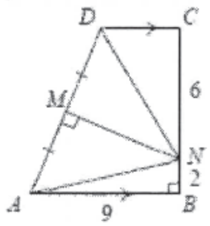
15. In the figure, a rectangular piece of paper $ABCD$ is folded along EF so that C and A coincide. If $AB = 12$ cm, $BC = 16$ cm, find BE.



A. 3.5 cm
B. 4.5 cm
C. 5 cm
D. 8 cm
E. 12.5 cm

[1993-CE-MATHS 2-53]

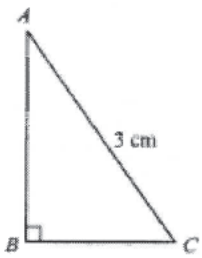
16. In the figure, $ABCD$ is a trapezium with $AB \parallel DC$, $\angle ABC = 90°$ and MN is the perpendicular bisector of AD. If $AB = 9$, $BN = 2$ and $NC = 6$, find CD.



A. $4\frac{1}{2}$
B. $6\frac{3}{4}$
C. 7
D. $\sqrt{41}$
E. $\sqrt{113}$

[1994-CE-MATHS 2-54]

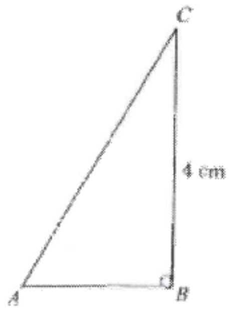
17. In the figure, $AB = 2BC$. Find BC correct to 3 significant figures.



A. 0.775 cm
B. 1.00 cm
C. 1.34 cm
D. 1.73 cm
E. 1.80 cm

[1998-CE-MATHS 2-31]

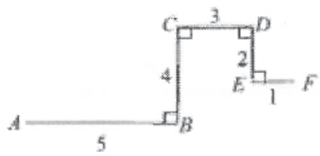
18. In the figure, $AC = 3AB$. Find AB correct to 3 significant figures.



A. 1.26 cm
B. 1.41 cm
C. 1.79 cm
D. 2.83 cm

[2002-CE-MATHS 2-25]

19. In the figure, the length of the line segment joining A and F is

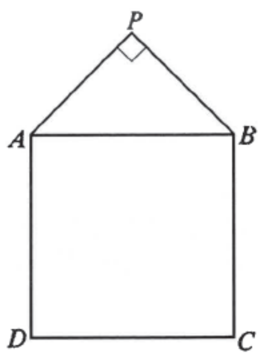


A. $\sqrt{68}$.
B. $\sqrt{77}$.
C. $\sqrt{82}$.
D. $\sqrt{85}$.

[2005-CE-MATHS 2-30]

Areas of Rectilinear Figures

20. In the figure, $ABCD$ is a square of area 16 cm^2. APB is an isosceles triangle right-angled at P. What is the area of ΔAPB?



A. 4 cm^2
B. 8 cm^2
C. $2\sqrt{2}$ cm^2
D. $4\sqrt{2}$ cm^2
E. $8\sqrt{2}$ cm^2

[SP-CE-MATHS 2-20]

21. The length of a side of a rhombus is 10 cm. If its shorter diagonal is of length 12 cm, what is the area of the rhombus in cm^2?

A. 60
B. 96
C. 100
D. 120
E. 192

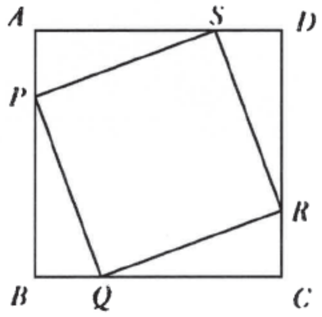
[1980-CE-MATHS 2-14]

22. What is the area, in cm^2, of an equilateral triangle of side x cm?

A. $\frac{\sqrt{3}}{4}x^2$
B. $\frac{\sqrt{3}}{2}x^2$
C. $\frac{1}{4}x^2$
D. $\frac{1}{2}x^2$
E. $\sqrt{3}x^2$

[1980-CE-MATHS 2-20]

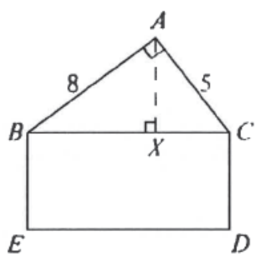
23. In the figure, $ABCD$ is a square with $AB = 5$. $AP = BQ = CR = DS = 1$. What is the area of $PQRS$?



A. 9
B. 15
C. 16
D. 17
E. 18

[1980-CE-MATHS 2-22]

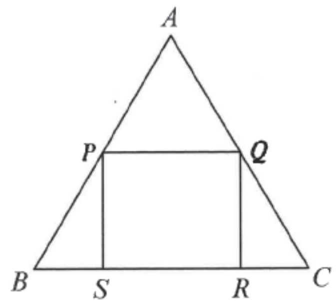
24. In the figure, $\angle BAC = 90°$, $AB = 8$, $AC = 5$ and $AX \perp BC$. $BCDE$ is a rectangle with $CD = AX$. What is the area of the rectangle $BCDE$?



A. 20
B. 40
C. 80
D. 89
E. $4\sqrt{89}$

[1981-CE-MATHS 2-40]

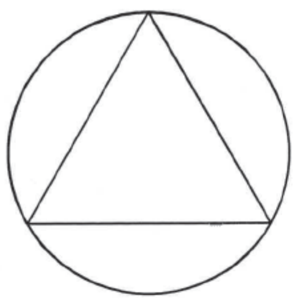
25. In the figure, ABC is an equilateral triangle of side $2a$. P and Q are the mid-points of AB and AC respectively. $PQRS$ is a rectangle. What is the area of $PQRS$?



A. a^2
B. $\frac{1}{2}a^2$
C. $\frac{2}{3}a^2$
D. $\frac{1}{\sqrt{3}}a^2$
E. $\frac{\sqrt{3}}{2}a^2$

[1981-CE-MATHS 2-50]

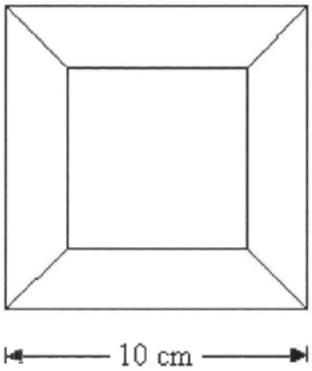
26. In the figure an equilateral triangle is inscribed in a circle of radius a. What is the area of the triangle?



A. $\frac{3}{2}a^2$
B. $\frac{3\sqrt{3}}{4}a^2$
C. $\frac{3}{4}a^2$
D. a^2
E. $\frac{3\sqrt{3}}{2}a^2$

[1982-CE-MATHS 2-39]

27. Four identical trapeziums, each of area 16 cm^2, are drawn inside a square of side 10 cm as shown in the figure. What is the height of each trapezium?



A. $\frac{1}{2}$ cm.

B. 1 cm.

C. 2 cm.

D. 3 cm.

E. 4 cm.

[1982-CE-MATHS 2-40]

28. If the lengths of the diagonals of a rhombus are 2 cm and 4 cm respectively, what is the area of the rhombus?

A. 2 cm^2

B. 4 cm^2

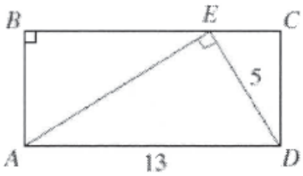
C. 8 cm^2

D. 16 cm^2

E. It cannot be determined

[1983-CE-MATHS 2-12]

29. In the figure, $ABCD$ is a rectangle. E is a point on BC such that $\angle AED = 90°$. $AD = 13$ and $DE = 5$. The area of $ABCD$ =



A. 30.

B. 52.

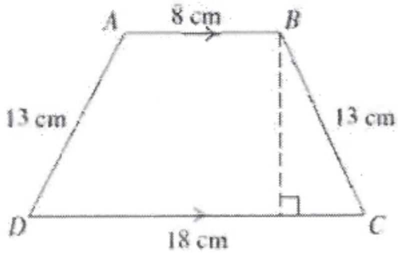
C. 60.

D. 65.

E. 120.

[1985-CE-MATHS 2-51]

30. $ABCD$ is a trapezium in which $AB // DC$, $AB = 8$ cm, $DC = 18$ cm, $AD = BC = 13$ cm. Find the area of the trapezium.



A. 156 cm^2

B. 169 cm^2

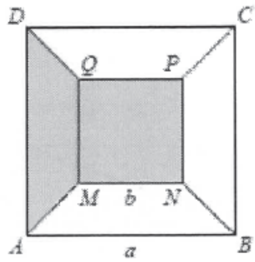
C. 216 cm^2

D. 312 cm^2

E. 338 cm^2

[1987-CE-MATHS 2-12]

31. In the figure, $ABCD$ is a square of side a and $MNPQ$ is a square of side b. The four trapeziums are identical. The area of the shaded region is



A. $\dfrac{3b^2 + a^2}{4}$.

B. $\dfrac{3b^2 - a^2}{2}$.

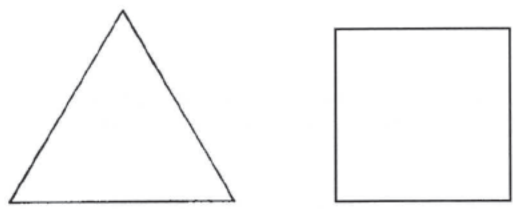
C. $\dfrac{5b^2 + a^2}{4}$.

D. $\dfrac{5b^2 - a^2}{4}$.

E. $\dfrac{(a-b)^2}{4} + b^2$.

[1991-CE-MATHS 2-12]

32. An equilateral triangle and a square have equal perimeters. $\dfrac{\text{Area of the triangle}}{\text{Area of the square}} =$



A. $\frac{9\sqrt{3}}{16}$.

B. $\frac{\sqrt{3}}{4}$.

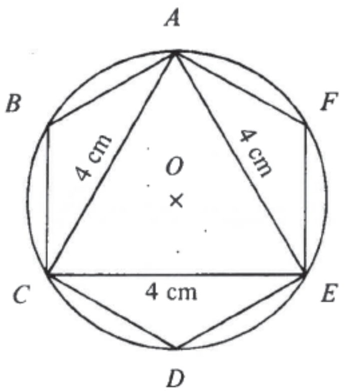
C. $\frac{\sqrt{3}}{3}$.

D. $\frac{4\sqrt{3}}{9}$.

E. 1 .

[1991-CE-MATHS 2-14]

33. In the figure, the equilateral triangle ACE of side 4 cm is inscribed in the circle. Find the area of the inscribed regular hexagon $ABCDEF$.



A. $8\sqrt{3}$ cm^2

B. $8\sqrt{2}$ cm^2

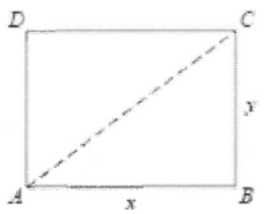
C. $4\sqrt{3}$ cm^2

D. $4\sqrt{2}$ cm^2

E. 16 cm^2

[1992-CE-MATHS 2-16]

34. In the figure, the rectangle has perimeter 16 cm and area 15 cm^2. Find the length of its diagonal AC.



A. $\sqrt{32}$ cm

B. $\sqrt{34}$ cm

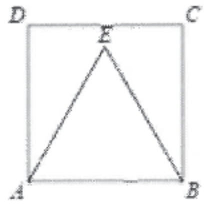
C. 7 cm

D. $\sqrt{226}$ cm

E. $\sqrt{241}$ cm

[1993-CE-MATHS 2-38]

35. In the figure, $ABCD$ is a square and ABE is an equilateral triangle. $\frac{\text{Area of } ABE}{\text{Area of } ABCD} =$



A. $\frac{1}{4}$.

B. $\frac{1}{3}$.

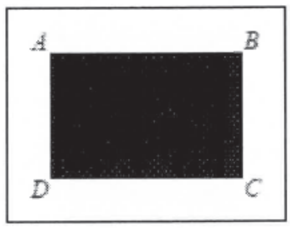
C. $\frac{\sqrt{3}}{8}$.

D. $\frac{\sqrt{3}}{4}$.

E. $\frac{\sqrt{3}}{2}$.

[1993-CE-MATHS 2-41]

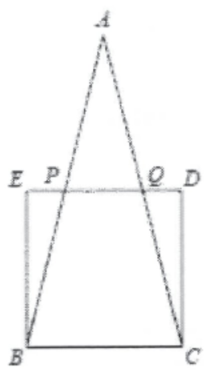
36. In the figure, $ABCD$ is a rectangular field of length p metres and width q metres. The path around the field is of width 2 metres. Find the area of the path.



A. $(4p + 4q)$ m^2
B. $(2p + 2q + 4)$ m^2
C. $(2p + 2q + 16)$ m^2
D. $(4p + 4q + 16)$ m^2
E. $(pq + 4p + 4q + 16)$ m^2

[1994-CE-MATHS 2-14]

37. In the figure, area of ΔABC : area of square $BCDE = 2 : 1$. Find $PQ : BC$.

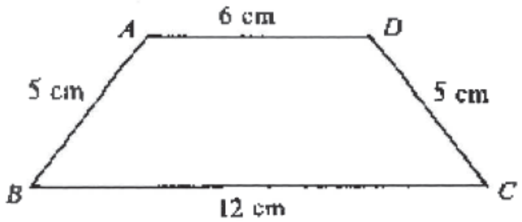


A. 1 : 2
B. 1 : 3

C. 1 : 4
D. 2 : 3
E. 3 : 4

[1994-CE-MATHS 2-46]

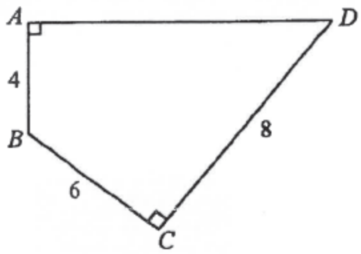
38. In the figure, *ABCD* is a trapezium. Find its area.



A. 36 cm^2
B. 45 cm^2
C. 48 cm^2
D. 72 cm^2
E. 90 cm^2

[1995-CE-MATHS 2-14]

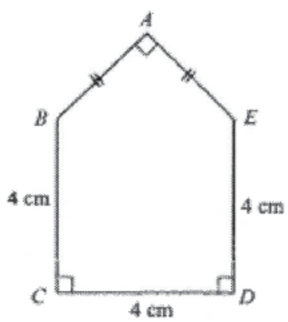
39. In the figure, the area of *ABCD* is



A. 36 .
B. 40 .
C. 44 .
D. $4\sqrt{21} + 24$.
E. $4\sqrt{29} + 24$.

[1996-CE-MATHS 2-17]

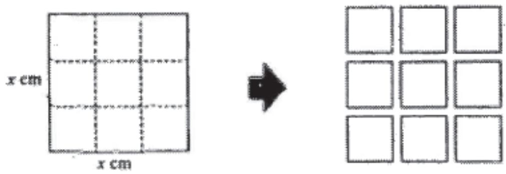
40. In the figure, find the area of the pentagon *ABCDE*.



A. 16 cm^2
B. 18 cm^2
C. 20 cm^2
D. 24 cm^2
E. 32 cm^2

[1998-CE-MATHS 2-21]

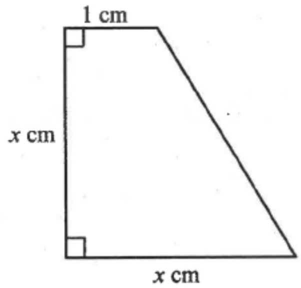
41. In the figure, a square of side x cm is cut into 9 equal squares. If the total perimeter of the 9 small squares is 72 cm more than the perimeter of the original square, then $x =$



A. 6 .
B. 8 .
C. 9 .
D. 12 .
E. 18 .

[2000-CE-MATHS 2-7]

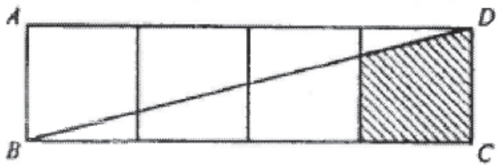
42. The figure shows a trapezium of area 6 cm^2. Find x.



A. 2
B. 3
C. 4
D. $\sqrt{6}$
E. $\sqrt{11}$

[2000-CE-MATHS 2-8]

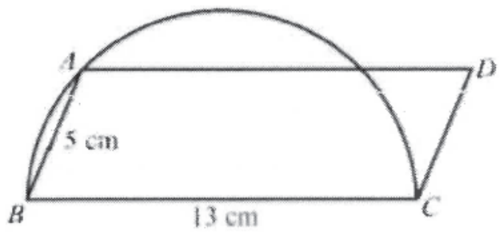
43. In the figure, *ABCD* is a rectangle formed by four squares each of area 1 cm^2. *DB* is a diagonal. Find the area of the shaded region.



A. $\frac{9}{10}\text{ cm}^2$
B. $\frac{7}{8}\text{ cm}^2$
C. $\frac{5}{6}\text{ cm}^2$
D. $\frac{4}{5}\text{ cm}^2$
E. $\frac{3}{4}\text{ cm}^2$

[2000-CE-MATHS 2-12]

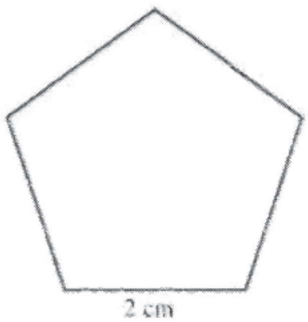
44. In the figure, CAB is a semicircle and $ABCD$ is a parallelogram. Find the area of $ABCD$.



A. 65 cm^2
B. 60 cm^2
C. 52 cm^2
D. 32.5 cm^2
E. 30 cm^2

[2000-CE-MATHS 2-31]

45. The figure shows a regular pentagon. Find its area correct to the nearest 0.01 cm^2.



A. 3.63 cm^2
B. 5.88 cm^2
C. 6.18 cm^2
D. 6.88 cm^2
E. 8.51 cm^2

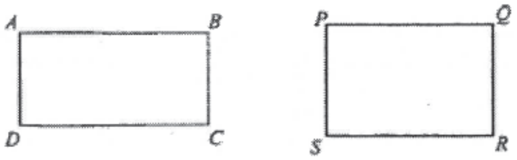
[2001-CE-MATHS 2-9]

46. The length of a side of a regular 8-sided polygon is 6 cm. Find its area, correct to 3 significant figures.

A. 27.6 cm^2
B. 29.8 cm^2
C. 66.5 cm^2
D. 174 cm^2

[2003-CE-MATHS 2-16]

47. In the figure, $ABCD$ and $PQRS$ are two rectangles of equal perimeter. If $AB : BC = 3 : 2$ and $PQ : QR = 4 : 3$, then area of $ABCD$: area of $PQRS$ =



A. 1 : 1 .
B. 1 : 2 .
C. 25 : 49 .
D. 49 : 50 .

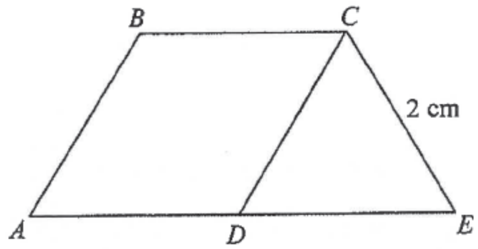
[2003-CE-MATHS 2-44]

48. If the area of a regular 10-sided polygon is 123 cm^2, find the length of the side of the 10-sided polygon. Give the answer correct to the nearest 0.1 cm.

A. 3.9 cm
B. 4.0 cm
C. 6.8 cm
D. 8.0 cm

[2004-CE-MATHS 2-19]

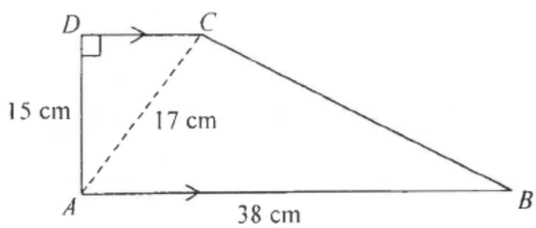
49. In the figure, $ABCD$ is a rhombus and CDE is an equilateral triangle. If ADE is a straight line, then the area of the quadrilateral $ABCE$ is



A. $2\sqrt{3}$ cm^2 .
B. $3\sqrt{3}$ cm^2 .
C. $4\sqrt{3}$ cm^2 .
D. $6\sqrt{3}$ cm^2 .

[2005-CE-MATHS 2-16]

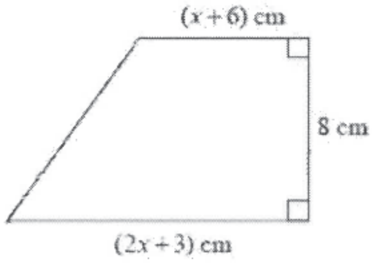
50. In the figure, the area of the trapezium $ABCD$ is



A. 345 cm^2 .
B. 349 cm^2 .
C. 690 cm^2 .
D. 698 cm^2 .

[2006-CE-MATHS 2-17]

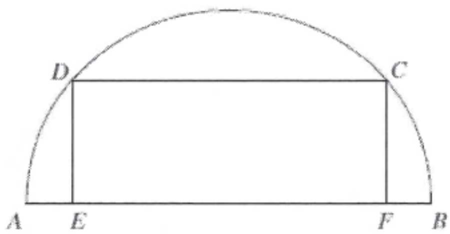
51. In the figure, the area of the trapezium is 96 cm^2. Find x.



A. 1
B. 5
C. 7
D. 11

[2009-CE-MATHS 2-7]

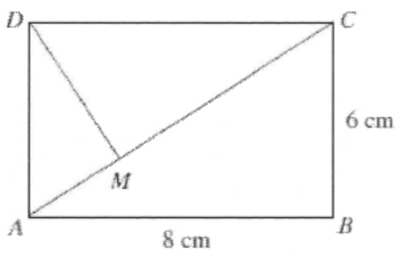
52. In the figure, $ABCD$ is a semicircle of diameter 26 cm. It is given that $CDEF$ is a rectangle such that E and F are points lying on AB. If $AE = 1$ cm, find the area of the rectangle $CDEF$.



A. 120 cm^2
B. 130 cm^2
C. 288 cm^2
D. 312 cm^2

[2010-CE-MATHS 2-20]

53. In the figure, $ABCD$ is a rectangle. If M is a point lying on AC such that DM is perpendicular to AC, then $AM : MC =$

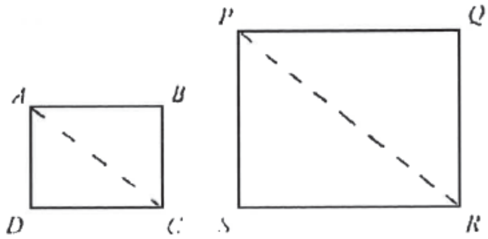


A. 3 : 4 .
B. 4 : 3 .
C. 9 : 16 .
D. 16 : 9 .

[2010-CE-MATHS 2-26]

Areas of Similar Figures

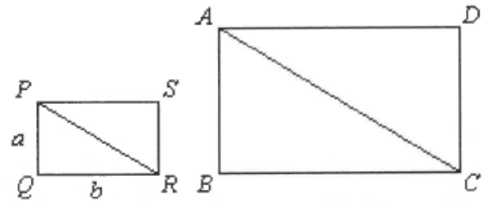
54. In the figure, $ABCD$ and $PQRS$ are similar rectangles, each representing a television screen. If AC is 40 cm and PR is 60 cm, what is the ratio of the areas of the rectangles $ABCD$ and $PQRS$?



A. 2 : 3
B. 3 : 4
C. 4 : 9
D. 9 : 16
E. It cannot be found from the information given.

[1979-CE-MATHS 2-43]

55. In the figure, the rectangles are similar. $PQ = a$, $QR = b$. If $AC = 2PR$, what is the area of $ABCD$?

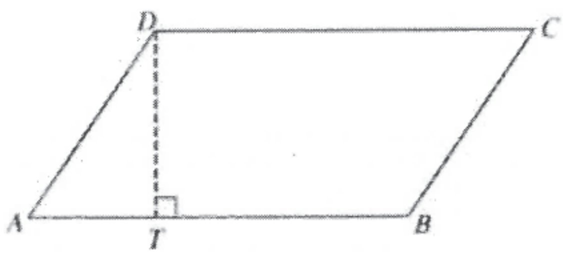


A. $2ab$
B. $4ab$
C. $2(a^2 + b^2)$
D. $2(a + b)\sqrt{a^2 + b^2}$
E. $2ab\sqrt{a^2 + b^2}$

[1982-CE-MATHS 2-43]

HKDSE Problems

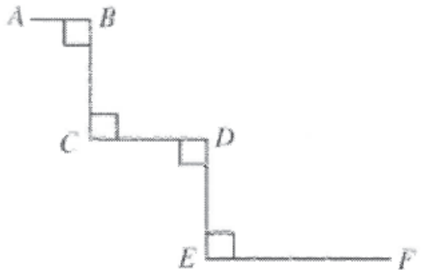
56. In the figure, $ABCD$ is a parallelogram. T is a point lying on AB such that DT is perpendicular to AB. It is given that $CD = 9$ cm and $AT : TB = 1 : 2$. If the area of the parallelogram $ABCD$ is 36 cm^2, then the perimeter of the parallelogram $ABCD$ is



A. 26 cm .
B. 28 cm.
C. 30 cm .
D. 32 cm .

[SP-DSE-MATHS 2-18]

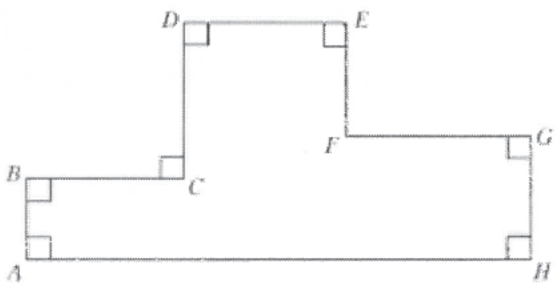
57. In the figure, $AB = 1$ cm, $BC = CD = DE = 2$ cm and $EF = 3$ cm. Find the distance between A and F correct to the nearest 0.1 cm.



A. 7.2 cm
B. 7.4 cm
C. 8.0 cm
D. 8.1 cm

[SP-DSE-MATHS 2-20]

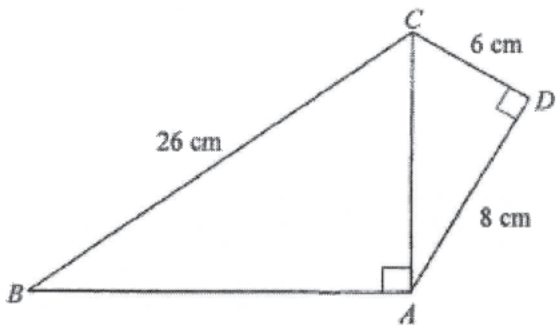
58. In the figure, $AB = 4$ cm, $BC = CD = DE = 8$ cm and $FG = 9$ cm. Find the perimeter of ΔAEH.



A. 60 cm
B. 74 cm
C. 150 cm
D. 164 cm

[PP-DSE-MATHS 2-18]

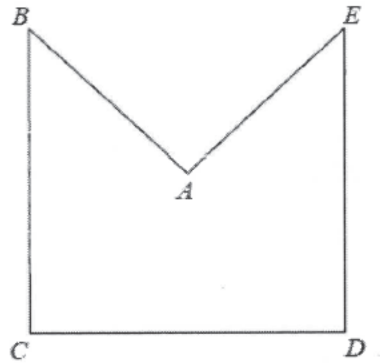
59. In the figure, the area of quadrilateral $ABCD$ is



A. 144 cm^2 .
B. 160 cm^2 .
C. 178 cm^2 .
D. 288 cm^2 .

[2012-DSE-MATHS 2-15]

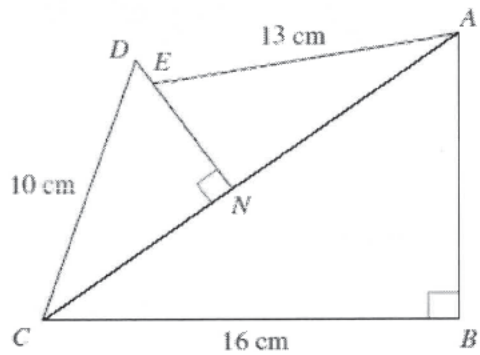
60. In the figure, $AB = AE$ and $\angle BAE = \angle BCD = \angle CDE = 90°$. If $BC = CD = DE = 16$ cm, then the area of the pentagon $ABCDE$ is



A. 71 cm^2 .
B. 128 cm^2 .
C. 192 cm^2 .
D. 224 cm^2 .

[2014-DSE-MATHS 2-15]

61. In the figure, N is a point lying on AC and E is a point lying on DN. If $DN = 6$ cm and $EN = 5$ cm, then the area of ΔABC is



A. 24 cm^2 .
B. 30 cm^2 .
C. 96 cm^2 .
D. 192 cm^2 .

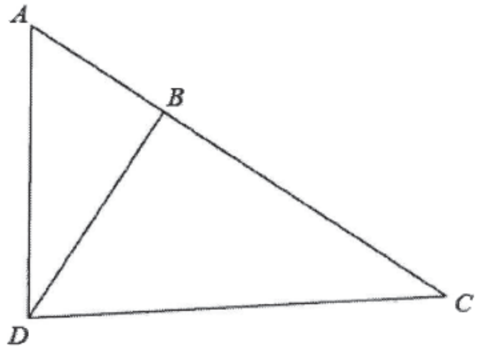
[2015-DSE-MATHS 2-15]

62. The diameters AC and BD of the circle $ABCD$ intersect at the point E. If $\angle AEB = 90°$ and $AC = 24$ cm, then the area of ΔAEB is

A. 41 cm^2 .
B. 72 cm^2 .
C. 144 cm^2 .
D. 288 cm^2 .

[2015-DSE-MATHS 2-21]

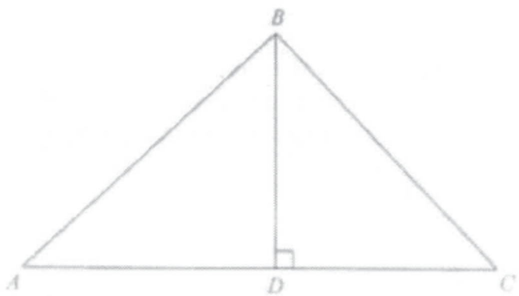
63. In the figure, ABC is a straight line. If $AB = 24$ cm, $AD = 40$ cm, $BD = 32$ cm and $CD = 68$ cm, then $BC =$



A. 43 cm .
B. 54 cm .
C. 55 cm .
D. 60 cm .

[2016-DSE-MATHS 2-16]

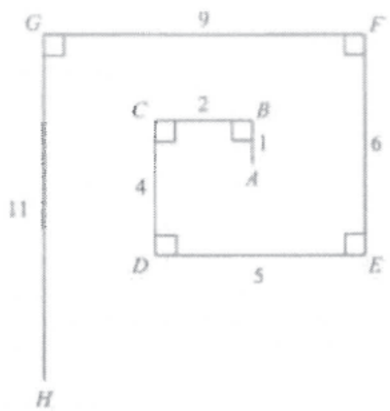
64. In the figure, D is a point lying on AC such that BD is perpendicular to AC. It is given that $AC = 14$ cm and $BD = 12$ cm. If the area of ΔABD is greater than the area of ΔBCD by 24 cm^2, then the perimeter of ΔABC is



A. 30 cm .
B. 42 cm .
C. 54 cm .
D. 84 cm .

[2017-DSE-MATHS 2-14]

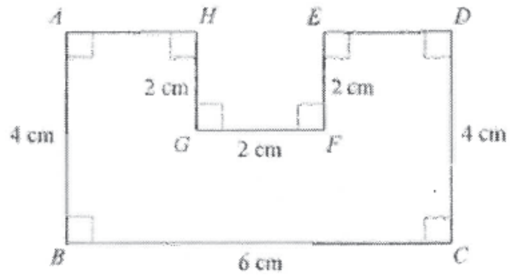
65. In the figure, the length of the line segment joining A and H is



A. 6 .
B. 8 .
C. 9 .
D. 10 .

[2017-DSE-MATHS 2-19]

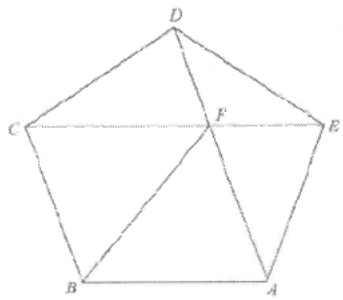
66. In the figure, $ABCDEFGH$ is an octagon, where all the measurements are correct to the nearest cm. Let x cm^2 be the actual area of the octagon. Find the range of values of x.



A. $13 < x < 23$
B. $13 < x < 27$
C. $17 < x < 23$
D. $17 < x < 27$

[2018-DSE-MATHS 2-14]

67. In the figure, $ABCDE$ is a regular pentagon. AD and CE intersect at the point F. Which of the following are true?

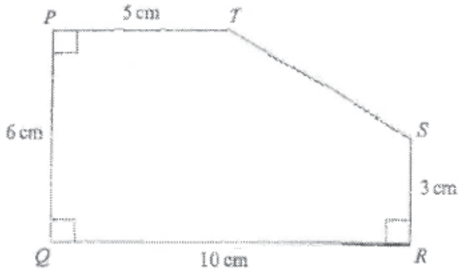


I. $CD = CF$
II. $\Delta ABF \cong \Delta CBF$
III. $\angle AFB + \angle EAF = 90°$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2019-DSE-MATHS 2-19]

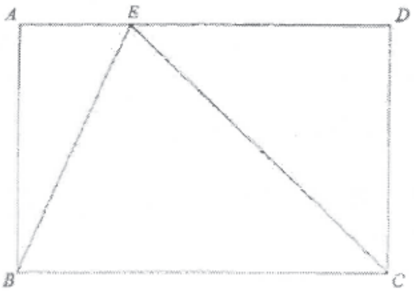
68. In the figure, $PQRST$ is a pentagon, where all measurements are correct to the nearest cm. Let $A\ cm^2$ be the actual area of the pentagon. Find the range of values of A.



A. $27.83 \leq A < 31.83$
B. $44.75 \leq A < 60.75$
C. $46.75 \leq A < 63.25$
D. $48.25 \leq A < 64.75$

[2020-DSE-MATHS 2-14]

69. In the figure, $ABCD$ is a rectangle. Let E be a point lying on AD such that $BE = 8$ cm and $CE = 15\ cm$. If $BC = 17\ cm$, find the area of the rectangle $ABCD$.



A. $60\ cm^2$
B. $68\ cm^2$
C. $120\ cm^2$
D. $136\ cm^2$

[2020-DSE-MATHS 2-21]

Definition of π

1. π is defined as

A. $\dfrac{\text{circumference of a circle}}{\text{diameter of the circle}}$.

B. $\dfrac{\text{area of a circle}}{\text{radius of the circle}}$.

C. $\dfrac{22}{7}$.

D. 3.142 .

E. 3.1416 .

[1979-CE-MATHS 2-38]

2. The real number π is

A. $\dfrac{22}{7}$.

B. 3.1416.

C. the ratio of the area of a circle to the square of its diameter.

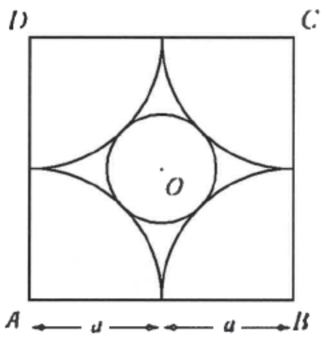
D. the ratio of the circumference of a circle to its radius.

E. the ratio of the circumference of a circle to its diameter.

[1987-CE-MATHS 2-22]

Lengths in Circles

3. In the figure, $ABCD$ is a square of side $2a$. Four quadrants of radius a arc drawn with A, B, C and D as centres. If the circle with centre O touches all the four quadrants, what is the diameter of the circle O?



A. a

B. $\sqrt{2}a$

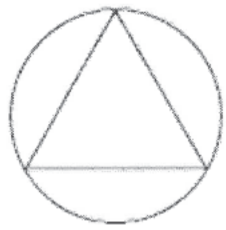
C. $2\sqrt{2}a$

D. $2(\pi-\sqrt{2})a$

E. $2(\sqrt{2}-1)a$

[1979-CE-MATHS 2-46]

4. In the figure, an equilateral triangle is inscribed in a circle of radius 1. The circumference of the circle is greater than the perimeter of the triangle by



A. $4\pi - 3\sqrt{3}$.

B. $4\pi - \dfrac{3\sqrt{3}}{2}$.

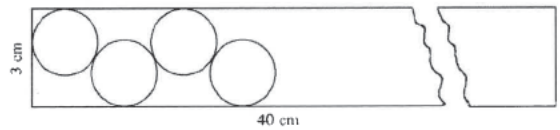
C. $2\pi - \sqrt{3}$.

D. $2\pi - \dfrac{3\sqrt{3}}{2}$.

E. $2\pi - 3\sqrt{3}$.

[1990-CE-MATHS 2-40]

5. From a rectangular metal sheet of width 3 cm and length 40 cm, at most how many circles each of radius 1 cm can be cut?



A. 20

B. 21

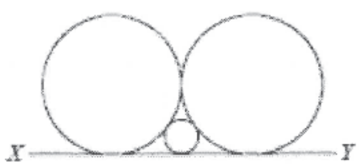
C. 22

D. 23

E. 24

[1991-CE-MATHS 2-44]

6. In the figure, the three circles touch one another. XY is their common tangent. The two larger circles are equal. If the radius of the smaller circle is 4 cm, find the radii of the larger circles.



A. 8 cm

B. 10 cm

C. 12 cm

D. 14 cm

E. 16 cm

[1993-CE-MATHS 2-54]

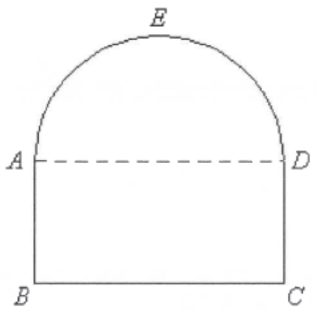
Areas of Circles

7. The area of a circle is A cm^2. Its circumference is s cm. Express s in terms of A.

A. $s = 2\sqrt{\pi A}$
B. $s = 2\pi\sqrt{A}$
C. $s = \sqrt{2\pi A}$
D. $s = \sqrt{\dfrac{A}{\pi}}$
E. $s = \sqrt{\dfrac{2A}{\pi}}$

[1978-CE-MATHS 2-39]

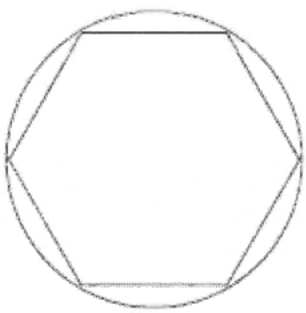
8. The perimeter of the given figure $ABCDE$ is $2(\pi + 4)$ cm. The upper portion AED is a semi-circle and the lower portion $ABCD$ is a rectangle. $AB : BC = 1 : 2$. What is the area of the given figure?



A. 8 cm^2
B. 2π cm^2
C. 4π cm^2
D. $4(\pi + 2)$ cm^2
E. $2(\pi + 4)$ cm^2

[1982-CE-MATHS 2-41]

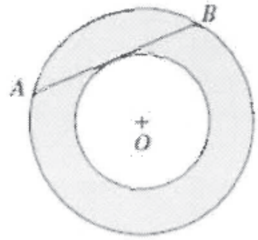
9. In the figure, a regular hexagon of side 2 cm is inscribed in a circle. The area of the circle is greater than the area of the hexagon by



A. $(3\pi - 6)$ cm^2
B. $(3\pi - 3\sqrt{3})$ cm^2
C. $(4\pi - 6)$ cm^2
D. $(4\pi - 3\sqrt{3})$ cm^2
E. $(4\pi - 6\sqrt{3})$ cm^2

[1985-CE-MATHS 2-16]

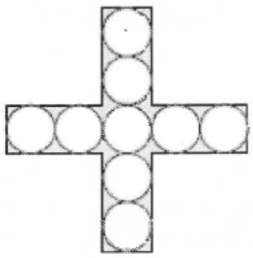
10. In the figure, O is the centre of two concentric circles. AB is tangent to the smaller circle. If $AB = 2$, find the area of the shaded part.



A. $\dfrac{\pi}{2}$
B. π
C. 2π
D. 4π
E. It cannot be found.

[1989-CE-MATHS 2-33]

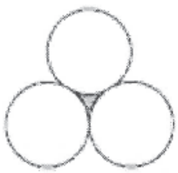
11. In the figure, there are nine circles, each of radius 1. Find the shaded area.



A. $9 - 9\pi$
B. $36 - 9\pi$
C. $40 - 9\pi$
D. $10 - 10\pi$
E. $40 - 10\pi$

[1990-CE-MATHS 2-13]

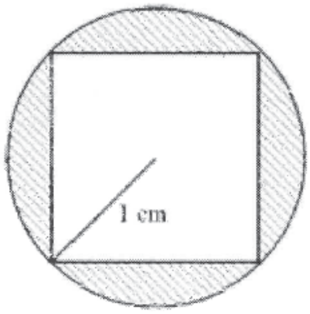
12. Three equal circles of radii 1 touch each other as shown in the figure, shaded area =



A. $1 - \dfrac{\pi}{2}$.
B. $\sqrt{3} - \dfrac{\pi}{2}$.
C. $2\sqrt{3} - \dfrac{\pi}{2}$.
D. $\sqrt{3} - \dfrac{\pi}{6}$.
E. $2\sqrt{3} - \dfrac{\pi}{6}$.

[1990-CE-MATHS 2-41]

13. In the figure, a square is inscribed in a circle with radius 1 cm. Find the area of the shaded region.



A. $(\pi - 2)$ cm^2

B. $(\pi - \sqrt{2})$ cm^2

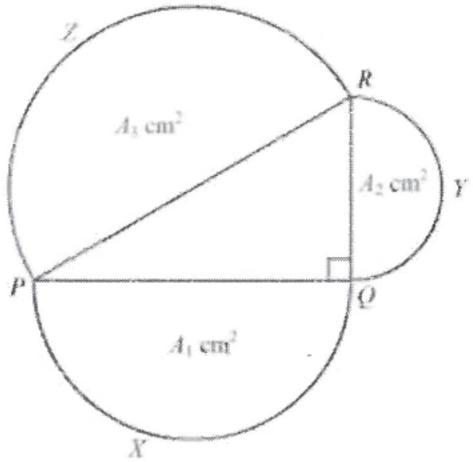
C. $(\pi - 1)$ cm^2

D. $(2\pi - 2)$ cm^2

E. $(2\pi - 1)$ cm^2

[1999-CE-MATHS 2-21]

14. In the figure, PXQ, QYR and RZP are semicircles with areas A_1 cm^2, A_2 cm^2 and A_3 cm^2 respectively. If $A_1 = 12$ and $A_2 = 5$, find A_3.



A. 13

B. 17

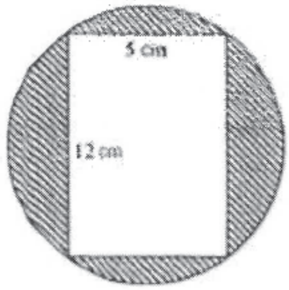
C. 169

D. 13π

E. $\frac{169}{8}\pi$

[2000-CE-MATHS 2-25]

15. The figure shows a rectangular inscribed in a circle. Find the area of the shaded region correct to the nearest 0.1 cm^2.



A. 60.0 cm^2

B. 72.7 cm^2

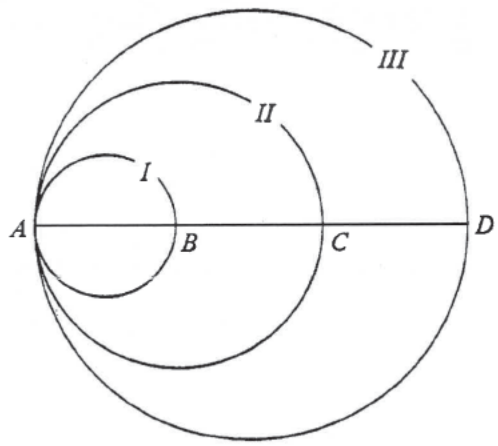
C. 132.7 cm^2

D. 470.9 cm^2

[2002-CE-MATHS 2-17]

Mensuration of Circles in Ratio

16. In the figure, $ABCD$ is a straight line with $AB = BC = CD$. Three circles I, II and III are drawn respectively on AB, AC and AD as diameters. Areas of circle I : Area of circle II : Area of circle III =



A. 1 : 2 : 3 .

B. 1 : 2 : 4 .

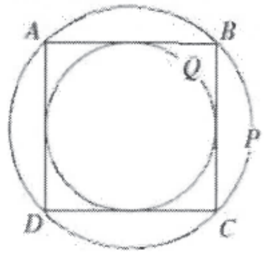
C. 1 : 4 : 9 .

D. 1 : 4 : 16 .

E. 1 : 8 : 27 .

[1986-CE-MATHS 2-10]

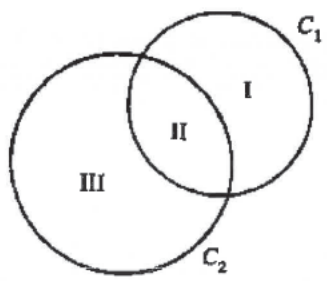
17. The figure shows the circumscribed circle P and the inscribed circle Q of the square $ABCD$. Find area of P : area of Q.



A. $\sqrt{2}:1$
B. $2:1$
C. $2\sqrt{2}:1$
D. $\pi:1$
E. $4:1$

[1988-CE-MATHS 2-46]

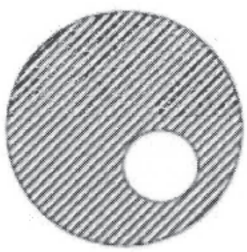
18. In the figure, C_1 and C_2 are two circles. If area of region I : area of region II : area of region III = 2 : 1 : 3, then radius of C_1 : radius C_2 =



A. $9:16$.
B. $2:3$.
C. $3:4$.
D. $\sqrt{2}:\sqrt{3}$.
E. $\sqrt{3}:2$.

[1995-CE-MATHS 2-46]

19. In the figure, the radii of the two circles are 3 cm and 1 cm respectively. Find the ratio of the area of the shaded part to that of the smaller circle.

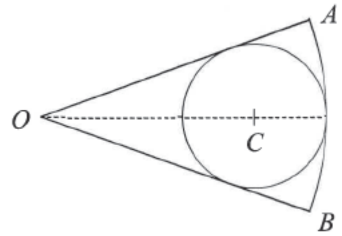


A. $2:1$
B. $3:1$
C. $4:1$
D. $8:1$
E. $9:1$

[1998-CE-MATHS 2-19]

Mensuration of Sectors

20. In the figure, a circle, centre C, of radius 1 cm is inscribed in a sector AOB of radius 3 cm. The length of arc AB =



A. $\frac{1}{2}\pi$ cm .
B. $\frac{2}{3}\pi$ cm .
C. $\frac{3}{4}\pi$ cm .
D. π cm .
E. $\frac{3}{2}\pi$ cm .

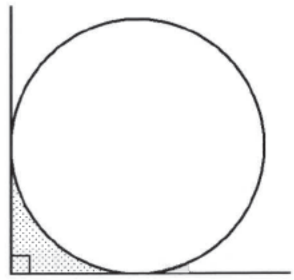
[1977-CE-MATHS 2-24]

21. The angle of a sector is 2 radians (i.e. $\frac{360^\circ}{\pi}$) and its perimeter is 12 cm. The area of the sector is

A. 6 cm^2 .
B. 9 cm^2 .
C. 16 cm^2 .
D. 18 cm^2 .
E. 36 cm^2 .

[1977-CE-MATHS 2-26*]

22. In the figure, the radius of the circle is r. The area of the shaded part is



A. $r^2 - \frac{\pi}{4}$.
B. $r(r - \frac{\pi}{4})$.
C. $r^2(1 - \frac{\pi}{4})$.
D. $r^2(1 - \pi)$.
E. $r^2(\pi - 1)$.

[SP-CE-MATHS 2-16]

23. What is the size of the angle of a circular sector whose area is 5 cm^2 and whose radius is 10 cm?

A. $\frac{9}{\pi}$ degrees

B. $\frac{18}{\pi}$ degrees

C. $\frac{90}{\pi}$ degrees

D. $\frac{360}{\pi}$ degrees

E. $\frac{900}{\pi}$ degrees

[SP-CE-MATHS 2-30*]

24. A wire of length b is bent to form the perimeter of a sector of radius r. The angle of the sector in degrees is

A. $\frac{b}{r} \times \frac{180°}{\pi}$.

B. $\frac{r}{b-r} \times \frac{180°}{\pi}$.

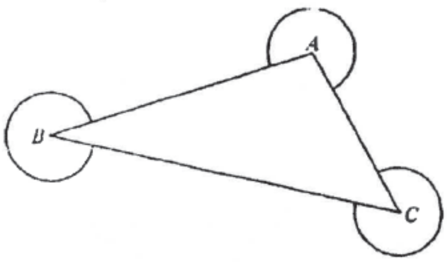
C. $\frac{r}{b-2r} \times \frac{180°}{\pi}$.

D. $\frac{b-r}{r} \times \frac{180°}{\pi}$.

E. $\frac{b-2r}{r} \times \frac{180°}{\pi}$.

[1978-CE-MATHS 2-30*]

25. In the figure, ΔABC is any triangle. Three circular arcs, with vertices as centres and radii 1 cm. What is the total length of the 3 arcs?



A. 6π cm

B. 5π cm

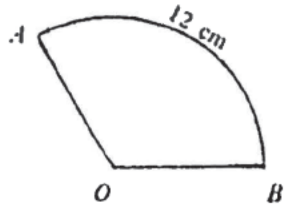
C. 4.5π cm

D. 4π cm

E. It cannot be found from the information given.

[1978-CE-MATHS 2-40]

26. The figure below shows a sector. The length of arc AB is 12 cm. If the area of the sector is 36 cm^2, then $\angle AOB =$



A. $\frac{270}{\pi}$ degrees.

B. $\frac{360}{\pi}$ degrees.

C. $\frac{450}{\pi}$ degrees.

D. $\frac{720}{\pi}$ degrees.

E. $\frac{1080}{\pi}$ degrees.

[1979-CE-MATHS 2-17*]

27. The perimeter of a sector is 16 and its angle is $\frac{360}{\pi}$ degrees. What is the area of the sector?

A. 16
B. 32
C. 64
D. 16π
E. 32π

[1980-CE-MATHS 2-41*]

28. The radius of a sector is 3 cm and the perimeter is 10 cm. What is the area of the sector?

A. 6 cm^2
B. 12 cm^2
C. 15 cm^2
D. 18 cm^2
E. 45 cm^2

[1981-CE-MATHS 2-46]

29. In a circle, the angle of a sector is 30° and the radius is 2 cm. The area of the sector is

A. 120 cm^2.

B. 60 cm^2.

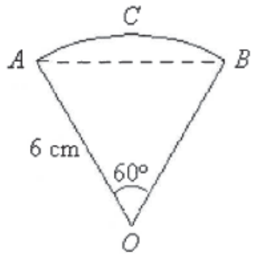
C. $\frac{30}{\pi}$ cm^2.

D. $\frac{2\pi}{3}$ cm^2.

E. $\frac{\pi}{3}$ cm^2.

[1982-CE-MATHS 2-22]

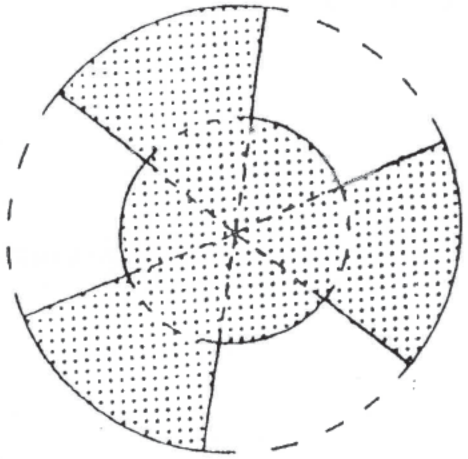
30. In the figure, $OACB$ is a sector of a circle of radius 6 cm. Arc ACB is longer than the chord AB by



A. $(\pi - 3)$ cm
B. $2(\pi - 3)$ cm
C. $3(\pi - 1)$ cm
D. $6(\pi - 1)$ cm
E. $3(2\pi - \sqrt{3})$ cm

[1982-CE-MATHS 2-23]

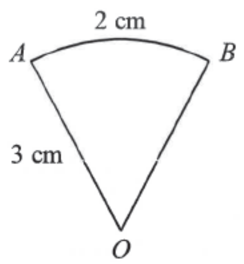
31. In the figure, the two concentric circles are of radius 2 cm and 4 cm respectively. Each circle is divided into 6 equal parts by 6 radii. What is the area of the shaded region?



A. 12π cm^2
B. 10π cm^2
C. 9π cm^2
D. 6π cm^2
E. 2π cm^2

[1982-CE-MATHS 2-42]

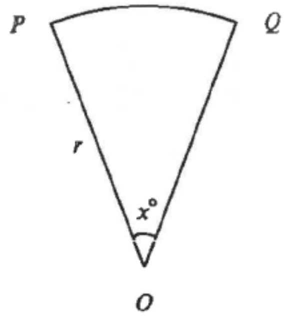
32. In the figure, OAB is a sector of a circle. Radius OA is 3 cm long and arc AB = 2 cm. The area of the sector is



A. 3 cm^2.
B. 6 cm^2.
C. 9 cm^2.
D. 3π cm^2.
E. 6π cm^2.

[1983-CE-MATHS 2-20]

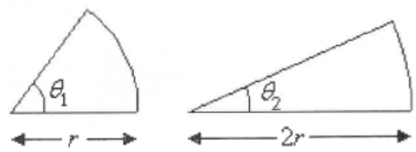
33. In the figure, the radius of the sector is r and $\angle POQ = x°$. If the area of the sector is A, then $x =$



A. $\frac{2A}{r^2}$.
B. $\frac{360A}{r^2}$.
C. $\frac{360A}{\pi r^2}$.
D. $\frac{180A}{r^2}$.
E. $\frac{180A}{\pi r^2}$.

[1984-CE-MATHS 2-47]

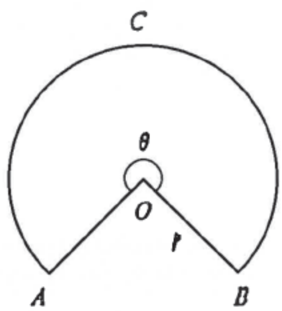
34. The figure shows two sectors with radii r and $2r$. If these two sectors are equal in area, then $\theta_1 : \theta_2 =$



A. 2 : 1.
B. 3 : 1.
C. 4 : 1.
D. 5 : 1.
E. 6 : 1.

[1986-CE-MATHS 2-9]

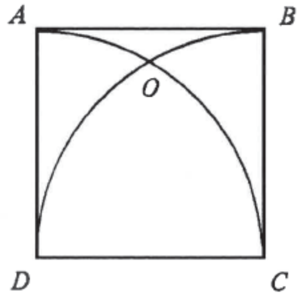
35. In the figure, if the area of the sector is x, then $\overset{\frown}{ACB} =$



A. $\frac{2x}{r}$.
B. $\frac{x}{r}$.
C. $\frac{2x}{r^2}$.
D. $\frac{\pi x}{90r}$.
E. $\frac{90x}{\pi r}$.

[1986-CE-MATHS 2-18]

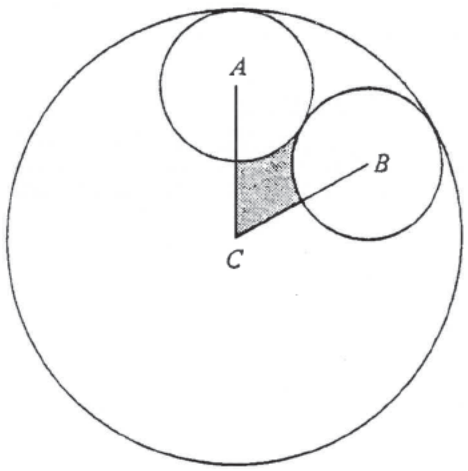
36. In the figure, $ABCD$ is a square. Arcs AC and BD are drawn with centres D and C respectively, intersecting at O. $\overset{\frown}{AO} : \overset{\frown}{OC} =$



A. $1 : \sqrt{2}$.
B. $1 : \sqrt{3}$.
C. $1 : 2$.
D. $1 : 3$.
E. $2 : 3$.

[1986-CE-MATHS 2-47]

37. Three circles, centres A, B and C touch each other as shown in the figure. The radii of the two circles with centre A and B are both 1 cm and radius of the circle with centre C is 3 cm. Find the area of the shaded part in cm^2.



A. $\sqrt{3} - \frac{\pi}{3}$
B. $\sqrt{3} - \frac{\pi}{6}$
C. $2\sqrt{3} - \frac{\pi}{3}$
D. $2\sqrt{3} - \frac{\pi}{6}$
E. It cannot be determined.

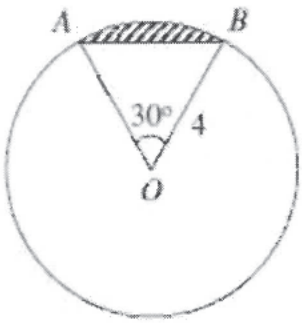
[1986-CE-MATHS 2-52]

38. The circumference of a circle is 6π cm. The length of an arc of the circle which subtends an angle of $\frac{60}{\pi}$ degrees at the centre is

A. 1 cm .
B. $\frac{3}{2}$ cm .
C. 2 cm .
D. π cm .
E. 2π cm .

[1987-CE-MATHS 2-17*]

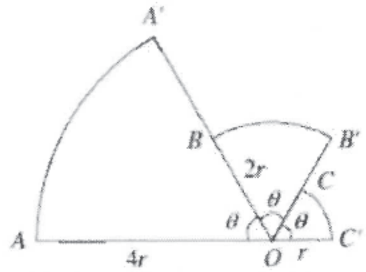
39. In the figure, O is the centre of the circle of radius 4. The area of the shaded region is



A. $\frac{4\pi}{3} - 4$.
B. $\frac{4\pi}{3} - 8$.
C. $\frac{4\pi}{3} - 4\sqrt{3}$.
D. $\frac{2\pi}{3} - 4$.
E. $\frac{8\pi}{3} - 8$.

[1987-CE-MATHS 2-52]

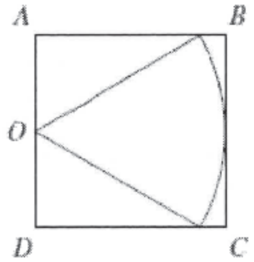
40. In the figure, AOC' is a straight line. OAA', OBB' and OCC' are 3 sectors. If $OA = 4r$, $OB = 2r$ and $OC' = r$, find the total area of the sectors in terms of r.



A. $7\pi r^2$
B. $\frac{7}{2}\pi r^2$
C. $\frac{7}{4}\pi r^2$
D. $\frac{7}{6}\pi r^2$
E. $\frac{7}{12}\pi r^2$

[1988-CE-MATHS 2-18]

41. $ABCD$ is a square of side 2 cm. O is the mid-point of AD. A sector with centre O is inscribed in the square as shown in the figure. What is the area of the sector?



A. $\frac{\pi}{2}$ cm^2

B. $2\sqrt{3}\pi$ cm^2

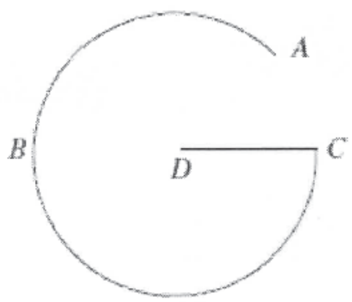
C. $\sqrt{3}\pi$ cm^2

D. $\frac{2}{3}\pi$ cm^2

E. $\frac{4}{3}\pi$ cm^2

[1988-CE-MATHS 2-49]

42. In the figure, $ABCD$ is a G-shaped curve, where ABC is an arc of a circle and DC is a radius. If the length of the curve $ABCD$ is the same as that of the complete circle, find the angle subtended by the arc ABC at the centre.



A. 270°

B. $(180 + \frac{180}{\pi})°$

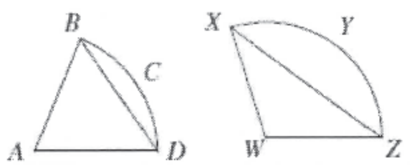
C. 240°

D. $(360 - \frac{180}{\pi})°$

E. 315°

[1988-CE-MATHS 2-50*]

43.



In the figure, $ABCD$ and $WXYZ$ are sectors of equal radii. If $\overset{\frown}{BCD} : \overset{\frown}{XYZ} = s : t$, then which of the following is / are true?

(1) $\frac{BD}{XZ} = \frac{s}{t}$

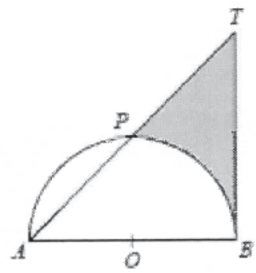
(2) $\frac{\text{area of sector } ABCD}{\text{area of sector } WXYZ} = \frac{s}{t}$

(3) $\frac{\angle BAD}{\angle XWZ} = \frac{s}{t}$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1989-CE-MATHS 2-32]

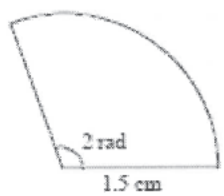
44. In the figure, TB touches the semi-circle at B. TA cuts the semi-circle at P such that $TP = PA$. If the radius of the semi-circle is 2, find the area of the shaded region.



A. $12 - \pi$
B. $8 - \pi$
C. $6 - \pi$
D. $4 - \pi$
E. $2(4 - \pi)$

[1991-CE-MATHS 2-13]

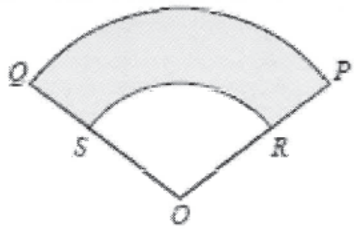
45. Find the perimeter of the sector in the figure. (π rad = 180°)



A. 2.25 cm
B. 3 cm
C. $\left(\frac{\pi}{60} + 3\right)$ cm
D. 4.5 cm
E. 6 cm

[1993-CE-MATHS 2-15]

46. In the figure, the radii of the sectors OPQ and ORS are 5 cm and 3 cm respectively, $\frac{\text{Area of shaded region}}{\text{Area of sector } OPQ} =$



A. $\frac{4}{25}$.

B. $\frac{2}{5}$.

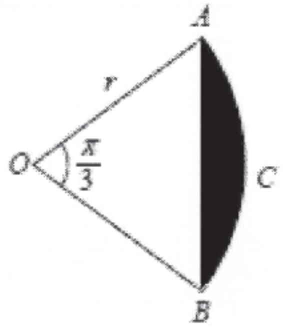
C. $\frac{9}{25}$.

D. $\frac{16}{25}$.

E. $\frac{21}{25}$.

[1993-CE-MATHS 2-42]

47. In the figure, $OACB$ is a sector of radius r. If $\angle AOB = \frac{\pi}{3}$ (i.e. 60°), find the area of the shaded part.



A. $\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)r^2$

B. $\left(\frac{\pi}{6} - \frac{1}{4}\right)r^2$

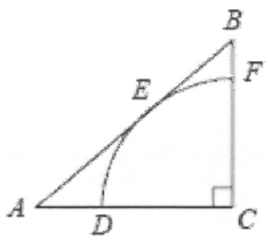
C. $\left(\frac{\pi}{3} - \frac{\sqrt{3}}{2}\right)r^2$

D. $\left(\frac{\pi}{3} - \frac{1}{2}\right)r^2$

E. $\frac{\pi}{3}r - \frac{\sqrt{3}}{4}r^2$.

[1994-CE-MATHS 2-15]

48. In the figure, $CDEF$ is a sector of a circle which touched AB at E. If $AB = 25$ and $BC = 15$, find the radius of the sector.



A. 9

B. 10

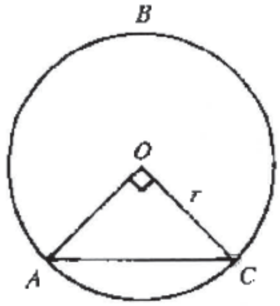
C. 11.25

D. 12

E. 12.5

[1994-CE-MATHS 2-44]

49. In the figure, O is the centre of the circle. Find the area of the major segment ABC.



A. $\frac{\pi}{4}r^2$

B. $\frac{3\pi}{4}r^2$

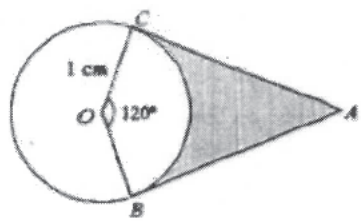
C. $\left(\frac{\pi}{4} - \frac{1}{2}\right)r^2$

D. $\left(\frac{3\pi}{4} - \frac{1}{2}\right)r^2$

E. $\left(\frac{3\pi}{4} + \frac{1}{2}\right)r^2$

[1995-CE-MATHS 2-45]

50. In the figure, O is the centre of the circle. AB and AC are tangents to the circle at B and C respectively. Area of the shaded region =



A. $(2 - \frac{\pi}{6})$ cm^2.

B. $(2 - \frac{\pi}{3})$ cm^2.

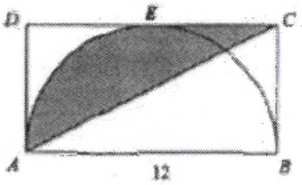
C. $(\sqrt{3} - \frac{\pi}{6})$ cm^2.

D. $(\sqrt{3} - \frac{\pi}{3})$ cm^2.

E. $(\frac{\sqrt{3}}{2} - \frac{\pi}{6})$ cm^2.

[1996-CE-MATHS 2-16]

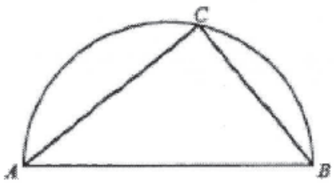
51. In the figure, BEA is a semicircle. $ABCD$ is a rectangle and DC touches the semicircle at E. Find the area of the shaded region.



A. 9π
B. 18π
C. 36π
D. $36 - 9\pi$
E. $36 + 9\pi$

[1997-CE-MATHS 2-16]

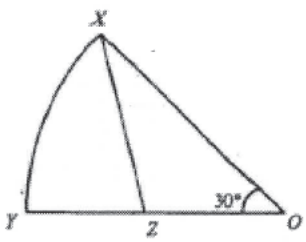
52. In the figure, BCA is a semicircle. If $AC = 6$ and $CB = 4$, find the area of the semicircle.



A. $\frac{5}{2}\pi$
B. $\frac{13}{2}\pi$
C. 10π
D. 13π
E. 26π

[1997-CE-MATHS 2-18]

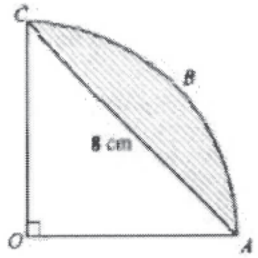
53. In the figure, OXY is a sector with centre O. If Z is the mid-point of YO, find area of ΔOXZ : area of sector OXY.



A. $1 : 2$
B. $2 : \sqrt{3}\pi$
C. $2 : 3\pi$
D. $3 : 2\pi$
E. $3\sqrt{3} : 2\pi$

[1997-CE-MATHS 2-48]

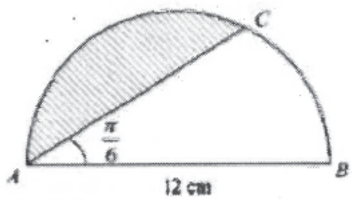
54. In the figure, $OABC$ is a sector. Find the area of the shaded region.



A. $(\pi - 2)$ cm^2
B. $(2\pi - 4)$ cm^2
C. $(4\pi - 8)$ cm^2
D. $(8\pi - 8)$ cm^2
E. $(8\pi - 16)$ cm^2

[1998-CE-MATHS 2-23]

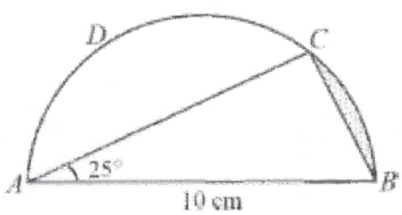
55. In the figure, ABC is a semicircle. Find the area of the shaded part.



A. 6π cm^2
B. 15π cm^2
C. $(6\pi - 9\sqrt{3})$ cm^2
D. $(6\pi + 9\sqrt{3})$ cm^2
E. $(12\pi - 9\sqrt{3})$ cm^2

[1998-CE-MATHS 2-46]

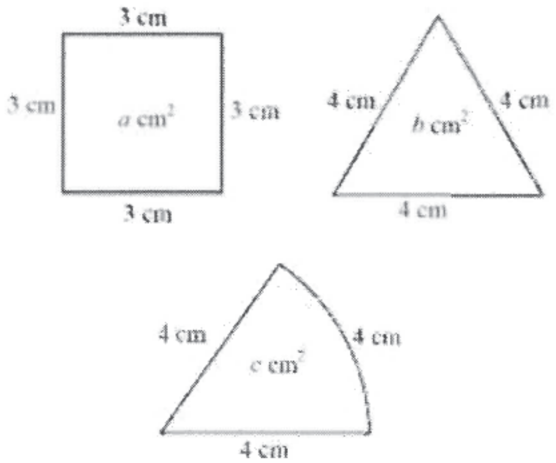
56. In the figure, $ABCD$ is a semicircle. Find the area of the shaded region correct to the nearest 0.01 cm^2.



A. 5.33 cm^2
B. 2.87 cm^2
C. 2.67 cm^2
D. 1.33 cm^2
E. 0.17 cm^2

[1999-CE-MATHS 2-25]

57. The figure shows a square, a triangle and a sector with areas a cm^2, b cm^2 and c cm^2 respectively.



Which of the following is true?

A. $a > b > c$

B. $a > c > b$

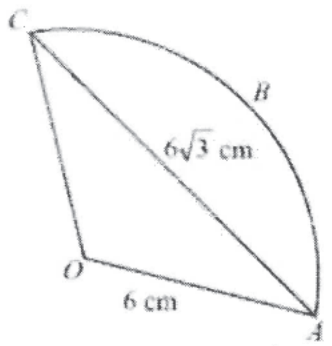
C. $b > a > c$

D. $b > c > a$

E. $c > a > b$

[2000-CE-MATHS 2-32]

58. In the figure, $OABC$ is a sector. Find the length of the arc ABC.



A. $\frac{2\pi}{3}$ cm

B. 4π cm

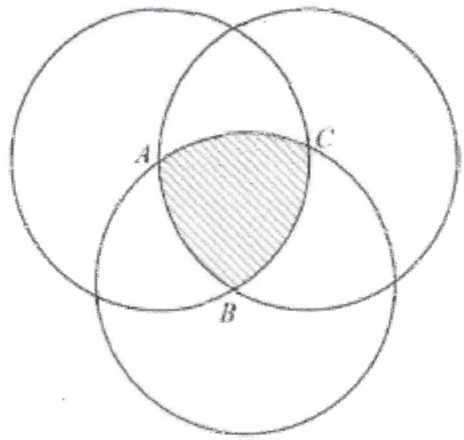
C. 5π cm

D. 6π cm

E. 12π cm

[2001-CE-MATHS 2-25]

59. In the figure, A, B and C are the centres of three equal circles, each of radius 1 cm. Find the area of the shaded region.



A. $\left(\frac{\pi}{2}-\frac{\sqrt{3}}{2}\right)$ cm^2

B. $\left(\frac{\pi}{2}-\frac{3\sqrt{3}}{4}\right)$ cm^2

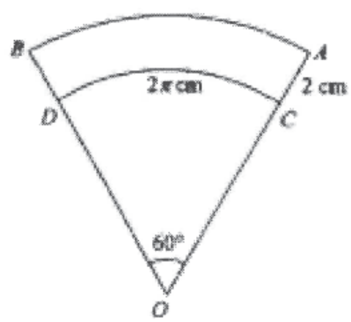
C. $\left(\frac{\pi}{2}+\frac{\sqrt{3}}{4}\right)$ cm^2

D. $\frac{\pi}{2}$ cm^2

E. $\left(\frac{\pi}{2}-\frac{\sqrt{3}}{4}\right)$ cm^2

[2001-CE-MATHS 2-26]

60. In the figure, OCD and OAB are two sectors. The length of $\overparen{AB}$ is



A. $\frac{8}{3}\pi$ cm

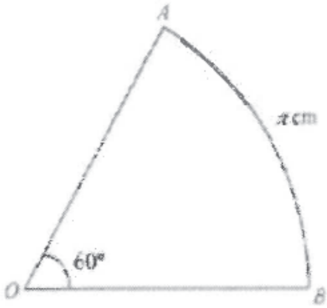
B. $\frac{10}{3}\pi$ cm

C. $(2\pi + 2)$ cm

D. 4π cm

[2002-CE-MATHS 2-20]

61. In the figure, OAB is a sector and $\overset{\frown}{AB} = \pi$ cm. Find the area of the sector.



A. $\frac{3}{2}\pi$ cm^2

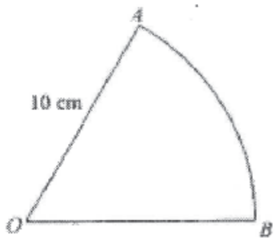
B. 3π cm^2

C. $\frac{9}{2}\pi$ cm^2

D. 6π cm^2

[2003-CE-MATHS 2-19]

62. In the figure, OAB is a sector. The perimeter and the area of the sector are x cm and y cm^2 respectively. If $x = y$, then $\overset{\frown}{AB} =$



A. 5 cm

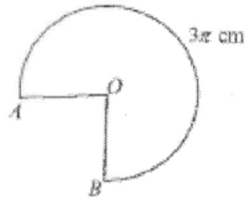
B. 10 cm

C. $\frac{5\pi}{3}$ cm

D. $\frac{10\pi}{3}$ cm

[2004-CE-MATHS 2-45]

63. In the figure, OAB is a sector of radius 2 cm. If the length of $\overset{\frown}{AB}$ is 3π cm, then the area of the sector OAB is



A. $\frac{3\pi}{2}$ cm^2 .

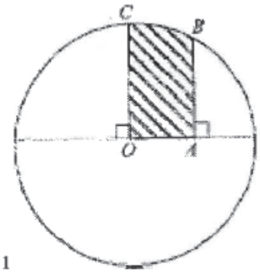
B. 3π cm^2 .

C. 4π cm^2 .

D. 6π cm^2 .

[2005-CE-MATHS 2-19]

64. In the figure, O is the centre of the circle. B and C are points lying on the circle. If $OC =$ 2 cm and $OA = 1$ cm, then the area of the shaded region $OABC$ is



A. $\frac{\pi}{2}$ cm^2 .

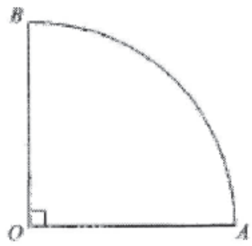
B. $\frac{2\pi}{3}$ cm^2 .

C. $\left(\frac{\sqrt{3}}{2} + \frac{\pi}{3}\right)$ cm^2 .

D. $\left(\sqrt{3} + \frac{2\pi}{3}\right)$ cm^2 .

[2006-CE-MATHS 2-19]

65. In the figure, OAB is a sector with centre O. If the perimeter of the sector OAB is 12 cm, find OA correct to the nearest 0.01 cm.



A. 3.36 cm

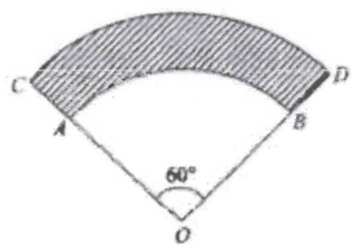
B. 3.91 cm

C. 4.31 cm

D. 7.64 cm

[2007-CE-MATHS 2-16]

66. In the figure, OAB and OCD are sectors with centre O. It is given that the area of the shaded region $ABCD$ is 54π cm^2 . If $AC = 6$ cm, then $OA =$



A. 15 cm .

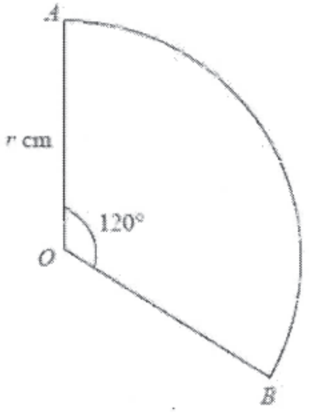
B. 21 cm .

C. 24 cm .

D. 30 cm .

[2008-CE-MATHS 2-20]

67. In the figure, OAB is a sector of radius r cm. If $\angle AOB = 120°$ and the area of the sector is 12π cm^2, then $r =$



A. 3 .
B. 4 .
C. 6 .
D. 18 .

[2009-CE-MATHS 2-20]

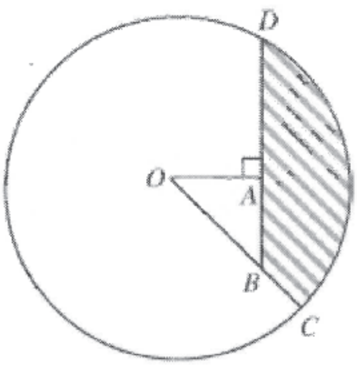
68. If the radius and the area of a sector are 12 cm and 48π cm^2 respectively, find the perimeter of the sector correct to the nearest 0.1 cm.

A. 25.1 cm .
B. 36.6 cm .
C. 49.1 cm .
D. 99.4 cm .

[2011-CE-MATHS 2-16]

HKDSE Problems

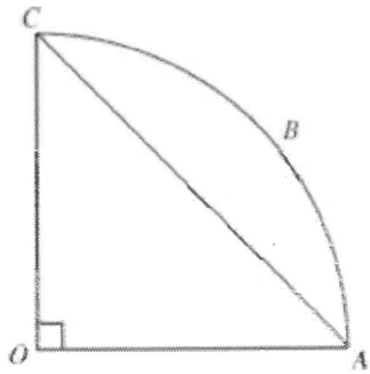
69. In the figure, O is the centre of the circle. C and D are points lying on the circle. OBC and BAD are straight lines. If $OC = 20$ cm and $OA = AB = 10$ cm, find the area of the shaded region BCD correct to the nearest cm^2.



A. 214 cm^2
B. 230 cm^2
C. 246 cm^2
D. 270 cm^2

[SP-DSE-MATHS 2-16]

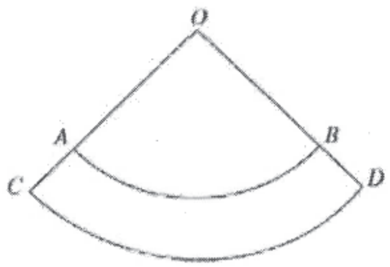
70. In the figure, O is the centre of the sector $OABC$. If the area of ΔOAC is 12 cm^2, find the area of the segment ABC.



A. $3(\pi - 2)$ cm^2
B. $3(\pi - 1)$ cm^2
C. $6(\pi - 2)$ cm^2
D. $6(\pi - 1)$ cm^2

[PP-DSE-MATHS 2-15]

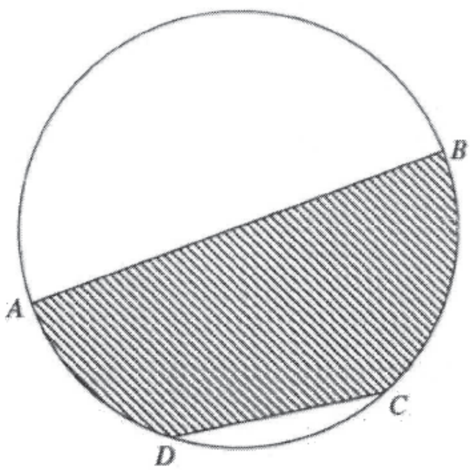
71. In the figure, OAB and OCD are sectors with centre O. If $\overset{\frown}{AB} = 12\pi$ cm, $\overset{\frown}{CD} = 16\pi$ cm and $OA = 30$ cm, then $AC =$



A. 5 cm .
B. 10 cm .
C. 20 cm .
D. 40 cm .

[2012-DSE-MATHS 2-16]

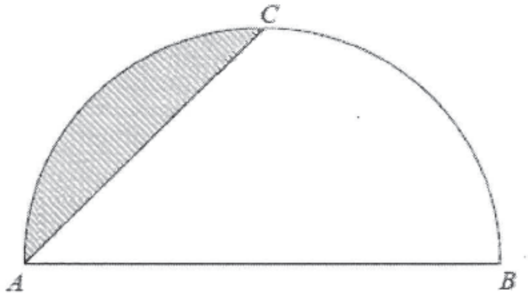
72. In the figure, AB is a diameter of the circle $ABCD$. If $AB = 12$ cm and $CD = 6$ cm, then the area of the shaded region is



A. $(12\pi - 9)\ \text{cm}^2$.
B. $(12\pi + 9)\ \text{cm}^2$.
C. $(12\pi - 9\sqrt{3})\ \text{cm}^2$.
D. $(12\pi + 9\sqrt{3})\ \text{cm}^2$.

[2012-DSE-MATHS 2-21]

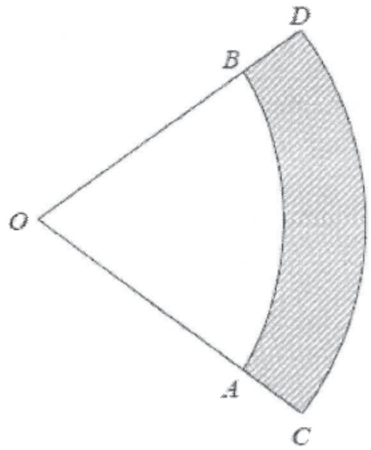
73. In the figure, the diameter of the semicircle ABC is 3 cm. If $AC = 2$ cm, find the area of the shaded region correct to the nearest $0.01\ \text{cm}^2$.



A. $0.23\ \text{cm}^2$
B. $0.52\ \text{cm}^2$
C. $0.64\ \text{cm}^2$
D. $1.07\ \text{cm}^2$

[2013-DSE-MATHS 2-16]

74.



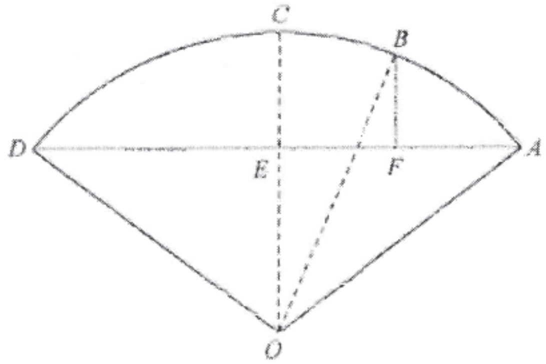
In the figure, OAB and OCD are sectors with centre O, where $OA = 33$ cm and $OC = 39$ cm. The area of the shaded region $ABDC$ is $72\pi\ \text{cm}^2$. Which of the following is/are true?

(1) The angle of the sector OAB is $60°$.
(2) The area of the sector OAB is $11\pi\ \text{cm}^2$.
(3) The perimeter of the sector OCD is 13π cm.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-19]

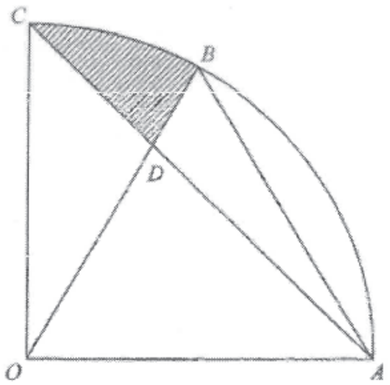
75. In the figure, O is the centre of the sector $OABCD$. AD and OC are perpendicular to each other and intersects at the point E. F is a point lying on AD such that BF is perpendicular to AD. If $AF = 9\ cm$, $DF = 39\ cm$ and $OE = 18\ cm$, then the area of the sector OBC is



A. $48\pi\ cm^2$
B. $75\pi\ cm^2$
C. $96\pi\ cm^2$
D. $150\pi\ cm^2$

[2018-DSE-MATHS 2-17]

76. In the figure, O is the centre of sector $OABC$. It is given that ΔOAB is an equilateral triangle. AC and OB intersect at the point D. If $OA = 12\ cm$ and $\angle AOC = 90°$, find the area of the shaded region BCD correct to the nearest cm^2.



A. $11\ cm^2$
B. $16\ cm^2$
C. $26\ cm^2$
D. $38\ cm^2$

[2019-DSE-MATHS 2-38]

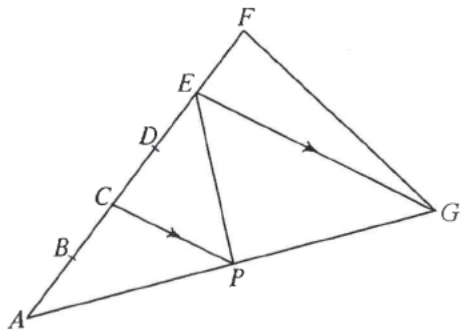
77. The angle of a sector is decreased by 60% but its radius is increased by k%. If the arc length of the sector remains unchanged, find the value of k.

A. 40
B. 60
C. 67
D. 150

[2020-DSE-MATHS 2-15]

Areas in Proportion

1. In ΔAFG, points B, C, D and E divide AF into 5 equal parts. $CP \parallel EG$. $\dfrac{\text{Area of } \Delta APE}{\text{Area of } \Delta AGF} =$



A. $\frac{1}{2}$.

B. $\frac{1}{3}$.

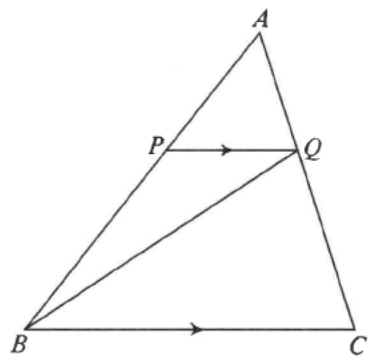
C. $\frac{2}{5}$.

D. $\frac{3}{5}$.

E. $\frac{4}{5}$.

[SP-CE-MATHS A2-50]

2. In ΔABC, $PQ \parallel BC$. The area of ΔAPQ is 4. The area of ΔPQB is 6. What is the area of ΔQBC?



A. 8

B. 9

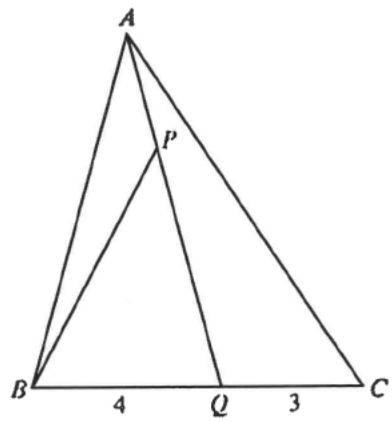
C. 10

D. 12

E. 15

[SP-CE-MATHS A2-52]

3. In the figure, $BQ : QC = 4 : 3$, and $AP : PQ = 1 : 3$. Then $\dfrac{\text{Area of } \Delta ABP}{\text{Area of } \Delta ABC} =$



A. $\frac{1}{3}$.

B. $\frac{1}{4}$.

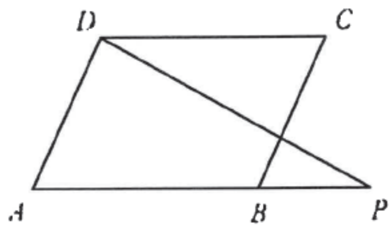
C. $\frac{1}{7}$.

D. $\frac{1}{8}$.

E. $\frac{1}{9}$.

[1978-CE-MATHS A2-54]

4. In the figure, $ABCD$ is a parallelogram. AB is produced to P such that $BP = \frac{1}{2}AB$. Then $\dfrac{\text{Area of } \Delta APD}{\text{Area of } ABCD} =$



A. $\frac{3}{4}$.

B. $\frac{2}{3}$.

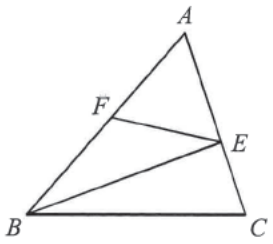
C. $\frac{1}{2}$.

D. $\frac{1}{3}$.

E. $\frac{1}{4}$.

[1979-CE-MATHS 2-44]

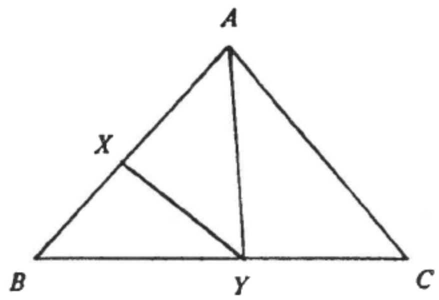
5. In the figure, F is the mid-point of AB. E is a point on AC such that $AE : EC = 2 : 1$. $\dfrac{\text{Area of } \Delta BFE}{\text{Area of } \Delta BCE} =$



A. $\frac{1}{2}$
B. $\frac{2}{3}$
C. 1
D. $\frac{3}{2}$
E. 2

[1981-CE-MATHS 2-53]

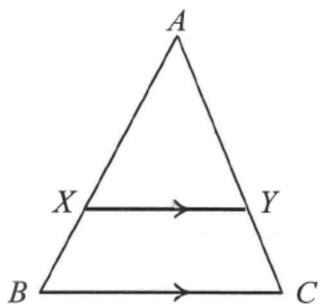
6. In the figure, X and Y are points on AB and BC respectively such that $AX : XB = 3 : 2$ and $BY : YC = 4 : 3$. If the area of $\Delta ABC = 70$, then the area of $\Delta AXY =$



A. 16 .
B. 24 .
C. 30 .
D. 40 .
E. 42 .

[1983-CE-MATHS 2-52]

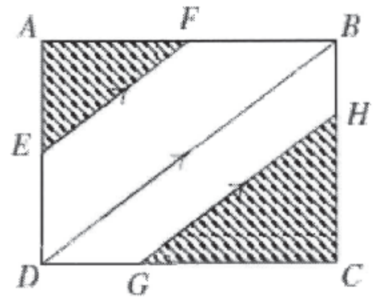
7. In the figure, $XY // BC$. $AX : XB = 2 : 1$. If the area of the trapezium $BCYX = 20$, then the area of $\Delta ABC =$



A. 80 .
B. 60 .
C. 45 .
D. 40 .
E. 36 .

[1984-CE-MATHS 2-50]

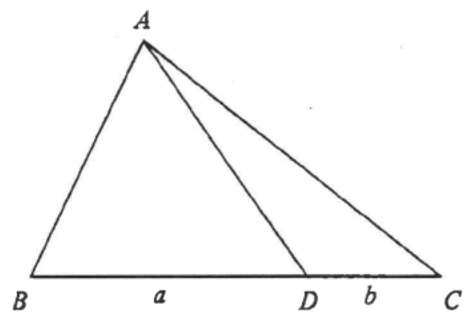
8. In the figure, $ABCD$ is a rectangle E, F, G and H are points on the four sides such that $EF // DB // GH$. $AF = FB$ and $HC = 2BH$. What fraction of the area of $ABCD$ is shaded?



A. $\frac{13}{36}$
B. $\frac{5}{12}$
C. $\frac{25}{36}$
D. $\frac{25}{72}$
E. $\frac{47}{72}$

[1985-CE-MATHS 2-52]

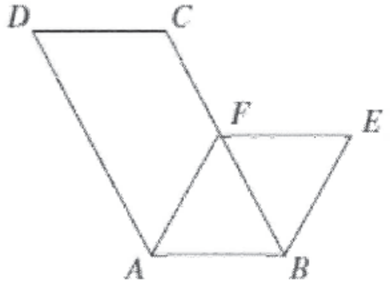
9. In the figure, $BD = a$, $DC = b$ and the area of $\Delta ABD = s$. Find the area of ΔABC.



A. $\dfrac{s(a+b)}{a}$
B. $\dfrac{s(a+b)}{b}$
C. $\dfrac{s(a+b)^2}{a^2}$
D. $\dfrac{s(a+b)^2}{b^2}$
E. $\dfrac{s(a^2+b^2)}{a^2}$

[1987-CE-MATHS 2-21]

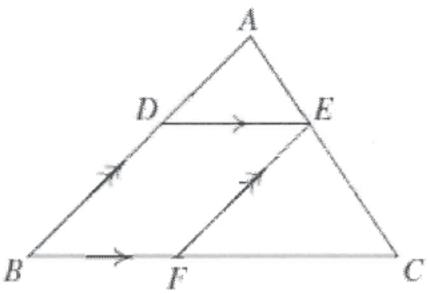
10. In the figure, $ABCD$ and $ABEF$ are parallelograms. $\dfrac{\text{Area of } ABCD}{\text{Area of } ABEF} =$



A. $\dfrac{AD}{AF}$.
B. $\dfrac{BC}{BF}$.
C. $\dfrac{BC}{EF}$.
D. $\dfrac{AD^2}{AF^2}$.
E. $\dfrac{BC^2}{EF^2}$.

[1987-CE-MATHS 2-24]

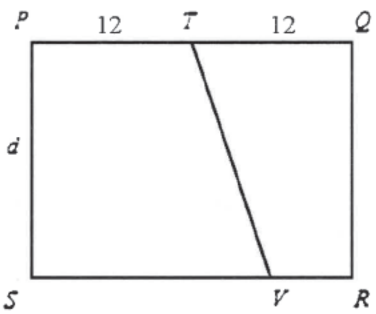
11. In the figure, $DE \parallel BC$ and $AB \parallel EF$. If $AE : EC = 1 : 2$, then area of ΔADE : area of parallelogram $BFED$ =



A. 1 : 2.
B. 1 : 3.
C. 1 : 4.
D. 1 : 5.
E. 1 : 6.

[1987-CE-MATHS 2-54]

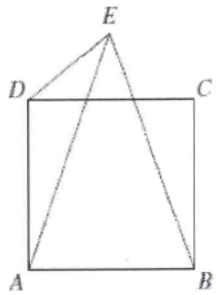
12. In the figure, $PQRS$ is a rectangle with $PQ = 24$ and $PS = d$. T is the mid-point of PQ. V is a point on SR and $\dfrac{\text{area } PTVS}{\text{area } TQRV} = 2$. $SV =$



A. 14.
B. 16.
C. 18.
D. 20.
E. 22.

[1988-CE-MATHS 2-11]

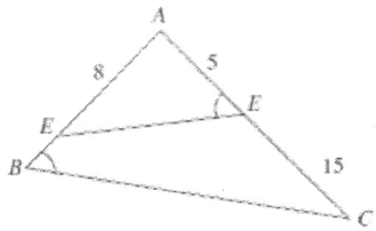
13. In the figure, $ABCD$ is a square and $AE = BE$. $\dfrac{\text{Area of } AED}{\text{Area of } ABCD} =$



A. $\dfrac{1}{2}$
B. $\dfrac{3}{8}$
C. $\dfrac{1}{3}$
D. $\dfrac{1}{4}$
E. $\dfrac{1}{8}$

[1989-CE-MATHS 2-11]

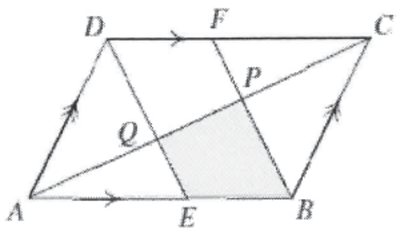
14. In the figure, D and E are points on AB and AC respectively such that $\angle ABC = \angle AED$, $AD = 8$, $AE = 5$ and $EC = 15$. If the area of ΔADE is 16, then the area of the quadrilateral $BCED$ is



A. 200.
B. 100.
C. 96.
D. 84.
E. 40.

[1989-CE-MATHS 2-37]

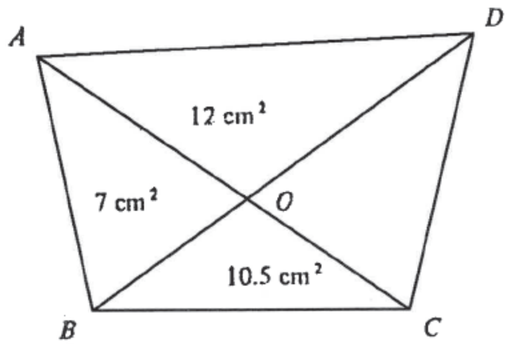
15. In the figure, $ABCD$ is a parallelogram. E and F are the mid-points of AB and DC respectively. BF and ED cut AC at P and Q respectively. If the area of $ABCD$ is 48, find the area of the shaded part.



A. 6
B. 8
C. 9.6
D. 12
E. 16

[1989-CE-MATHS 2-53]

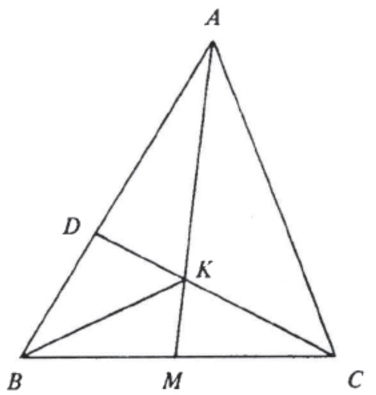
16. In the figure, AC cuts BD at O. The areas of ΔAOB, ΔAOD and ΔBOC are 7 cm^2, 12 cm^2 and 10.5 cm^2 respectively. Find the area of ΔOCD.



A. 5.5 cm^2
B. 8 cm^2
C. 8.5 cm^2
D. 15.5 cm^2
E. 18 cm^2

[1989-CE-MATHS 2-54]

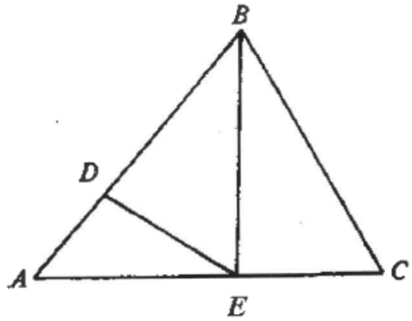
17. In the figure, M is the mid-point of BC and $AD = 2DB$. AM and CD intersect at K. Find $\dfrac{\text{area of } \Delta ADK}{\text{area of } \Delta AKC}$.



A. $\frac{1}{2}$
B. $\frac{2}{3}$
C. $\frac{3}{4}$
D. $\frac{4}{5}$
E. 1

[1991-CE-MATHS 2-53]

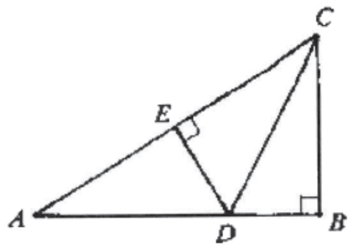
18. In the figure, $AD : DB = 1 : 2$, $AE : EC = 3 : 2$. Area of ΔBDE : Area of ΔABC =



A. 1 : 3 .
B. 2 : 5 .
C. 3 : 4 .
D. 4 : 25 .
E. 36 : 65 .

[1994-CE-MATHS 2-45]

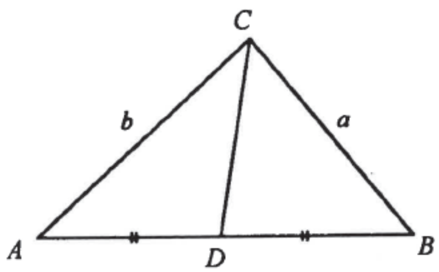
19. In the figure, $DE = DB$, $AC = 13$ and $BC = 5$. Area of ΔADE : Area of ΔACB =



A. 64 : 169 .
B. 5 : 13 .
C. 4 : 9 .
D. 8 : 13 .
E. 2 : 3 .

[1995-CE-MATHS 2-47]

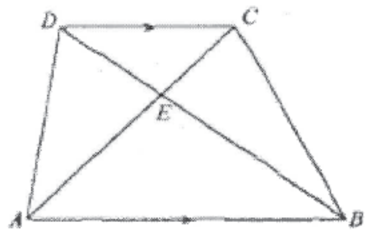
20. In the figure, area of ΔACD : area of ΔBCD =



A. $1:1$.
B. $a:b$.
C. $b:a$.
D. $a^2:b^2$.
E. $b^2:a^2$.

[1996-CE-MATHS 2-15]

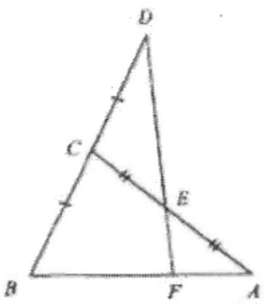
21. In the figure, if $\frac{\text{Area of triangle } CDE}{\text{Area of triangle } BCE} = \frac{1}{2}$, find $\frac{\text{Area of triangle } CDE}{\text{Area of trapezium } ABCD}$.



A. $\frac{1}{10}$
B. $\frac{1}{9}$
C. $\frac{1}{8}$
D. $\frac{1}{7}$
E. $\frac{1}{6}$

[1996-CE-MATHS 2-46]

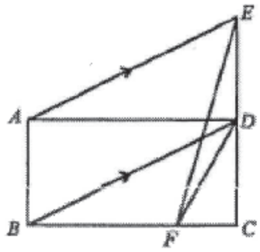
22. In the figure, $DE:EF =$



A. $1:1$.
B. $2:1$.
C. $3:1$.
D. $3:2$.
E. $4:1$.

[1996-CE-MATHS 2-52]

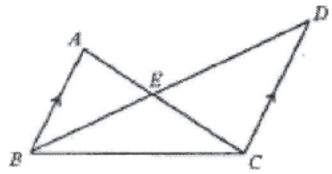
23. In the figure, $ABCD$ is a rectangle. CDE is a straight line and $AE \,//\, BD$. If the area of $ABCD$ is 24 and F is a point on BC such that $BF:FC = 3:1$, find the area of ΔDEF.



A. 2
B. 3
C. 4
D. 6
E. 8

[1997-CE-MATHS 2-53]

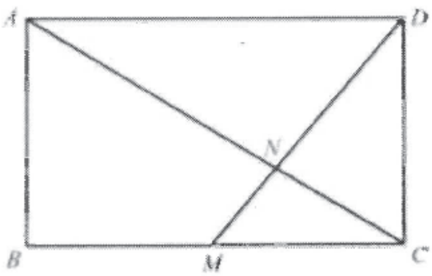
24. In the figure, $AB \,//\, DC$. If the areas of ΔABE and ΔCDE are 4 and 9 respectively, find the area of ΔBCE.



A. 4
B. 5
C. 6
D. 6.5
E. 9

[1997-CE-MATHS 2-54]

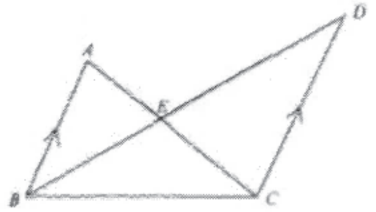
25. In the figure, $ABCD$ is a rectangle. M is the midpoint of BC and AC intersects MD at N. Area of ΔNCD : area of $ABMN$ =



A. $1:2$.
B. $1:3$.
C. $2:3$.
D. $2:5$.
E. $4:7$.

[1999-CE-MATHS 2-54]

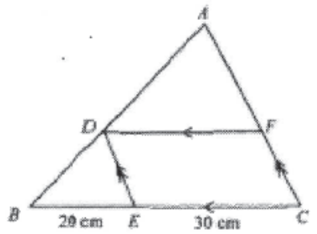
26. In the figure, AEC and BED are straight lines. If the area of $\Delta ABE = 4\text{ cm}^2$ and the area of $\Delta BCE = 5\text{ cm}^2$, find the area of ΔCDE.



A. 4.5 cm^2
B. 5 cm^2
C. 6 cm^2
D. 6.25 cm^2
E. 9 cm^2

[2000-CE-MATHS 2-54]

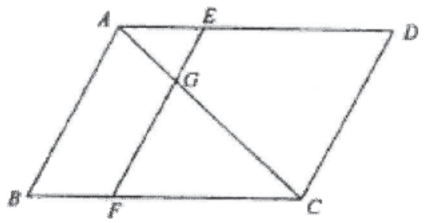
27. In the figure, ADB, BEC and CFA are straight lines. If the area of ΔABC is 225 cm^2, find the area of the parallelogram $DECF$.



A. 81 cm^2
B. 108 cm^2
C. 126 cm^2
D. 135 cm^2
E. 162 cm^2

[2001-CE-MATHS 2-50]

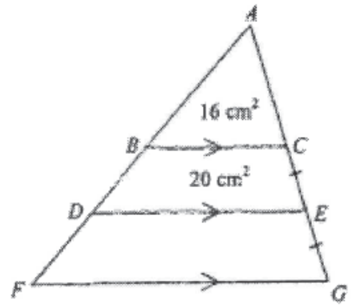
28. In the figure, $ABCD$ is a parallelogram. E and F are points on AD and BC respectively such that $AB \parallel EF$. EF meets AC at G. If $AG : GC = 1 : 2$, then area of $ABFG$: area of $EGCD$ =



A. $1 : 2$.
B. $1 : 4$.
C. $3 : 4$.
D. $5 : 8$.

[2002-CE-MATHS 2-44]

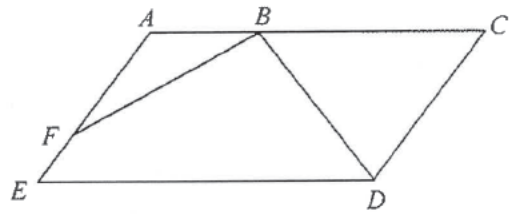
29. In the figure, $ABDF$ and $ACEG$ are straight lines. If the area of ΔABC is 16 cm^2 and the area of quadrilateral $BDEC$ is 20 cm^2, then the area of quadrilateral $DFGE$ is



A. 24 cm^2 .
B. 28 cm^2 .
C. 36 cm^2 .
D. 44 cm^2 .

[2003-CE-MATHS 2-17]

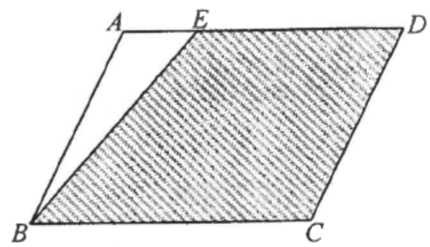
30. In the figure, $AEDC$ is a parallelogram. If $AB : BC = 1 : 2$ and $AF : FE = 2 : 1$, then the area of ΔABF : area of ΔBCD =



A. $1 : 2$.
B. $1 : 3$.
C. $1 : 4$.
D. $2 : 9$.

[2003-CE-MATHS 2-18]

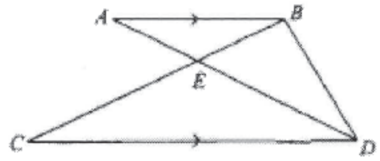
31. In the figure, $ABCD$ is a parallelogram and E is a point on AD such that $AE : ED = 1 : 3$. If the area of ΔABE is 3 cm^2, then the area of the shaded region is



A. 9 cm^2 .
B. 15 cm^2 .
C. 21 cm^2 .
D. 24 cm^2 .

[2004-CE-MATHS 2-17]

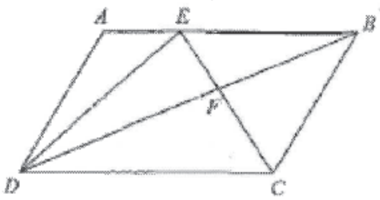
32. In the figure, AD and BC meet at E. If $CE : EB = 3 : 1$, then area of ΔABD : area of ΔCDE =



A. $1 : 1$.
B. $1 : 3$.
C. $2 : 3$.
D. $4 : 9$.

[2004-CE-MATHS 2-18]

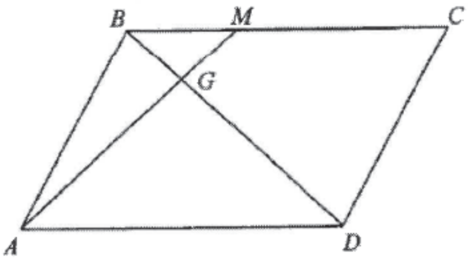
33. In the figure, $ABCD$ is a parallelogram. E is a point lying on AB. If EC and BD intersect at F, then the ratio of the area of ΔDEF to the area of ΔCBF is



A. $1 : 1$.
B. $1 : 2$.
C. $2 : 1$.
D. $2 : 3$.

[2007-CE-MATHS 2-19]

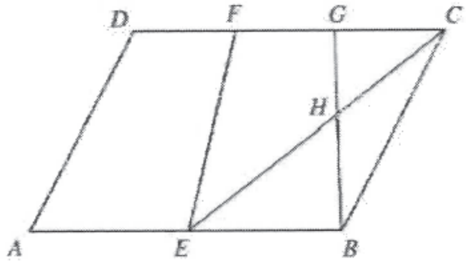
34. In the figure, $ABCD$ is a parallelogram. M is a point lying on BC such that $BM : MC = 1 : 2$. If BD and AM intersect at G and the area of ΔBGM is 1 cm^2, then the area of the parallelogram $ABCD$ is



A. 9 cm^2 .
B. 11 cm^2 .
C. 12 cm^2 .
D. 24 cm^2 .

[2008-CE-MATHS 2-21]

35. In the figure, $ABCD$ is a parallelogram. E is the mid-point of AB. F and G are points lying on CD such that $DF = FG = GC$. BG and CE intersect at H. If the area of ΔBCH is 6 cm^2, then the area of the quadrilateral $EFGH$ is

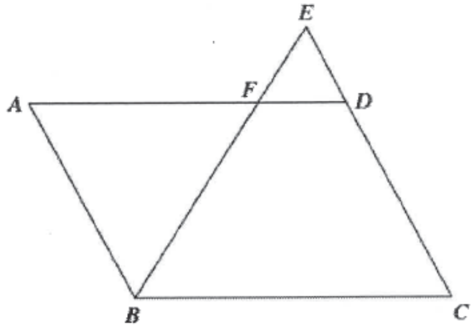


A. 10 cm^2 .
B. 12 cm^2 .
C. 15 cm^2 .
D. 16 cm^2 .

[2011-CE-MATHS 2-19]

HKDSE Problems

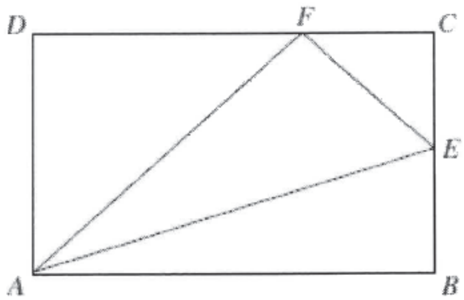
36. In the figure, $ABCD$ is a parallelogram. F is a point lying on AD. BF produced and CD produced meet at E. If $CD : DE = 2 : 1$, then $AF : BC$ =



A. $1 : 2$.
B. $2 : 3$.
C. $3 : 4$.
D. $8 : 9$.

[SP-DSE-MATHS 2-23]

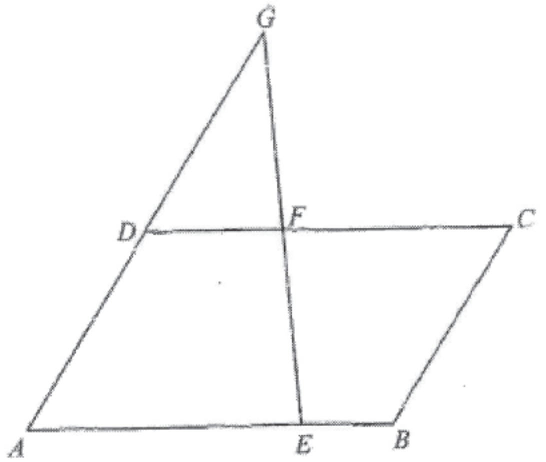
37. In the figure, $ABCD$ is a rectangle. E is the mid-point of BC. F is a point lying on CD such that $DF = 2CF$. If the area of ΔCEF is 1 cm^2, then the area of ΔAEF is



A. 2 cm^2 .
B. 3 cm^2 .
C. 4 cm^2 .
D. 6 cm^2 .

[PP-DSE-MATHS 2-17]

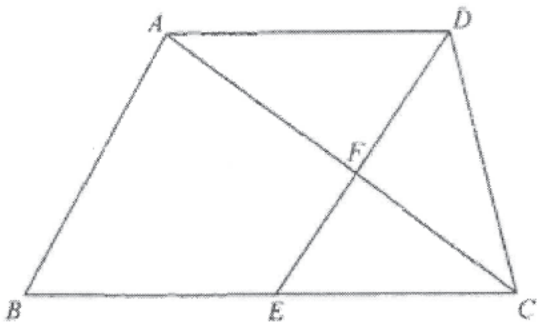
38. In the figure, $ABCD$ is a parallelogram. E and F are points lying on AB and CD respectively. AD produced and EF produced meet at G. It is given that $DF : FC = 3 : 4$ and $AD : DG = 1 : 1$. If the area of ΔDFG is $3\ \text{cm}^2$, then the area of the parallelogram $ABCD$ is



A. $12\ \text{cm}^2$.
B. $14\ \text{cm}^2$.
C. $18\ \text{cm}^2$.
D. $21\ \text{cm}^2$.

[2012-DSE-MATHS 2-17]

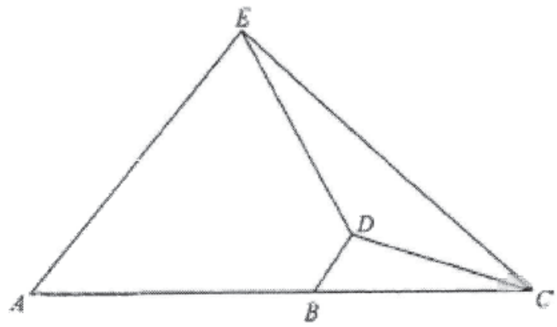
39. In the figure, $ABCD$ is a trapezium with $AD // BC$ and $AD : BC = 2 : 3$. Let E be the mid-point of BC. AC and DE intersect at F. If the area of ΔCEF is $36\ \text{cm}^2$, then the area of the trapezium $ABCD$ is



A. $216\ \text{cm}^2$.
B. $264\ \text{cm}^2$.
C. $280\ \text{cm}^2$.
D. $320\ \text{cm}^2$.

[2013-DSE-MATHS 2-18]

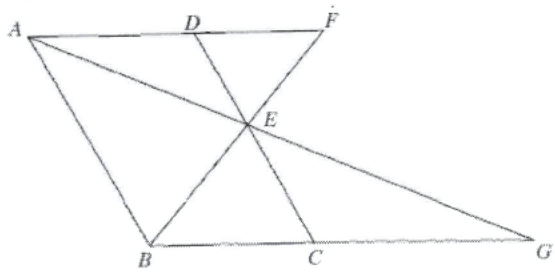
40. In the figure, B is a point lying on AC such that $AB : BC = 3 : 2$. It is given that $AE // BD$. If the area of ΔBCD and the area of ΔCDE are $4\ \text{cm}^2$ and $8\ \text{cm}^2$ respectively, then the area of the trapezium $ABDE$ is



A. $18\ \text{cm}^2$.
B. $21\ \text{cm}^2$.
C. $27\ \text{cm}^2$.
D. $33\ \text{cm}^2$.

[2014-DSE-MATHS 2-17]

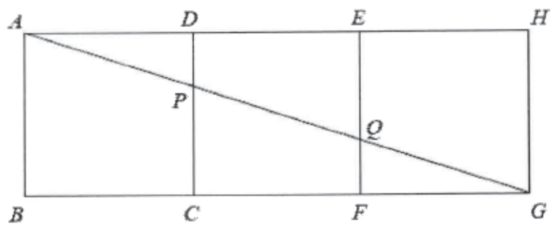
41. In the figure, $ABCD$ is a parallelogram. E is a point lying on CD such that $DE : EC = 2 : 3$. AD produced and BE produced meet at F while AE produced and BC produced meet at G. If the area of ΔDEF is $8\ \text{cm}^2$, then the area of ΔCEG is



A. $12\ \text{cm}^2$.
B. $18\ \text{cm}^2$.
C. $20\ \text{cm}^2$.
D. $27\ \text{cm}^2$.

[2015-DSE-MATHS 2-17]

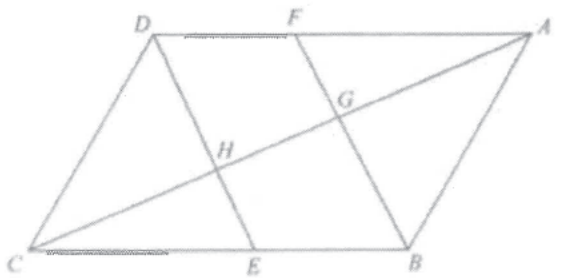
42. In the figure, $ABCD$, $CDEF$ and $EFGH$ are squares. AG cuts CD and EF at P and Q respectively. Find the ratio of the area of the quadrilateral $DEQP$ to the area of the quadrilateral $ABCP$.



A. $1 : 2$
B. $2 : 3$
C. $3 : 5$
D. $4 : 9$

[2016-DSE-MATHS 2-20]

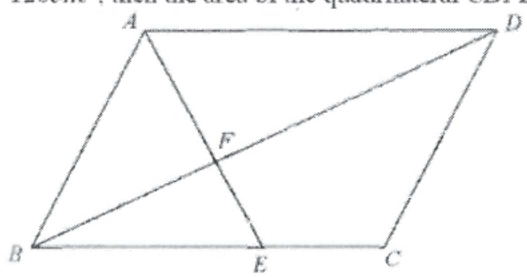
43. In the figure, $ABCD$ and $BEDF$ are parallelograms. E is a point lying on BC such that $BE:EC = 2:3$. AC cuts BF and DE at G and H respectively. If the area of ΔABG is 135 cm^2, then the area of the quadrilateral $DFGH$ is



A. 60 cm^2.
B. 81 cm^2.
C. 90 cm^2.
D. 144 cm^2.

[2017-DSE-MATHS 2-16]

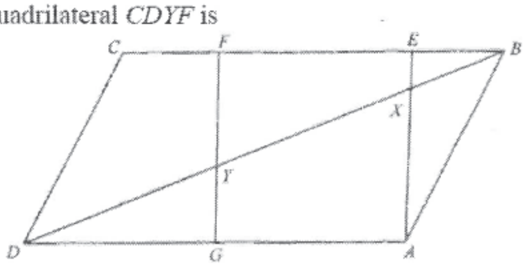
44. In the figure, $ABCD$ is a parallelogram. E is a point lying on BC such that $BE:EC = 5:3$. AE and BD intersect at point F. If the area of ΔABF is $120cm^2$, then the area of the quadrilateral $CDFE$ is



A. $237\ cm^2$
B. $307\ cm^2$
C. $312\ cm^2$
D. $429\ cm^2$

[2018-DSE-MATHS 2-16]

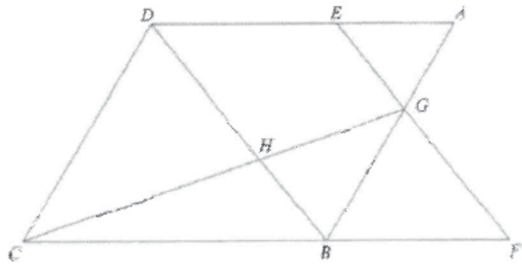
45. In the figure, $ABCD$ is parallelogram and $AEFG$ is a square. It is given that $BE:EF:FC = 2:7:3$. BD cuts AE and FG at points X and Y respectively. If the area of ΔABX is $24\ cm^2$, then the area of the quadrilateral $CDYF$ is



A. $54\ cm^2$
B. $77\ cm^2$
C. $81\ cm^2$
D. $87\ cm^2$

[2019-DSE-MATHS 2-16]

46. In the figure, $ABCD$ is a parallelogram. Let E be a point lying on AD such that $AE:ED = 2:5$. CB is produced to the point F such that $BF = DE$. Denote the point of intersection of AB and EF by G. It is given that BD and CG intersect at the point H. If the area of ΔAEG is $48\ cm^2$, then the area of ΔCDH is



A. $98\ cm^2$
B. $343\ cm^2$
C. $420\ cm^2$
D. $588\ cm^2$

[2020-DSE-MATHS 2-18]

Mensuration of Solids

1. A cube of edge 4 cm floats upright in water with $\frac{3}{4}$ of its volume immersed. The total surface area under water is

A. 72 cm^2.
B. 64 cm^2.
C. 60 cm^2.
D. 52 cm^2.
E. 48 cm^2.

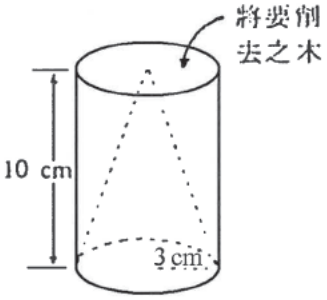
[1977-CE-MATHS 2-12]

2. If the height, the width and the length of a rectangular block are in the ratios of 1 : 2 : 3 respectively and its total surface area is 88 cm^2, then the height of the block is

A. 8 cm.
B. 6 cm.
C. 4 cm.
D. 2 cm.
E. 1 cm.

[SP-CE-MATHS A2-42]

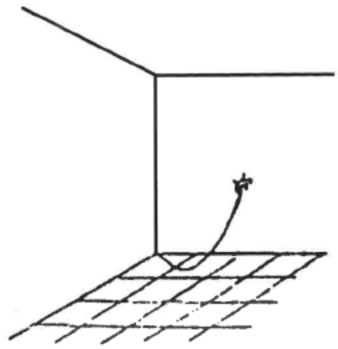
3. A solid wooden cylinder of base radius 3 cm and height 10 cm is to be cut into a right circular cone of the same base radius and height. The volume of wood to be cut away is



A. 10π cm^3.
B. 20π cm^3.
C. 30π cm^3.
D. 60π cm^3.
E. 90π cm^3.

[1978-CE-MATHS 2-23]

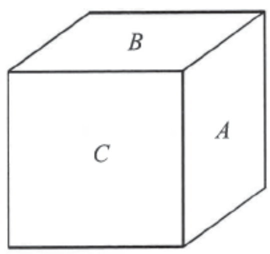
4. A dragonfly is tied to a string 1 metre long attached to a corner of a room. (See figure.) The walls and the floor are at right angles to one another. In how much space, in m^3, can the dragonfly move?



A. $\frac{3}{32}\pi$
B. $\frac{1}{6}\pi$
C. $\frac{1}{3}\pi$
D. $\frac{2}{3}\pi$
E. $\frac{4}{3}\pi$

[1979-CE-MATHS 2-26]

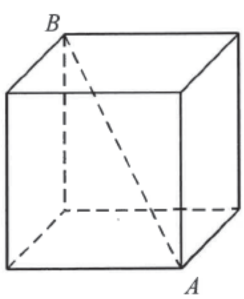
5. In the figure, the areas of the surfaces A, B, C of the cuboid are 10 cm^2, 14 cm^2 and 35 cm^2 respectively. What is the volume of the cuboid?



A. 49 cm^3
B. 70 cm^3
C. 140 cm^3
D. 350 cm^3
E. 4900 cm^3

[1980-CE-MATHS 2-39]

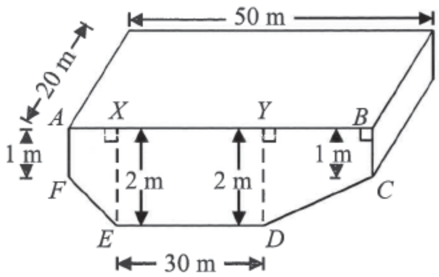
6. The total area of the six faces of the solid cube in the figure is 96 cm^2. What is the length of the diagonal AB?



A. $6\sqrt{2}$ cm
B. $4\sqrt{3}$ cm
C. $4\sqrt{2}$ cm
D. $2\sqrt{6}$ cm
E. 4 cm

[1981-CE-MATHS 2-16]

7.



The figure above represents a 50 m × 20 m swimming pool. The pool is in the shape of a prism with a rectangular surface and four vertical walls. The dimensions of the sidewall *ABCDEF* are as shown in the figure. What is the capacity of the pool in m^3?

A. 1200
B. 1500
C. 1800
D. 2000
E. It cannot be determined

[1981-CE-MATHS 2-42]

8.

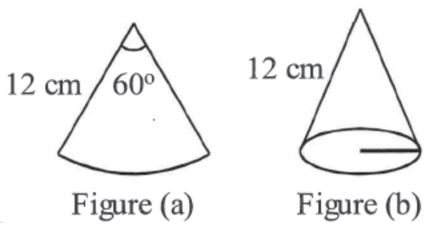


Figure (a) Figure (b)

The cone in Figure (b) is formed by bending the sector in Figure (a). The angle of the sector is 60° and the radius is 12 cm. The radius of the base of the cone is

A. 2 cm .
B. 4 cm .
C. 6 cm .
D. 2π cm .
E. $\dfrac{360}{\pi}$ cm .

[1981-CE-MATHS 2-47]

9. A right circular cone of altitude $3r$ and base radius r has the same volume as a cube of side x. $x =$

A. πr^3 .
B. πr .
C. $\frac{1}{3}\pi r$.
D. $\sqrt[3]{3\pi}\,r$.
E. $\sqrt[3]{\pi}\,r$.

[1982-CE-MATHS 2-14]

10. A hollow cylindrical metal pipe, 1 m long, has an external radius and an internal radius of 5 cm and 4 cm respectively. The volume of metal is

A. 90π cm^3 .
B. 100π cm^3 .
C. 180π cm^3 .
D. 900π cm^3 .
E. 1800π cm^3 .

[1983-CE-MATHS 2-13]

11. A rectangular box, without a lid, is 40 cm long, 30 cm wide and 10 cm height. The area of the external surface of the box is

A. 2 600 cm^2 .
B. 3 400 cm^2 .
C. 3 500 cm^2 .
D. 3 800 cm^2 .
E. 12 000 cm^2 .

[1984-CE-MATHS 2-13]

12. The base radii of two right circular cylinders are in the ratio 2 : 3. If the two cylinders have the same height, what is the ratio of their curved surface area?

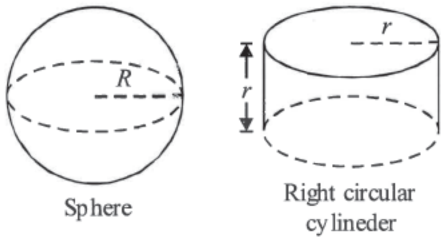
A. 2 : 3
B. 4 : 9
C. 8 : 27
D. $\sqrt{8} : \sqrt{27}$
E. None of the above.

[1984-CE-MATHS 2-43]

13. A cone of base radius $2r$ cm and height h cm has a volume of 60 cm^3. The volume of a cylinder of base radius r cm and height $4h$ cm is

A. 60 cm^3 .
B. 120 cm^3 .
C. 180 cm^3 .
D. 240 cm^3 .
E. 360 cm^3 .

[1985-CE-MATHS 2-43]

14. 

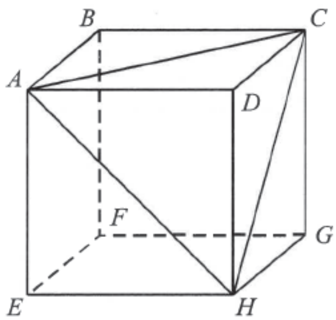
In the figure, if $\dfrac{\text{Volume of the sphere}}{\text{Volume of the right circular cylinder}} = \dfrac{9}{2}$,

then $\dfrac{R}{r} =$

A. $\dfrac{3}{2}$.
B. $\dfrac{3}{\sqrt{2}}$.
C. 3.
D. $\dfrac{\sqrt[3]{9}}{\sqrt[3]{2}}$.
E. $\dfrac{9}{2}$.

[1986-CE-MATHS 2-12]

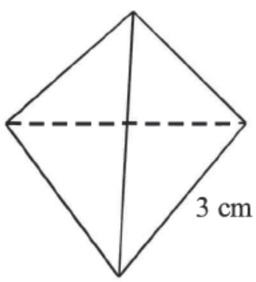
15. *ABCDEFGH* is a cube of side 3 cm. A tetrahedron *DACH* is cut away along the plane *ACH*. The volume of the remaining solid is



A. 6 cm^3.
B. 9 cm^3.
C. 13.5 cm^3.
D. 18 cm^3.
E. 22.5 cm^3.

[1986-CE-MATHS 2-38]

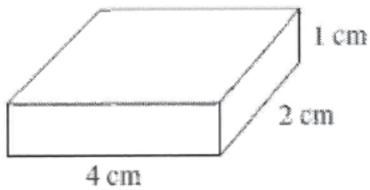
16. The total surface area of a regular tetrahedron of side 3 cm is



A. $\dfrac{9\sqrt{3}}{4}\text{ cm}^2$.
B. 9 cm^2.
C. $\dfrac{27\sqrt{3}}{4}\text{ cm}^2$.
D. $9\sqrt{3}\text{ cm}^2$.
E. $12\sqrt{3}\text{ cm}^2$.

[1986-CE-MATHS 2-40]

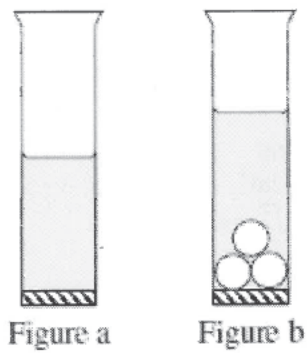
17. A solid rectangular iron block, 4 cm × 2 cm × 1 cm, is melted and recast into a cube. The decrease in the total surface area is



A. 1 cm^2.
B. 2 cm^2.
C. 3 cm^2.
D. 4 cm^2.
E. 5 cm^2.

[1987-CE-MATHS 2-13]

18. Figure A shows a circular measuring cylinder 4 cm in diameter containing water. Three iron balls, each of diameter 2 cm, are dropped into the cylinder as shown in Figure B. What is the rise in the water level?



A. $\dfrac{1}{4}$ cm
B. $\dfrac{1}{3}$ cm
C. $\dfrac{1}{2}$ cm
D. 1 cm
E. 2 cm

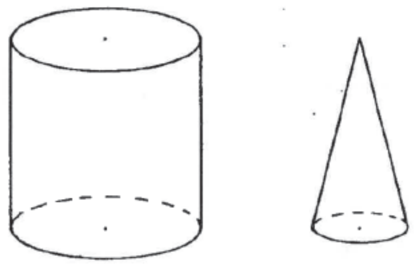
[1987-CE-MATHS 2-14]

19. A solid iron sphere of radius r is melted and recast into a circular cone and a circular cylinder. If both of them have the same height h and the same base radius r, find h in terms of r.

A. $\frac{r}{2}$
B. $\frac{9r}{16}$
C. $\frac{2r}{3}$
D. $\frac{3r}{4}$
E. r

[1988-CE-MATHS 2-10]

20. In the figure, the circular cylinder and the circular cone have the same height. The radius of the base of the cylinder is twice that of the cone. If the volume of the cone is 20 cm^3, what is the volume of the cylinder?



A. 40 cm^3
B. 80 cm^3
C. 120 cm^3
D. 240 cm^3
E. 300 cm^3

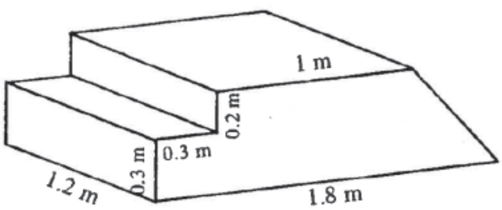
[1990-CE-MATHS 2-11]

21. The length, width and height of a cuboid are in the ratios $3:2:1$. If the total surface area of the cuboid is 88 cm^2, find its volume.

A. 6 cm^3
B. 48 cm^3
C. $48\sqrt{2}\text{ cm}^3$
D. $96\sqrt{2}\text{ cm}^3$
E. 384 cm^3

[1990-CE-MATHS 2-12]

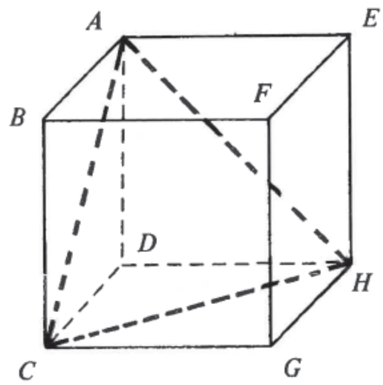
22. The figure shows a solid platform with steps on one side and a slope on the other. Find its volume.



A. 0.75 m^3
B. 0.84 m^3
C. 0.858 m^3
D. 1.008 m^3
E. 1.608 m^3

[1992-CE-MATHS 2-13]

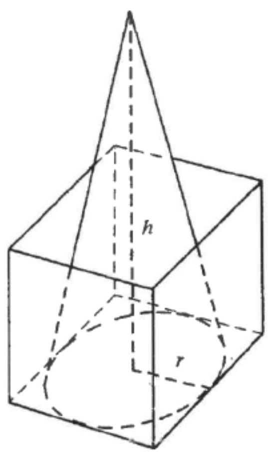
23. Find the ratio of the volume of the tetrahedron $ACHD$ to the volume of the cube $ABCDEFGH$ in the figure.



A. $1:8$
B. $1:6$
C. $1:4$
D. $1:3$
E. $1:2$

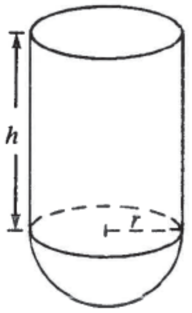
[1992-CE-MATHS 2-15]

24. In the figure, the base of the conical vessel is inscribed in the bottom of the cubical box. If the box and the conical vessel have the same capacity, find $h:r$.



A. $24:\pi$
B. $3:1$
C. $6:\pi$
D. $3:\pi$
E. $8:3\pi$

[1993-CE-MATHS 2-16]

25. 

The figure shows a solid consisting of a cylinder of height h and a hemisphere of radius r. The area of the curved surface of the cylinder is twice that of the hemisphere.

Find the ratio

volume of cylinder : volume of hemisphere .

A. 1 : 3

B. 2 : 3

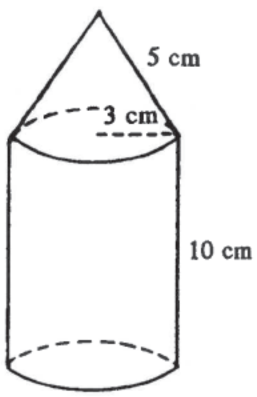
C. 3 : 4

D. 3 : 2

E. 3 : 1

[1993-CE-MATHS 2-17]

26. In the figure, the solid consists of a cylinder and a right circular cone with a common base which is a circle of radius 3 cm. The height of the cylinder is 10 cm and the slant height of the cone is 5 cm. Find the total surface area of the solid.



A. 75π cm^3

B. 84π cm^3

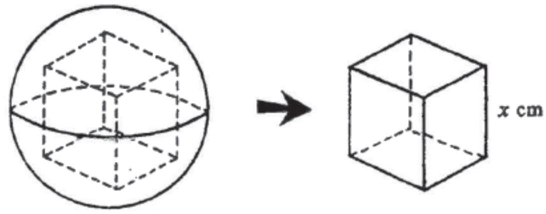
C. 93π cm^3

D. 105π cm^3

E. 114π cm^3

[1995-CE-MATHS 2-15]

27. In the figure, a solid wooden sphere of radius 3 cm is to be cut into a cube of side x cm. Find the largest possible value of x.



A. $3\sqrt{2}$

B. $2\sqrt{3}$

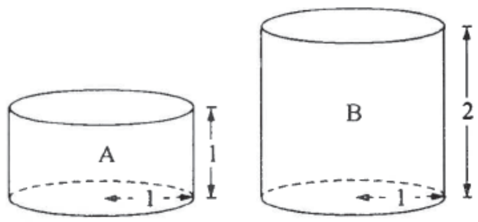
C. 3

D. $\frac{3}{2}\sqrt{2}$

E. $\sqrt{3}$

[1995-CE-MATHS 2-48]

28. In the figure, A and B are two right solid cylinders with the same base radius 1. If the heights of A and B are 1 and 2 respectively, find $\dfrac{\text{the total surface area of } A}{\text{the total surface area of } B}$.



A. $\frac{1}{8}$

B. $\frac{1}{4}$

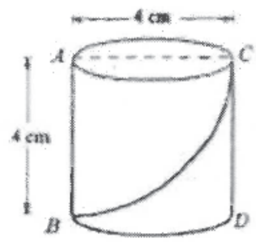
C. $\frac{1}{2}$

D. $\frac{3}{5}$

E. $\frac{2}{3}$

[1996-CE-MATHS 2-18]

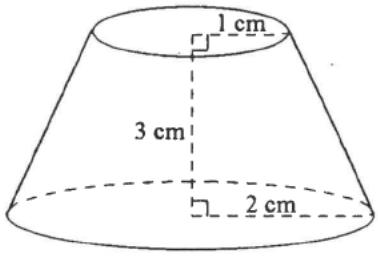
29. The figure shows a right circular cylinder with AC being a diameter of its upper face. AB and CD are two vertical lines on the curved surface. A curve is drawn on the surface of the cylinder from B to C. Find its shortest possible length.



A. 2π cm
B. $2\sqrt{\pi^2 + 4}$ cm
C. $4\sqrt{2}$ cm
D. $4\sqrt{\pi^2 + 1}$ cm
E. $4\sqrt{\pi^2 + 4}$ cm

[1996-CE-MATHS 2-27]

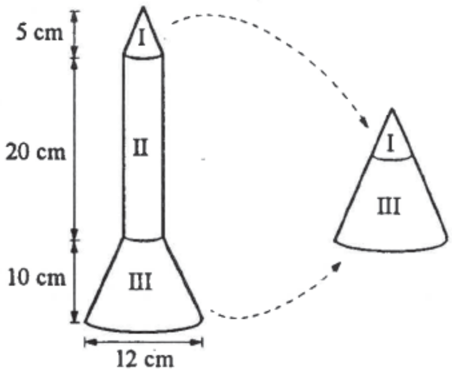
30. The figure shows a frustum of a right circular cone. The radii of the upper face and the base are 1 cm and 2 cm respectively. If the height is 3 cm, find the volume.



A. 3π cm^3
B. $\frac{9}{2}\pi$ cm^3
C. $\frac{11}{2}\pi$ cm^3
D. 7π cm^3
E. $\frac{15}{2}\pi$ cm^3

[1996-CE-MATHS 2-45]

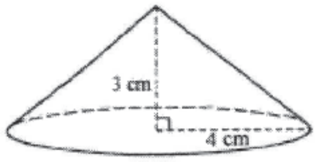
31. In the figure, the rocket model consists of three parts. Parts I and III can be joined together to form a right circular cone. Part II is a right cylinder. Find the volume of the rocket model.



A. 260π cm^3
B. 360π cm^3
C. 620π cm^3
D. 720π cm^3
E. 900π cm^3

[1997-CE-MATHS 2-49]

32. The figure shows a right circular cone of base radius 4 cm and height 3 cm. Find the area of its curved surface.

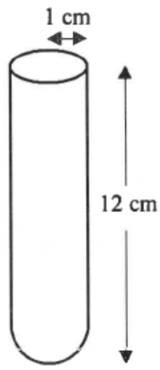


A. 12π cm^2
B. 16π cm^2
C. 20π cm^2
D. 24π cm^2
E. 48π cm^2

[1998-CE-MATHS 2-20]

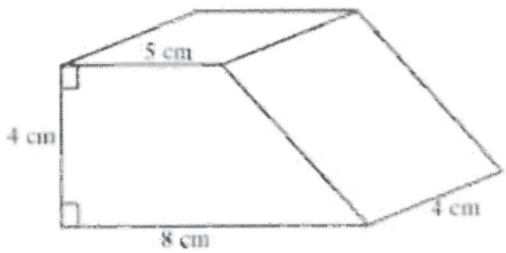
33. The figure shows a test tube consisting of a cylindrical upper part of radius 1 cm and a hemispherical lower part of the same radius. If the height of the test tube is 12 cm, find its capacity.

A. $\frac{35}{3}\pi$ cm^3
B. $\frac{37}{3}\pi$ cm^3
C. $\frac{38}{3}\pi$ cm^3
D. $\frac{40}{3}\pi$ cm^3
E. $\frac{68}{3}\pi$ cm^3



[1998-CE-MATHS 2-22]

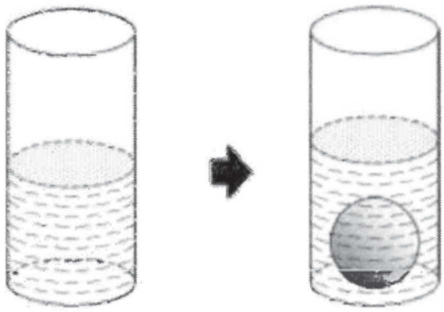
34. The figure shows a right prism. Find its total surface area.



A. 104 cm^2
B. 108 cm^2
C. 114 cm^2
D. 120 cm^2
E. 140 cm^2

[1999-CE-MATHS 2-22]

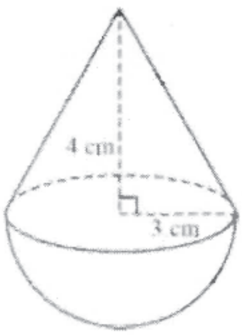
35. In the figure, a cylindrical vessel of internal diameter 6 cm contains some water. A steel ball of radius 2 cm is completely submerged in the water. Find the rise in the water level.



A. $\frac{32}{27}$ cm
B. $\frac{8}{27}$ cm
C. $\frac{16}{9}$ cm
D. $\frac{4}{9}$ cm
E. $\frac{8}{3}$ cm

[1999-CE-MATHS 2-23]

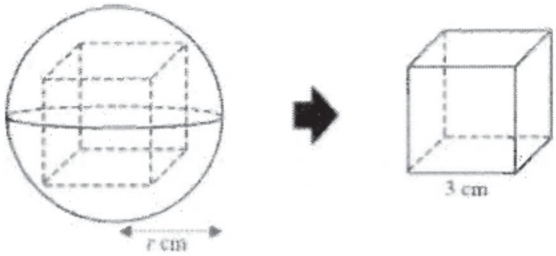
36. In the figure, the solid consists of a right circular cone and a hemisphere with a common base. Find the volume of the solid.



A. 30π cm^3
B. 33π cm^3
C. 48π cm^3
D. 54π cm^3
E. 72π cm^3

[1999-CE-MATHS 2-24]

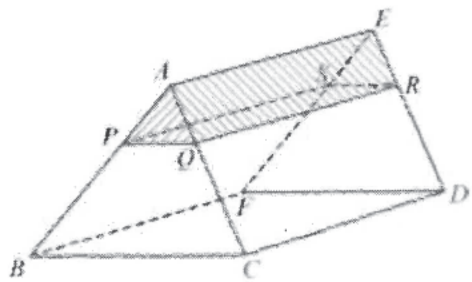
37. In the figure, a solid wooden sphere of radius r cm is to be cut into a cube of side 3 cm. Find the smallest possible value of r.



A. $\frac{3\sqrt{3}}{2}$
B. $\frac{3\sqrt{2}}{2}$
C. $\frac{3}{2}$
D. $3\sqrt{3}$
E. $3\sqrt{2}$

[2000-CE-MATHS 2-33]

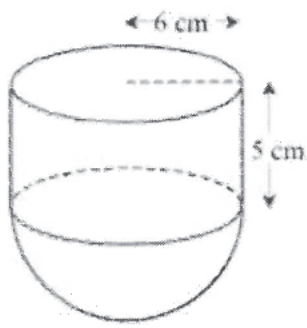
38. In the figure, $ABCDEF$ is a right triangular prism. It is cut into two parts along the plane $PQRS$, which is parallel to the face $BCDF$, and $AP : PB = 2 : 5$. Find $\frac{\text{volume of the prism } APQRES}{\text{volume of the prism } ABCDEF}$.



A. $\frac{2}{7}$
B. $\frac{4}{25}$
C. $\frac{4}{49}$
D. $\frac{8}{125}$
E. $\frac{8}{343}$

[2000-CE-MATHS 2-43]

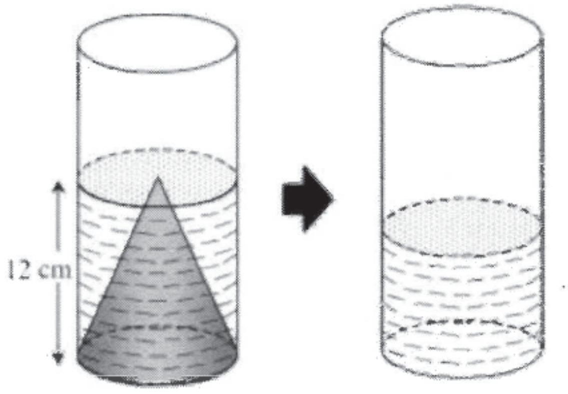
39. In the figure, the solid consists of a cylinder and a hemisphere with a common base of radius 6 cm. Find the total surface area of the solid.



A. 132π cm^2
B. 168π cm^2
C. 204π cm^2
D. 240π cm^2
E. 324π cm^2

[2001-CE-MATHS 2-8]

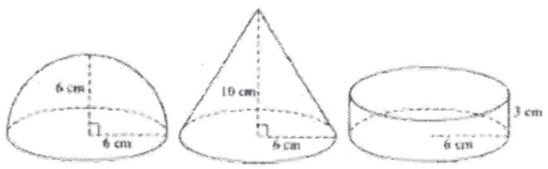
40. In the figure, a solid right circular cone of height 12 cm is put into a cylinder which has the same internal radius as the base radius of the cone. Water is then poured into the cylinder until the water level just reaches the tip of the cone. If the cone is removed, what is the height of the water in the cylinder?



A. 3 cm
B. 4 cm
C. 6 cm
D. 8 cm
E. 9 cm

[2001-CE-MATHS 2-24]

41. The figure shows a hemisphere, a right circular cone and a right cylinder with equal base radii. Their volumes are a cm^3, b cm^3 and c cm^3 respectively.

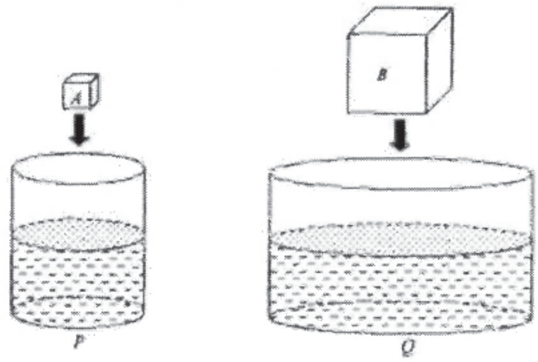


Which of the following is true?

A. $a < b < c$
B. $a < c < b$
C. $c < a < b$
D. $c < b < a$

[2002-CE-MATHS 2-19]

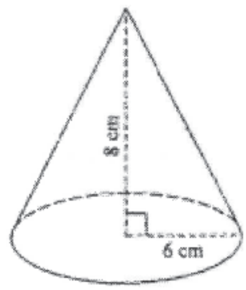
42. In the figure, P and Q are two right cylindrical vessels each containing some water. The two vessels are placed on the same horizontal surface. The internal base radii of P and Q are in the ratio $1:3$. A and B are two cubes with sides in the ratio $1:2$. A and B are put into P and Q respectively. Suppose both cubes are totally immersed in water without any overflow. If the rise in water level in P is 1 cm, then the rise in water level in Q is



A. $\frac{2}{3}$ cm .
B. $\frac{9}{8}$ cm .
C. $\frac{8}{9}$ cm .
D. $\frac{8}{27}$ cm .

[2002-CE-MATHS 2-45]

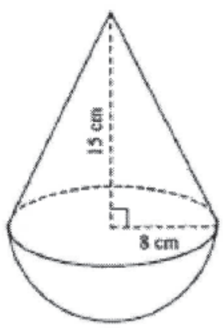
43. The figure shows a right circular cone of base radius 6 cm and height 8 cm. Find its volume.



A. 32π cm^3
B. 60π cm^3
C. 96π cm^3
D. 288π cm^3

[2003-CE-MATHS 2-20]

44. In the figure, the solid consists of a right circular cone and a hemisphere with a common base. Find the total surface area of the solid.



A. $136\pi\ \text{cm}^2$
B. $248\pi\ \text{cm}^2$
C. $264\pi\ \text{cm}^2$
D. $392\pi\ \text{cm}^2$

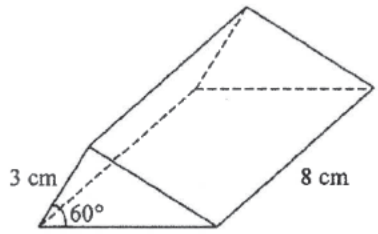
[2003-CE-MATHS 2-21]

45. The figure shows a solid right circular cone of height 5 cm and slant height 13 cm. Find the total surface area of the cone.

A. $144\pi\ \text{cm}^2$
B. $156\pi\ \text{cm}^2$
C. $240\pi\ \text{cm}^2$
D. $300\pi\ \text{cm}^2$

[2005-CE-MATHS 2-17]

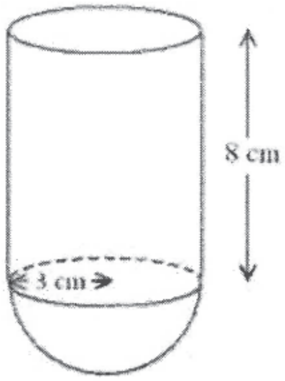
46. The figure shows a right triangular prism. Find the volume of the prism.



A. $36\ \text{cm}^3$
B. $72\ \text{cm}^3$
C. $36\sqrt{3}\ \text{cm}^3$
D. $72\sqrt{3}\ \text{cm}^3$

[2005-CE-MATHS 2-18]

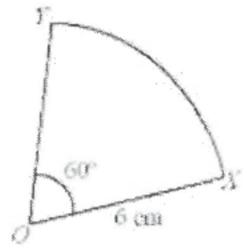
47. In the figure, the solid consists of a hemisphere of radius 3 cm joined to the bottom of a right circular cylinder of height 8 cm and base radius 3 cm. Find the volume of the solid.

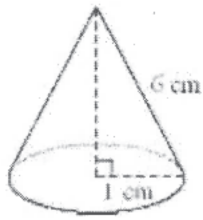


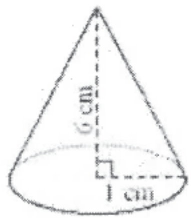
A. $75\pi\ \text{cm}^3$
B. $90\pi\ \text{cm}^3$
C. $93\pi\ \text{cm}^3$
D. $108\pi\ \text{cm}^3$

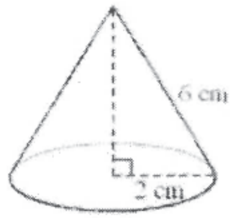
[2006-CE-MATHS 2-18]

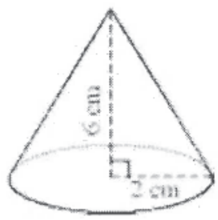
48. In the figure, sector OXY is a thin metal sheet. By joining OX and OY together, which of the following right circular cones can be folded?



A.


B.


C.


D.


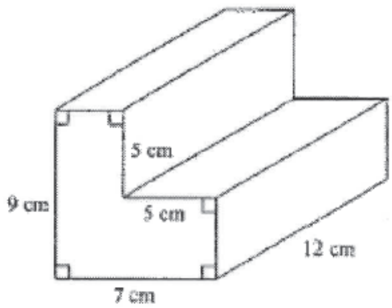
[2006-CE-MATHS 2-20]

49. If the length of a side of a regular tetrahedron is 3 cm, then the height of the tetrahedron is

A. 3 cm.
B. $\sqrt{3}$ cm.
C. $\sqrt{6}$ cm.
D. $\frac{3\sqrt{3}}{2}$ cm.

[2006-CE-MATHS 2-45]

50. In the figure, the volume of the right prism is



A. 456 cm^3.
B. 540 cm^3.
C. 552 cm^3.
D. 636 cm^3.

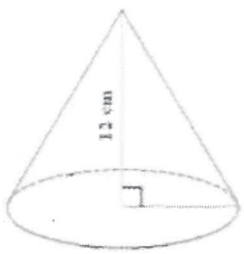
[2007-CE-MATHS 2-17]

51. If a solid metal hemisphere of radius r is melted and recast into 3 identical solid right circular cones of height h and base radius r, then $r : h =$

A. $2 : 3$.
B. $3 : 2$.
C. $3 : 4$.
D. $4 : 3$.

[2007-CE-MATHS 2-18]

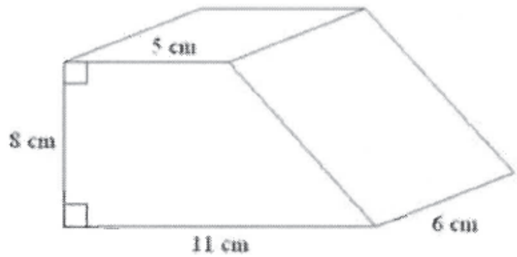
52. The figure shows a solid right circular cone of height 12 cm. The circumference of the base is 18π cm. Find the total surface area of the circular cone.



A. $81\pi \text{ cm}^2$
B. $135\pi \text{ cm}^2$
C. $216\pi \text{ cm}^2$
D. $324\pi \text{ cm}^2$

[2008-CE-MATHS 2-18]

53. In the figure, the volume of the right prism is



A. 128 cm^3.
B. 332 cm^3.
C. 384 cm^3.
D. 768 cm^3.

[2008-CE-MATHS 2-19]

54. The base of a solid right pyramid is a square. If the perimeter of the base is 48 cm and the length of each slant edge of the pyramid is 10 cm, then the total surface area of the pyramid is

A. 192 cm^2.
B. 336 cm^2.
C. 384 cm^2.
D. $96\sqrt{7} \text{ cm}^2$.

[2009-CE-MATHS 2-17]

55. The base radius and the height of a right circular cylinder are 3 cm and 12 cm respectively while the base radius of a right circular cone is 6 cm. If the volume of the circular cylinder and the volume of the circular cone are the same, then the height of the circular cone is

A. 3 cm.
B. 9 cm.
C. 18 cm.
D. 27 cm.

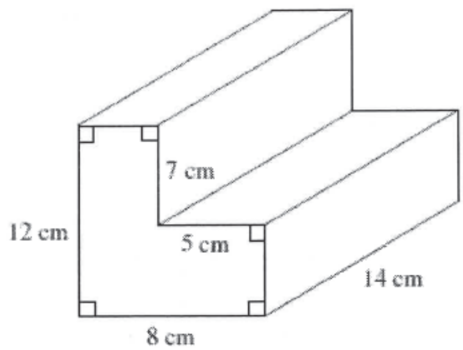
[2009-CE-MATHS 2-18]

56. The volume of a right circular cylinder of radius R is twice the volume of another right circular cylinder of radius r. If the heights of these two circular cylinders are the same, then $R : r =$

A. $2 : 1$.
B. $4 : 1$.
C. $\sqrt{2} : 1$.
D. $\sqrt{3} : 1$.

[2010-CE-MATHS 2-18]

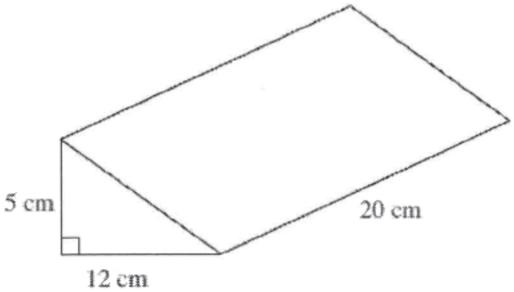
57. In the figure, the total surface area of the solid right prism is



A. 560 cm^2.
B. 621 cm^2.
C. 682 cm^2.
D. 854 cm^2.

[2010-CE-MATHS 2-19]

58. In the figure, the total surface area of the solid right triangular prism is



A. 120 cm^2.
B. 600 cm^2.
C. 660 cm^2.
D. 720 cm^2.

[2011-CE-MATHS 2-17]

59. If the volume of a solid hemisphere of radius r is equal to the volume of a solid right circular cylinder of height h and base radius r, then $r : h =$

A. $2 : 3$.
B. $3 : 2$.
C. $3 : 4$.
D. $4 : 3$.

[2011-CE-MATHS 2-18]

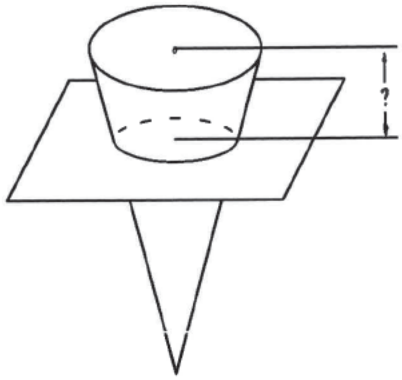
Mensuration of Similar Solids

60. V_1 = the volume of a sphere of radius $2a$.
V_2 = the volume of a sphere of radius $3a$.
Then $V_1 : V_2 =$

A. $2 : 3$.
B. $4 : 9$.
C. $8 : 27$.
D. $4\pi : 9\pi$.
E. $\sqrt[3]{2} : \sqrt[3]{3}$.

[SP-CE-MATHS 2-34]

61. A circular hole of diameter 8 cm is drilled in a thin plate for holding a right circular cone. (See figure.) The base of the cone is parallel to the plate. If the base diameter of the cone is 10 cm and the height of the cone is 20 cm, what is the distance between the base of the cone and the plate?



A. 2 cm
B. 4 cm
C. 6 cm
D. 8 cm
E. 10 cm

[1979-CE-MATHS 2-45]

62. A, B, C are three spheres.

If $\dfrac{\text{Surface area of } A}{\text{Surface area of } B} = 4$ and

$\dfrac{\text{Volume of } B}{\text{Volume of } C} = 2$,

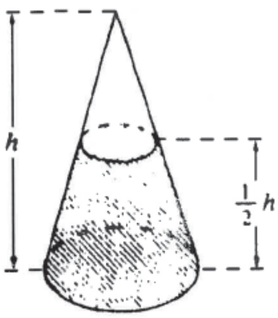
then $\dfrac{\text{Volume of } A}{\text{Volume of } C} =$

A. 16.
B. 8.
C. 2.
D. $\frac{1}{8}$.
E. $\frac{1}{16}$.

[1980-CE-MATHS 2-30]

63. The height of the cone in the figure is h. It contains water to a depth of $\frac{1}{2}h$.
$\dfrac{\text{Volume of water}}{\text{Capacity of the cone}} =$

A. $\frac{1}{8}$.
B. $\frac{1}{4}$.
C. $\frac{1}{2}$.
D. $\frac{3}{4}$.
E. $\frac{7}{8}$.



[1981-CE-MATHS 2-41]

64. The external and internal radii of a hollow metal sphere are 4 cm and 3 cm respectively. $\dfrac{\text{Volume of metal}}{\text{Volume of the enclosed empty space}} =$

A. $\dfrac{1}{27}$.

B. $\dfrac{1}{3}$.

C. $\dfrac{4}{3}$.

D. $\dfrac{37}{27}$.

E. $\dfrac{64}{27}$.

[1984-CE-MATHS 2-41]

65. A solid metal sphere of volume 252 cm^3 is melted and recast into 3 smaller solid spheres whose radii are in the ratio 1 : 2 : 3. The volume of the smaller sphere is

A. 5 cm^3.

B. 7 cm^3.

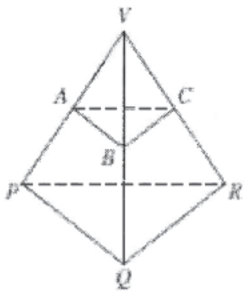
C. 14 cm^3.

D. 18 cm^3.

E. 28 cm^3.

[1984-CE-MATHS 2-42]

66. In the figure, the volumes of the pyramids *VABC* and *VPQR* are 27 cm^3 and 64 cm^3 respectively. Planes *ABC* and *PQR* are parallel. Area of ΔABC : Area of ΔPQR =



A. $\sqrt{27} : \sqrt{64}$.

B. $\sqrt{37} : \sqrt{64}$.

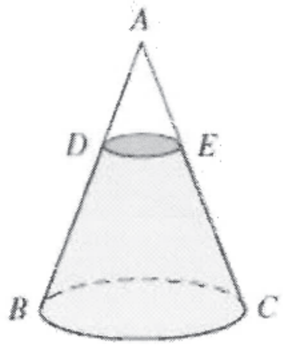
C. 3 : 4.

D. 9 : 16.

E. 27 : 64.

[1985-CE-MATHS 2-44]

67. A right conical vessel placed on horizontal ground contains some water as shown in the figure. If $AD : DB = 2 : 3$, then $\dfrac{\text{volume of empty space}}{\text{volume of water}} =$



A. $\dfrac{4}{9}$.

B. $\dfrac{8}{19}$.

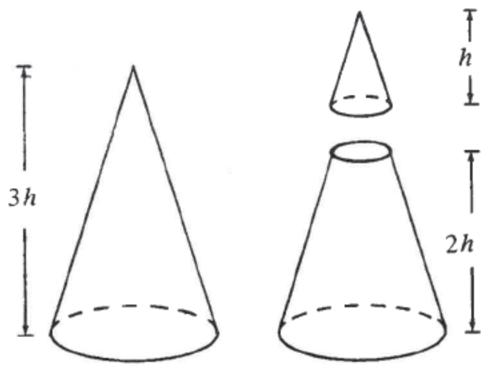
C. $\dfrac{8}{27}$.

D. $\dfrac{8}{117}$.

E. $\dfrac{8}{125}$.

[1989-CE-MATHS 2-12]

68.



In the figure, a cone of height $3h$ is cut by a plane parallel to its base into a smaller cone of height h and a frustum. Find the ratio of the volume of the smaller cone to the volume of the frustum.

A. 1 : 27

B. 1 : 26

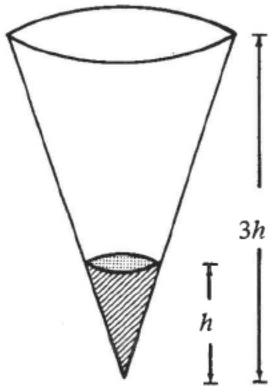
C. 1 : 9

D. 1 : 8

E. 1 : 7

[1992-CE-MATHS 2-17]

69. In the figure, the paper cup in the form of a circular cone contains 10 ml of water. How many ml of water must be added to fill up the paper cup?



A. 20

B. 80

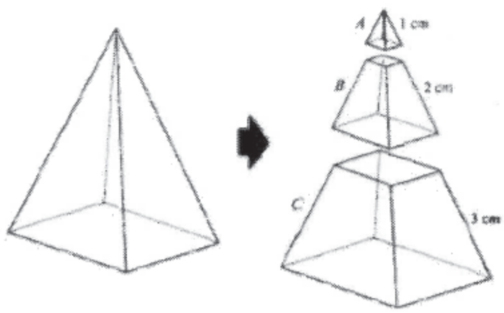
C. 90

D. 260

E. 270

[1994-CE-MATHS 2-13]

70. In the figure, a right pyramid with a square base is divided into three parts A, B and C by two planes parallel to the base such that the lengths of their slant edges are 1 cm, 2 cm and 3 cm respectively.



Find volume of A : volume of B : volume of C.

A. 1 : 2 : 3

B. 1 : 4 : 9

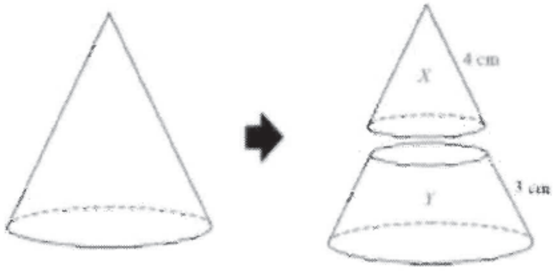
C. 1 : 8 : 27

D. 1 : 26 : 189

E. 1 : 27 : 216

[1998-CE-MATHS 2-42]

71. In the figure, a right circular cone is divided into two parts X and Y by a plane parallel to the base such that the lengths of their slant edges are 4 cm and 3 cm respectively. Find the ratio of the curved surface areas of X and Y.



A. 16 : 9

B. 16 : 33

C. 16 : 49

D. 64 : 27

E. 64 : 279

[1999-CE-MATHS 2-37]

72. It is given that A, B and C are solid spheres. If the volume of B : the volume of C = 1 : 8 and the surface area of A : the surface area of B = 9 : 4, then the radius of A : the radius of C =

A. 3 : 4 .

B. 3 : 16 .

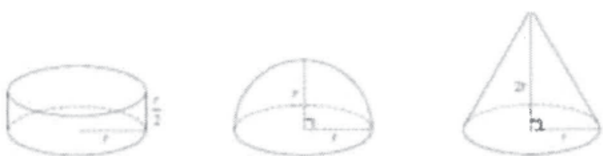
C. 9 : 8 .

D. 9 : 32 .

[2009-CE-MATHS 2-19]

HKDSE Problems

73. The figure shows a right circular cylinder, a hemisphere and a right circular cone with equal base radii. Their curved surface areas are a cm^2, b cm^2 and c cm^2 respectively.



Which of the following is true?

A. $a < b < c$

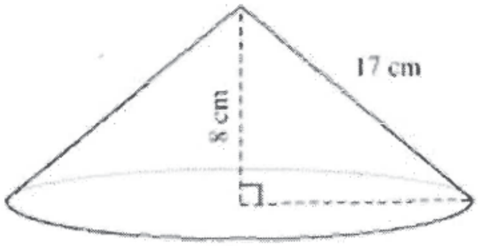
B. $a < c < b$

C. $c < a < b$

D. $c < b < a$

[SP-DSE-MATHS 2-17]

74. The figure shows a right circular cone of height 8 cm and slant height 17 cm. Find the volume of the circular cone.



A. 255π cm^3

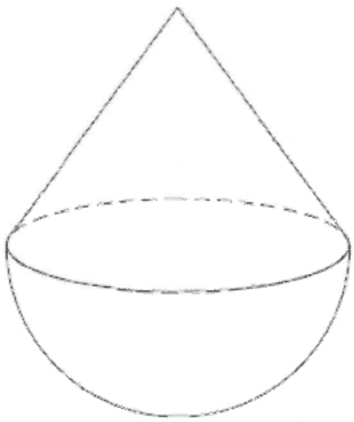
B. 345π cm^3

C. 480π cm^3

D. 600π cm^3

[PP-DSE-MATHS 2-16]

75. In the figure, the solid consists of a right circular cone and a hemisphere with a common base. The base radius and the height of the circular cone are 3 cm and 4 cm respectively. Find the total surface area of the solid.



A. 30π cm^2

B. 33π cm^2

C. 48π cm^2

D. 51π cm^2

[2013-DSE-MATHS 2-17]

76. If the height of a regular tetrahedron is 2 cm, then the volume of the tetrahedron is

A. 2 cm^3 .

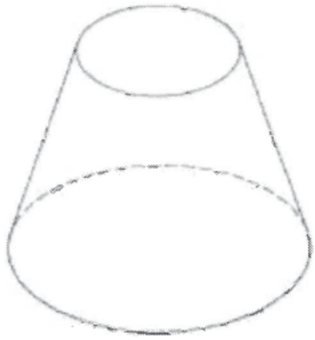
B. $\sqrt{3}$ cm^3 .

C. $\sqrt{6}$ cm^3 .

D. $3\sqrt{3}$ cm^3 .

[2013-DSE-MATHS 2-40]

77. The height and the base radius of a right circular cone are 12 cm and 9 cm respectively. The figure shows a frustum which is made by cutting off the upper part of the circular cone. The height of the frustum is 8 cm. Find the volume of the frustum.



A. 210π cm^3

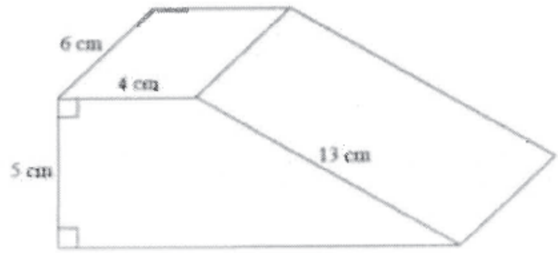
B. 312π cm^3

C. 324π cm^3

D. 936π cm^3

[2015-DSE-MATHS 2-16]

78. The figure shows a right prism. Find the volume of the prism.



A. 216 cm^3 .

B. 240 cm^3 .

C. 300 cm^3 .

D. 328 cm^3 .

[2016-DSE-MATHS 2-18]

79. The base radius of a right circular cone is 2 times the base radius of a right circular cylinder while the height of the circular cylinder is 3 times the height of the circular cone. If the volume of the circular cone is 36π cm^3, then the volume of the circular cylinder is

A. 27π cm^3 .

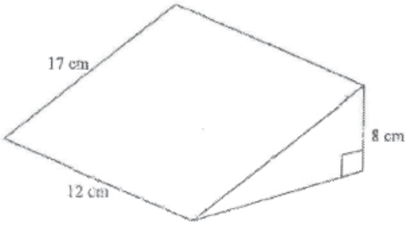
B. 48π cm^3 .

C. 81π cm^3 .

D. 144π cm^3 .

[2017-DSE-MATHS 2-15]

80. In the figure, the volume of the solid right triangular prism is



A. 544 cm^3
B. 600 cm^3
C. 660 cm^3
D. 720 cm^3

[2018-DSE-MATHS 2-15]

81. The base of a solid right pyramid is a square of side 18 cm. If the height of the pyramid is 12 cm, then the total surface area of the pyramid is

A. 432 cm^2
B. 540 cm^2
C. 756 cm^2
D. 864 cm^2

[2019-DSE-MATHS 2-15]

82. If the volume of a right circular cylinder of base radius $5a$ cm and height $7b$ cm is 525 cm^3, then the volume of a right circular cone of base radius $7a$ cm and height $5b$ cm is

A. 175 cm^3
B. 245 cm^3
C. 490 cm^3
D. 735 cm^3

[2020-DSE-MATHS 2-16]

Percentage Change in Mensuration

1. If the height and the base diameter of a cone are doubled, the new volume of the cone will be

   A. 2 times the original volume.
   B. 2π times the original volume.
   C. 4 times the original volume.
   D. 4π times the original volume.
   E. 8 times the original volume.

   [SP-CE-MATHS 2-35]

2. If the length of a rectangle is increased by 10% and the width decreased by 10%, which of the following is true?

   A. Its area remains the same.
   B. Its area is decreased by 1%.
   C. Its area is increased by 1%.
   D. Its area is decreased by 10%.
   E. Its area is increased by 10%.

   [1980-CE-MATHS 2-13]

3. If the surface area of a spherical soap bubble increases by 44%, its volume increases by

   A. 20% .
   B. 33.1% .
   C. 60% .
   D. 66% .
   E. 72.8% .

   [1981-CE-MATHS 2-15]

4. Some air escapes from a spherical balloon of volume a^3. The balloon keeps its spherical shape and is now of volume b^3. What is the percentage decrease in the radius?

   A. $\frac{a-b}{a} \times 100\%$
   B. $\frac{a-b}{b} \times 100\%$
   C. $\sqrt[3]{\frac{a^3-b^3}{a^3}} \times 100\%$
   D. $\sqrt[3]{\frac{a^3-b^3}{b^3}} \times 100\%$
   E. $\frac{a^3-b^3}{a^3} \times 100\%$

   [1982-CE-MATHS 2-15]

5. A solid sphere is cut into two hemispheres. The percentage increase in the total surface area is

   A. 25% .
   B. $33\frac{1}{3}\%$.
   C. 50% .
   D. 75% .
   E. 100% .

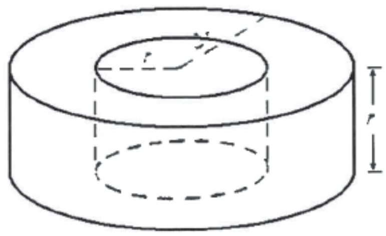
   [1983-CE-MATHS 2-45]

6. The length and the width of a cuboid are each increased by 10% and the height remains unchanged. The percentage increased in volume is

   A. 10% .
   B. 20% .
   C. 21% .
   D. 24% .
   E. 33% .

   [1985-CE-MATHS 2-42]

7. A cylindrical hole of radius r is drilled through a solid cylinder, base radius $2r$ and height r, as shown in the figure. The percentage increase in the total surface area is

   A. 0% .
   B. $16\frac{2}{3}\%$.
   C. 20% .
   D. 25% .
   E. $33\frac{1}{3}\%$.

   [1988-CE-MATHS 2-45]

8. A blanket loses 10% of its length and 8% of its width after washing. The percentage loss in area is

   A. 18.8% .
   B. 18% .
   C. 17.2% .
   D. 9% .
   E. 8% .

   [1991-CE-MATHS 2-11]

9. The length of a rectangle is decreased by 20%. If the area remains unchanged, find the percentage increase of its width.

A. $1\frac{1}{4}\%$
B. $12\frac{1}{2}\%$
C. $16\frac{2}{3}\%$
D. 20%
E. 25%

[1996-CE-MATHS 2-43]

10. The length of a rectangle is decreased by 20% but its breadth is increased by $k\%$. If the area of the rectangle remains unchanged, find the value of k.

A. 20
B. 25
C. 75
D. 80

[2011-CE-MATHS 2-11]

HKDSE Problems

11. If the length and the width of a rectangle are increased by 20% and $x\%$ respectively so that its area is increased by 50%, then $x =$

A. 20 .
B. 25 .
C. 30 .
D. 35 .

[SP-DSE-MATHS 2-12]

12. If the circumference of a circle is increased by 40%, then the area of the circle is increased by

A. 18% .
B. 20% .
C. 40% .
D. 96% .

[PP-DSE-MATHS 2-11]

13. If the angle and the radius of a sector are decreased by $x\%$ and 50% respectively so that its area is decreased by 90%, then $x =$

A. 20 .
B. 40 .
C. 60 .
D. 80 .

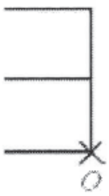
[2014-DSE-MATHS 2-10]

Rotation of Figures

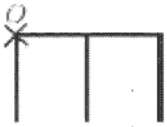
1.

If the plane figure above is rotated anticlockwise about the point O through 90°, which of the following is its image?

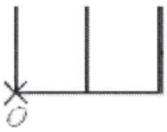
A.



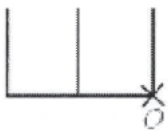
B.



C.

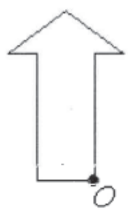


D.



[2006-CE-MATHS 2-25]

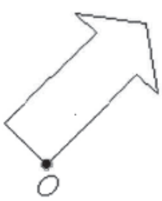
2.



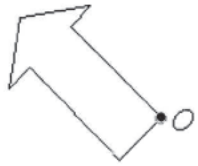
If the plane figure above is rotated anticlockwise about the point O through 135°, which of the following is its image?

A.

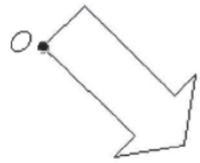
B.



C.



D.

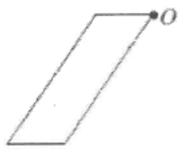


[2008-CE-MATHS 2-25]

3.

If the plane figure above is rotated anticlockwise about the point O through 270°, which of the following is its image?

A.



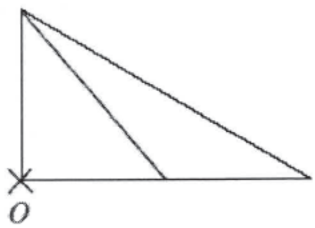
B.

C.

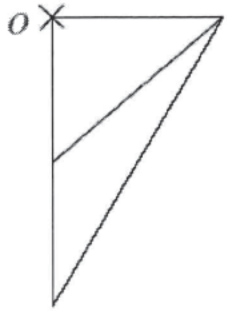
D.

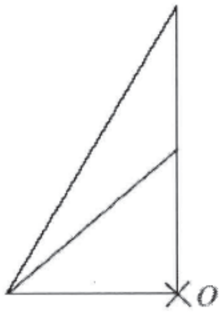
[2010-CE-MATHS 2-24]

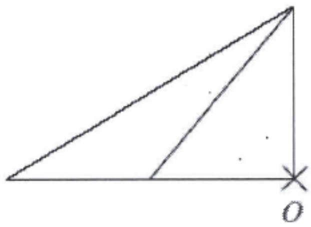
4.

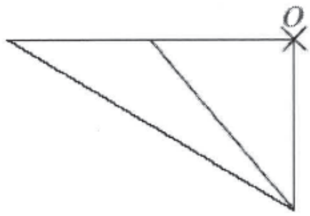


If the plane figure above is rotated anticlockwise about the point O through 270°, which of the following is its image?

A. 

B. 

C. 

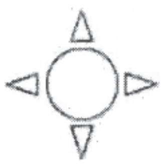
D. 

[2011-CE-MATHS 2-25]

Rotational Symmetry

5. Which of the following plane figures have rotational symmetry?

(1) 

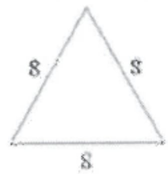
(2) 

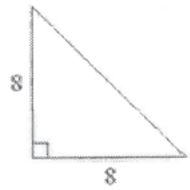
(3) 

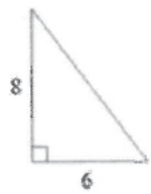
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

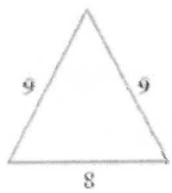
[2007-CE-MATHS 2-25]

6. Which of the following triangles have reflectional symmetry but do not have rotational symmetry?

(1) 

(2) 

(3) 

(4) 

A. (1) and (3) only
B. (1) and (4) only
C. (2) and (3) only
D. (2) and (4) only

[2008-CE-MATHS 2-26]

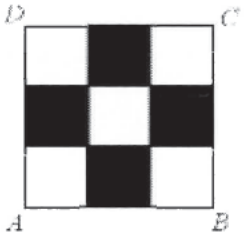
7. In the figure, the regular hexagon is divided into six equilateral triangles and two of them are shaded. The number of folds of rotational symmetry of the hexagon is

A. 2.
B. 3.
C. 4.
D. 6.

[2009-CE-MATHS 2-29]

Reflectional Symmetry

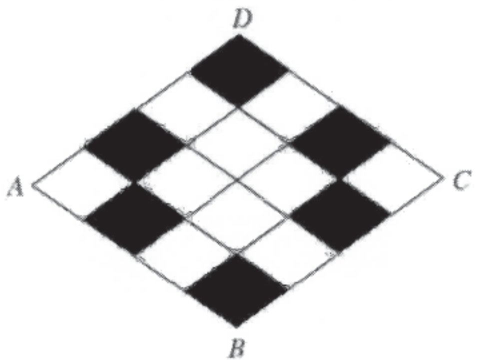
8. In the figure, the square *ABCD* is divided into nine identical squares and four of them are shaded. The number of axes of reflectional symmetry of the square *ABCD* is



A. 2.
B. 4.
C. 5.
D. 8.

[2007-CE-MATHS 2-26]

9. In the figure, the rhombus *ABCD* is divided into sixteen identical rhombuses and six of them are shaded. The number of axes of reflectional symmetry of the rhombus *ABCD* is



A. 2.
B. 3.
C. 4.
D. 6.

[2011-CE-MATHS 2-26]

Miscellaneous

10. Which of the following statements about a cube must be true?

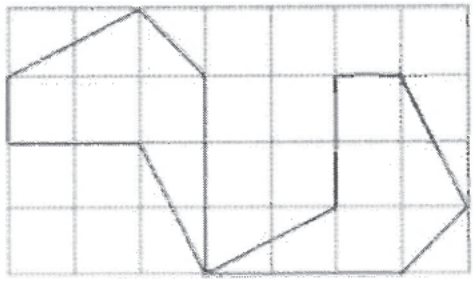
(1) The number of planes of reflection is 9.
(2) All the axes of rotational symmetry intersect at the same point.
(3) The angle between any two intersecting axes of rotational symmetry is 90°.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2010-CE-MATHS 2-23]

HKDSE Problems

11. In the figure, the two 6-sided polygons show

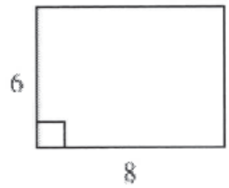


A. a rotation transformation.
B. a reflection transformation.
C. a translation transformation.
D. a dilation transformation.

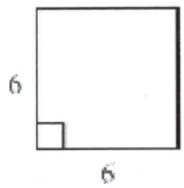
[SP-DSE-MATHS 2-25]

12. Which of the following parallelograms have rotational symmetry and reflectional symmetry?

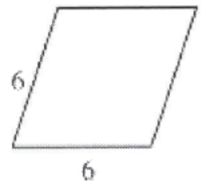
(1)



(2)



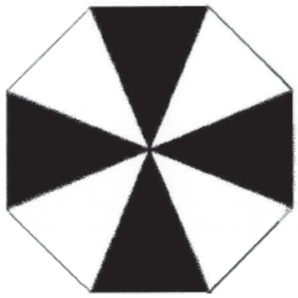
(3)



A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[PP-DSE-MATHS 2-24]

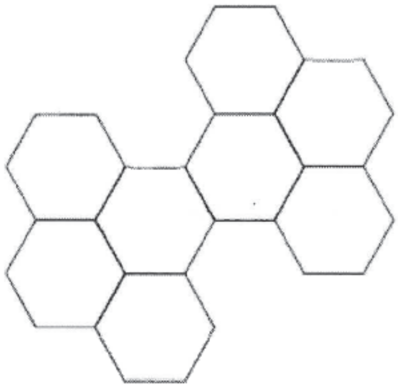
13. In the figure, the regular octagon is divided into eight identical isosceles triangles and four of them are shaded. The number of axes of reflectional symmetry of the octagon is



A. 2.
B. 4.
C. 8.
D. 16.

[2013-DSE-MATHS 2-15]

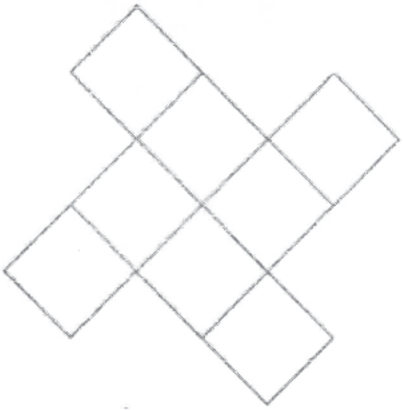
14. The figure below consists of eight identical regular hexagons. The number of axes of reflectional symmetry of the figure is



A. 2.
B. 4.
C. 6.
D. 8.

[2016-DSE-MATHS 2-23]

15. The figure below consists of eight identical squares. The number of folds of rotational symmetry of the figure is

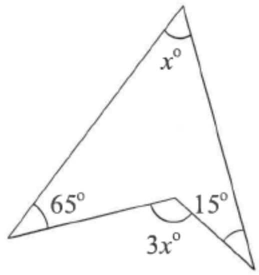


A. 2
B. 4
C. 6
D. 8

[2018-DSE-MATHS 2-23]

Angles in Plane Figures

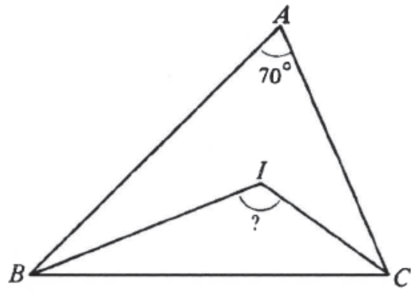
1. In the figure, $x =$



A. 50 .
B. 45 .
C. 40 .
D. 35 .
E. 20 .

[1977-CE-MATHS 2-28]

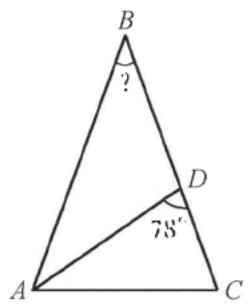
2. In ΔABC, IB and IC are bisectors of $\angle B$ and $\angle C$ respectively. $\angle A = 70°$. $\angle BIC =$



A. 100° .
B. 110° .
C. 120° .
D. 125° .
E. 135° .

[SP-CE-MATHS 2-21]

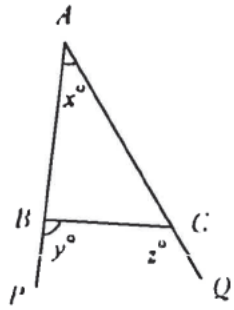
3. In ΔABC, $AB = BC$ and AD bisects $\angle BAC$. $\angle ABC =$



A. 51° .
B. 48° .
C. 46° .
D. 44° .
E. 39° .

[1978-CE-MATHS 2-19]

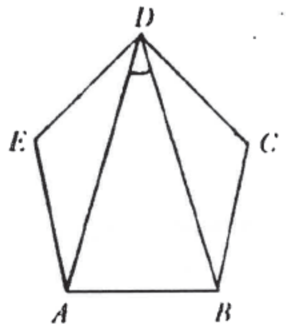
4. In ΔABC, AB and AC are produced as shown. Express x in terms of y and z.



A. $x = \dfrac{y+z}{2}$
B. $x = \dfrac{y+z}{2} - 90$
C. $x = y + z - 180$
D. $x = 180 - y - z$
E. $x = 360 - y - z$

[1979-CE-MATHS 2-8]

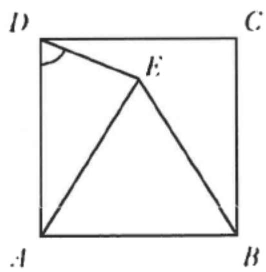
5. In the figure, $ABCDE$ is a regular pentagon. $\angle ADB =$



A. 35° .
B. 36° .
C. 40° .
D. 54° .
E. 72° .

[1980-CE-MATHS 2-21]

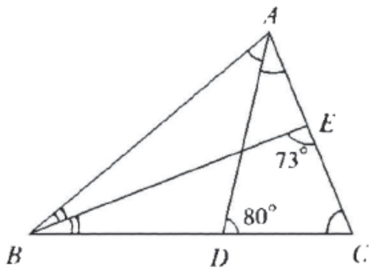
6. In the figure, $ABCD$ is a square and ABE is an equilateral triangle. $\angle ADE = ?$



A. 72°
B. 74°
C. 76°
D. 78°
E. None of the above

[1980-CE-MATHS 2-23]

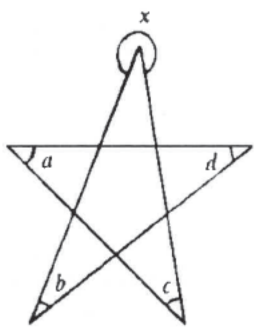
7. In the figure, AD and BE bisect $\angle A$ and $\angle B$ respectively. $\angle C =$



A. $50°$.
B. $68°$.
C. $74°$.
D. $78°$.
E. $80°$.

[1980-CE-MATHS 2-44]

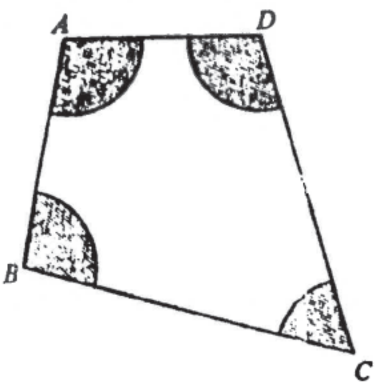
8. With the notation in the figure, express $a + b + c + d$ in terms of x.



A. $x - 180°$
B. x
C. $540° - x$
D. $360° - x$
E. $180° - x$

[1980-CE-MATHS 2-53]

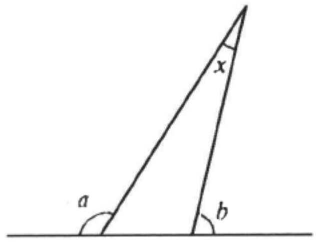
9. In the figure, $ABCD$ is a quadrilateral. The shaded portions are four sectors with centres at A, B, C and D. Their radii are all equal to a. What is the total area of the four sectors?



A. πa^2
B. $2\pi a^2$
C. $4\pi a^2$
D. $\sqrt{2}\pi a^2$
E. It cannot be determined

[1981-CE-MATHS 2-28]

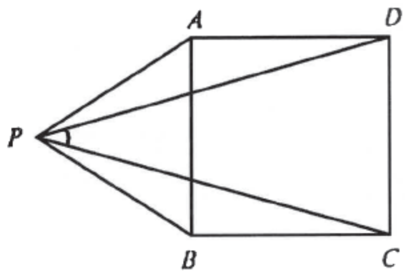
10. In the figure, $x =$



A. $a - b$.
B. $a + b - 180°$.
C. $a + b - 90°$.
D. $180° - a + b$.
E. $360° - a - b$.

[1982-CE-MATHS 2-24]

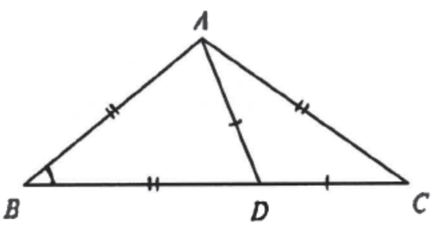
11. In the figure, $ABCD$ is a square and PAB is an equilateral triangle. $\angle CPD =$



A. $20°$.
B. $25°$.
C. $30°$.
D. $32°$.
E. $36°$.

[1982-CE-MATHS 2-25]

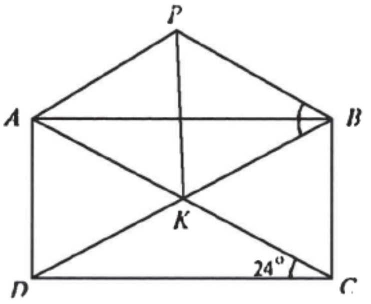
12. In the figure, D is a point on BC such that $AD = CD$ and $AB = AC = BD$. $\angle B =$



A. $22\frac{1}{2}°$.
B. $30°$.
C. $36°$.
D. $45°$.
E. $60°$.

[1982-CE-MATHS 2-26]

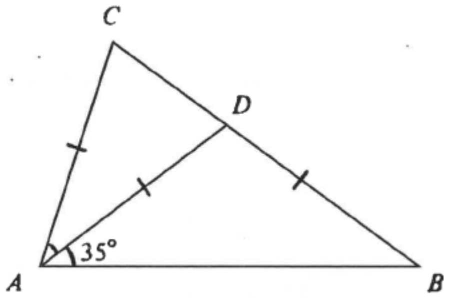
13. In the figure, $ABCD$ is a rectangle. AC and BC intersect at K. PAK is an equilateral triangle. $\angle PBK =$



A. 48°.
B. 50°.
C. 52°.
D. 54°.
E. 60°.

[1982-CE-MATHS 2-51]

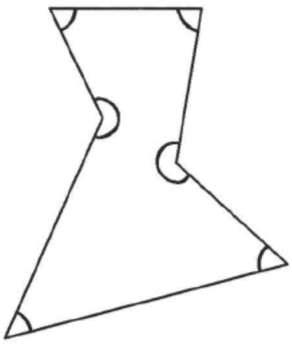
14. In the figure, D is a point on BC and $AC = AD = BD$. $\angle CAD =$



A. 20°.
B. 25°.
C. 30°.
D. 35°.
E. 40°.

[1983-CE-MATHS 2-22]

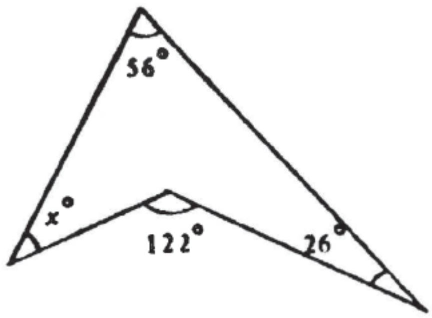
15. The sum of the six marked angles in the figure is



A. 360°.
B. 540°.
C. 600°.
D. 720°.
E. 900°.

[1983-CE-MATHS 2-23]

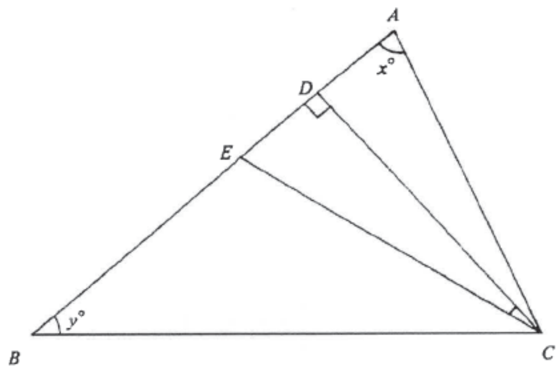
16. In the figure, $x = ?$



A. 31.
B. 34.
C. 40.
D. 48.
E. It cannot be determined.

[1984-CE-MATHS 2-23]

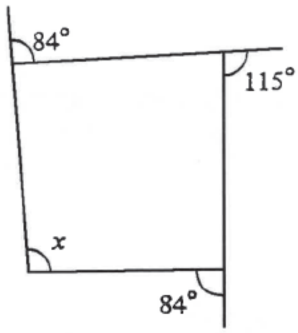
17. In the figure, A, D, E and B lie on a straight line. CE bisects $\angle ACB$ and $CD \perp AB$. $\angle DCE =$



A. $\frac{1}{2}(x° - y°)$.
B. $\frac{1}{2}(x° + y°)$.
C. $x° - y°$.
D. $90° - \frac{1}{2}(x° + y°)$.
E. $90° - (x° - y°)$.

[1985-CE-MATHS 2-24]

18. In the figure, $x =$

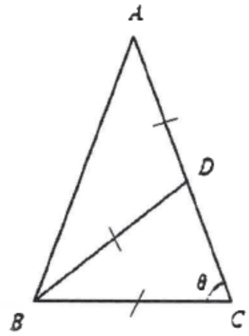


A. 77°.
B. 84°.
C. 96°.

D. 103°.
E. 115°.

[1986-CE-MATHS 2-23]

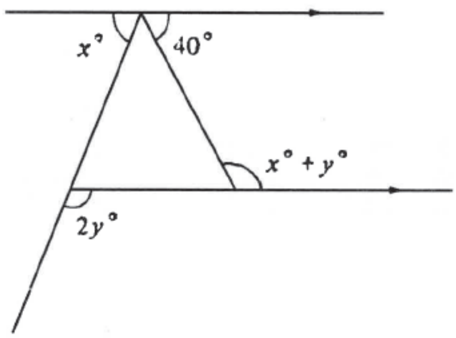
19. In the figure, if $AB = AC$ and $AD = BD = BC$, then $\angle ACB =$



A. 30°.
B. 32°.
C. 36°.
D. 40°.
E. 72°.

[1988-CE-MATHS 2-54]

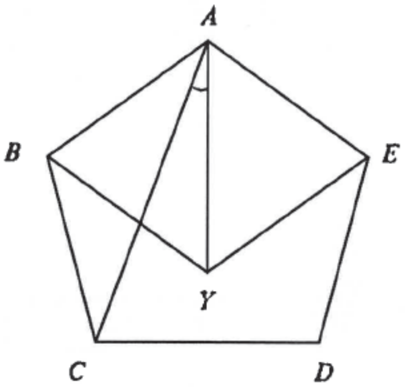
20. Referring to the figure, find y.



A. 20
B. 30
C. 40
D. 50
E. 80

[1989-CE-MATHS 2-20]

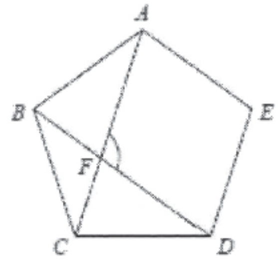
21. In the figure, $ABCDE$ is a regular pentagon and $ABYE$ is a rhombus. Find $\angle CAY$.



A. 27°
B. 24°
C. 21°
D. 18°
E. 15°

[1989-CE-MATHS 2-21]

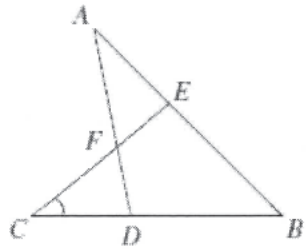
22. In the figure, $ABCDE$ is a regular pentagon. Find $\angle AFD$.



A. 120°
B. 112°
C. 110°
D. 108°
E. 100°

[1990-CE-MATHS 2-23]

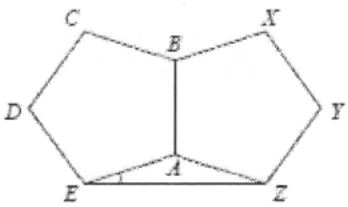
23. In the figure, if $CD = CF$, $CE = BE$ and $DA = DB$, then $\angle C =$



A. 30°
B. 36°
C. 40°
D. 45°
E. 60°

[1990-CE-MATHS 2-52]

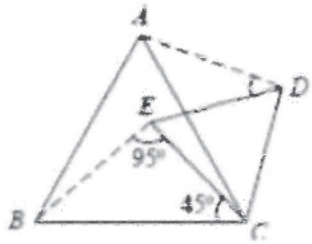
24. In the figure, $ABCDE$ and $ABXYZ$ are two identical regular pentagons. Find $\angle AEZ$.



A. 15°
B. 18°
C. 24°
D. 30°
E. 36°

[1991-CE-MATHS 2-23]

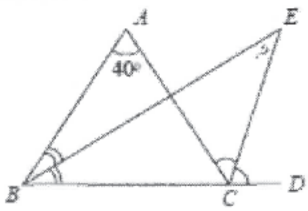
25. In the figure, ABC and CDE are equilateral triangles. Find $\angle ADE$.



A. 15°
B. 35°
C. 40°
D. 45°
E. 50°

[1991-CE-MATHS 2-51]

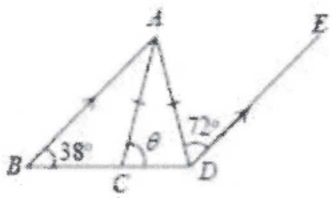
26. In the figure, EB and EC are the angle bisectors of $\angle ABC$ and $\angle ACD$ respectively. If $\angle A = 40°$, find $\angle E$.



A. 20°
B. 25°
C. 30°
D. 35°
E. 40°

[1992-CE-MATHS 2-51]

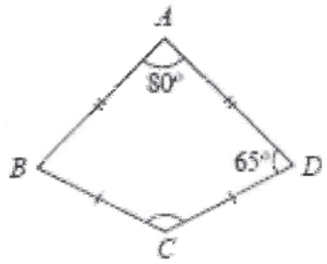
27. In the figure, $BA \parallel DE$ and $AC = AD$. Find θ.



A. 34°
B. 54°
C. 70°
D. 72°
E. 76°

[1993-CE-MATHS 2-25]

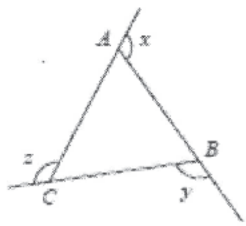
28. In the figure, $AB = AD$ and $BC = CD$. If $\angle BAD = 80°$ and $\angle ADC = 65°$, then $\angle BCD =$



A. 100° .
B. 130° .
C. 145° .
D. 150° .
E. 160° .

[1994-CE-MATHS 2-24]

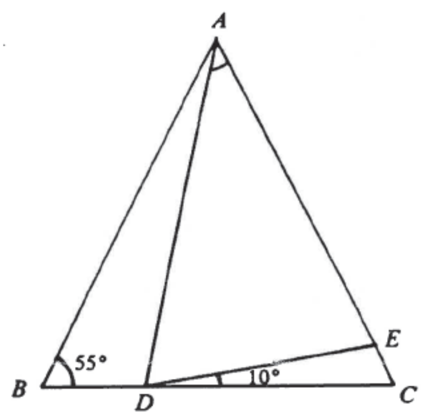
29. In the figure, x, y and z are the exterior angles of ΔABC. If $x : y : z = 4 : 5 : 6$, then $\angle BAC =$



A. 48° .
B. 84° .
C. 96° .
D. 120° .
E. 132° .

[1994-CE-MATHS 2-25]

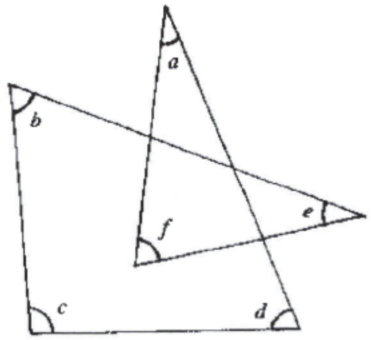
30. In the figure, $AB = AC$ and $AD = AE$. $\angle DAC =$



A. 45° .
B. 50° .
C. 55° .
D. 60° .
E. 65° .

[1995-CE-MATHS 2-25]

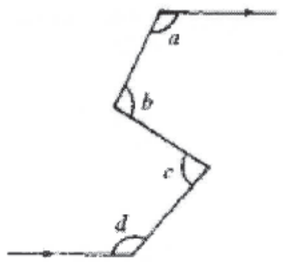
31. In the figure, $a + b + c + d + e + f =$



A. $270°$.
B. $360°$.
C. $450°$.
D. $540°$.
E. $720°$.

[1995-CE-MATHS 2-53]

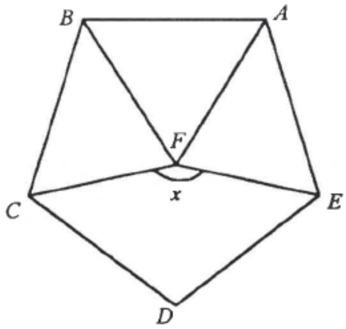
32. According to the figure, which of the following must be true?



A. $a + b = c + d$
B. $a + d = b + c$
C. $a + b + c + d = 360°$
D. $a + b + c + d = 540°$
E. $2a + 2b - c - d = 720°$.

[1995-CE-MATHS 2-54]

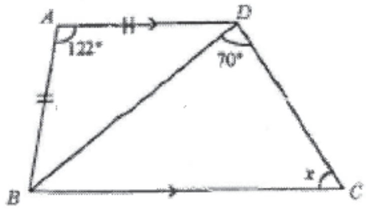
33. In the figure, $ABCDE$ is a regular pentagon and ABF is an equilateral triangle. Find x.



A. $120°$
B. $126°$
C. $144°$
D. $156°$
E. $168°$

[1996-CE-MATHS 2-28]

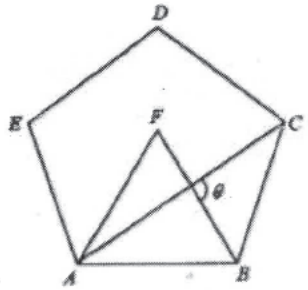
34. In the figure, find x.



A. $52°$
B. $58°$
C. $61°$
D. $70°$
E. $81°$

[1997-CE-MATHS 2-17]

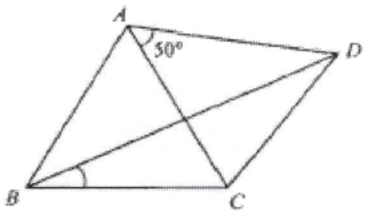
35. In the figure, $ABCDE$ is a regular pentagon and ABF is an equilateral triangle. Find θ.



A. $66°$
B. $84°$
C. $90°$
D. $96°$
E. $108°$

[1997-CE-MATHS 2-19]

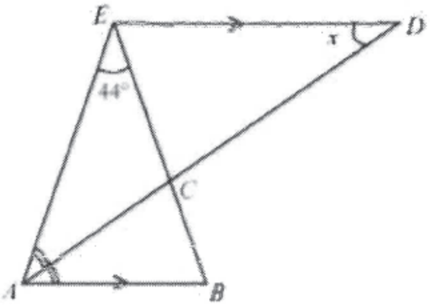
36. In the figure, $AB = BC = CA = CD$. Find $\angle CBD$.



A. $20°$
B. $25°$
C. $27.5°$
D. $30°$
E. $35°$

[1998-CE-MATHS 2-30]

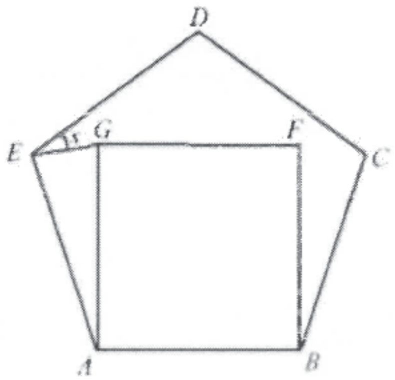
37. In the figure, ACD and ECB are straight lines. If $\angle EAC = \angle CAB$ and $EA = EB$, find x.



A. 22°
B. 34°
C. 44°
D. 46°
E. 68°

[1999-CE-MATHS 2-28]

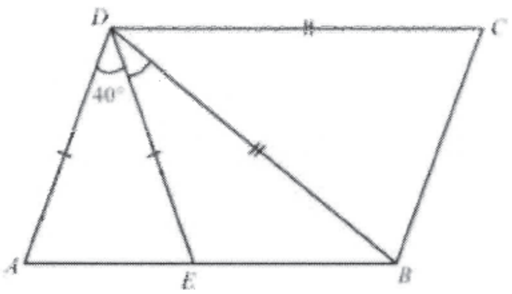
38. In the figure, $ABCDE$ is a regular pentagon and $ABFG$ is a square. Find x.



A. 18°
B. 27°
C. 30°
D. 36°
E. 45°

[1999-CE-MATHS 2-29]

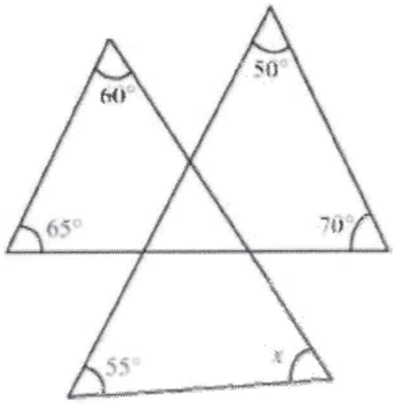
39. In the figure, $ABCD$ is a parallelogram. Find $\angle BDE$.



A. 30°
B. 35°
C. 40°
D. 50°
E. 55°

[2000-CE-MATHS 2-19]

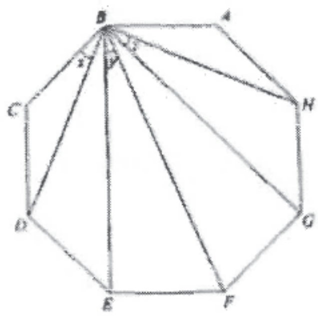
40. In the figure, x =



A. 50°.
B. 55°.
C. 60°.
D. 65°.
E. 70°.

[2001-CE-MATHS 2-20]

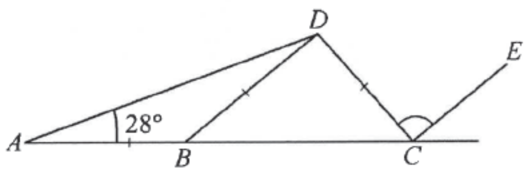
41. In the figure, $ABCDEFGH$ is a regular octagon. $x + y + z =$



A. 60°.
B. 67.5°.
C. 82.5°.
D. 90°.

[2002-CE-MATHS 2-27]

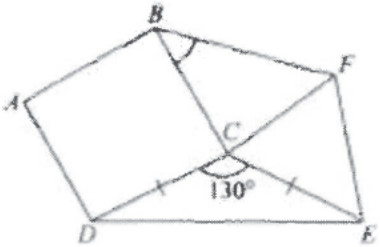
42. In the figure, ABC is a straight line. If $BD \parallel CE$, then $\angle DCE =$



A. 56°.
B. 68°.
C. 112°.
D. 124°.

[2004-CE-MATHS 2-27]

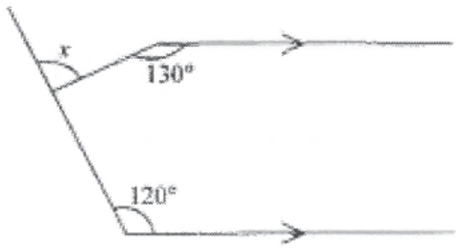
43. In the figure, $ABCD$ is a square. If CEF is an equilateral triangle, then $\angle CBF =$



A. 45°.
B. 50°.
C. 60°.
D. 80°.

[2005-CE-MATHS 2-27]

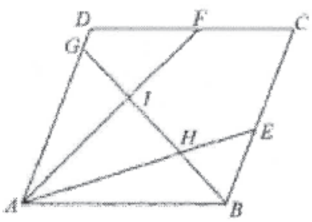
44. In the figure, $x =$



A. 50°.
B. 60°.
C. 70°.
D. 90°.

[2005-CE-MATHS 2-28]

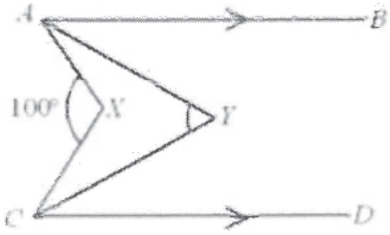
45. In the figure, $ABCD$ is a parallelogram. E, F and G are points lying on BC, CD and DA respectively. AE and AF divide $\angle BAD$ into three equal parts and BG bisects $\angle ABC$. If AE and AF intersect BG at H and I respectively, then $\angle GIF + \angle GHE =$



A. 120°.
B. 150°.
C. 180°.
D. 210°.

[2005-CE-MATHS 2-52]

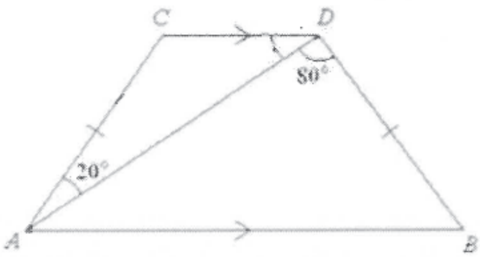
46. In the figure, AY and CY are the angle bisectors of $\angle BAX$ and $\angle DCX$ respectively. $\angle AXC = 100°$, then $\angle AYC =$



A. 40°.
B. 50°.
C. 60°.
D. 80°.

[2007-CE-MATHS 2-28]

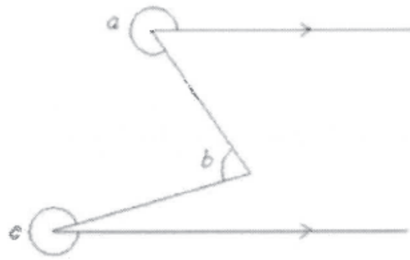
47. In the figure, $AB // CD$ and $AC = BD$. If $\angle CAD = 20°$ and $\angle ADB = 80°$, then $\angle ADC =$



A. 30°.
B. 40°.
C. 50°.
D. 60°.

[2008-CE-MATHS 2-27]

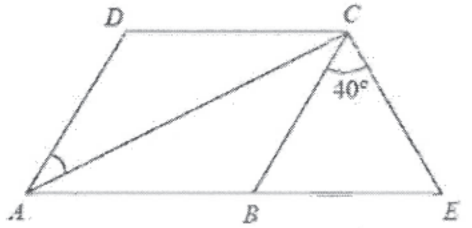
48. According to the figure, which of the following must be true?



A. $a + b = c$
B. $a + b = c + 90°$
C. $a + c = b + 540°$
D. $a + b + c = 720°$

[2008-CE-MATHS 2-28]

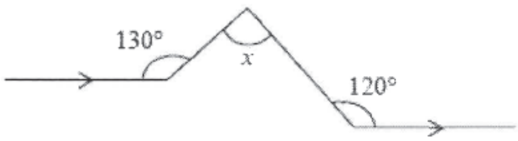
49. In the figure, $ABCD$ is a rhombus and ABE is a straight line. If $\angle BCE = 40°$ and $BC = CE$, then $\angle CAD =$



A. 35°.
B. 40°.
C. 45°.
D. 50°.

[2009-CE-MATHS 2-26]

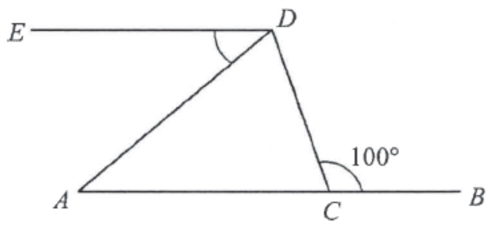
50. In the figure, $x =$



A. 50°.
B. 60°.
C. 70°.
D. 80°.

[2009-CE-MATHS 2-28]

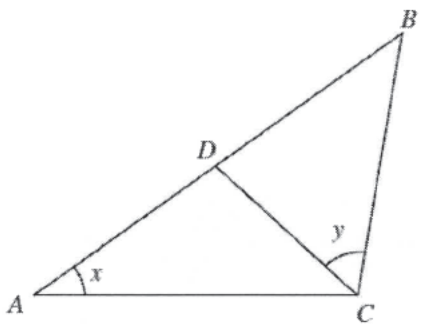
51. In the figure, C is a point lying on AB such that $AC = AD$. If $AB // ED$, find $\angle ADE$.



A. 20°
B. 30°
C. 40°
D. 50°

[2010-CE-MATHS 2-25]

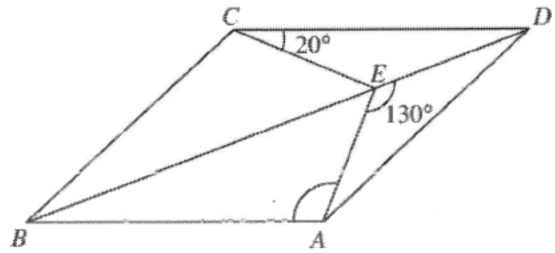
52. In the figure, D is a point lying on AB such that $AD = BD = CD$. Find $x + y$.



A. 75°
B. 90°
C. 95°
D. 105°

[2011-CE-MATHS 2-23]

53. In the figure, BED is a diagonal of the parallelogram $ABCD$. If $\angle DCE = 20°$, $\angle AED = 130°$ and $CE = DE$, then $\angle BAE =$



A. 100°
B. 105°
C. 110°
D. 115°

[2011-CE-MATHS 2-27]

Interior Angles of Polygons

54. The sum of the interior angles of a 10-sided polygon is

A. 10 right angles.
B. 12 right angles.
C. 16 right angles.
D. 20 right angles.
E. 24 right angles.

[1978-CE-MATHS 2-13]

55. The sum of the interior angles of a convex polygon is greater than the sum of the exterior angles by 360°. How many sides has the polygon?

A. 3
B. 4
C. 5
D. 6
E. 8

[1984-CE-MATHS 2-22]

56. The exterior angles of a pentagon are $x°$, $2x°$, $3x°$, $4x°$ and $5x°$. The smallest interior angle of the pentagon is

A. 120°.
B. 60°.
C. 48°.
D. 36°.
E. 24°.

[1985-CE-MATHS 2-23]

57. If the sum of the interior angles of a convex n-sided polygon is 4 times the sum of the exterior angles polygon, then $n =$

A. 4.
B. 6.
C. 8.
D. 10.

[2007-CE-MATHS 2-27]

58. If each interior angle of a regular n-sided polygon is 144°, then $n =$

A. 10.
B. 12.
C. 14.
D. 16.

[2009-CE-MATHS 2-27]

59. Each interior angle of a regular 24-sided polygon is

A. 144°.
B. 160°.
C. 165°.
D. 171°.

[2010-CE-MATHS 2-27]

60. If the sum of the exterior angles of a regular n-sided polygon is 3 times an interior angle of the polygon, then $n =$

A. 3.
B. 4.
C. 6.
D. 12.

[2011-CE-MATHS 2-28]

Properties of Quadrilaterals

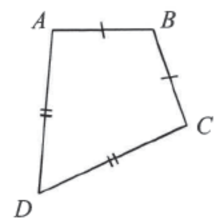
61. Which of the following are properties of a rhombus?

(1) All the four sides are equal in length.
(2) The diagonals are perpendicular to each other.
(3) The diagonals are equal in length.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1978-CE-MATHS 2-14]

62.



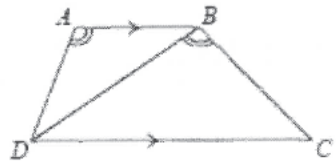
In the figure, $ABCD$ is a quadrilateral with $AB = BC$ and $AD = DC$. Which of the following is/are true?

(1) $\angle BAD = \angle BCD$
(2) $AC \perp BD$
(3) BD bisects AC

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1983-CE-MATHS 2-51]

63.



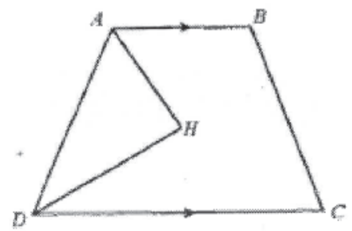
In the figure, $AB // DC$ and $\angle DAB = \angle DBC$. Which of the following is/are true?

(1) $\frac{AB}{BD} = \frac{BD}{DC}$
(2) $\frac{AB}{BD} = \frac{AD}{BC}$
(3) $\frac{AD}{BD} = \frac{BD}{CD}$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1994-CE-MATHS 2-53]

64.



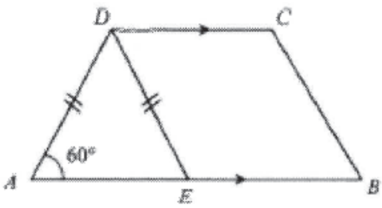
In the figure, $ABCD$ is a trapezium with $AB // DC$. AH bisects $\angle BAD$ and DH bisects $\angle ADC$. Which of the following must be true?

(1) $\angle AHD = 90°$
(2) $\angle ADC = \angle BCD$
(3) $\angle BAD + \angle BCD = 180°$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1996-CE-MATHS 2-51]

65.



In the figure, $ABCD$ is a trapezium. Which of the following must be true?

(1) AED is an equilateral triangle.
(2) $EBCD$ is a parallelogram.
(3) $AB = 2DC$.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-38]

Other Problems

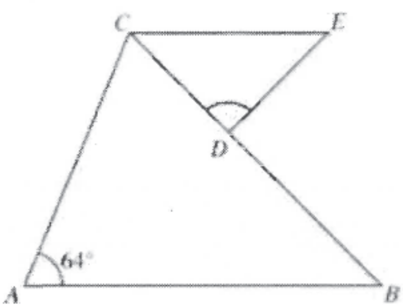
66. When the hour hand has turned through an angle of $x°$, what is the angle through which the minute hand has turned?

A. $6x°$
B. $12x°$
C. $60x°$
D. $360x°$
E. $3600x°$

[1980-CE-MATHS 2-10]

HKDSE Problems

67. In the figure, $AB = BC$ and D is a point lying on BC such that $CD = DE$. If $AB // CE$, find $\angle CDE$.



A. 52°
B. 58°
C. 64°
D. 76°

[PP-DSE-MATHS 2-19]

68. Which of the following statements about a regular 12-sided polygon are true?

(1) Each exterior angle is 30°.
(2) Each interior angle is 150°.
(3) The number of axes of reflectional symmetry is 6.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-22]

69. If an interior angle of a regular n-sided polygon is 4 times an exterior angle of the polygon, which of the following is/are true?

(1) The value of n is 10.
(2) The number of diagonals of the polygon is 10.
(3) The number of folds of rotational symmetry of the polygon is 10.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2013-DSE-MATHS 2-21]

70. If an interior angle of a regular n-sided polygon is greater than an exterior angle by 100°, which of the following are true?

(1) The value of n is 10.
(2) Each exterior angle of the polygon is 40°.
(3) The number of axes of reflectional symmetry of the polygon is 9.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2014-DSE-MATHS 2-22]

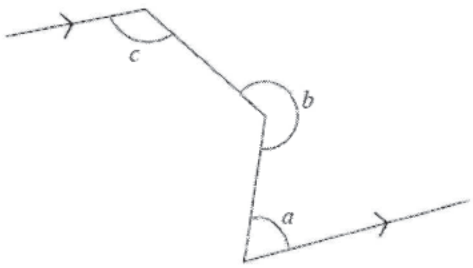
71. If an interior angle of a regular polygon is 5 times an exterior angle of the polygon, which of the following is/are true?

(1) Each interior angle of the polygon is 150°.
(2) The number of diagonals of the polygon is 6.
(3) The number of folds of rotational symmetry of the polygon is 6.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2015-DSE-MATHS 2-22]

72.



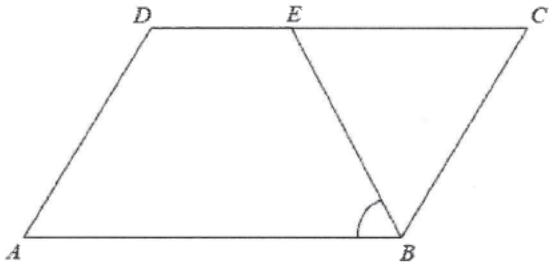
According to the figure, which of the following must be true?

(1) $a + c = 180°$
(2) $a + b - c = 180°$
(3) $b + c = 360°$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-15]

73. In the figure, $ABCD$ is a parallelogram. E is a point lying on CD such that $BE = CE$. If $\angle ADC = 114°$, then $\angle ABE =$



A. 48°
B. 57°
C. 62°
D. 66°

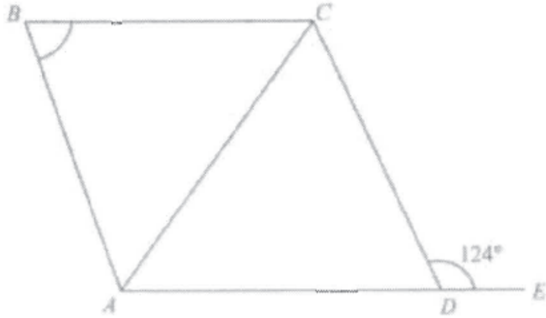
[2016-DSE-MATHS 2-17]

74. If the sum of the interior angles of a regular n-sided polygon is 3240°, which of the following is true?

A. The value of n is 16.
B. Each exterior angle of the polygon is 18°.
C. The number of diagonals of the polygon is 20.
D. Each interior angle of the polygon is 160°.

[2016-DSE-MATHS 2-24]

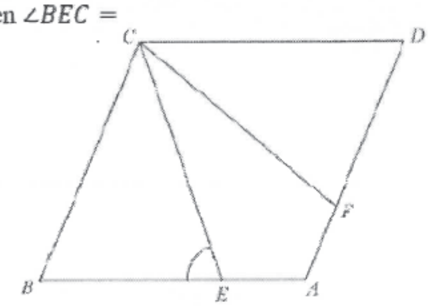
75. In the figure, $AB = BC$ and D is a point lying on AE such that $AC = AD$. If $AE \parallel BC$, then $\angle ABC =$



A. 44°
B. 56°
C. 62°
D. 68°

[2017-DSE-MATHS 2-18]

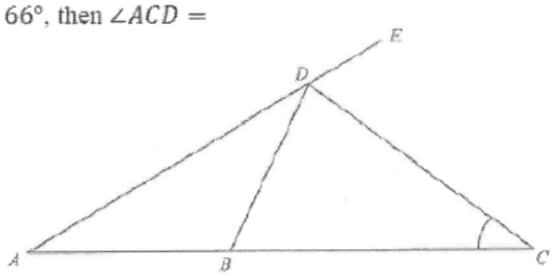
76. In the figure, $ABCD$ is a rhombus. E and F are points lying on AB and AD respectively such that $AE = AF$ and $\angle ECF = 42°$. If $\angle BAD = 110°$, then $\angle BEC =$



A. 70°
B. 76°
C. 80°
D. 84°

[2018-DSE-MATHS 2-18]

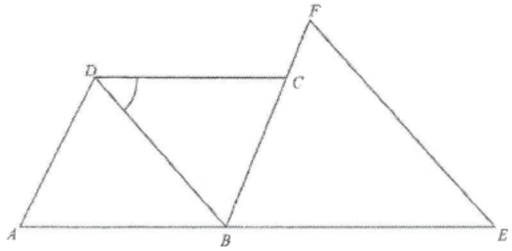
77. In the figure, ABC and ADE are straight lines. It is given that $AB = BD$ and $BC = CD$. If $\angle CDE = 66°$, then $\angle ACD =$



A. 28°
B. 33°
C. 36°
D. 38°

[2019-DSE-MATHS 2-17]

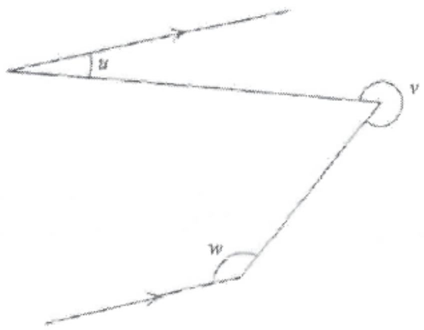
78. In the figure, $ABCD$ is a rhombus. ABE and BCF are straight lines such that $BE = EF$. If $\angle BEF = 56°$, then $\angle BDC =$



A. 48°
B. 56°
C. 59°
D. 62°

[2019-DSE-MATHS 2-20]

79. According to the figure, which of the following must be true?

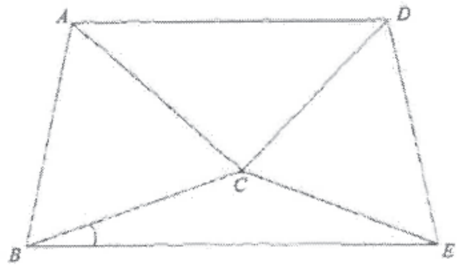


I. $u - v + w = 0°$
II. $u + v - w = 180°$
III. $u + v + w = 450°$

A. I only
B. II only
C. I and III only
D. II and III only

[2020-DSE-MATHS 2-23]

80. In the figure, ABC is an equilateral triangle and CDE is an isosceles triangle with $CD = CE$. If $\angle DCE = 78°$ and $\angle ADC = \angle CAD = 40°$, then $\angle CBE =$



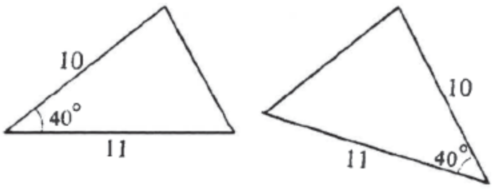
A. 14°
B. 19°
C. 24°
D. 29°

[2020-DSE-MATHS 2-20]

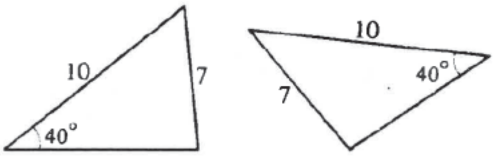
Congruent Triangles

1. In which of the following 3 cases are the given data sufficient for the triangles to be congruent? **The figures are not necessarily drawn to scale.**

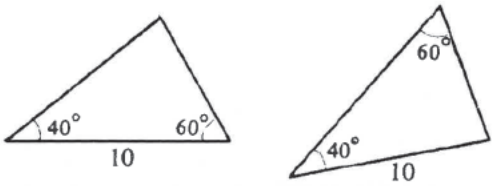
(1)



(2)



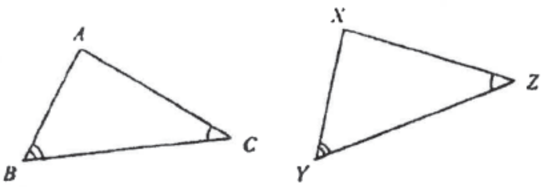
(3)



A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[SP-CE-MATHS 2-22]

2.



In ΔABC and ΔXYZ, it is given that

$\angle B = \angle Y$ and $\angle C = \angle Z$.

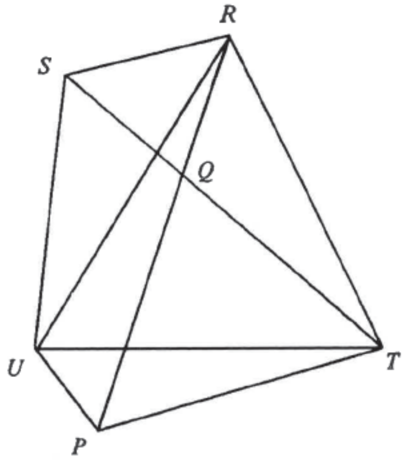
If it is also given that

(1) $\angle A = \angle X$, is there sufficient information to prove that $\Delta ABC \cong \Delta XYZ$?
(2) $AB = XY$, is there sufficient information to prove that $\Delta ABC \cong \Delta XYZ$?
(3) $BC = YZ$, is there sufficient information to prove that $\Delta ABC \cong \Delta XYZ$?

	(1)	(2)	(3)
A.	not sufficient	not sufficient	sufficient
B.	not sufficient	sufficient	not sufficient
C.	sufficient	not sufficient	sufficient
D.	not sufficient	sufficient	sufficient
E.	sufficient	sufficient	sufficient

[1979-CE-MATHS 2-47]

3.



In the figure, ΔPTQ, ΔSQR and ΔRUT are equilateral triangles. Which of the following is / are true?

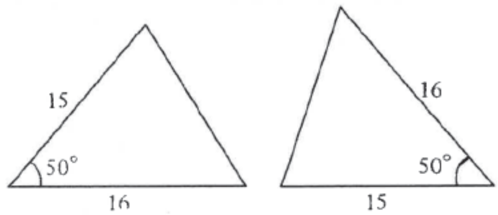
(1) $\Delta UPT \cong \Delta RQT$
(2) $PU = QS$
(3) $PQSU$ is a parallelogram

A. All of them
B. None of them
C. (1) and (2) only
D. (1) and (3) only
E. (2) and (3) only

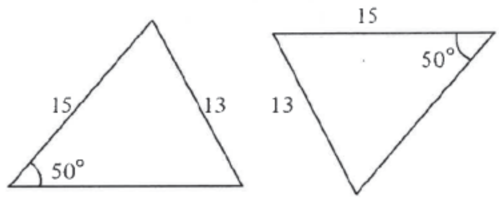
[1990-CE-MATHS 2-54]

4. In the figure, which of the pairs of triangles **must** be congruent?

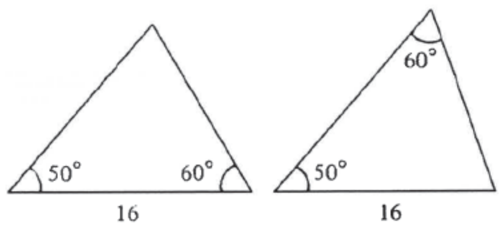
(1)



(2)



(3)

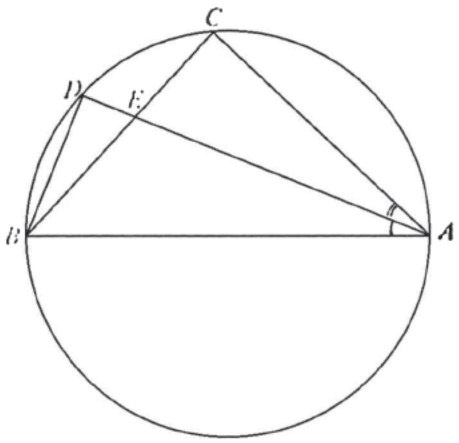


A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1991-CE-MATHS 2-54]

Similar Triangles

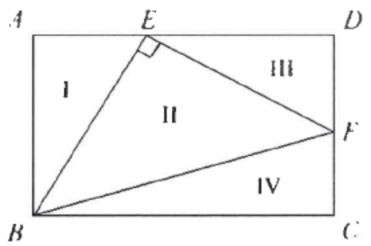
5. In the figure, AD bisects $\angle BAC$, and cuts BC at E. Which of the triangles ACE, ABD and BDE are similar?



A. ΔACE and ΔABD only
B. ΔACE and ΔBDE only
C. ΔABD and ΔBDE only
D. The three triangles are similar
E. No two of them are similar

[1978-CE-MATHS 2-41]

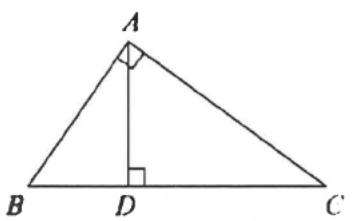
6. In the figure, $ABCD$ is a rectangle $\angle BEF = 90°$. Which two of the triangles I, II, III, and IV must be similar?



A. I and II
B. I and III
C. II and III
D. II and IV
E. III and IV

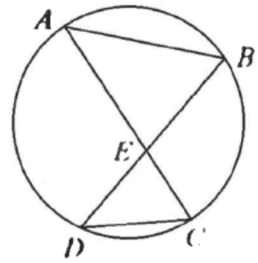
[1980-CE-MATHS 2-26]

7. (1)



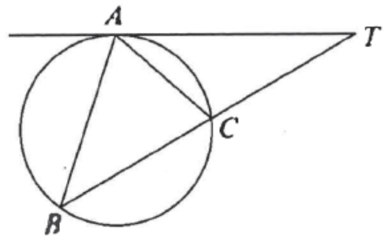
$\angle BAC = 90°$, $AD \perp BC$.

(2)



AC and BC intersect at E.

(3)



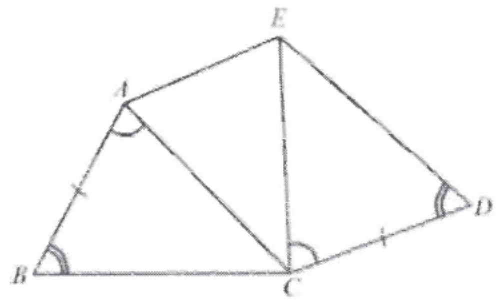
BC produced meets the tangent AT at T.

Which of the above figures contains one or more pairs of similar triangles?

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1981-CE-MATHS 2-52]

8.



In the figure, $AB = CD$, $\angle CAB = \angle ECD$ and $\angle ABC = \angle CDE$. Which of the following **must** be true?

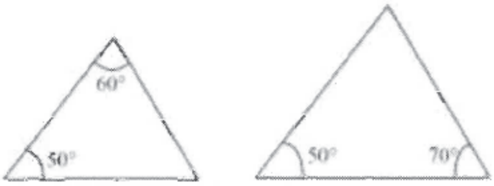
(1) $\Delta ABC \cong \Delta CDE$
(2) $\Delta ABC \sim \Delta EAC$
(3) EAC is an isosceles triangle

A. (1) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

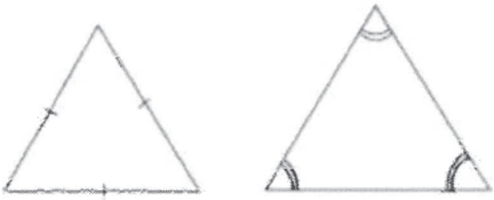
[2000-CE-MATHS 2-24]

9. Which of the following pairs of triangles is/are similar?

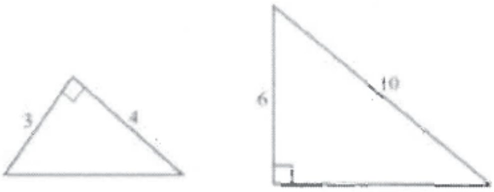
(1)



(2)



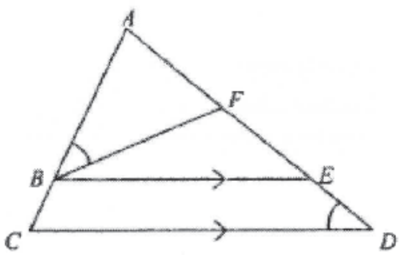
(3)



A. (2) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[2001-CE-MATHS 2-19]

10.



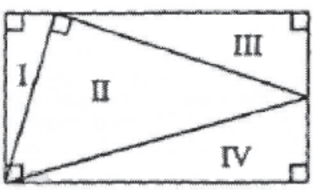
In the figure, ABC and $AFED$ are straight lines. $\angle ABF = \angle CDE$ and $BE \parallel CD$. Which of the following triangles are similar?

(1) ΔABF
(2) ΔAEB
(3) ΔADC

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2002-CE-MATHS 2-26]

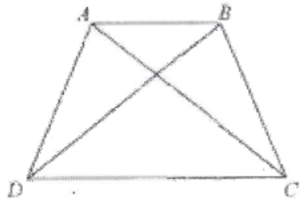
11. Which of the following statements about the triangles in the figure must be true?



A. I and III are similar.
B. I and IV are similar.
C. II and III are similar.
D. II and IV are similar.

[2003-CE-MATHS 2-27]

12. If $AC = BD$ and $AB \parallel DC$, how many pairs of similar triangles are there in the figure?

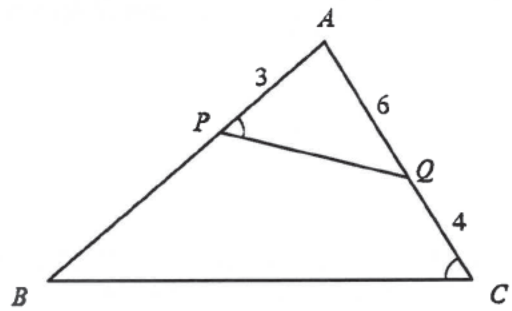


A. 2 pairs
B. 3 pairs
C. 4 pairs
D. 5 pairs

[2005-CE-MATHS 2-26]

Applications

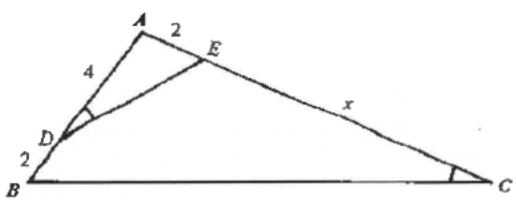
13. In ΔABC, $AP = 3$, $AQ = 6$ and $QC = 4$. If $\angle APQ = \angle ACB$, then $PB =$



A. 7 .
B. 8 .
C. 10 .
D. 17 .
E. 20 .

[1986-CE-MATHS 2-51]

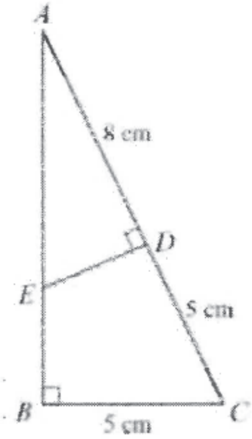
14. In the figure, $\angle ADE = \angle ACB$. Find x.



A. 4
B. 8
C. 10
D. 12
E. 16

[1995-CE-MATHS 2-26]

15. In the figure, AEB and ADC are straight lines. Find ED.

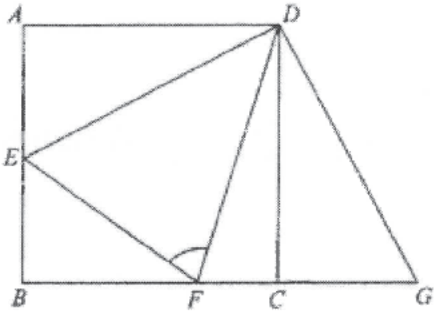


A. $\frac{10}{3}$ cm
B. $\frac{40}{13}$ cm
C. 3 cm
D. $\sqrt{40}$ cm
E. $\sqrt{80}$ cm

[1999-CE-MATHS 2-30]

HKDSE Problems

16. In the figure, $ABCD$ is a square. BC is produced to G such that $\angle CDG = 25°$. E is a point lying on AB such that $AE = CG$. If F is a point lying on BC such that $\angle CDF = 20°$, then $\angle DFE =$



A. 60° .
B. 65° .
C. 70° .
D. 73° .

[2014-DSE-MATHS 2-16]

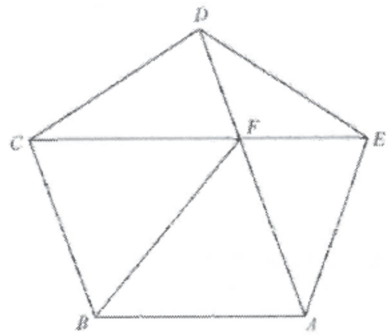
17. $ABCD$ is a parallelogram. Let E be the mid-point of AD. If $\angle ABE = \angle CBD = \angle DBE$, which of the following are true?

(1) $AB = BD$
(2) $\angle ABC = 135°$
(3) $\Delta ABE \cong \Delta DBE$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2017-DSE-MATHS 2-20]

18. In the figure, $ABCDE$ is a regular pentagon. AD and CE intersect at the point F. Which of the following are true?

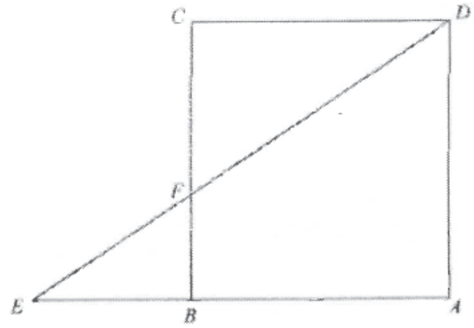


I. $CD = CF$
II. $\Delta ABF \cong CBF$
III. $\angle AFB + \angle EAF = 90°$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2018-DSE-MATHS 2-19]

19. In the figure, $ABCD$ is a square. E is a point lying on AB produced such that $BE = 4\ cm$. BC and DE intersect at the point F. If $EF = 5cm$, then $DF =$

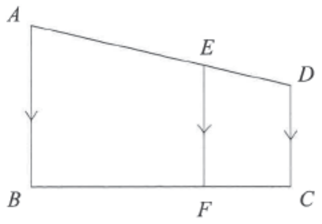


A. 12 cm
B. 15 cm
C. 16 cm
D. 20 cm

[2018-DSE-MATHS 2-20]

Mid-point & Intercept Theorems

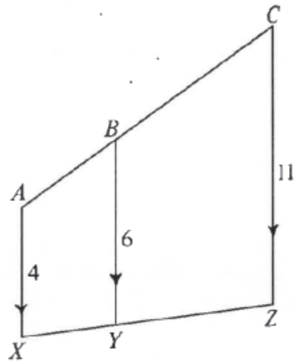
1. In the figure, $ABCD$ is a trapezium and $EF \parallel AB \parallel DC$. $AE = 2ED$. If $AB = 21$ cm, $CD = 15$ cm, then $EF =$



A. 17 cm.
B. 17.5 cm.
C. 18 cm.
D. 18.5 cm.
E. 19 cm.

[1977-CE-MATHS 2-31]

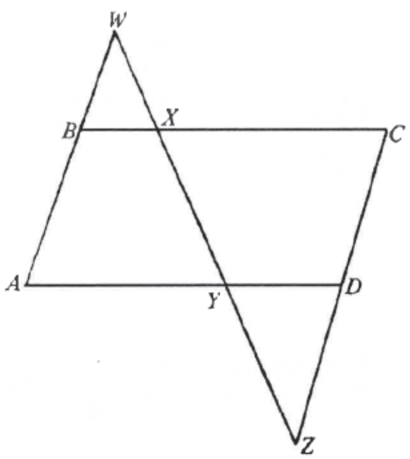
2. In the figure, $AX \parallel BY \parallel CZ$. ABC and XYZ are straight lines. $AX = 4$; $BY = 6$; $CZ = 11$. $AB : BC =$



A. 2 : 3.
B. 2 : 5.
C. 2 : 7.
D. 4 : 11.
E. 6 : 11.

[SP-CE-MATHS 2-24]

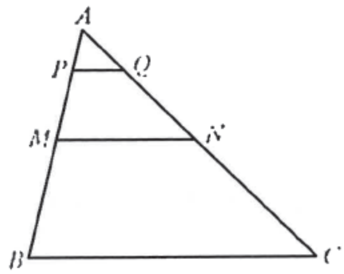
3. In the figure, $ABCD$ is a parallelogram. ABW, $WXYZ$ and CDZ are straight lines. If $BC = 5$, $BX = 1$ and $AY = 3$, then $WX : XY : YZ =$



A. 1 : 2 : 3.
B. 1 : 2 : 2.
C. 1 : 3 : 5.
D. 2 : 3 : 5.
E. 2 : 4 : 5.

[SP-CE-MATHS A2-53]

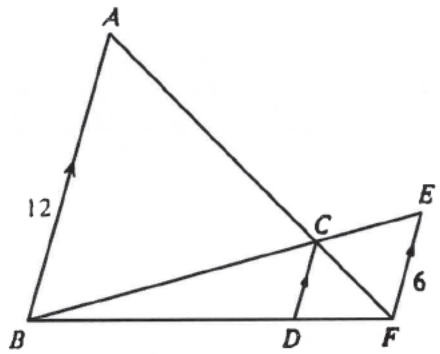
4. In ΔABC, $PQ \parallel MN \parallel BC$. If $AP : PM : MB = 1 : 3 : 6$, then $PQ : MN : BC =$



A. 1 : 2 : 3.
B. 1 : 2 : 5.
C. 1 : 3 : 6.
D. 1 : 4 : 9.
E. 1 : 4 : 10.

[1978-CE-MATHS 2-25]

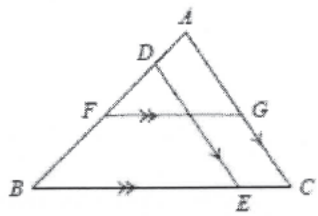
5. In the figure, $AB \parallel CD \parallel EF$. ACF, BCE and BDF are straight lines. $AB = 12$, $EF = 6$. $CD = ?$



A. 4.5
B. 4
C. 3.6
D. 3
E. 2

[1981-CE-MATHS 2-54]

6. In the figure, $AC \parallel DE$, $FG \parallel BC$ and $AD : DF : FB = 1 : 2 : 3$. If $BE = 10$, find FG.

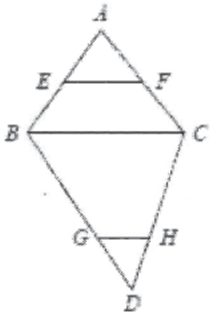


A. 5
B. 6

C. 8
D. 9
E. 10

[1990-CE-MATHS 2-22]

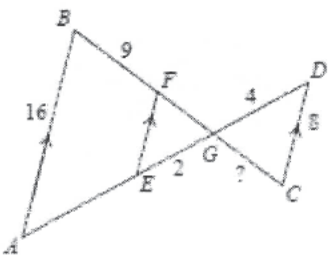
7. In the figure, E and F are the mid-points of AB and AC respectively. G and H divide DB and DC respectively in the ratio $1:3$. If $EF = 12$, find GH.



A. 3
B. 4
C. 6
D. 8
E. 12

[1991-CE-MATHS 2-25]

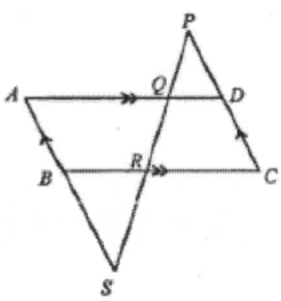
8. In the figure, $AB = 16$, $CD = 8$, $BF = 9$, $GD = 4$, $EG = 2$. Find GC.



A. 4.5
B. 5
C. 6
D. 8
E. 10

[1992-CE-MATHS 2-53]

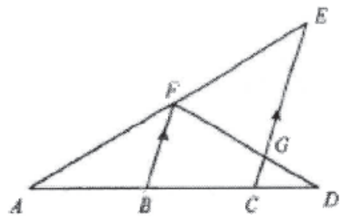
9. In the figure, $ABCD$ is a parallelogram. PDC, $PQRS$ and ABS are straight lines. If $AQ = 4$, $QD = 2$ and $BR = RC = 3$, then $PQ : QR : RS =$



A. $1:1:1$.
B. $1:2:6$.
C. $2:1:3$.
D. $2:3:4$.
E. $8:12:9$.

[1997-CE-MATHS 2-52]

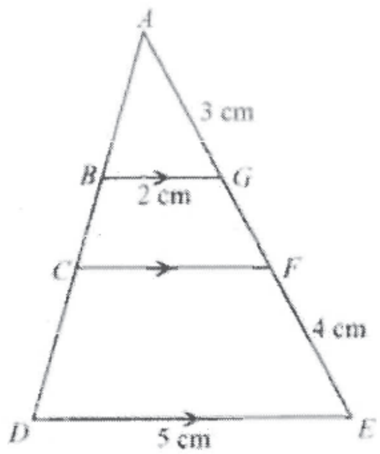
10. In the figure, $ABCD$, AFE, CGE and FGD are straight lines. If $AB = BC = 2CD$, then $CG : GE =$



A. $1:2$.
B. $1:3$.
C. $1:4$.
D. $1:5$.
E. $1:6$.

[1998-CE-MATHS 2-50]

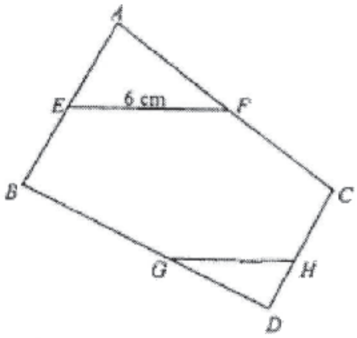
11. In the figure, $ABCD$ and $AGFE$ are straight lines. Find CF.



A. 4 cm
B. 3 cm
C. $\frac{7}{2}$ cm
D. $\frac{5}{2}$ cm
E. $\frac{7}{3}$ cm

[2001-CE-MATHS 2-52]

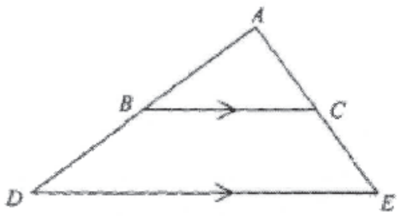
12. In the figure, E and F are the mid-points of AB and AC respectively. G and H are points on BD and CD respectively such that $\frac{DG}{GB} = \frac{DH}{HC} = \frac{3}{5}$. If $EF = 6$ cm, then $GH =$



A. 3.6 cm
B. 4.5 cm
C. 7.2 cm
D. 7.5 cm

[2002-CE-MATHS 2-50]

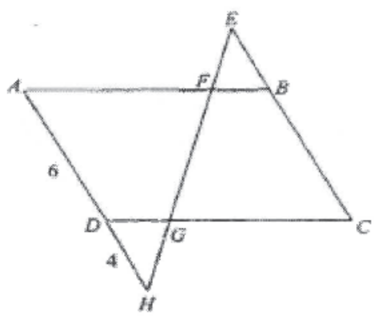
13. In the figure, ABD and ACE are straight lines. If $AC : CE = 3 : 4$, then $BC : DE =$



A. 1 : 2 .
B. 3 : 4 .
C. 3 : 7 .
D. 4 : 7 .

[2003-CE-MATHS 2-28]

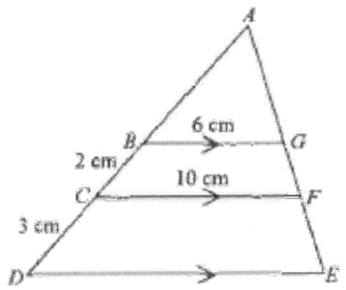
14. In the figure, $ABCD$ is a parallelogram and ADH, EBC and $EFGH$ are straight lines. If $AD = 6$, $DH = 4$ and $EB : BC = 3 : 4$, then $EF : GH =$



A. 1 : 1 .
B. 3 : 4 .
C. 5 : 4 .
D. 9 : 8 .

[2003-CE-MATHS 2-53]

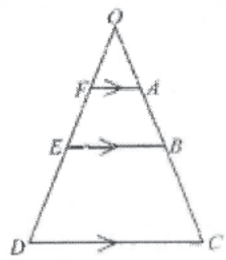
15. In the figure, $ABCD$ and $AGFE$ are straight lines. If $BC = 2$ cm, $CD = 3$ cm, $BG = 6$ cm and $CF = 10$ cm, then $DE =$



A. 12 cm .
B. 14 cm .
C. 15 cm .
D. 16 cm .

[2004-CE-MATHS 2-28]

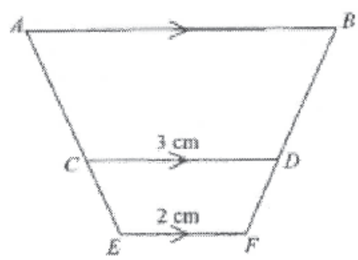
16. In the figure, $OABC$ and $OFED$ are straight lines. If $AB : BC = 2 : 3$ and $FA : DC = 1 : 5$, then $OA : AB =$



A. 1 : 1 .
B. 1 : 2 .
C. 5 : 8 .
D. 5 : 13 .

[2005-CE-MATHS 2-29]

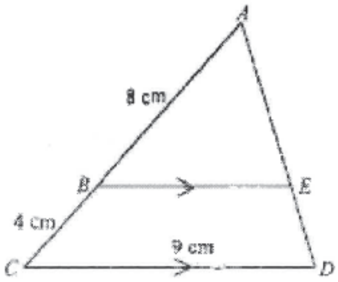
17. In the figure, ACE and BDF are straight lines. If the areas of the quadrilaterals $ABDC$ and $CDFE$ are 16 cm^2 and 5 cm^2 respectively, then the length of AB is



A. 4.5 cm .
B. 5 cm .
C. 5.5 cm .
D. 6 cm .

[2005-CE-MATHS 2-43]

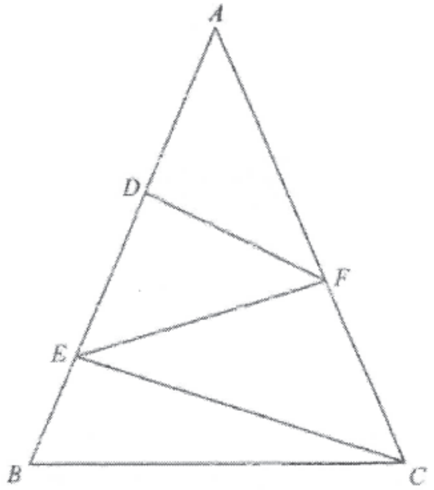
18. In the figure, ABC and AED are straight lines. If $AB = 8$ cm, $BC = 4$ cm and $CD = 9$ cm, then $BE =$



A. $\frac{32}{9}$ cm .
B. $\frac{9}{2}$ cm .
C. 5 cm .
D. 6 cm .

[2006-CE-MATHS 2-26]

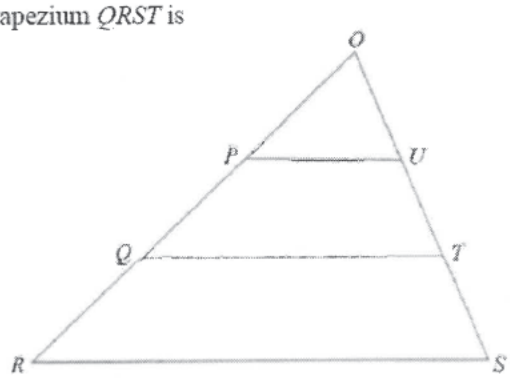
19. In the figure, ABC is an isosceles triangle with $AB = AC$. D and E are points lying on AB such that $AD = DE = 2EB$ while F is a point lying on AC such that $DF // EC$. If $\angle ADF = 90°$ and $CE = 60$ cm, then $EF =$



A. 40 cm
B. 45 cm
C. 48 cm
D. 50 cm

[2019-DSE-MATHS 2-18]

20. In the figure, P and Q are points lying on OR while U and T are points lying on OS such that $OP = PQ = QR$ and $PU // QT // RS$. The ratio of the area of trapezium $PQTU$ to the area of the trapezium $QRST$ is

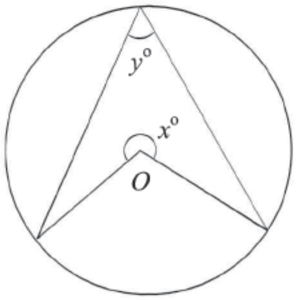


A. 1 : 2
B. 2 : 3
C. 3 : 5
D. 4 : 9

[2020-DSE-MATHS 2-17]

Basic Properties in Circles

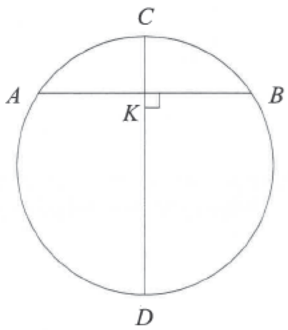
1. In the figure, O is the centre of the circle. $y =$



A. $\frac{x}{2}$.
B. $180 - \frac{x}{2}$.
C. $180 - x$.
D. $360 - x$.
E. $360 - 2x$.

[1977-CE-MATHS 2-29]

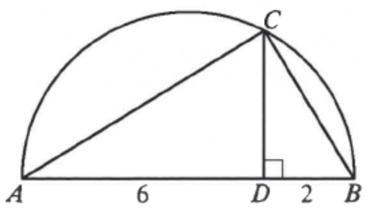
2. In the figure, CD is a diameter of the circle. $AB \perp CD$. If $AB = 8$ cm and $CK = 1$ cm, the length of the diameter is



A. 7.5 cm.
B. 8.5 cm.
C. 15 cm.
D. 17 cm.
E. 19 cm.

[1977-CE-MATHS 2-30]

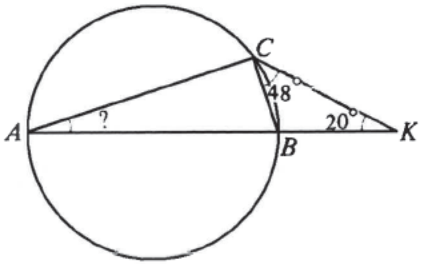
3. In the figure, ACB is a semi-circle. $CD \perp AB$. $AD = 6$; $DB = 2$. $CD =$



A. 2.
B. 4.
C. $\sqrt{3}$.
D. $2\sqrt{3}$.
E. $\sqrt{6}$.

[SP-CE-MATHS 2-27]

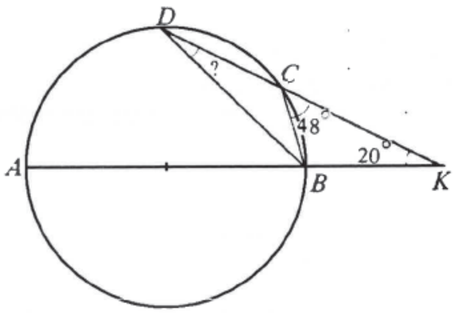
4. In the figure, diameter AB is produced to K. $\angle K = 20°$; $\angle BCK = 48°$. $\angle BAC =$



A. 20°.
B. 22°.
C. 24°.
D. 28°.
E. 48°.

[SP-CE-MATHS 2-45]

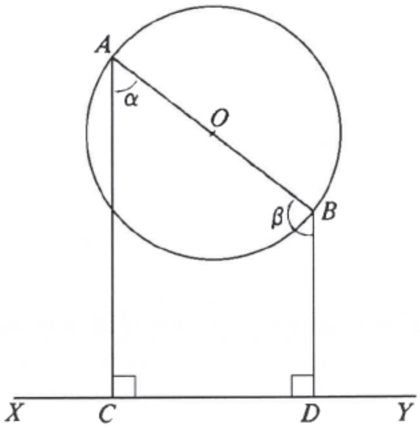
5. In the figure, diameter AB and chord DC when produced meet at K. $\angle K = 20°$; $\angle BCK = 48°$. $\angle BDC =$



A. 20°.
B. 22°.
C. 24°.
D. 28°.
E. 32°.

[SP-CE-MATHS A2-48]

6.



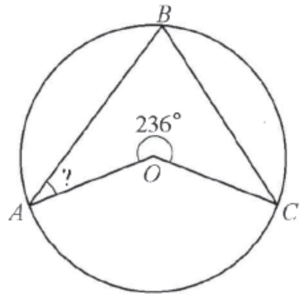
In the figure, circle O is a fixed circle and XY is a fixed straight line. AOB is a variable diameter. $AC \perp XY$; $BD \perp XY$. As AOB varies, which of the following is/are constant?

(1) $AC + BD$
(2) $AC - BD$
(3) $\alpha + \beta$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[SP-CE-MATHS A2-55]

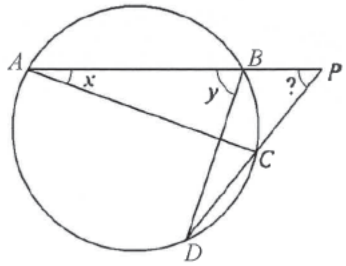
7. In the figure, AB and BC are two equal chords of the circle, centre O. $\angle OAB =$



A. $30°$.
B. $31°$.
C. $35°$.
D. $59°$.
E. $62°$.

[1978-CE-MATHS 2-8]

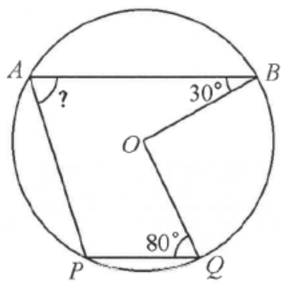
8. In the figure, the chords AB and DC, when produced, and meet at P. Express $\angle APD$ in terms of x and y.



A. $y - x$
B. $2y - x$
C. $2(y - x)$
D. $\frac{1}{2}(y + x)$
E. $x + \frac{1}{2}y$

[1978-CE-MATHS A2-47]

9. In the figure, AB and PQ are two parallel chords in the circle. O is the centre. $\angle PAB =$

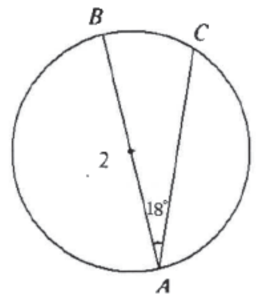


A. $70°$.
B. $65°$.
C. $60°$.
D. $55°$.
E. $50°$.

[1978-CE-MATHS A2-48]

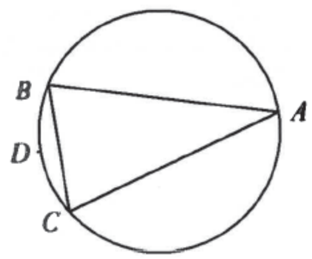
10. In the figure, diameter $AB = 2$. $\angle CAB = 18°$. Minor arc $BC =$

A. $\frac{\pi}{10}$.
B. $\frac{\pi}{5}$.
C. $\frac{3\pi}{10}$.
D. $\frac{4\pi}{5}$.
E. $\frac{9\pi}{10}$.



[1980-CE-MATHS 2-42*]

11.



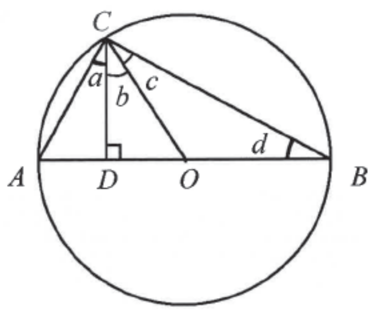
In the figure, $AB = AC$. D is the mid-point of arc BC. Which of the following is/are true?

(1) AD bisects $\angle BAC$
(2) $BC \perp AD$
(3) AD is a diameter of the circle

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1980-CE-MATHS 2-49]

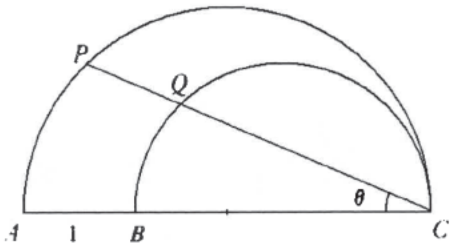
12. In the figure, AOB is a diameter of the circle, centre O. CD is the perpendicular bisector of OA. Which of the angles a, b, c, d is/are equal $30°$?



A. a only
B. a and b only
C. a, b and c only
D. a, b, c and d
E. None of them

[1980-CE-MATHS 2-50]

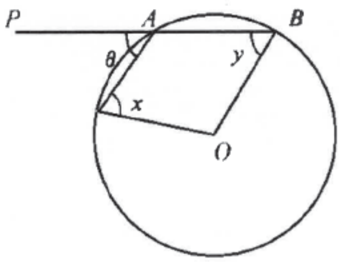
13. In the figure, AC and BC are diameters of two semi-circles touching each other internally at C. PQC is a straight line. If $AB = 1$, then $PQ =$



A. $\cos\theta$.
B. $\sin\theta$.
C. $\tan\theta$.
D. $\dfrac{1}{\sin\theta}$.
E. $\dfrac{1}{\cos\theta}$.

[1980-CE-MATHS 2-52]

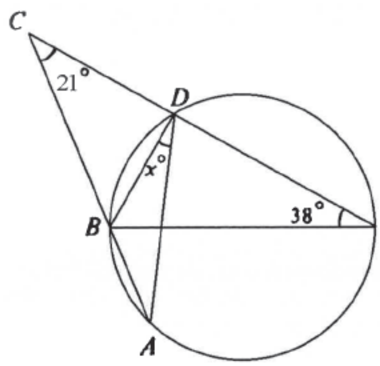
14. In the figure, O is the centre of the circle. PAB is a straight line. $x + y =$



A. 2θ.
B. $90° + \theta$.
C. $180° - \theta$.
D. $180° - 2\theta$.
E. $180°$.

[1980-CE-MATHS 2-54]

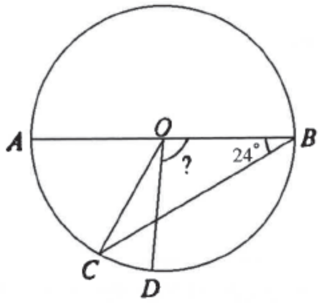
15. In the figure, BE is a diameter of the circle. ABC and EDC are straight lines. $x° =$



A. $21°$.
B. $31°$.
C. $38°$.
D. $52°$.
E. $59°$.

[1981-CE-MATHS 2-24]

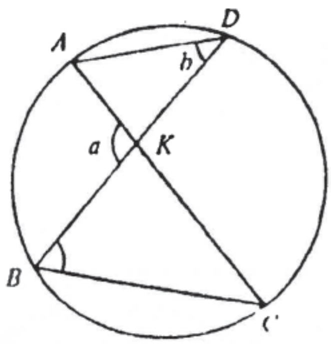
16. In the figure, AB is a diameter of the circle with centre at O. The length of the minor arc AC is twice the length of the minor arc CD. $\angle BOD =$



A. $72°$.
B. $90°$.
C. $108°$.
D. $132°$.
E. $144°$.

[1981-CE-MATHS 2-26]

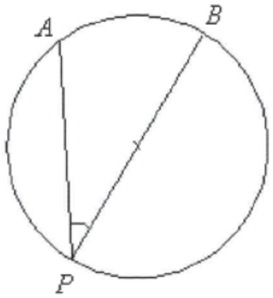
17. In the figure, AKC and BKD are two chords of the circle. $\angle CBD =$



A. $a - b$.
B. $a + b$.
C. $a + b - 90°$.
D. $\frac{1}{2}a$.
E. $\frac{1}{2}a + b$.

[1982-CE-MATHS 2-27]

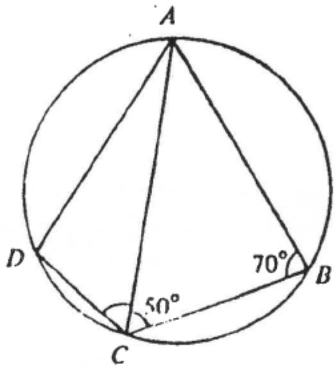
18. In the figure, BP is a diameter of the circle. The minor arc AB and the radius are of equal length. $\angle APB =$



A. $\frac{90°}{\pi}$.
B. $\frac{180°}{\pi}$.
C. $30°$.
D. $45°$.
E. $60°$.

[1982-CE-MATHS 2-47*]

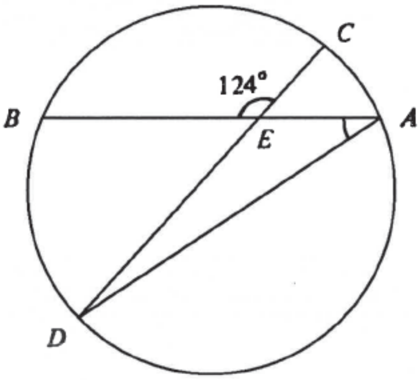
19. In the figure, the length of the minor arc CD is half the length of the minor arc BC. $\angle ACD =$



A. $30°$.
B. $35°$.
C. $40°$.
D. $45°$.
E. $50°$.

[1982-CE-MATHS 2-53]

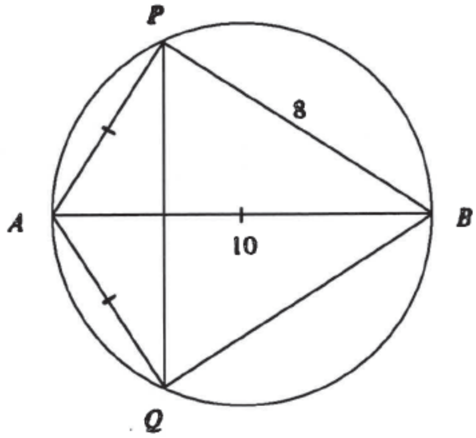
20. In the figure, chords AB and CD intersect at E. The length of the minor arc BD is three times the length of the minor arc AC. $\angle BAD =$



A. $31°$.
B. $35°$.
C. $42°$.
D. $45°$.
E. $56°$.

[1983-CE-MATHS 2-53]

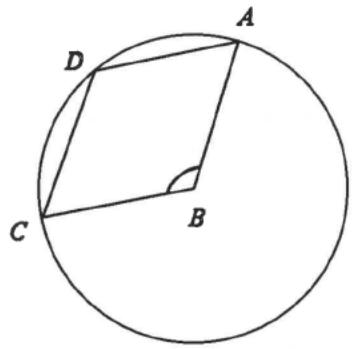
21. In the figure, AB is a diameter of the circle. $AP = AQ$, $AB = 10$ and $BP = 8$, $PQ =$



A. 5.
B. 6.
C. 6.4.
D. 8.
E. 9.6.

[1984-CE-MATHS 2-53]

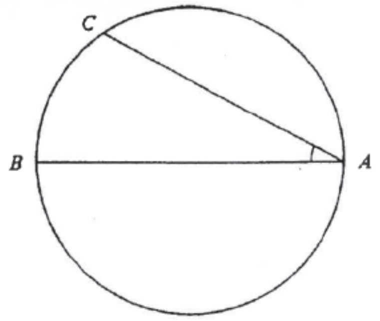
22. In the figure, $ABCD$ is a rhombus. B is the centre of the circle. $\angle ABC =$



A. $105°$.
B. $120°$.
C. $130°$.
D. $135°$.
E. $150°$.

[1985-CE-MATHS 2-25]

23. In the figure, AB is a diameter of the circle ABC. If arc AC has the same length as AB, then $\angle CAB =$



A. 90°.

B. $(90-\frac{90}{\pi})°$.

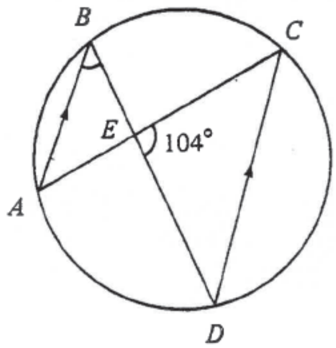
C.* $(90-\frac{180}{\pi})°$.

D. $(90-\frac{360}{\pi})°$.

E. $(180-\frac{90}{\pi})°$ radians.

[1985-CE-MATHS 2-48*]

24. In the figure, chords AC and BD meet at E and $AB \parallel DC$. If $\angle CED = 104°$, find $\angle ABD$.



A. 76°

B. 52°

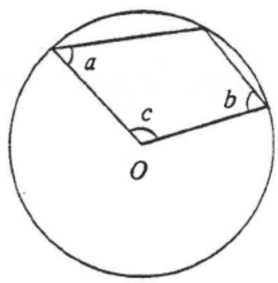
C. 38°

D. 14°

E. It cannot be determined.

[1987-CE-MATHS 2-20]

25. In the figure, O is the centre of the circle. $a+b=$



A. 180°.

B. c.

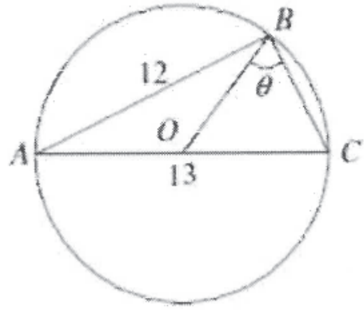
C. $\frac{c}{2}$.

D. $180°-c$.

E. $180°-\frac{c}{2}$.

[1987-CE-MATHS 2-45]

26. In the figure, O is the centre of the circle. If $AB=12$ and $AC=13$, then $\cos\theta=$



A. $\frac{5}{12}$.

B. $\frac{5}{13}$.

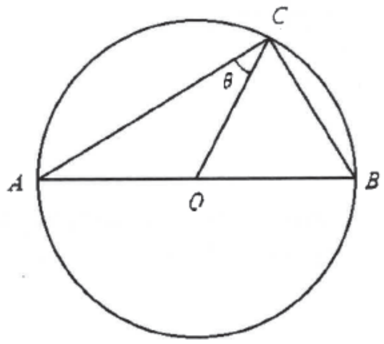
C. $\frac{12}{13}$.

D. $\frac{12}{25}$.

E. $\frac{13}{25}$.

[1987-CE-MATHS 2-47]

27. In the figure, O is the centre of the circle of diameter 13. $AC=12$. $\sin\theta=$



A. $\frac{5}{12}$.

B. $\frac{5}{13}$.

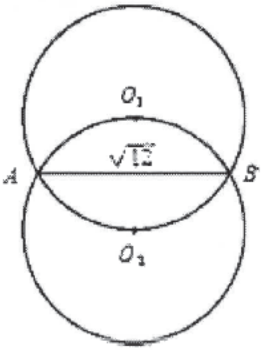
C. $\frac{\sqrt{313}}{13}$.

D. $\frac{12}{13}$.

E. $\frac{13}{12}$.

[1988-CE-MATHS 2-22]

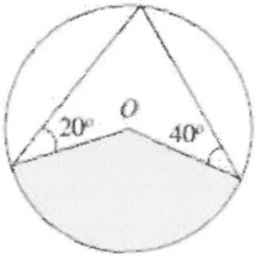
28. In the figure, O_1 and O_2 are the centres of the two circles, each of radius r and $AB=\sqrt{12}$. Find r.



A. $\frac{1}{2}$
B. 2
C. 4
D. 6
E. 8

[1988-CE-MATHS 2-52]

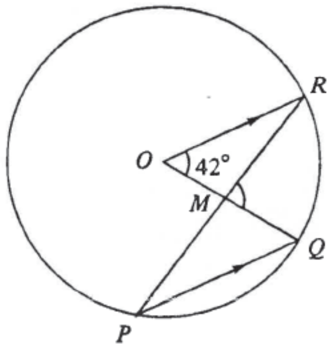
29. In the figure, O is the centre of the circle of radius 6 cm. The area of the shaded part is



A. 2π cm^2.
B. 4π cm^2.
C. 6π cm^2.
D. 9π cm^2.
E. 12π cm^2.

[1989-CE-MATHS 2-38]

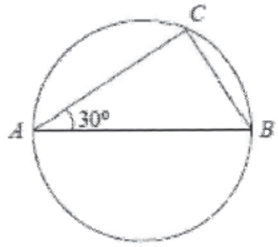
30. In the figure, O is the centre of the circle. If $OR // PQ$ and $\angle ROQ = 42°$, find $\angle RMQ$.



A. 21°
B. 42°
C. 63°
D. 84°
E. 126°

[1990-CE-MATHS 2-21]

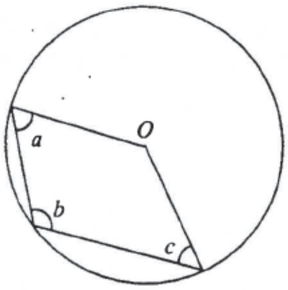
31. In the figure, AB is a diameter and $\angle BAC = 30°$. If the area of ΔABC is $\sqrt{3}$, then the radius of the circle is



A. $\frac{1}{2}$.
B. 1.
C. $\sqrt{2}$.
D. $\sqrt{3}$.
E. 2.

[1990-CE-MATHS 2-48]

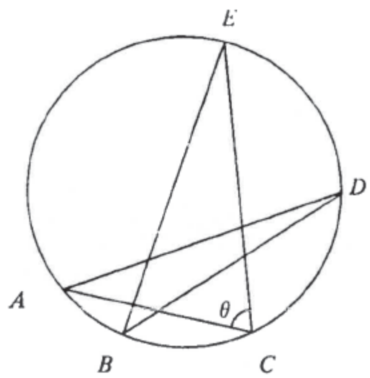
32. In the figure, O is the centre of the circle. Find $a + c$.



A. b
B. $2b$
C. $180° - b$
D. $360° - b$
E. $360° - 2b$

[1991-CE-MATHS 2-21]

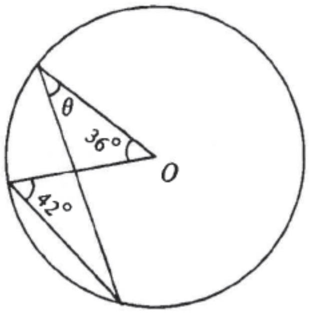
33. In the figure, $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} : \overset{\frown}{DE} : \overset{\frown}{EA} = 1 : 2 : 3 : 4 : 5$. Find θ.



A. 30°
B. 36°
C. 60°
D. 72°
E. 120°

[1991-CE-MATHS 2-52]

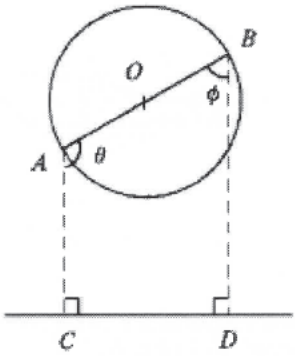
34. In the figure, O is the centre of the circle. Find θ.



A. 42°
B. 36°
C. 24°
D. 21°
E. 18°

[1992-CE-MATHS 2-24]

35.



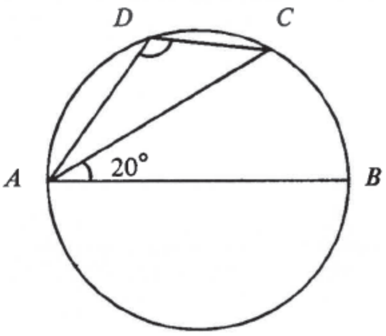
In the figure, O is the centre of the circle. If the diameter AOB rotates about O, which of the following is / are constant?

(1) $\theta + \phi$
(2) $AC + BD$
(3) $AC \times BD$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[1992-CE-MATHS 2-52]

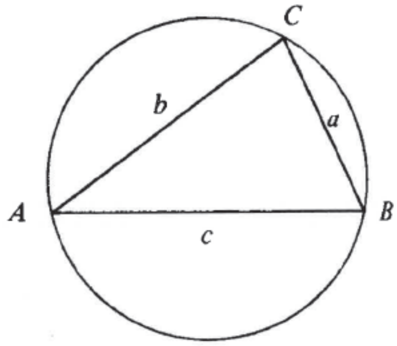
36. In the figure, AB is a diameter. Find $\angle ADC$.



A. 100°
B. 110°
C. 120°
D. 135°
E. 140°

[1993-CE-MATHS 2-26]

37.



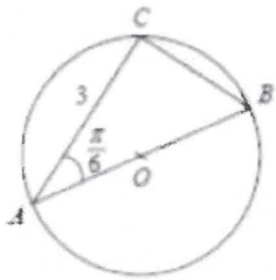
In the figure, if $\overset{\frown}{BC} : \overset{\frown}{CA} : \overset{\frown}{AB} = 1:2:3$, which of the following is / are true?

(1) $\angle A : \angle B : \angle C = 1:2:3$
(2) $a : b : c = 1:2:3$
(3) $\sin A : \sin B : \sin C = 1:2:3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1), (2) and (3)

[1993-CE-MATHS 2-49]

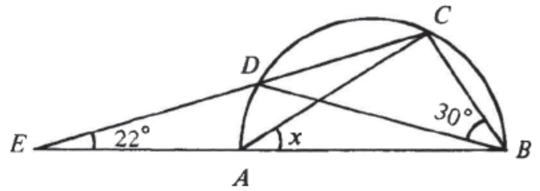
38. In the figure, O is the centre of the circle. If $AC = 3$ and $\angle BAC = \frac{\pi}{6}$ (i.e. 30°), find the diameter AB.



A. $\frac{3}{2}$
B. 6
C. $\frac{3\sqrt{3}}{2}$
D. $2\sqrt{3}$
E. $3\sqrt{3}$

[1994-CE-MATHS 2-21*]

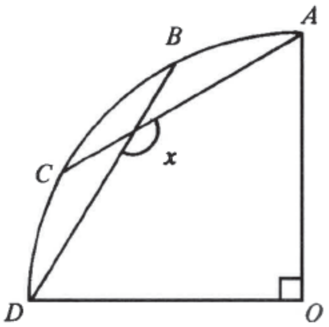
39. In the figure, $ABCD$ is a semi-circle, CDE and BAE are straight lines. If $\angle CBD = 30°$ and $\angle DEA = 22°$, find x.



A. 38°
B. 41°
C. 44°
D. 52°
E. 60°

[1994-CE-MATHS 2-51]

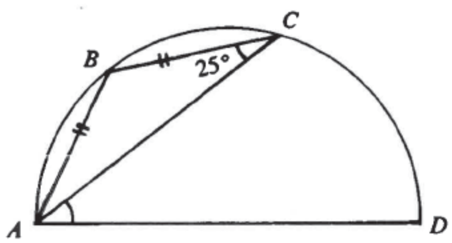
40. In the figure, $OABCD$ is sector of a circle. If $\overset{\frown}{AB} = \overset{\frown}{BC} = \overset{\frown}{CD}$, then $x =$



A. 105°.
B. 120°.
C. 135°.
D. 144°.
E. 150°.

[1994-CE-MATHS 2-52]

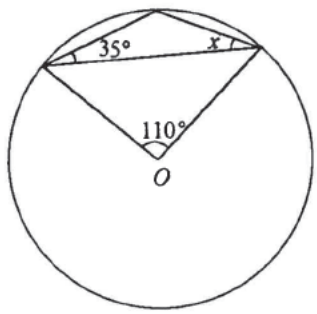
41. In the figure, $ABCD$ is a semi-circle. $\angle CAD =$



A. 25°.
B. 40°.
C. 45°.
D. 50°.
E. 65°.

[1995-CE-MATHS 2-22]

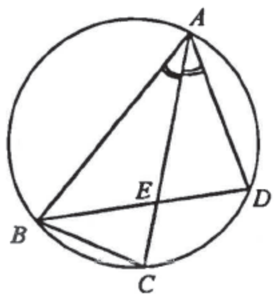
42. In the figure, O is the centre of the circle. Find x.



A. 20°
B. 27.5°
C. 35°
D. 37.5°
E. 40°

[1996-CE-MATHS 2-25]

43.



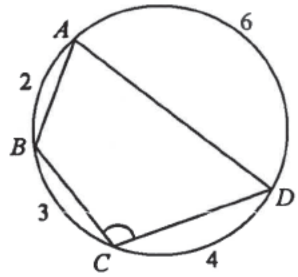
In the figure, AC is the angle bisector of $\angle BAD$. Which of the following statements must be true?

(1) $\Delta BCE \sim \Delta ADE$
(2) $\Delta ABC \sim \Delta AED$
(3) $\Delta ABC \sim \Delta BDA$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1997-CE-MATHS 2-50]

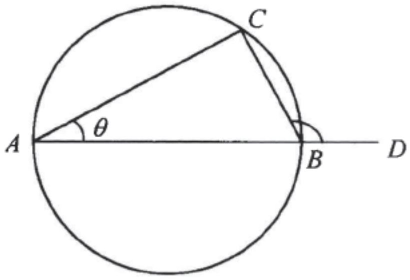
44. In the figure, $\overset{\frown}{AB} = 2$, $\overset{\frown}{BC} = 3$, $\overset{\frown}{CD} = 4$ and $\overset{\frown}{DA} = 6$. Find $\angle BCD$.



A. 72°
B. 84°
C. 90°
D. 96°
E. 144°

[1997-CE-MATHS 2-51]

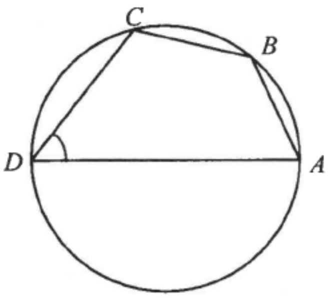
45. In the figure, AB is a diameter of the circle and ABD is a straight line. $\angle CBD =$



A. 2θ.
B. 4θ.
C. $90° + \theta$.
D. $180° - \theta$.
E. $180° - 2\theta$.

[1998-CE-MATHS 2-28]

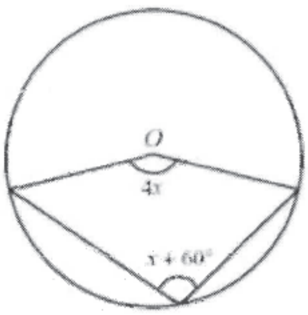
46. In the figure, AD is a diameter of the circle. If $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} = 3 : 5 : 7$, then $\angle ADC =$



A. 36°.
B. 45°.
C. 48°.
D. 49°.
E. 72°.

[1998-CE-MATHS 2-29]

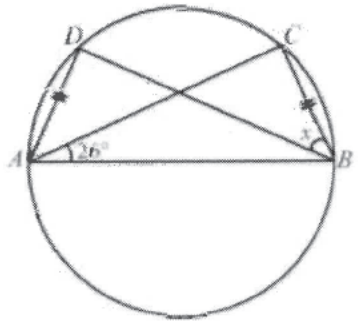
47. In the figure, O is the centre of the circle. Find x.



A. 12°
B. 20°
C. 24°
D. 40°
E. 60°

[1999-CE-MATHS 2-26]

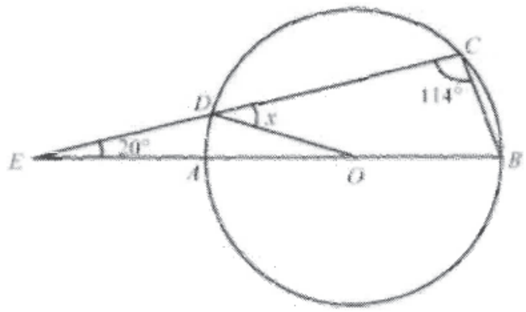
48. In the figure, AB is a diameter of the circle. Find x.



A. 26°
B. 32°
C. 38°
D. 52°
E. 64°

[1999-CE-MATHS 2-27]

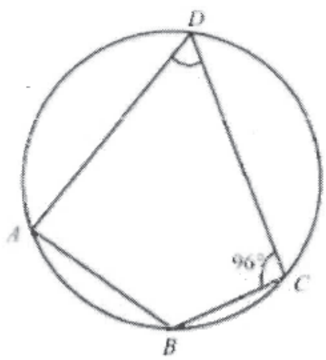
49. In the figure, O is the centre of the circle. $EAOB$ and EDC are straight lines. Find x.



A. 40°
B. 46°
C. 57°
D. 66°
E. 68°

[2000-CE-MATHS 2-20]

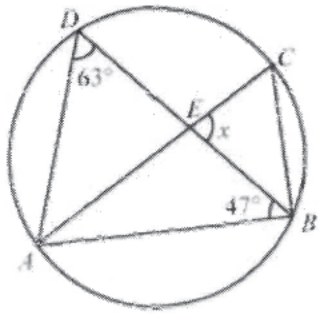
50. In the figure, $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} = 2 : 1 : 3$. Find $\angle ADC$.



A. 56°
B. 60°
C. 63°
D. 72°
E. 84°

[2000-CE-MATHS 2-46]

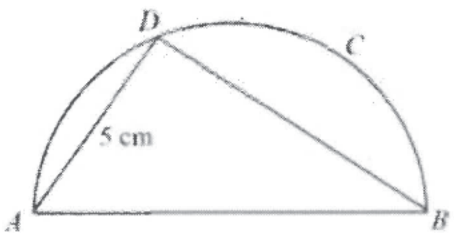
51. In the figure, AEC is a diameter and DEB is a straight line. Find x.



A. 54°
B. 70°
C. 74°
D. 92°
E. 94°

[2001-CE-MATHS 2-18]

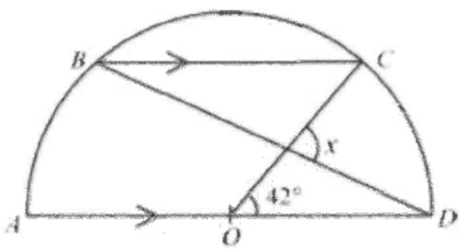
52. In the figure, $ABCD$ is a semicircle, $AB : BD = 4 : 3$. Find AB correct to the nearest 0.1 cm.



A. 5.7 cm
B. 7.6 cm
C. 10.7 cm
D. 13.0 cm
E. 14.3 cm

[2001-CE-MATHS 2-32]

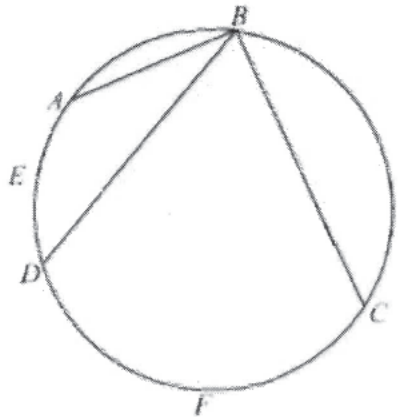
53. In the figure, O is the centre of the semicircle $ABCD$ and $BC // AD$. If $\angle COD = 42°$, then x =



A. 48°.
B. 63°.
C. 84°.
D. 90°.

[2002-CE-MATHS 2-28]

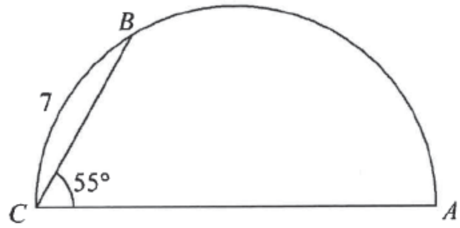
54. In the figure, $\overset{\frown}{AED} = 1$ and $\overset{\frown}{CFD} = 4$. If $\angle ABC = 100°$, then $\angle ABD$ =



A. 18°.
B. 20°.
C. 24°.
D. 25°.

[2002-CE-MATHS 2-29]

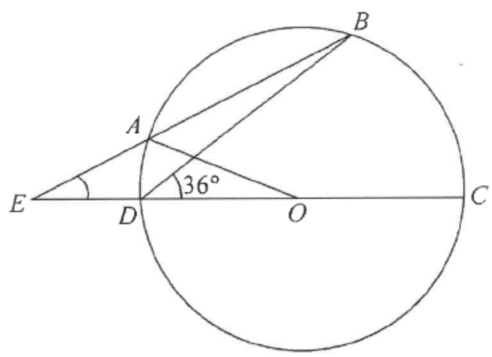
55. In the figure, ABC is a semicircle with $\overset{\frown}{BC} = 7$ and $\angle ACB = 55°$. Find $\overset{\frown}{AB}$.



A. 9
B. 10
C. 11
D. 14

[2003-CE-MATHS 2-25]

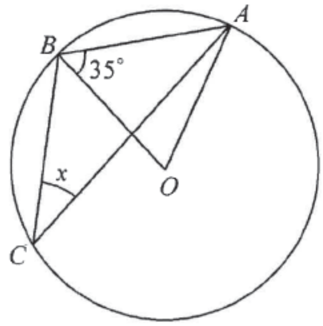
56. In the figure, O is the centre of the circle $ABCD$. If EAB and $EDOC$ are straight lines and $EA = AO$, find $\angle AEO$.



A. 18°
B. 24°
C. 27°
D. 36°

[2004-CE-MATHS 2-23]

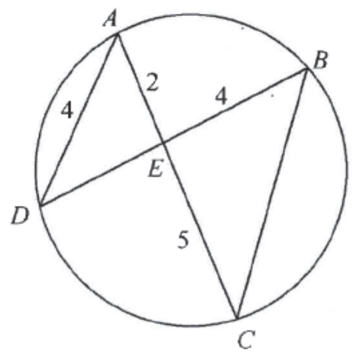
57. In the figure, O is the centre of the circle ABC. Find x.



A. 17.5°
B. 27.5°
C. 35°
D. 55°

[2004-CE-MATHS 2-24]

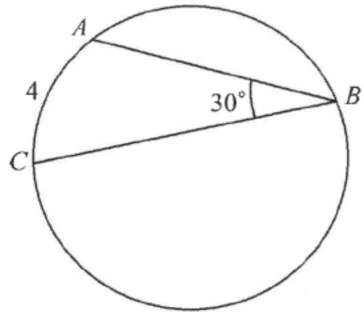
58. In the figure, $ABCD$ is a circle. AC and BD meet at E. If $AD = 4$, $EC = 5$ and $BE = 4$, then $BC =$



A. 6 .
B. 7 .
C. 8 .
D. 10 .

[2004-CE-MATHS 2-25]

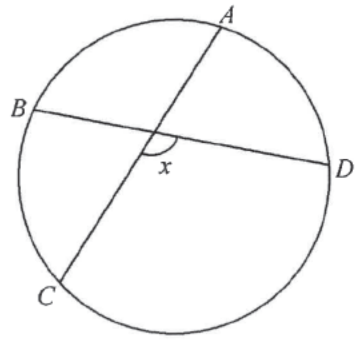
59. In the figure, ABC is a circle. If $\angle ABC = 30°$ and $\overset{\frown}{AC} = 4$, then the circumference of the circle is



A. 24 .
B. 48 .
C. 8π .
D. 16π .

[2004-CE-MATHS 2-26]

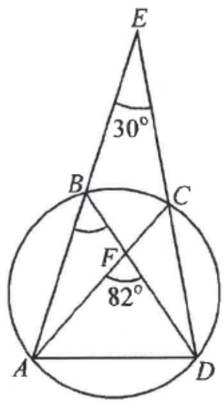
60. In the figure, $ABCD$ is a circle. If $\overset{\frown}{CD} = 2\overset{\frown}{DA} = 2\overset{\frown}{AB} = 2\overset{\frown}{BC}$, then $x =$



A. 108° .
B. 112° .
C. 120° .
D. 144° .

[2004-CE-MATHS 2-50]

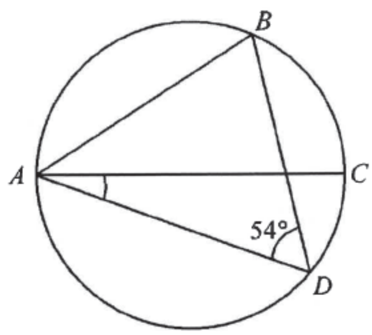
61. In the figure, $ABCD$ is a circle. AB produced and DC produced meet at E. If AC and BD intersect at F, then $\angle ABD =$



A. 41° .
B. 52° .
C. 56° .
D. 60° .

[2005-CE-MATHS 2-24]

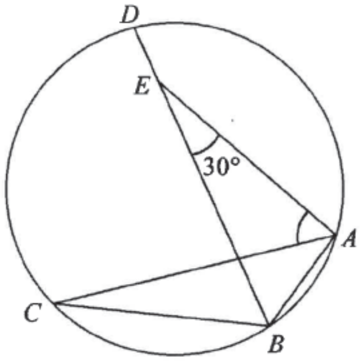
62. In the figure, $ABCD$ is a circle. If AC is a diameter of the circle and $AB = BD$, then $\angle CAD =$



A. 18°.
B. 21°.
C. 27°.
D. 36°.

[2005-CE-MATHS 2-25]

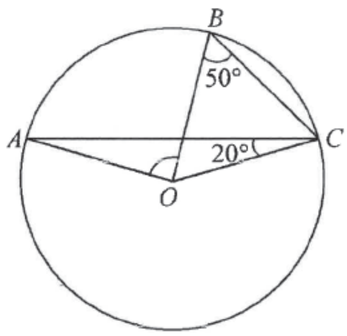
63. In the figure, $ABCD$ is a circle. If $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} : \overset{\frown}{DA} = 1:2:3:3$ and E is a point lying on BD, then $\angle CAE =$



A. 45°
B. 50°
C. 55°
D. 60°

[2005-CE-MATHS 2-51]

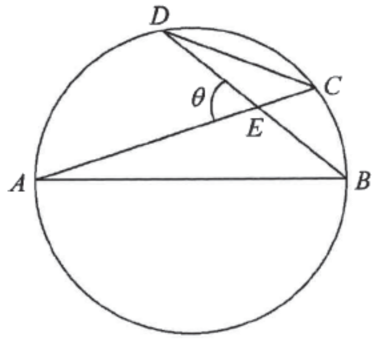
64. In the figure, O is the centre of the circle ABC. If $\angle OBC = 50°$ and $\angle ACO = 20°$, then $\angle BOA$ =



A. 50°.
B. 60°.
C. 70°.
D. 80°.

[2006-CE-MATHS 2-46]

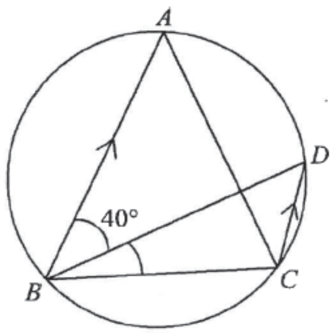
65. In the figure, AB is a diameter of the circle $ABCD$. It is given that AC and BD intersect at E. If $\angle AED = \theta$, then $\frac{CD}{AB} =$



A. $\sin\theta$.
B. $\cos\theta$.
C. $\tan\theta$.
D. $\frac{1}{\tan\theta}$.

[2009-CE-MATHS 2-48]

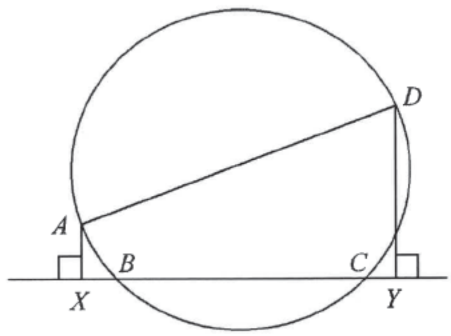
66. In the figure, $ABCD$ is a circle. If $AB = AC$, $AB \parallel DC$ and $\angle ABD = 40°$, then $\angle CBD =$



A. 10°.
B. 20°.
C. 30°.
D. 40°.

[2009-CE-MATHS 2-49]

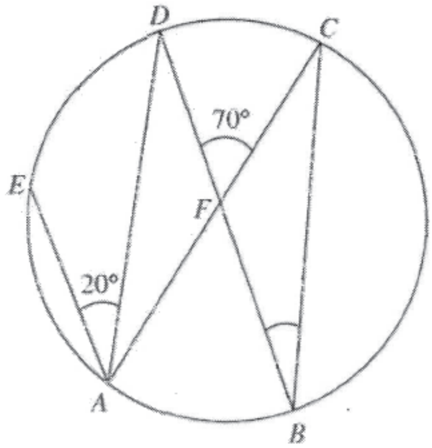
67. In the figure, AD is a diameter of the circle $ABCD$. It is given that $XBCY$ is a straight line. If $AD = 20$ cm and $BC = 12$ cm, then $AX + DY$ =



A. 12 cm.
B. 16 cm.
C. 32 cm.
D. 36 cm.

[2010-CE-MATHS 2-49]

68. In the figure, $ABCDE$ is a circle. AC and BD intersect at F. If $AE // BD$, $\angle DAE = 20°$ and $\angle CFD = 70°$, then $\angle CBD =$

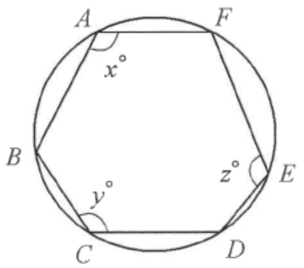


A. 20°.
B. 35°.
C. 45°.
D. 50°.

[2011-CE-MATHS 2-48]

Cyclic Quadrilaterals

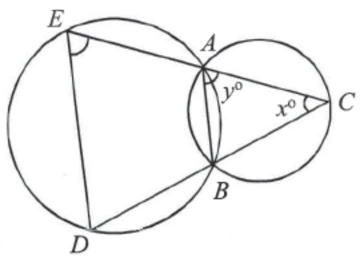
69. In the figure, $ABCDEF$ is a hexagon inscribed in a circle. What is $x + y + z$ equal to?



A. 270
B. 360
C. 450
D. 540
E. the sum, $x + y + z$, is not a constant.

[1979-CE-MATHS 2-32]

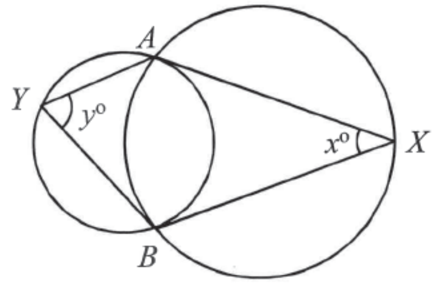
70. In the figure, the two circles intersect at A and B. CAE and CBD are straight lines. $\angle CED =$



A. $y°$.
B. $180° - y°$.
C. $180° - x° - y°$.
D. $180° - x° + y°$.
E. $360° - x° - y°$.

[1980-CE-MATHS 2-24]

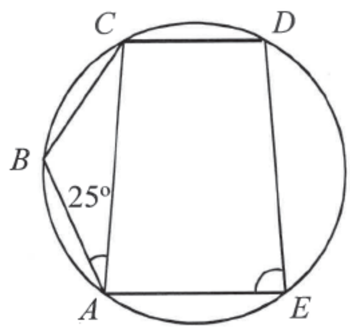
71. In the figure, circle AXB passes through the centre of circle AYB. $y =$



A. $2x$.
B. $180 - 2x$.
C. $180 - x$.
D. $\frac{1}{2}(90 - x)$.
E. $\frac{1}{2}(180 - x)$.

[1980-CE-MATHS 2-25]

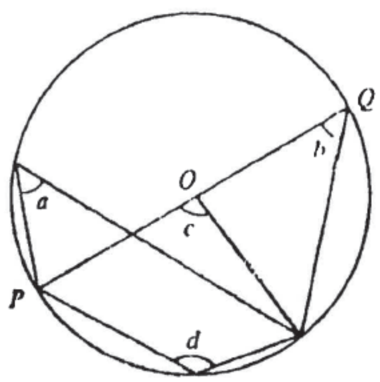
72. In the figure, $AB = BC = CD$. $\angle AED =$



A. 50°
B. 65°
C. 75°
D. 90°
E. 105°

[1980-CE-MATHS 2-47]

73.



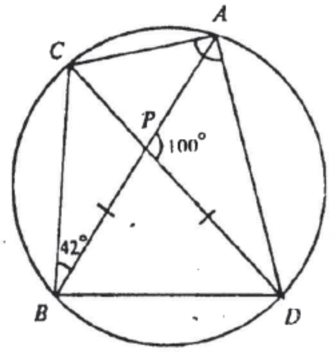
In the figure, O is the centre of the circle. PQ is a diameter. Which of the following is/are true?

(1) $a = b$
(2) $c = 2a$
(3) $c + d = 180°$

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1982-CE-MATHS 2-52]

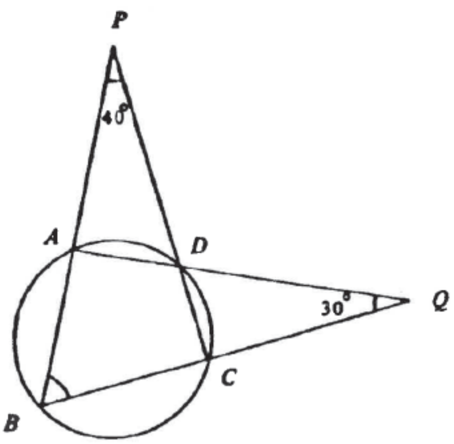
74. In the figure, chords AB and CD intersect at P. $BP = DP$. $\angle CAD =$



A. 58°.
B. 86°.
C. 88°.
D. 92°.
E. 142°.

[1983-CE-MATHS 2-24]

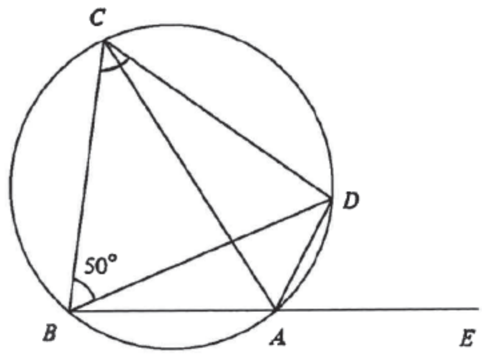
75. In the figure, the chords BA and CD, when produced, meet at P. The chords AD and BC, when produced, meet at Q. $\angle B =$



A. 35°.
B. 40°.
C. 45°.
D. 50°.
E. 55°.

[1984-CE-MATHS 2-54]

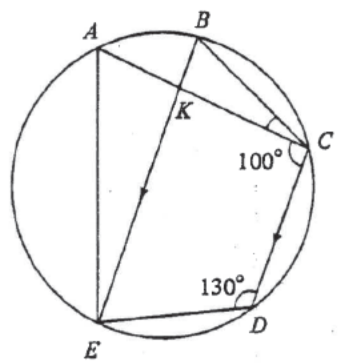
76. In the figure, $ABCD$ is a cyclic quadrilateral. BA is produced to E. DA bisects $\angle CAE$. $\angle BCD =$



A. 40°.
B. 45°.
C. 50°.
D. 55°.
E. 65°.

[1985-CE-MATHS 2-22]

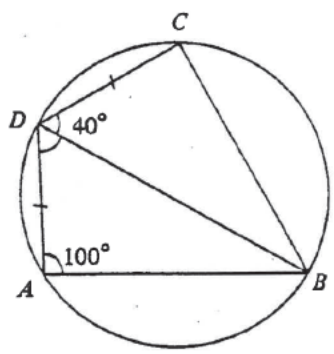
77. In the figure, A, B, C, D and E lie on a circle. AC intersects BE at K. $\angle ACD = 100°$ and $\angle CDE = 130°$. If $BE // CD$, then $\angle ACB =$



A. 25°.
B. 30°.
C. 36°.
D. 40°.
E. 42°.

[1986-CE-MATHS 2-25]

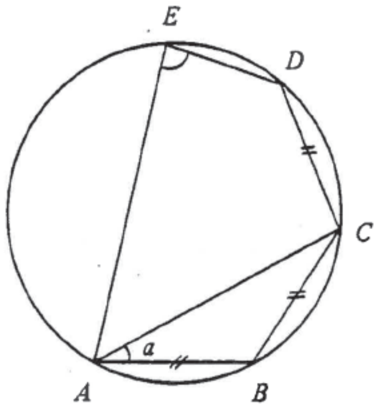
78. DA and DC are equal chords of the circle $ABCD$. $\angle CDB = 40°$ and $\angle DAB = 100°$. $\angle ADB =$



A. 20°.
B. 25°.
C. 30°.
D. 35°.
E. 40°.

[1986-CE-MATHS 2-49]

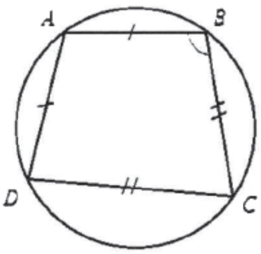
79. In the figure, AB, BC and CD are three equal chords of a circle. If $\angle BAC = a$, then $\angle AED =$



A. $2a$.
B. $3a$.
C. $90° - a$.
D. $180° - 2a$.
E. $180° - 3a$.

[1987-CE-MATHS 2-23]

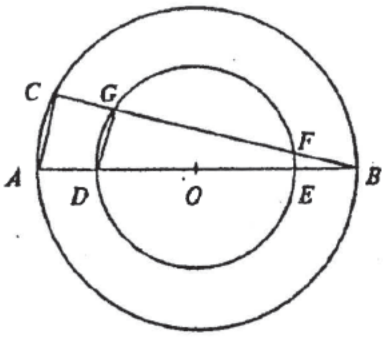
80. $ABCD$ is a cyclic quadrilateral with $AB = AD$ and $CB = CD$. Find $\angle ABC$.



A. 75°
B. 90°
C. 105°
D. 120°
E. It cannot be found

[1988-CE-MATHS 2-51]

81.



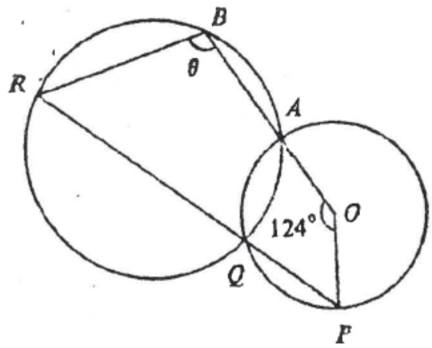
In the figure, O is the centre of two concentric circles. $ADOEB$ and $CGFB$ are straight lines. Which of the following is/are true?

(1) $AC // DG$
(2) $BF = CG$
(3) A, E, F, C are concyclic

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1989-CE-MATHS 2-23]

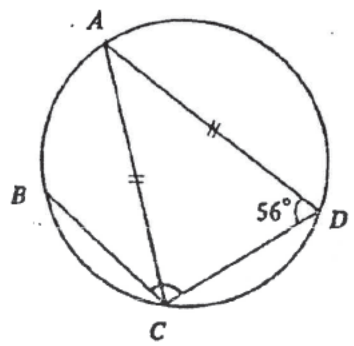
82. In the figure, O is the centre of the smaller circle. OAB and PQR are straight lines. Find θ.



A. 56°
B. 108°
C. 112°
D. 118°
E. 124°

[1989-CE-MATHS 2-51]

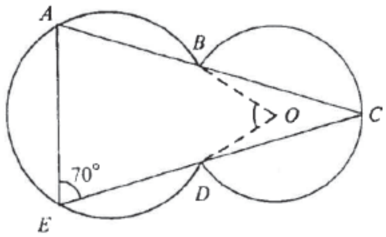
83. In the figure, B is the mid-point of arc AC. $AC = AD$. If $\angle ADC = 56°$, then $\angle BCD =$



A. 84°.
B. 90°.
C. 96°.
D. 112°.
E. 124°.

[1989-CE-MATHS 2-52]

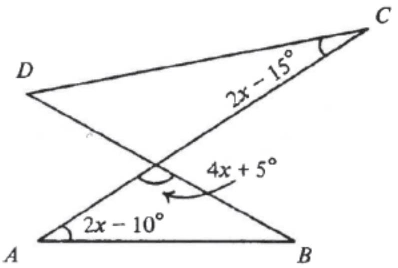
84. In the figure, O is the centre of the circle BCD. ABC and EDC are straight lines. $BC = DC$ and $\angle AED = 70°$. Find $\angle BOD$.



A. 40°
B. 70°
C. 80°
D. 90°
E. 140°

[1991-CE-MATHS 2-22]

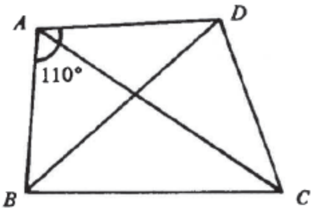
85. In the figure, points A, B, C and D are concyclic. Find x.



A. 20°
B. 22.5°
C. 25°
D. 27.5°
E. 30°

[1993-CE-MATHS 2-24]

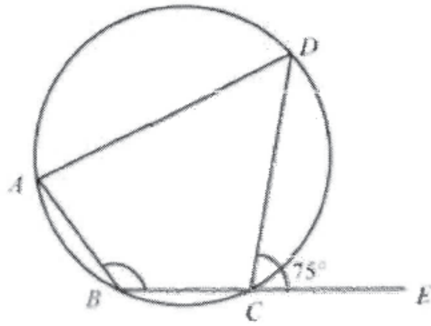
86. In the figure, $ABCD$ is a cyclic quadrilateral. If $\angle DAB = 110°$ and $BC = BD$, find $\angle DAC$.



A. 20°
B. 35°
C. 40°
D. 55°
E. 70°

[1995-CE-MATHS 2-24]

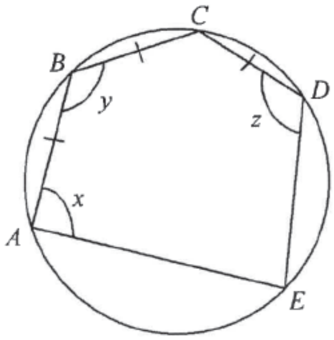
87. In the figure, $\overset{\frown}{AB} = \overset{\frown}{BC} = \frac{1}{2}\overset{\frown}{CD}$. Find $\angle ABC$.



A. 100°
B. 105°
C. 112.5°
D. 130°
E. 150°

[2001-CE-MATHS 2-46]

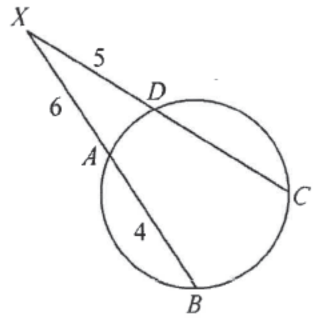
88. The figure shows a circle with diameter AD. If $AB = BC = CD$, find $x + y + z$.



A. 315°
B. 324°
C. 330°
D. 360°

[2003-CE-MATHS 2-50]

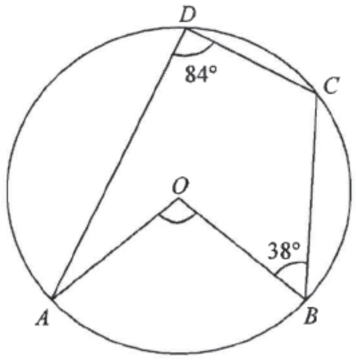
89. In the figure, XAB and XDC are straight lines. If $DX = 5$, $AX = 6$ and $AB = 4$, find CD.



A. 5
B. 7
C. $\frac{10}{3}$
D. $\frac{24}{5}$

[2003-CE-MATHS 2-51]

90. In the figure, O is the centre of the circle $ABCD$. If $\angle ADC = 84°$ and $\angle CBO = 38°$, then $\angle AOB =$

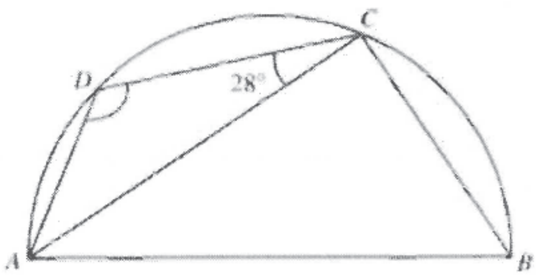


A. 64°.
B. 88°.
C. 104°.
D. 168°.

[2008-CE-MATHS 2-50]

HKDSE Problems

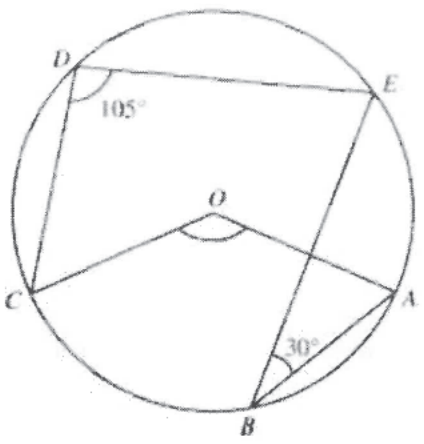
91. In the figure, $ABCD$ is a semi-circle. If $BC = CD$, then $\angle ADC =$



A. 118°.
B. 121°.
C. 124°.
D. 126°.

[SP-DSE-MATHS 2-21]

92. In the figure, O is the centre of the circle $ABCDE$. If $\angle ABE = 30°$ and $\angle CDE = 105°$, then $\angle AOC =$



A. 120°.

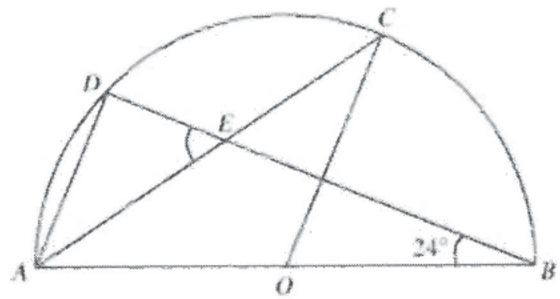
B. 135°.

C. 150°.

D. 165°.

[SP-DSE-MATHS 2-22]

93. In the figure, O is the centre of the semi-circle $ABCD$. AC and BD intersect at E. If $AD \,//\, OC$, then $\angle AED =$



A. 48°.

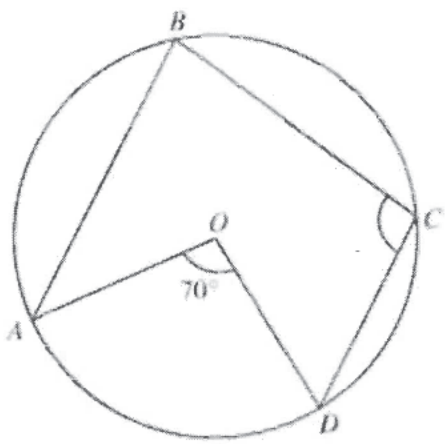
B. 55°.

C. 57°.

D. 66°.

[PP-DSE-MATHS 2-20]

94. In the figure, O is the centre of the circle $ABCD$. If $\overset{\frown}{AB} = \overset{\frown}{BC} = 2\overset{\frown}{CD}$, then $\angle BCD =$



A. 64°.

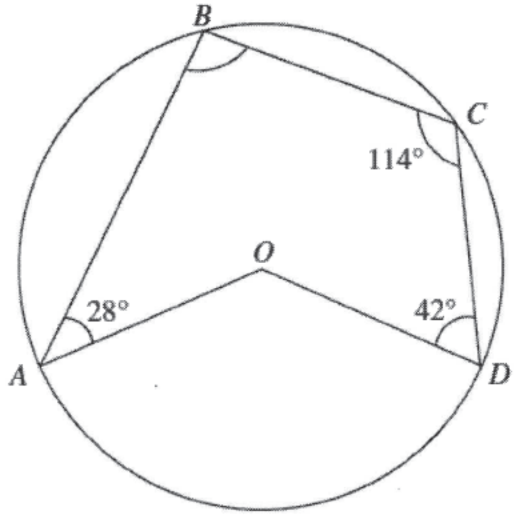
B. 87°.

C. 93°.

D. 116°.

[PP-DSE-MATHS 2-21]

95. In the figure, O is the centre of the circle $ABCD$. If $\angle BAO = 28°$, $\angle BCD = 114°$ and $\angle CDO = 42°$, then $\angle ABC =$



A. 90°.

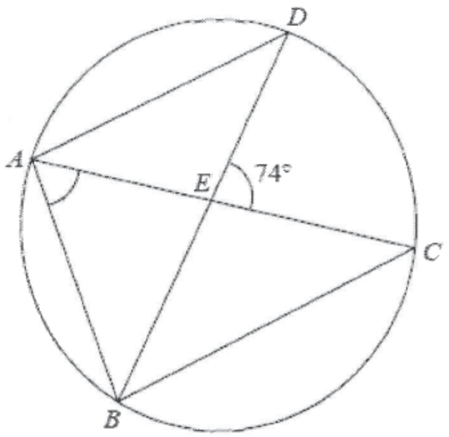
B. 96°.

C. 100°.

D. 138°.

[2012-DSE-MATHS 2-20]

96. In the figure, $ABCD$ is a circle. AC and BD intersect at E. If $AB = AD$ and $AD // BC$, then $\angle BAE =$



A. 53°.

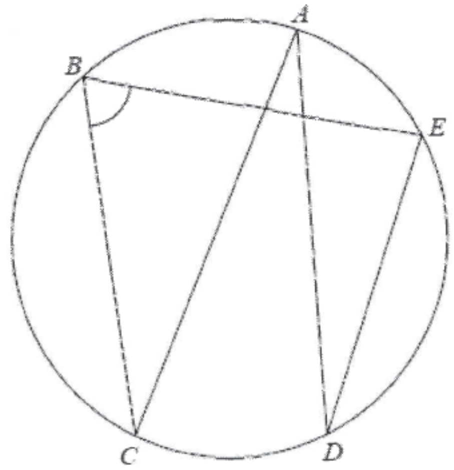
B. 57°.

C. 69°.

D. 74°.

[2013-DSE-MATHS 2-19]

97. In the figure, AC is a diameter of the circle $ABCDE$. If $\angle ADE = 28°$, then $\angle CBE =$



A. 56°.

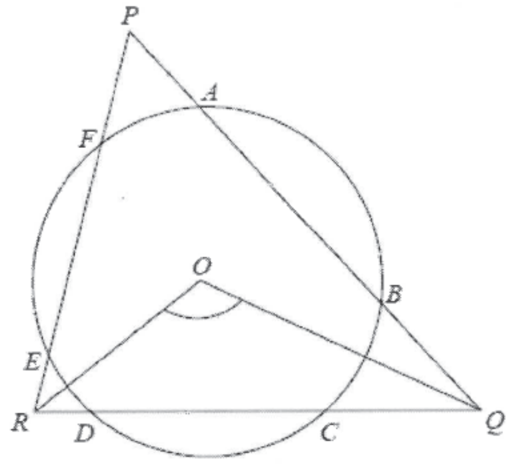
B. 62°.

C. 72°.

D. 76°.

[2014-DSE-MATHS 2-20]

98. In the figure, O is the centre of the circle $ABCDEF$. ΔPQR intersects the circle at A, B, C, D, E and F. If $\angle QPR = 38°$ and $AB = CD = EF$, then $\angle QOR =$



A. 109°.

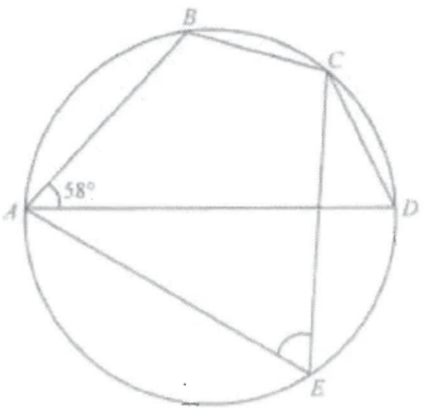
B. 117°.

C. 123°.

D. 142°.

[2014-DSE-MATHS 2-21]

99. In the figure, AD is a diameter of the circle $ABCDE$. If $\angle BAD = 58°$ and $BC = CD$, then $\angle AEC =$



A. 32°.

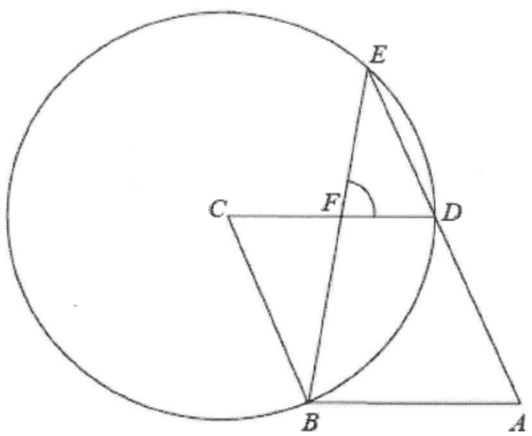
B. 58°.

C. 61°.

D. 64°.

[2015-DSE-MATHS 2-20]

100. In the figure, $ABCD$ is a rhombus. C is the centre of the circle BDE and ADE is a straight line. BE and CD intersect at F. If $\angle ADC = 118°$, then $\angle DFE =$



A. 59°.

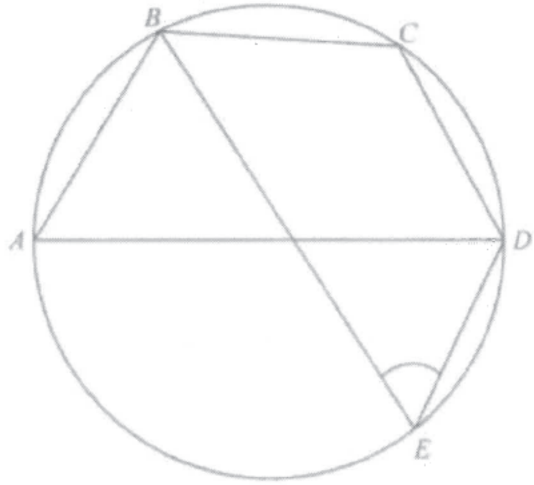
B. 62°.

C. 78°.

D. 87°.

[2016-DSE-MATHS 2-22]

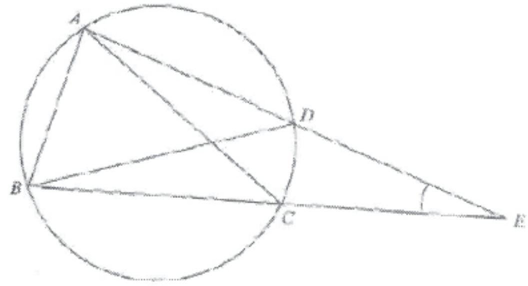
101. In the figure, AD is a diameter of the circle $ABCDE$. If $BC = CD$ and $\angle ABC = 110°$, then $\angle BED =$



A. 20°.
B. 35°.
C. 40°.
D. 55°.

[2017-DSE-MATHS 2-21]

102. In the figure, $ABCD$ is a circle. AD produced and BC produced meet at the point E. It is given that $BD = DE$, $\angle BAC = 66°$ and $\angle ABD = 30°$. Find $\angle CED$.



A. 20°

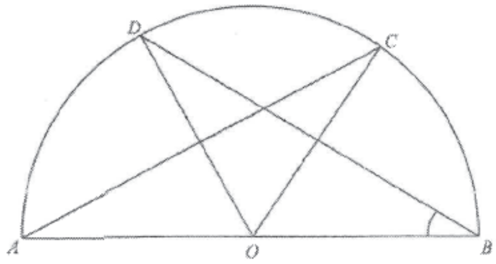
B. 28°

C. 36°

D. 42°

[2018-DSE-MATHS 2-22]

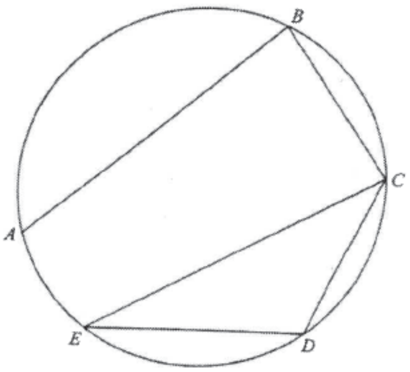
103. In the figure, O is the centre of the semi-circle $ABCD$. If $AC = BD$ and $\angle COD = 48°$, then $\angle ABD =$



A. 31°
B. 33°
C. 42°
D. 48°

[2019-DSE-MATHS 2-21]

104. In the figure, $ABCDE$ is a circle. If $AB = 10\ cm, BC = 5\ cm,\ \angle ABC = 90°$ and $\angle CED = 40°$, find CD correct to the nearest cm.

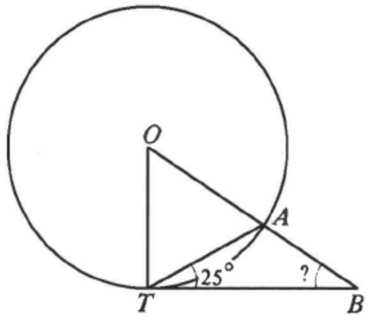


A. 5 cm
B. 6 cm
C. 7 cm
D. 8 cm

[2020-DSE-MATHS 2-22

Properties of Tangents

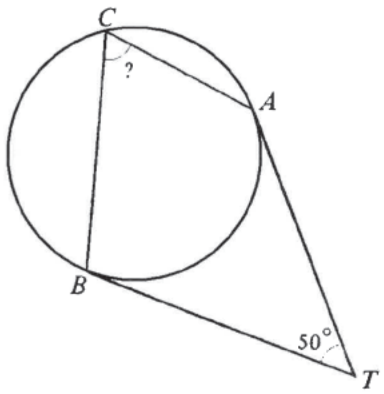
1. In the figure, O is the centre of the circle. TB is a tangent. OAB is a straight line. $\angle ATB = 25°$. $\angle ABT =$



A. 30°.
B. 40°.
C. 45°.
D. 50°.
E. 60°.

[SP-CE-MATHS 2-23]

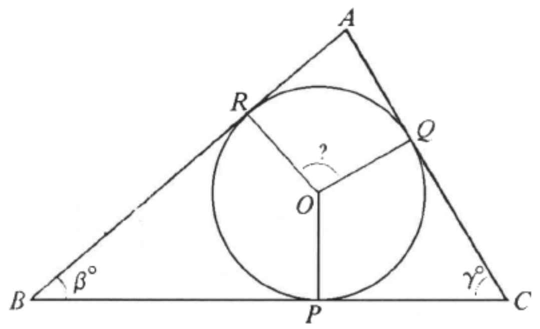
2. In the figure, TA and TB are tangents. $\angle ATB = 50°$. $\angle ACB =$



A. 40°.
B. 50°.
C. 60°.
D. 65°.
E. 75°.

[SP-CE-MATHS A2-47]

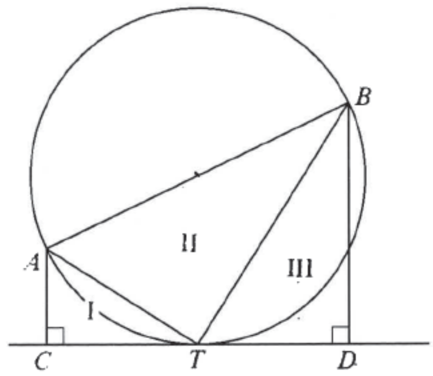
3. In the figure, circle O touches the three sides of ΔABC. $\angle B = \beta°$; $\angle C = \gamma°$. $\angle ROQ =$



A. $(\beta + \gamma)°$.
B. $(\beta + \gamma)° - 180°$.
C. $90° - (\beta + \gamma)°$.
D. $180° - (\beta + \gamma)°$.
E. $360° - (\beta + \gamma)°$.

[SP-CE-MATHS A2-49]

4. In the figure, AB is a diameter. CTD is a tangent. $AC \perp CD$; $BD \perp CD$. ΔACT, ΔATB and ΔBTD are denoted by I, II and III respectively.

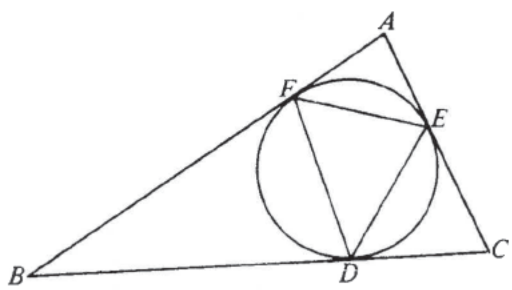


Which of the following is a true statement about the triangles?

A. No two of them are similar.
B. Only I and II are similar.
C. Only I and III are similar.
D. Only II and III are similar.
E. All three of them are similar.

[SP-CE-MATHS A2-54]

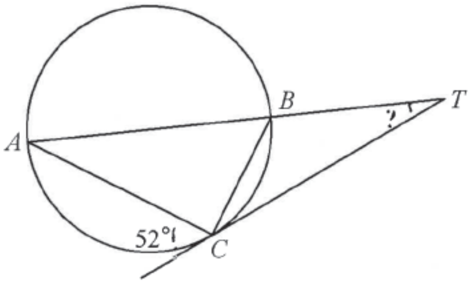
5. ABC is a triangle. The circle touches the sides of ΔABC at D, E and F as shown in the figure. Which of the following statements is true?



A. $FD \parallel AC$.
B. BDF is an isosceles triangle.
C. $FD = \frac{1}{2}AC$.
D. $ACDF$ is a cyclic quadrilateral.
E. DEF is an equilateral triangle.

[SP-CE-MATHS A2-56]

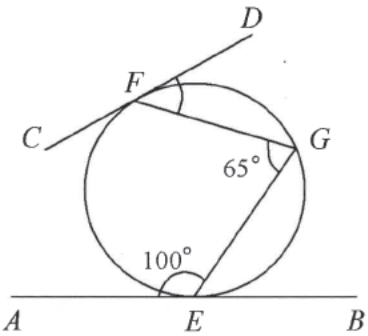
6. In the figure, the tangent to the circle at C meets the diameter AB produced at T. $\angle ATC =$



A. 38°.
B. 26°.
C. 19°.
D. 14°.
E. 13°.

[1978-CE-MATHS 2-7]

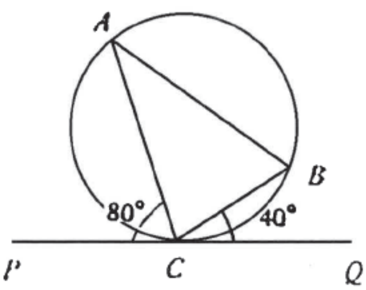
7. In the figure, AB and CD touch the circle at E and F respectively. If $\angle AEG = 100°$ and $\angle EGF = 65°$, then $\angle GFD =$



A. 30°.
B. 35°.
C. 45°.
D. 50°.
E. 60°.

[1979-CE-MATHS 2-9]

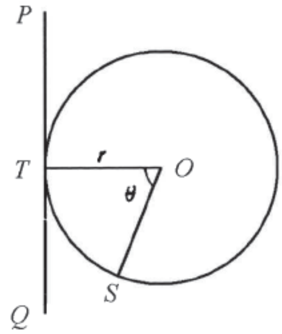
8. In the figure, PQ touches the circle at C, and the length of minor arc AC is 12 cm. What is the length of minor arc AB?



A. 9 cm
B. 8 cm
C. 7.5 cm
D. 7 cm
E. 6 cm

[1979-CE-MATHS 2-10]

9. In the figure, PQ touches the circle centre O and radius r, at T. $\angle TOS = \theta$. How far is S from PQ?



A. $r \sin\theta$

B. $r \cos\theta$

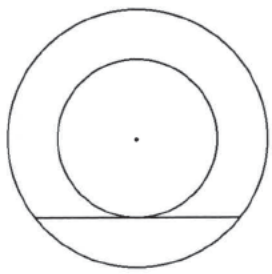
C. $r(1 - \sin\theta)$

D. $r(1 - \cos\theta)$

E. $r(1 - \tan\theta)$

[1979-CE-MATHS 2-33]

10. In the figure, the two concentric circles are of radii a and b, where $a > b$. A chord of the greater circle touches the smaller circle. How long is this chord?



A. $2(a - b)$

B. $\sqrt{a^2 + b^2}$

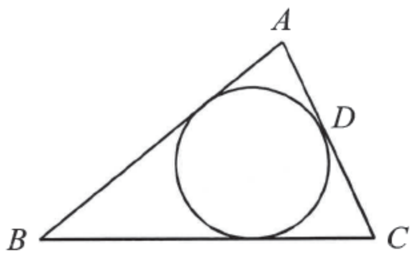
C. $2\sqrt{a^2 + b^2}$

D. $\sqrt{a^2 - b^2}$

E. $2\sqrt{a^2 - b^2}$

[1979-CE-MATHS 2-34]

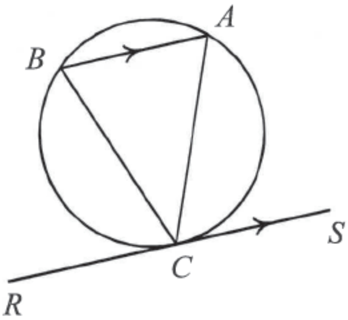
11. In the figure, the inscribed circle of ΔABC touches AC at D. If $AB = 7$, $AC = 5$ and $AD = 2$, then $BC =$



A. 9.5 .
B. 9 .
C. 8.5 .
D. 8 .
E. 7.5 .

[1980-CE-MATHS 2-27]

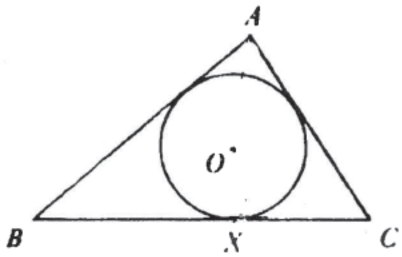
12. In the figure, RS is a tangent to the circle at C. BA is any chord parallel to RCS. Which of the chords AB, BC and CA must be equal in length?



A. AB and BC only
B. AC and BC only
C. AB and AC only
D. All of them
E. No two of them

[1980-CE-MATHS 2-48]

13.



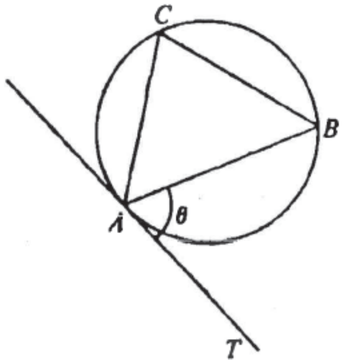
In the figure, circle O is inscribed in ΔABC, touching BC at X. Which of the following must be true?

(1) $OX \perp BC$
(2) OA bisects $\angle A$
(3) AO produced bisects BC

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (1), (2) and (3)
E. None of them

[1980-CE-MATHS 2-51]

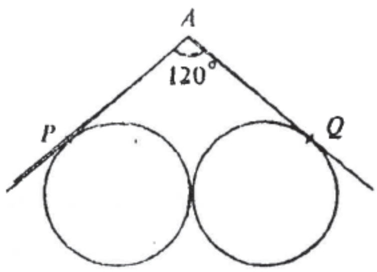
14. In the figure, AT touches the circle at A. In ΔABC, $\angle A : \angle B : \angle C = 2 : 3 : 4$. $\theta =$



A. $40°$.
B. $50°$.
C. $60°$.
D. $70°$.
E. $80°$.

[1981-CE-MATHS 2-25]

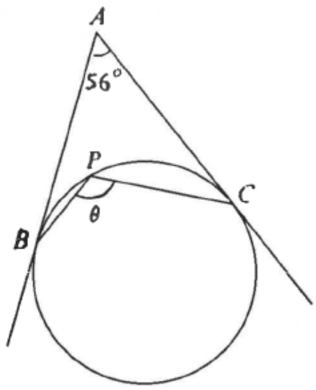
15. In the figure, two circles both with radius 2 cm touch each other externally. AP and AQ are equal tangents to the two circles. $AP =$



A. $\sqrt{3}$ cm .
B. $2\sqrt{3}$ cm .
C. 4 cm .
D. $4\sqrt{3}$ cm .
E. $\frac{4\sqrt{3}}{3}$ cm .

[1981-CE-MATHS 2-27]

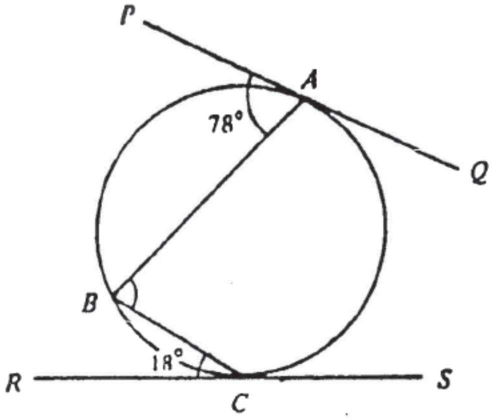
16. In the figure, AB and AC touch the circle at B and C. If P is any point on the minor arc BC, what is θ?



A. 112°
B. 118°
C. 124°
D. 146°
E. It cannot be determined

[1981-CE-MATHS 2-51]

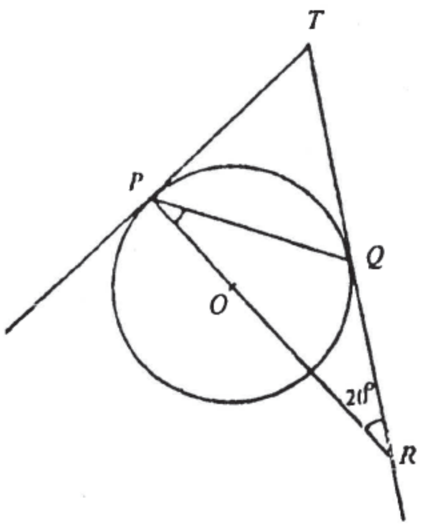
17. In the figure, PQ and RS touch the circle at A and C respectively. $\angle ABC =$



A. 48°.
B. 60°.
C. 84°.
D. 90°.
E. 96°.

[1982-CE-MATHS 2-28]

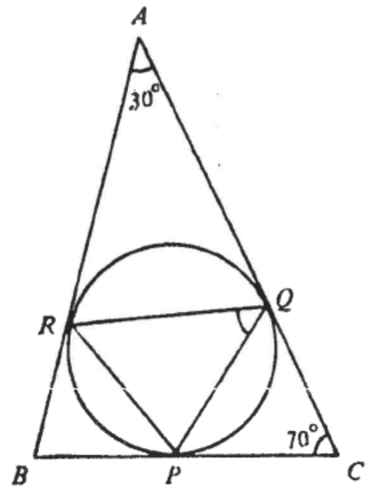
18. In the figure, TP and TQ touch the circle at P and Q respectively. R is the point on TQ produced such that PR passes through the centre O of the circle. $\angle QPR =$



A. 55°.
B. 40°.
C. 35°.
D. 30°.
E. 20°.

[1982-CE-MATHS 2-54]

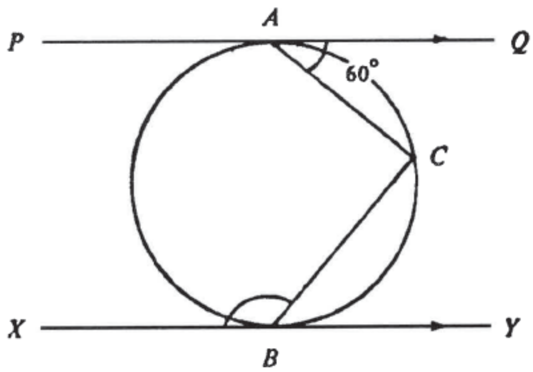
19. In the figure, the three sides of ΔABC touch the circle at the points P, Q and R. $\angle PQR =$



A. 30°.
B. 50°.
C. 55°.
D. 70°.
E. 75°.

[1983-CE-MATHS 2-25]

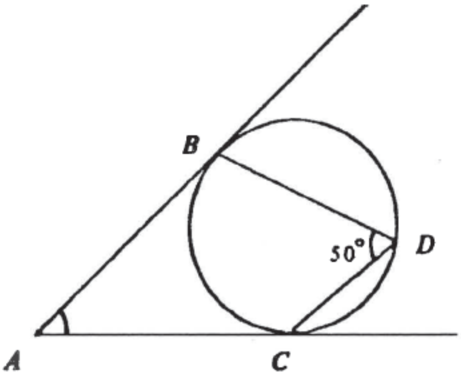
20. In the figure, PQ and XY touch the circle at A and B respectively. $PQ // XY$ and $\angle QAC = 60°$. $\angle CBX =$



A. 150°.
B. 135°.
C. 120°.
D. 110°.
E. 100°.

[1983-CE-MATHS 2-54]

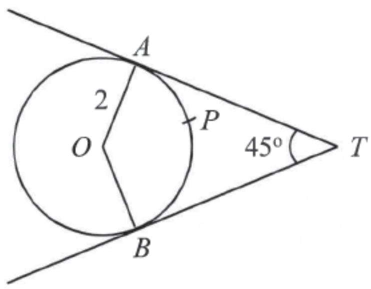
21. In the figure, AB and AC touch the circle at B and C respectively. $\angle A =$



A. 30°.
B. 40°.
C. 50°.
D. 80°.
E. 85°.

[1984-CE-MATHS 2-24]

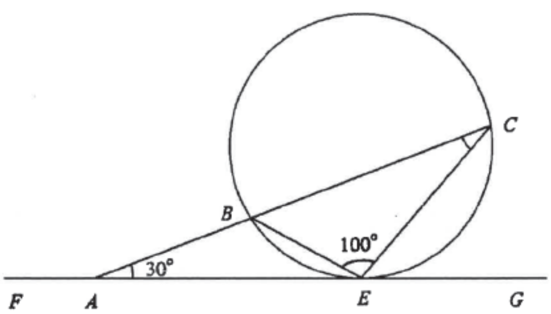
22. In the figure, O is the centre of the circle. TA and TB touch the circle at A and B respectively. $OA = 2$. The length of the arc APB is



A. $\frac{\pi}{4}$.
B. $\frac{\pi}{2}$.
C. $\frac{3\pi}{4}$.
D. $\frac{3\pi}{2}$.
E. 3π.

[1984-CE-MATHS 2-25]

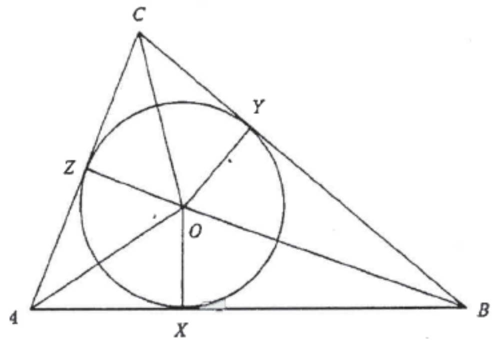
23. In the figure, FG touches the circle at E. The chord CB is produced to meet FG at A. $\angle ACE =$



A. 10°.
B. 20°.
C. 25°.
D. 30°.
E. 35°.

[1985-CE-MATHS 2-53]

24.



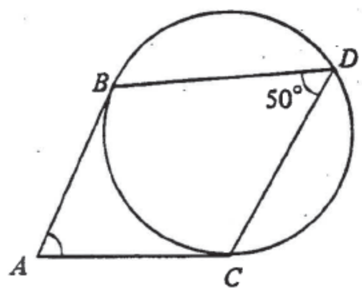
In the figure, the circle touches the sides of ΔABC at X, Y and Z. O is the centre of the circle. Which of the following must be true?

(1) OA bisects $\angle BAC$
(2) A, X, O and Z are concyclic
(3) $AX = AZ$

A. (3) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1985-CE-MATHS 2-54]

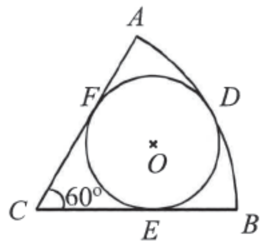
25. In the figure, AB and AC are tangents to the circle BCD. If $\angle BDC = 50°$, then $\angle A =$



A. 130°.
B. 100°.
C. 85°.
D. 80°.
E. 50°.

[1986-CE-MATHS 2-50]

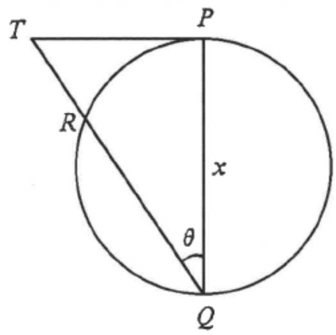
26. A circle, centre O, touches the sector ABC internally at D, E and F. $\angle C = 60^\circ$ and $AC = 18$. Find the radius of the circle.



A. 9
B. 6
C. 5
D. 4
E. 3

[1986-CE-MATHS 2-53]

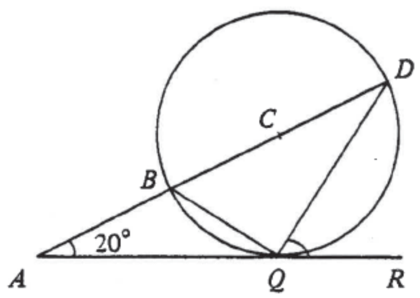
27. In the figure, PQ is a diameter and PT is a tangent of the circle. QT cuts the circle at R. Let $\angle Q = \theta$ and $PQ = x$, then $TR =$



A. $\dfrac{x}{\cos\theta}$.
B. $\dfrac{x}{\sin\theta}$.
C. $\dfrac{x}{\sin\theta\tan\theta}$.
D. $x\sin\theta\tan\theta$.
E. $x\cos\theta\tan\theta$.

[1986-CE-MATHS 2-54]

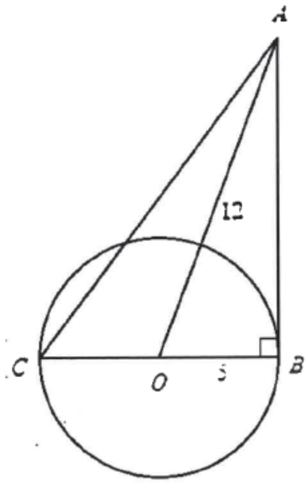
28. In the figure, C is the centre of the circle. $ABCD$ is a straight line. AQR touches the circle at Q. If $\angle DAR = 20^\circ$, then $\angle DQR =$



A. 35°.
B. 40°.
C. 55°.
D. 65°.
E. 70°.

[1987-CE-MATHS 2-53]

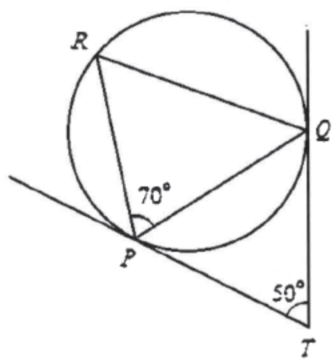
29. In the figure, O is the centre of the circle of radius 5. AB is a tangent and $AO = 12$. $AC =$



A. 13
B. 17
C. $\sqrt{219}$
D. $\sqrt{244}$
E. $\sqrt{269}$

[1988-CE-MATHS 2-21]

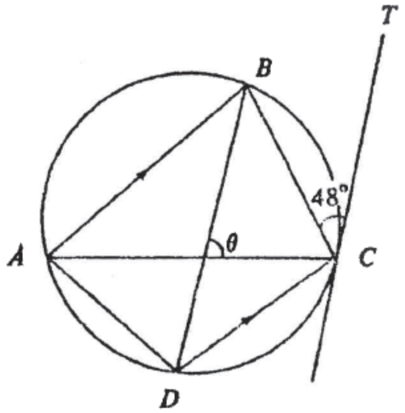
30. In the figure, TP and TQ are tangents to the circle PQR. If $\angle RPQ = 70^\circ$ and $\angle PTQ = 50^\circ$, then $\angle RQP =$



A. 20°
B. 45°
C. 50°
D. 60°
E. 70°

[1988-CE-MATHS 2-24]

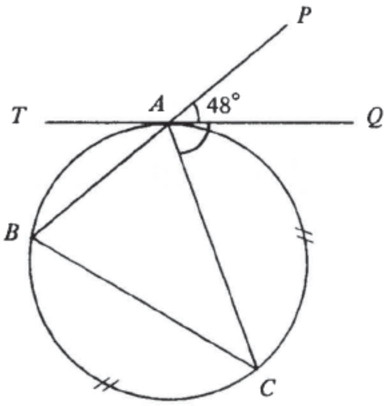
31. In the figure, TC is a tangent to the circle at C and $AB // DC$. If $\angle BCT = 48°$, then $\theta =$



A. 48°.
B. 72°.
C. 84°.
D. 90°.
E. 96°.

[1989-CE-MATHS 2-24]

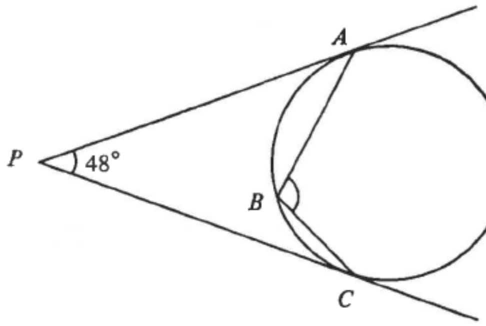
32. In the figure, TQ is a tangent to the circle at A. If arc AC = arc BC and $\angle PAQ = 48°$, then $\angle QAC =$



A. 42°.
B. 48°.
C. 66°.
D. 71°.
E. 84°.

[1990-CE-MATHS 2-20]

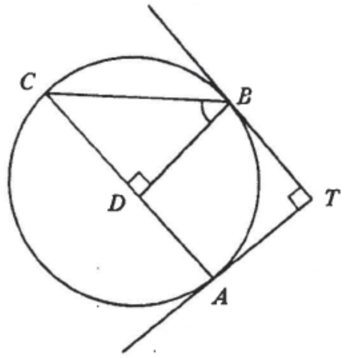
33. In the figure, PA and PC are tangents to the circle ABC. If $\angle P = 48°$, then $\angle ABC =$



A. 84°.
B. 96°.
C. 106°.
D. 114°.
E. 132°.

[1990-CE-MATHS 2-50]

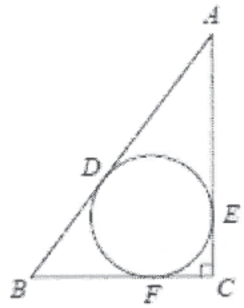
34. In the figure, TA and TB are tangents to the circle ABC. If $TA \perp TB$ and $BD \perp AC$, find $\angle CBD$.



A. 30°
B. 40°
C. 45°
D. 50°
E. 60°

[1990-CE-MATHS 2-51]

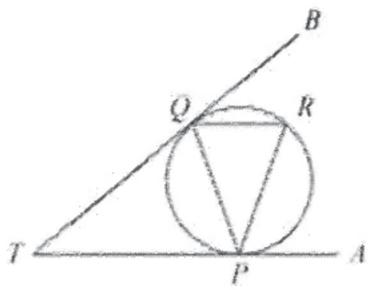
35. In the figure, AB, AC and BC are three tangents touching the circle at D, E and F respectively. If $AC = 24$, $BC = 18$ and $\angle ACB = 90°$, find the radius of the circle.



A. 3
B. 4
C. 5
D. 6
E. 7

[1990-CE-MATHS 2-53]

36.



In the figure, TPA and TQB are tangents to the circle at P and Q respectively. If $PQ = PR$, which of the following must be true?

(1) $\angle APR = \angle QRP$

(2) $\angle QTP = \angle QPR$

(3) $\angle QPR = \angle APR$

A. (1) only

B. (2) only

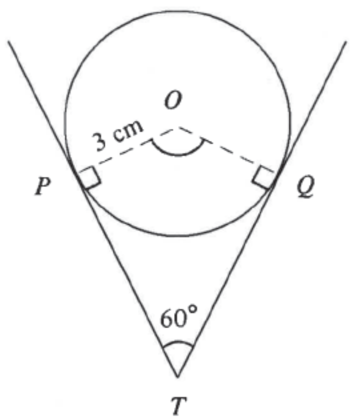
C. (3) only

D. (1) and (2) only

E. (1) and (3) only

[1991-CE-MATHS 2-24]

37. In the figure, TP and TQ are tangent to the circle of radius 3 cm. Find the length of the minor arc PQ.



A. 3π cm

B. 2π cm

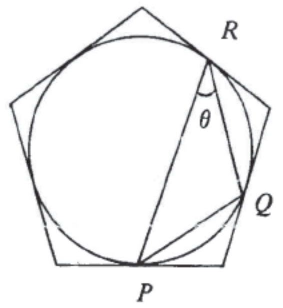
C. $\frac{3\pi}{2}$ cm

D. π cm

E. $\frac{\pi}{2}$ cm

[1992-CE-MATHS 2-14]

38. In the figure, the circle is inscribed in a regular pentagon. P, Q and R are points of contact. Find θ.



A. 30°

B. 32°

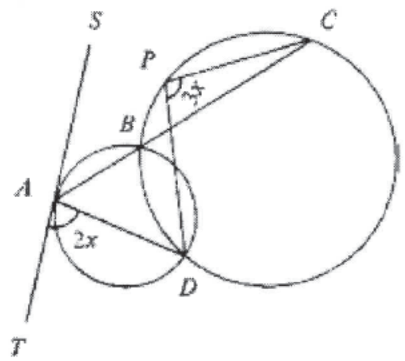
C. 35°

D. 36°

E. 45°

[1992-CE-MATHS 2-26]

39. In the figure, ST is a tangent to the smaller circle. ABC is a straight line. If $\angle TAD = 2x$ and $\angle DPC = 3x$, find x.



A. 30°

B. 36°

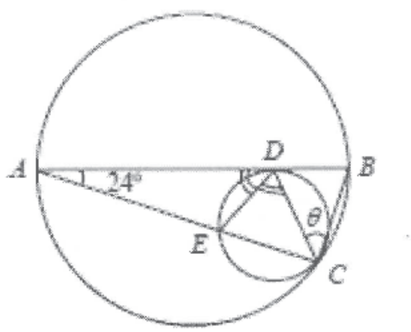
C. 40°

D. 42°

E. 45°

[1992-CE-MATHS 2-27]

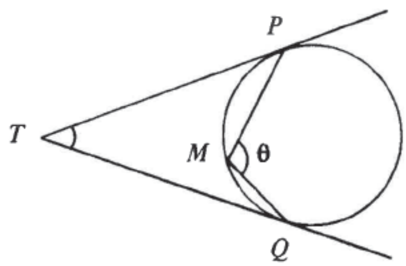
40. In the figure, the two circles touch each other at C. The diameter AB of the bigger circle is tangent to the smaller circle at D. If DE bisects $\angle ADC$, find θ.



A. 24°
B. 38°
C. 45°
D. 52°
E. 66°

[1992-CE-MATHS 2-50]

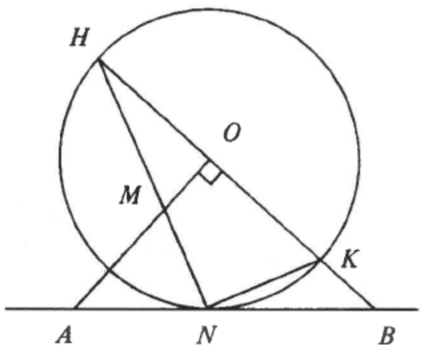
41. In the figure, TP and TQ are tangents to the circle at P and Q respectively. If M is a point on the minor arc PQ and $\angle PMQ = \theta$, then $\angle PTQ =$



A. $\frac{\theta}{2}$.
B. $\theta - 90°$.
C. $180° - \theta$.
D. $180° - 2\theta$.
E. $2\theta - 180°$.

[1993-CE-MATHS 2-50]

42.



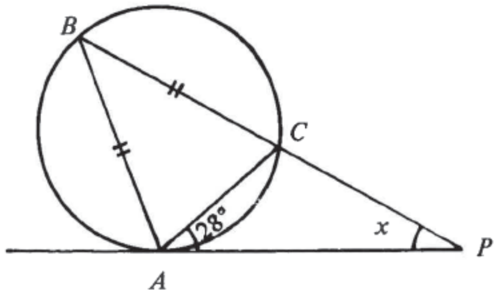
In the figure, O is the centre of the circle. AB touches the circle at N. Which of the following is/are correct?

(1) M, N, K, O are concyclic.
(2) $\Delta HNB \sim \Delta NKB$
(3) $\angle OAN = \angle NOB$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1), (2) and (3)

[1993-CE-MATHS 2-51]

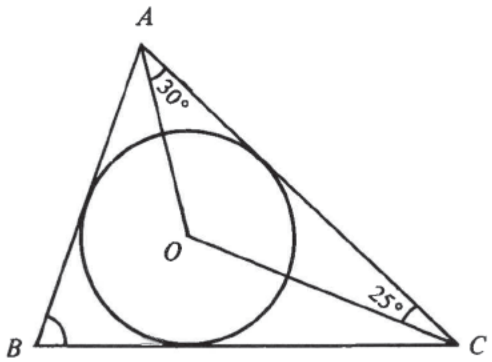
43. In the figure, PA is tangent to the circle at A, $\angle CAP = 28°$ and $BA = BC$. Find x.



A. 28°
B. 48°
C. 56°
D. 62°
E. 76°

[1994-CE-MATHS 2-22]

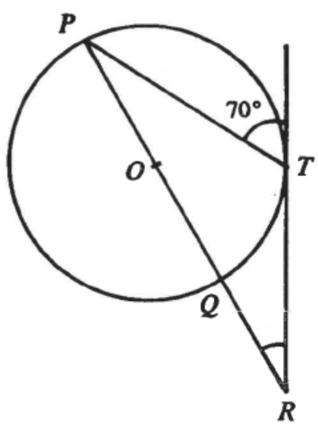
44. In the figure, O is the centre of the inscribed circle of ΔABC. If $\angle OAC = 30°$ and $\angle OCA = 25°$. Find $\angle ABC$.



A. 50°
B. 55°
C. 60°
D. 62.5°
E. 70°

[1994-CE-MATHS 2-23]

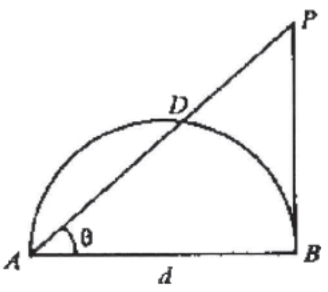
45. In the figure, O is the centre of the circle, $POQR$ is a straight line. TR is the tangent to the circle at T. $\angle PRT =$



A. 20°.
B. 35°.
C. 45°.
D. 50°.
E. 70°.

[1995-CE-MATHS 2-23]

46. In the figure, PB touches the semicircle ADB at B. $PD =$



A. $\frac{d}{2\cos\theta}$.

B. $d\sin\theta\tan\theta$.

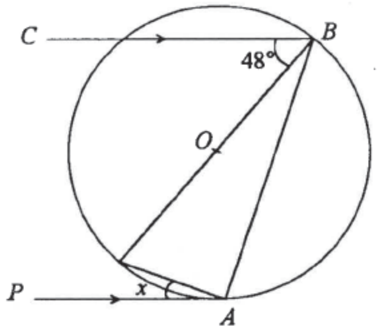
C. $\frac{d}{\sin\theta\tan\theta}$.

D. $\frac{d\cos\theta}{\tan\theta}$.

E. $\frac{d\tan\theta}{\cos\theta}$.

[1995-CE-MATHS 2-52]

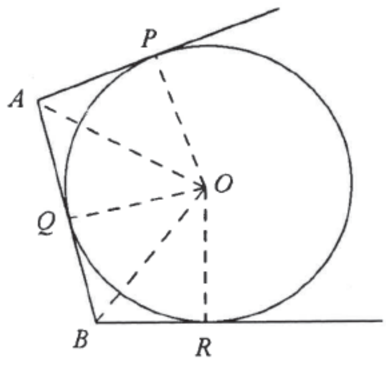
47. In the figure, O is the centre of the circle. PA is the tangent to the circle at A and CB // PA. Find x.



A. 21°
B. 24°
C. 42°
D. 45°
E. 48°

[1996-CE-MATHS 2-26]

48.



In the figure, O is the centre of the circle. AP, AB and BR are tangents to the circle at P, Q and R respectively. Which of the following must be true?

(1) $AP + BR = AB$

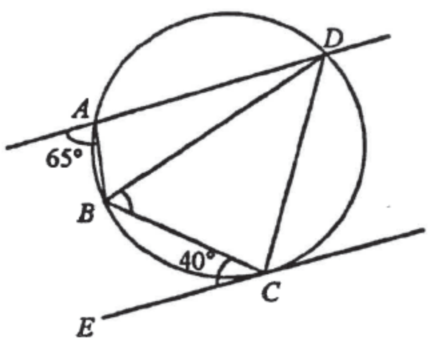
(2) OQ bisects $\angle AOB$

(3) $\angle AOB = \frac{1}{2}\angle POR$

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1996-CE-MATHS 2-50]

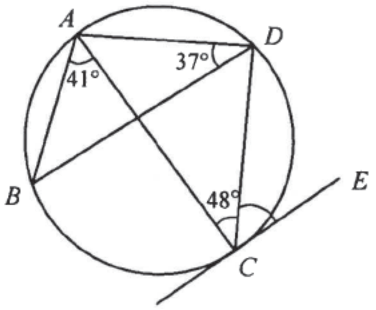
49. In the figure, EC is the tangent to the circle at C. Find $\angle CBD$.



A. 40°
B. 50°
C. 65°
D. 70°
E. 75°

[1997-CE-MATHS 2-20]

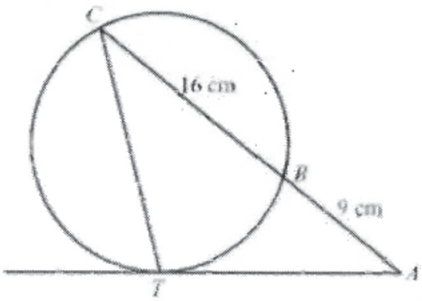
50. In the figure, CE is tangent to the circle at C. Find $\angle DCE$.



A. 40°
B. 42°
C. 49°
D. 54°
E. 78°

[1998-CE-MATHS 2-49]

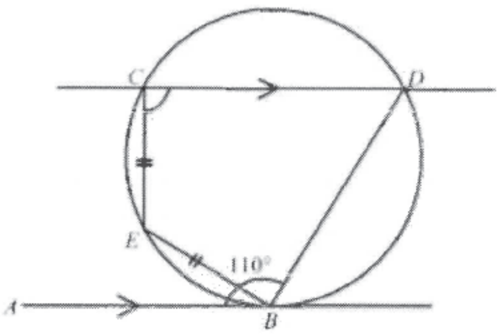
51. In the figure, AT is tangent to the circle at T and ABC is a straight line. Find AT.



A. 9 cm
B. 12 cm
C. 15 cm
D. 16 cm
E. 20 cm

[1999-CE-MATHS 2-50]

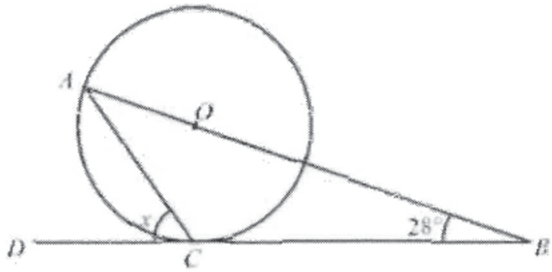
52. In the figure, AB is tangent to the circle at B. Find $\angle DCE$.



A. 70°
B. 75°
C. 90°
D. 95°
E. 105°

[2000-CE-MATHS 2-45]

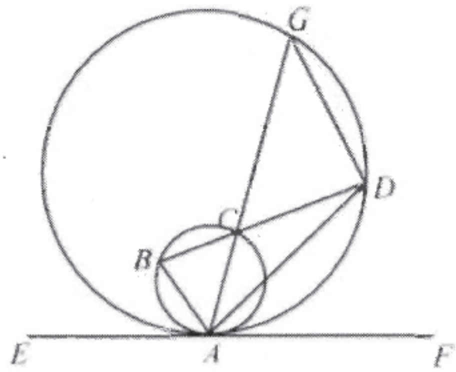
53. In the figure, O is the centre of the circle, AOB is a straight line and BCD is the tangent to the circle at C. Find x.



A. 50°
B. 53°
C. 56°
D. 59°
E. 62°

[2001-CE-MATHS 2-45]

54.



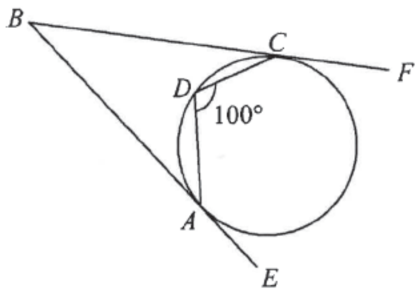
In the figure, EAF is a common tangent to the circles at the point A. Chords AC and BC of the smaller circle are produced to meet the larger circle at G and D respectively. Which of the following must be true?

(1) $\angle ADG = \angle EAG$
(2) $\angle ABD = \angle AGD$
(3) $\angle BAE = \angle ADB$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2002-CE-MATHS 2-51]

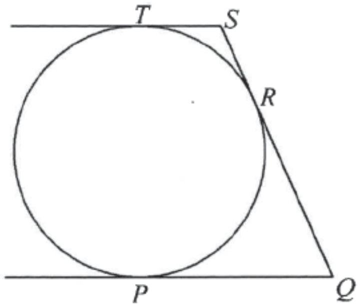
55. In the figure, BE and BF are tangents to the circle at A and C respectively. If $\angle ADC = 100°$, then $\angle ABC =$



A. 20°.
B. 30°.
C. 40°.
D. 50°.

[2003-CE-MATHS 2-52]

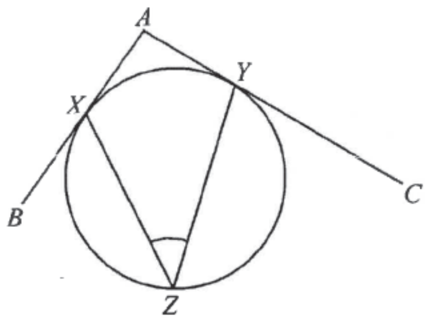
56. In the figure, TS, SQ and QP are tangents to the circle at T, R and P respectively. If $TS // PQ$, $TS = 3$ and $QP = 12$, then the radius of the circle is



A. 4.5.
B. 6.
C. 7.5.
D. 9.

[2004-CE-MATHS 2-51]

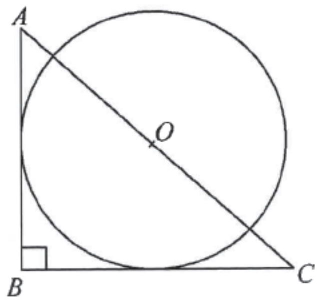
57. In the figure, AB and AC are tangents to the circle at X and Y respectively. Z is a point lying on the circle. If $\angle BAC = 100^\circ$, then $\angle XZY =$



A. 40°.
B. 45°.
C. 50°.
D. 55°.

[2005-CE-MATHS 2-49]

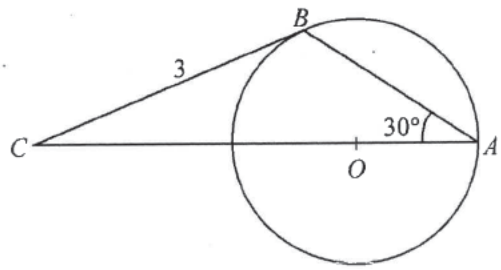
58. In the figure, O is the centre of the circle and AOC is a straight line. If AB and BC are tangents to the circle such that $AB = 3$ and $BC = 4$, then the radius of the circle is



A. $\frac{3}{2}$.
B. $\frac{12}{7}$.
C. 2.
D. $\frac{5}{2}$.

[2005-CE-MATHS 2-50]

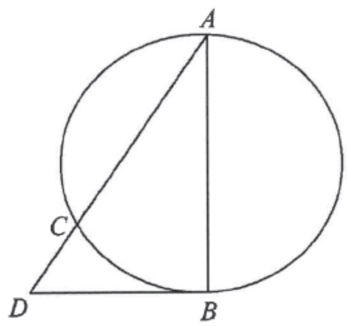
59. In the figure, O is the centre of the circle. A and B are points lying on the circle. If AOC is a straight line and BC is a tangent to the circle, then the radius of the circle is



A. $\frac{3}{2}$.
B. $\sqrt{3}$.
C. $2\sqrt{3}$.
D. $3\sqrt{3}$.

[2006-CE-MATHS 2-47]

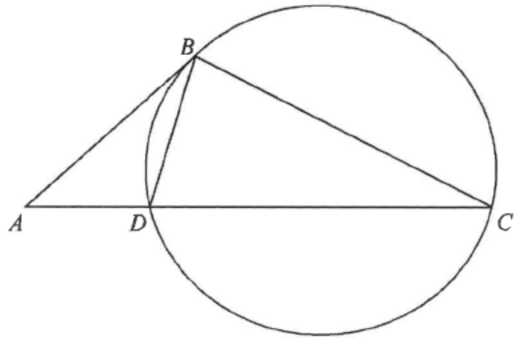
60. In the figure, A, B and C are points lying on the circle. AB is a diameter of the circle. DB tangent to the circle at B. If ACD is a straight line with $AC = 4$ and $CD = 2$, then $AB =$



A. $2\sqrt{6}$.
B. $4\sqrt{3}$.
C. $4\sqrt{6}$.
D. $8\sqrt{3}$.

[2007-CE-MATHS 2-49]

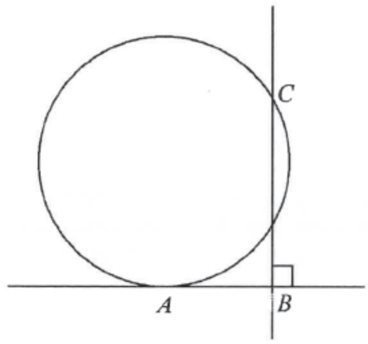
61. In the figure, AB is the tangent to the circle at B and ADC is a straight line. If $AB : AD = 2 : 1$, then the area of ΔABD : the area of ΔBCD =



A. 1 : 2 .
B. 1 : 3 .
C. 1 : 4 .
D. 2 : 3 .

[2008-CE-MATHS 2-51]

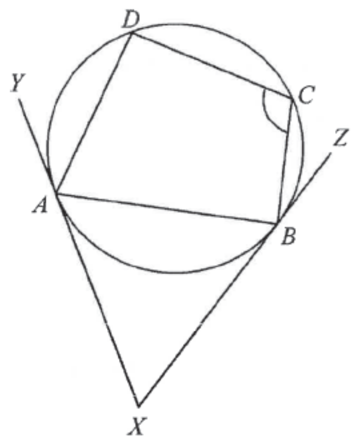
62. In the figure, AB is the tangent to the circle at A. If $AB = 20$ and $BC = 50$, find the radius of the circle.



A. 20
B. 25
C. 29
D. 30

[2009-CE-MATHS 2-50]

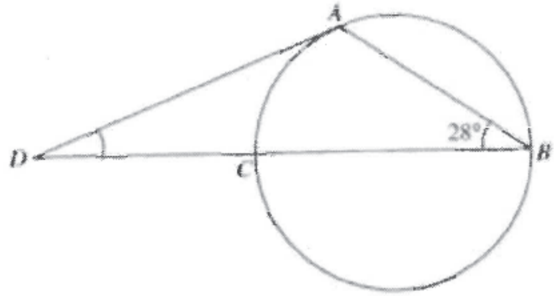
63. In the figure, XY and XZ are the tangents to the circle $ABCD$ at A and B respectively. If $\angle AXB = 50°$ and $\angle DAY = 30°$, then $\angle BCD$ =



A. 65° .
B. 80° .
C. 95° .
D. 130° .

[2010-CE-MATHS 2-50]

64. In the figure, BC is a diameter of the circle ABC. BCD is a straight line and DA is the tangent to the circle at A. If $\angle ABC = 28°$, then $\angle ADB$ =

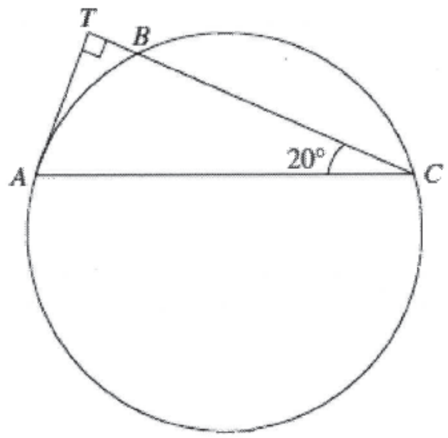


A. 22° .
B. 28° .
C. 34° .
D. 62° .

[2011-CE-MATHS 2-49]

HKDSE Problems

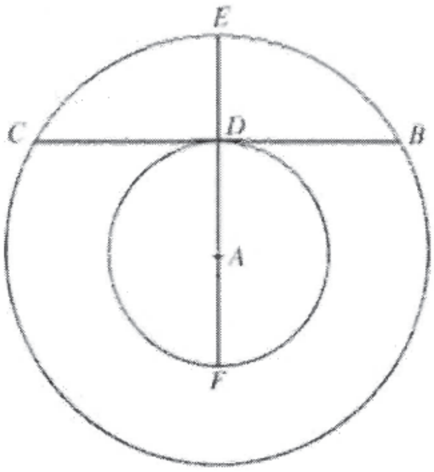
65. In the figure, A, B and C are points lying on the circle. TA is the tangent to the circle at A. The straight line CBT is perpendicular to TA. If $BC = 6$ cm, find the radius of the circle correct to the nearest 0.1 cm.



A. 3.2 cm
B. 3.9 cm
C. 4.2 cm
D. 4.7 cm

[SP-DSE-MATHS 2-41]

66. In the figure, A is the common centre of the two circles. BC is a chord of the larger circle and touches the smaller circle at D. AD produced meets the larger circle at E. F is a point lying on the smaller circle such that E, D, A and F are collinear. If $BC = 24$ cm and $DE = 8$ cm, then $EF =$



A. 13 cm .

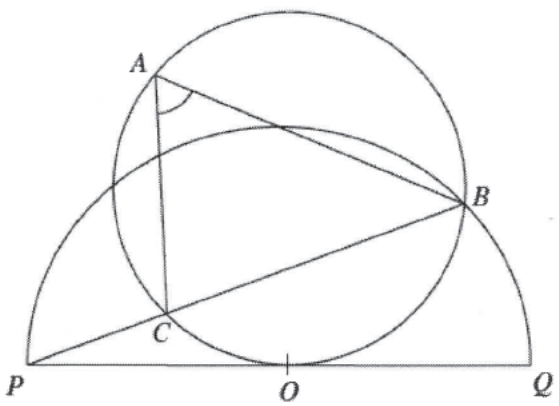
B. 16 cm .

C. 18 cm .

D. 20 cm .

[PP-DSE-MATHS 2-40]

67. In the figure, PQ is the tangent to the circle ABC at O, where O is the centre of the semicircle PBQ. It is given that BCP is a straight line. If $\angle BPQ = 12°$, then $\angle BAC =$



A. 18° .

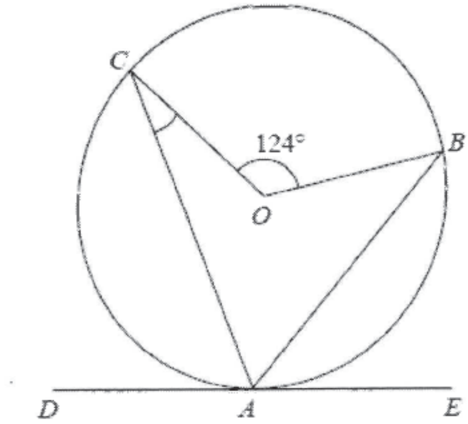
B. 24° .

C. 36° .

D. 54° .

[2012-DSE-MATHS 2-41]

68. In the figure, O is the centre of the circle ABC. DE is the tangent to the circle at A. If AB is the angle bisector of $\angle CAE$, then $\angle ACO =$



A. 26° .

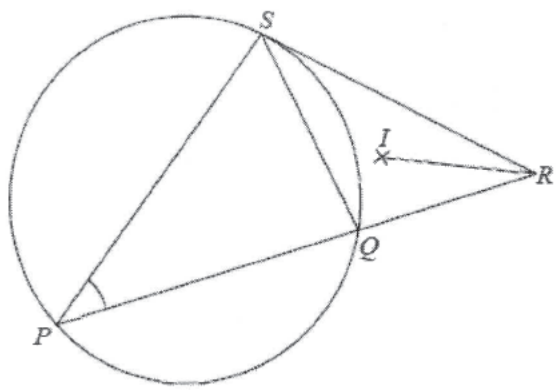
B. 28° .

C. 31° .

D. 34° .

[2013-DSE-MATHS 2-41]

69. In the figure, PQS is a circle. PQ is produced to R such that RS is the tangent to the circle at S. I is the in-centre of ΔQRS. If $\angle IRQ = 12°$ and $\angle PSQ = 70°$, then $\angle QPS =$



A. 24° .

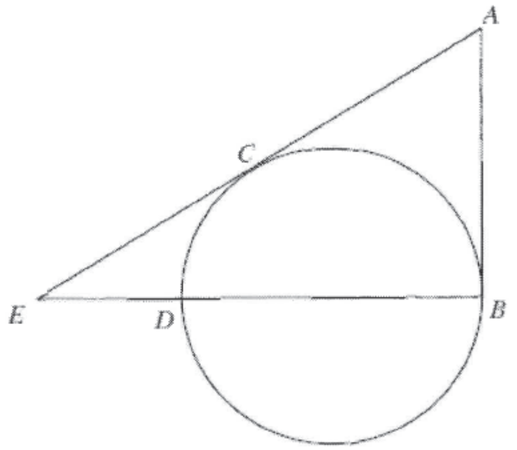
B. 37° .

C. 43° .

D. 62° .

[2014-DSE-MATHS 2-41]

70. In the figure, AB and AC are the tangents to the circle at B and C respectively. BD is a diameter of the circle. AC produced and BD produced meet at E. If $AB = 6$ cm and $AE = 10$ cm, then $BD =$



A. 3 cm .

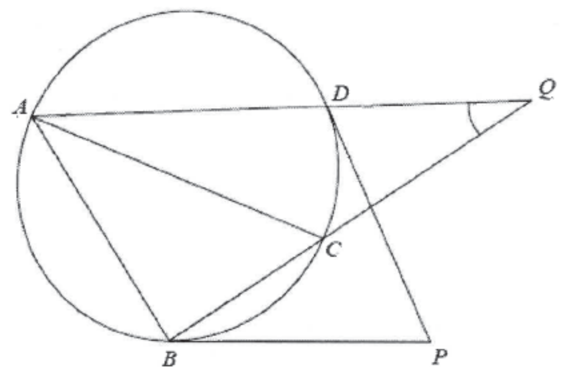
B. 5 cm .

C. 6 cm .

D. 8 cm .

[2015-DSE-MATHS 2-40]

71. In the figure, AC is a diameter of the circle $ABCD$. PB and PD are tangents to the circle. AD produced and BC produced meet at Q. If $\angle BPD = 68°$, then $\angle AQB =$



A. 22° .

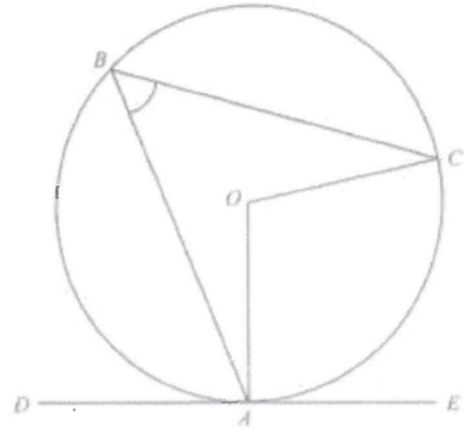
B. 28° .

C. 32° .

D. 34° .

[2016-DSE-MATHS 2-40]

72. In the figure, O is the centre of the circle ABC. DE is the tangent to the circle at A. If $\angle BAD = 68°$ and $\angle BCO = 26°$, then $\angle ABC =$



A. 42° .

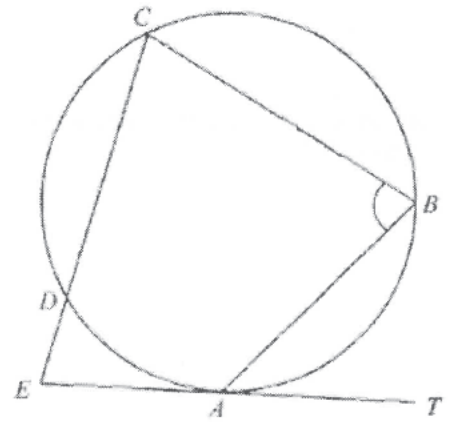
B. 48° .

C. 54° .

D. 64° .

[2017-DSE-MATHS 2-40]

73. In the figure, TA is the tangent to the circle $ABCD$ at the point A. CD produced and TA produced meet at the point E. It is given that $AB = CD$, $\angle BAT = 24°$ and $\angle AED = 72°$. Find $\angle ABC$.



A. 60°

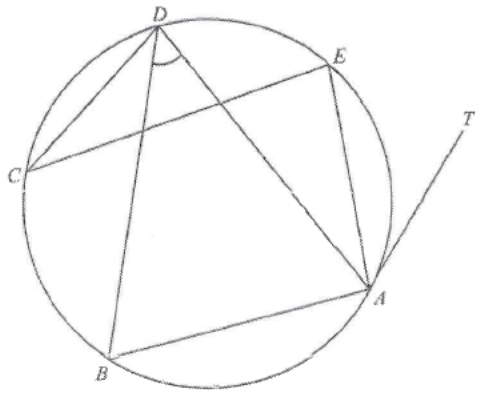
B. 66°

C. 72°

D. 78°

[2018-DSE-MATHS 2-39]

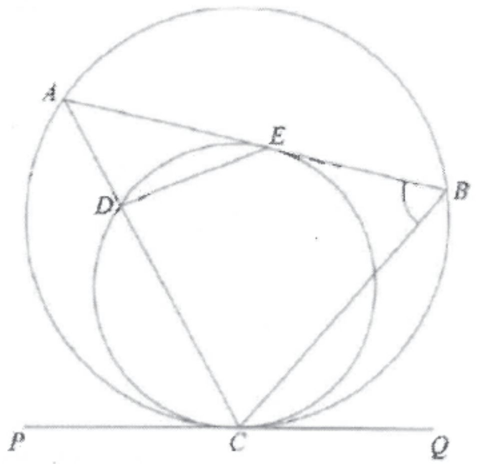
74. In the figure, TA is the tangent to the circle $ABCDE$ at point A. If $\angle BAD = 64°$, $\angle EAT = 38°$ and $\angle DCE = 22°$, then $\angle ADB =$



A. 52°
B. 56°
C. 60°
D. 68°

[2019-DSE-MATHS 2-39]

75. In the figure, ABC and CDE are circles such that ADC is a straight line. PQ is the common tangent to the two circles at C. AB is the tangent to the circle CDE at E. If $\angle ADE = 100°$ and $\angle BCQ = 35°$, then $\angle ABC =$



A. 55°
B. 65°
C. 70°
D. 80°

[2020-DSE-MATHS 2-39]

HKDSE Problems

1. If P is a moving point in the rectangular coordinate plane such that the distance between P and the point (20, 12) is equal to 5, then the locus of P is a

   A. circle.
   B. square.
   C. parabola.
   D. triangle.

   [2012-DSE-MATHS 2-24]

2. The coordinates of the points A and B are (2, 5) and (4, –1) respectively. Let P be a moving point in the rectangular coordinate plane such that $AP = BP$. Find the equation of the locus of P.

   A. $x - 3y + 3 = 0$
   B. $x - 3y - 7 = 0$
   C. $x - 3y + 13 = 0$
   D. $3x + y - 11 = 0$

   [2013-DSE-MATHS 2-24]

3. The equations of the straight lines L_1 and L_2 are $2x + 3y = 5$ and $4x + 6y = 7$ respectively. If P is a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2, then the locus of P is a

   A. circle.
   B. square.
   C. parabola.
   D. straight line.

   [2014-DSE-MATHS 2-24]

4. The coordinates of the points A and B are (2, 0) and (1, 5) respectively. If P is a moving point in the rectangular coordinate plane such that P is equidistant from A and B, then the locus of P is

   A. the perpendicular bisector of AB.
   B. the circle with AB as a diameter.
   C. the straight line which passes through A and B.
   D. the angle bisector of $\angle AOB$, where O is the origin.

   [2015-DSE-MATHS 2-24]

5. It is given that A and B are two distinct points lying on the circle $x^2 + y^2 - 6x - 4y - 87 = 0$. Let P be a moving point in the rectangular coordinate plane such that $AP = BP$. The equation of the locus of P is $x + 2y + k = 0$, where k is a constant. Find k.

   A. –8
   B. –7
   C. 7
   D. 8

   [2017-DSE-MATHS 2-27]

6. The equations of the straight lines L_1 and L_2 are $3x - y + 7 = 0$ and $12x - 4y - 11 = 0$ respectively. Let P be a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2. Find the equation of the locus of P.

   A. $8x - 24y - 17 = 0$
   B. $8x - 24y + 17 = 0$
   C. $24x - 8y - 17 = 0$
   D. $24x - 8y + 17 = 0$

   [2018-DSE-MATHS 2-25]

7. The equation of the straight line L is $5x - 7y - 14 = 0$. If P is a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L is equal to 3, then the locus of P is

   A. a sector
   B. a square
   C. a parabola
   D. a pair of straight lines

   [2019-DSE-MATHS 2-26]

8. Let A be the point of intersection of straight lines $9x + 4y - 7 = 0$ and $9x - 4y + 7 = 0$. If P is a moving point in the rectangular coordinate plane such that the distance between P and A is 8, then the locus of P is

   A. circle
   B. triangle
   C. quadrilateral
   D. regular hexagon

   [2020-DSE-MATHS 2-25]

Polar Coordinates

1. If the polar coordinates of the points A and B are $(5, 45°)$ and $(12, 135°)$ respectively, then the distance between A and B is

   A. 3 .
   B. 7 .
   C. 13 .
   D. 17 .

   [2006-CE-MATHS 2-27]

2. If the rectangular coordinates of the point A are $(-1, 1)$, then the polar coordinates of A are

   A. $(1, 135°)$.
   B. $(1, 225°)$.
   C. $(\sqrt{2}, 135°)$.
   D. $(\sqrt{2}, 225°)$.

   [2007-CE-MATHS 2-30]

3. If the polar coordinates of the point P are $(2, 300°)$, then the rectangular coordinates of P are

   A. $(-\sqrt{3}, 1)$.
   B. $(-1, \sqrt{3})$.
   C. $(1, -\sqrt{3})$.
   D. $(\sqrt{3}, -1)$.

   [2008-CE-MATHS 2-30]

4. If the polar coordinates of the point are $(6, 210°)$, then the rectangular coordinates of the point are

   A. $(-3, -3\sqrt{3})$.
   B. $(-3, 3\sqrt{3})$.
   C. $(-3\sqrt{3}, -3)$.
   D. $(-3\sqrt{3}, 3)$.

   [2010-CE-MATHS 2-30]

5. If the polar coordinates of the point P are $(2, 150°)$, then the rectangular coordinates of P are

   A. $(-1, \sqrt{3})$.
   B. $(\sqrt{3}, -1)$.
   C. $(1, -\sqrt{3})$.
   D. $(-\sqrt{3}, 1)$.

   [2011-CE-MATHS 2-30]

HKDSE Problems

6. The rectangular coordinates of the point P are $(-3, -3\sqrt{3})$. If P is rotated anticlockwise about the origin through 90°, then the polar coordinates of its image are

   A. $(3, 150°)$.
   B. $(3, 330°)$.
   C. $(6, 150°)$.
   D. $(6, 330°)$.

   [2012-DSE-MATHS 2-23]

7. The rectangular coordinates of the point P are $(-1, \sqrt{3})$. If P is reflected with respect to the x-axis, then the polar coordinates of its image are

   A. $(2, 210°)$.
   B. $(2, 240°)$.
   C. $(4, 210°)$.
   D. $(4, 240°)$.

   [2014-DSE-MATHS 2-23]

8. The rectangular coordinates of the point A are $(\sqrt{3}, -1)$. If A is reflected with respect to the y-axis, then the polar coordinates of its image are

   A. $(1, 210°)$.
   B. $(1, 240°)$.
   C. $(2, 210°)$.
   D. $(2, 240°)$.

   [2015-DSE-MATHS 2-23]

9. The polar coordinates of the points P, Q and R are $(3, 160°)$, $(4, 280°)$ and $(6, 340°)$ respectively. The perpendicular distance from Q to PR is

   A. 2 .
   B. 3 .
   C. $2\sqrt{3}$.
   D. $3\sqrt{3}$.

   [2017-DSE-MATHS 2-25]

10. The polar coordinates of the points C, D and E are $(16,127°)$ m $(12,127°)$ and $(5,307°)$ respectively. Find the perimeter of ΔCDE.

   A. 54
   B. 78
   C. 126
   D. 130

   [2018-DSE-MATHS 2-24]

11. The point P is translated leftward by 4 units to the point Q. If the coordinates of the reflection image of Q with respect to the y-axis are $(5, -1)$, then the polar coordinates of P are

A. $(1, 45°)$
B. $(1, 225°)$
C. $(\sqrt{2}, 45°)$
D. $(\sqrt{2}, 225°)$

[2020-DSE-MATHS 2-24]

Distance between Points

1. If P is the point $(x, 0)$, Q the point $(0, 1)$ and R the point $(0, x)$, and $PQ = 2RQ$, then x satisfies

   A. $x^2 - 4x + 1 = 0$.
   B. $3x^2 - 8x + 3 = 0$.
   C. $x^2 - 2x + 3 = 0$.
   D. $3x^2 - 4x + 3 = 0$.
   E. $x^2 + 2x - 3 = 0$.

   [1972-CE-MATHS B1-17]

2. If d is the distance between the point (a, b) and (b, a), then $d^2 =$

   A. 0 .
   B. $a^2 + b^2$.
   C. $2(a^2 + b^2)$.
   D. $(a - b)^2$.
   E. $2(a - b)^2$.

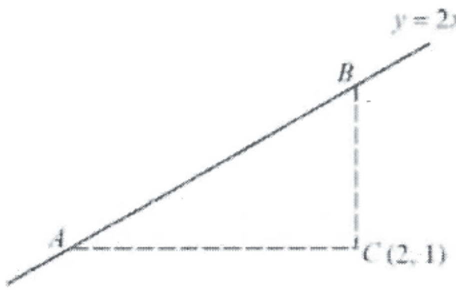
   [1983-CE-MATHS 2-29]

3. The distance between $(1-k, k)$ and $(2, 1+k)$ is $\sqrt{26}$. $k =$

   A. 4 .
   B. 6 .
   C. −4 or 6 .
   D. 4 or −6 .
   E. −4 or −6 .

   [1985-CE-MATHS 2-26]

4. In the figure, A, B and C are points on a rectangular coordinate plane. AC and BC are parallel to the x-axis and y-axis respectively. If the coordinates of C are $(2, 1)$ and the equation of the straight line AB is $y = 2x + 3$, find the distance between A and B.



   A. $\sqrt{5}$
   B. $\frac{3\sqrt{5}}{2}$
   C. $\sqrt{37}$
   D. $3\sqrt{5}$
   E. $\sqrt{65}$

   [2001-CE-MATHS 2-34]

5. If the length of the line segment joining the points $(2, 3)$ and $(k, 1-k)$ is 4, then $k =$

   A. 2 .
   B. 4 .
   C. 0 or 4 .
   D. −2 or 2 .

   [2002-CE-MATHS 2-30]

Collinear Points

6. If the points $(1, 1)$, $(3, 2)$ and $(7, k)$ are on the same straight line, then $k =$

   A. 3 .
   B. 4 .
   C. 6 .
   D. 7 .
   E. 10 .

   [1993-CE-MATHS 2-27]

7. The points $A(4, -1)$, $B(-2, 3)$ and $C(x, 5)$ lie on a straight line. Find x.

   A. −5
   B. −4
   C. 0
   D. 2
   E. 5

   [1994-CE-MATHS 2-26]

Mid-Point

8. If $(-2, 3)$ is the mid-point of $(a, -1)$ and $(4, b)$, then $b =$

   A. −7 .
   B. 7 .
   C. −8 .
   D. 8 .

   [2004-CE-MATHS 2-31]

9. The coordinates of the points A and B are $(-2, a)$ and $(b, 7)$ respectively. If the coordinates of the mid-point of AB are $(1, 5)$, then $a =$

   A. 0 .
   B. 3 .
   C. 4 .
   D. 17 .

   [2008-CE-MATHS 2-29]

Point of Division

10. The point P divides AB internally so that $AP : PB = 2 : 1$. The coordinates of A and B are (x_1, y_1) and (x_2, y_2) respectively. The coordinates of P are

A. $\left(\frac{2x_1 + x_2}{3}, \frac{2y_1 + y_2}{3}\right)$
B. $\left(\frac{x_1 + 2x_2}{3}, \frac{y_1 + 2y_2}{3}\right)$
C. $\left(\frac{2x_1 - x_2}{3}, \frac{2y_1 - y_2}{3}\right)$
D. $\left(\frac{x_1 - 2x_2}{3}, \frac{y_1 - 2y_2}{3}\right)$
E. $\left(\frac{x_1 + x_2}{3}, \frac{y_1 + y_2}{3}\right)$

[1984-CE-MATHS 2-26]

11. $ABCD$ is a line segment. $AB : BC : CD = 3 : 2 : 1$. If $A = (4, 5)$, $D = (10, 11)$, find C.

A. (5, 6)
B. (6, 7)
C. (7, 8)
D. (8, 9)
E. (9, 10)

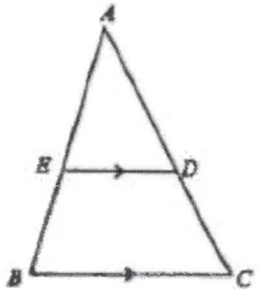
[1990-CE-MATHS 2-27]

12. $A(-3, 2)$ and $B(1, 3)$ are two points. C is a point on the AB produced such that $AB : BC = 1 : 2$. Find the coordinates of C.

A. $(-\frac{5}{3}, \frac{7}{3})$
B. $(-\frac{1}{3}, \frac{8}{3})$
C. $(3, \frac{7}{2})$
D. (5, 4)
E. (9, 5)

[1996-CE-MATHS 2-53]

13. In the figure, AEB and ADC are straight lines. $ED // BC$ and $ED : BC = 2 : 3$. If the coordinates of A and B are (4, 7) and (0, 1) respectively, find the coordinates of E.



A. $(\frac{4}{3}, 3)$
B. $(\frac{8}{3}, 5)$
C. $(\frac{8}{5}, \frac{5}{17})$
D. $(\frac{12}{5}, \frac{23}{5})$
E. $(\frac{8}{7}, \frac{19}{7})$

[1997-CE-MATHS 2-47]

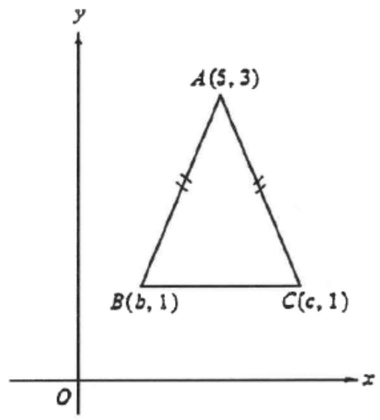
14. $A(7, 14)$ and $B(1, 2)$ are two points. C is a point on AB produced such that $AB : BC = 2 : 1$. Find the coordinates of C.

A. (–5, –10)
B. (–2, –4)
C. (3, 6)
D. (5, 10)
E. (10, 20)

[1998-CE-MATHS 2-54]

Vertices of Polygons

15. In the figure, $A(5, 3)$, $B(b, 1)$ and $C(c, 1)$ are the vertices of a triangle. If $AB = AC$, then $b + c =$



A. 3 .
B. 5 .
C. 6 .
D. 8 .
E. 10 .

[1988-CE-MATHS 2-28]

16. $PQRS$ is a parallelogram with vertices $P = (0, 0)$, $Q = (a, b)$ and $S = (-b, a)$. Find R.

A. $(-a, -b)$
B. $(a, -b)$
C. $(a - b, a - b)$
D. $(a - b, a + b)$
E. $(a + b, a + b)$

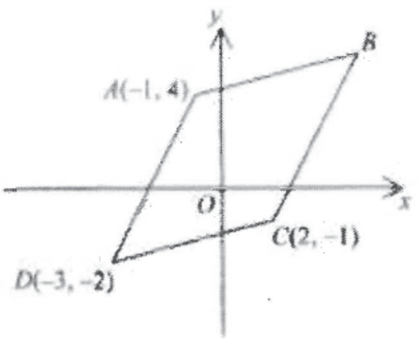
[1991-CE-MATHS 2-28]

17. The mid-points of the sides of a triangle are (3, 4), (2, 0) and (4, 2). Which of the following points is a vertex of the triangle?

 A. (3.5, 3)
 B. (3, 2)
 C. (3, 1)
 D. (1.5, 2)
 E. (1, 2)

[1992-CE-MATHS 2-31]

18. In the figure, $ABCD$ is a parallelogram. The coordinates of B are



 A. (3, 2).
 B. (3, 5).
 C. (4, 5).
 D. (4, 6).

[2005-CE-MATHS 2-32]

19. If the points (0, 0), (2, 0) and (1, b) are the vertices of an equilateral triangle, then b =

 A. 1.
 B. $\sqrt{3}$.
 C. 1 or −1.
 D. $\sqrt{3}$ or $-\sqrt{3}$.

[2006-CE-MATHS 2-31]

Transformation of Points

20. If the point (3, −2) is rotated clockwise about the origin through 90°, then the coordinates of its image are

 A. (2, 3).
 B. (3, 2).
 C. (−2, −3).
 D. (−3, −2).

[2007-CE-MATHS 2-29]

21. The coordinates of the point A are (−3, 3). If A is reflected with respect to the straight line $x = 1$ to the point B, then the distance between A and B is

 A. 4.
 B. 5.
 C. 6.
 D. 8.

[2009-CE-MATHS 2-30]

22. If the point $R(-4, -3)$ is reflected with respect to the straight line $y + 7 = 0$ to the point S, then the coordinates of S are

 A. (−4, −10).
 B. (−4, −11).
 C. (−10, −3).
 D. (−11, −3).

[2010-CE-MATHS 2-29]

23. The coordinates of the point A are (−3, 2). If A is translated downwards by 7 units to the point B, then the coordinates of the reflection image of B with respect to the straight line $x = 1$ are

 A. (5, 5).
 B. (5, −5).
 C. (−5, 5).
 D. (−5, −5).

[2011-CE-MATHS 2-29]

HKDSE Problems

24. If the point (−4, 3) is rotated anti-clockwise about the origin through 180°, then the coordinates of its image are

 A. (−3, −4).
 B. (3, 4).
 C. (−4, −3).
 D. (4, −3).

[SP-DSE-MATHS 2-26]

25. If the point (−2, −1) is reflected with respect to the straight line $y = -5$, then the coordinates of its image are

 A. (−8, −1).
 B. (−2, −9).
 C. (−2, 11).
 D. (12, −1).

[PP-DSE-MATHS 2-25]

26. The coordinates of the point A are $(-5,-2)$. A is translated rightwards by 9 units to the point B. B is then rotated anticlockwise about the origin through $90°$ to point C. Find the y-coordinate of C.

    A. -4
    B. -2
    C. 2
    D. 4

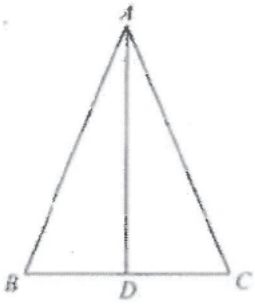
[2019-DSE-MATHS 2-25]

1. Let O be the origin. If the coordinates of the points A and B are (6, 0) and (0, 6) respectively, then the coordinates of the in-centre of ΔABO are

A. (0, 0) .
B. (2, 2) .
C. (3, 3) .
D. $(6-3\sqrt{2},\ 6-3\sqrt{2})$.

[2006-CE-MATHS 2-48]

2.



In the figure, ABC is an acute-angled triangle, $AB = AC$ and D is a point lying on BC such that AD is perpendicular to BC. Which of the following must be true?

(1) The circumcentre of ΔABC lies on AD.
(2) The orthocentre of ΔABC lies on AD.
(3) The centroid of ΔABC lies on AD.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2006-CE-MATHS 2-49]

3. If ΔABC is an obtuse-angled triangle, which of the following points must lie outside ΔABC?

(1) The centroid of ΔABC
(2) The circumcentre of ΔABC
(3) The orthocentre of ΔABC

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2007-CE-MATHS 2-50]

4. Let O be the origin. If the coordinates of the points A and B are (48, 0) and (24, 18) respectively, then the y-coordinate of the orthocentre of ΔABO is

A. −7 .
B. 6 .
C. 8 .
D. 32 .

[2008-CE-MATHS 2-52]

5. The coordinates of two vertices of a triangle are (−4, −8) and (6, 2). If the coordinates of the circumcentre of the triangle are (k, −4), then k =

A. −1 .
B. 0 .
C. 1 .
D. 2 .

[2009-CE-MATHS 2-52]

HKDSE Problems

6. Let O be the origin. If the coordinates of the points A and B are (18, −24) and (18, 24) respectively, then the x-coordinate of the orthocentre of ΔOAB is

A. −14 .
B. 10 .
C. 12 .
D. 25 .

[PP-DSE-MATHS 2-42]

7. Let O be the origin. If the coordinates of the points A and B are (0, 12) and (30, 12) respectively, then the y-coordinate of the circumcentre of ΔOAB is

A. 6 .
B. 8 .
C. 12 .
D. 15 .

[2013-DSE-MATHS 2-43]

8. Let O be the origin. The coordinates of the points P and Q are (0, 60) and (96, 48) respectively. The x-coordinate of the orthocentre of ΔOPQ is

A. 6 .
B. 32 .
C. 45 .
D. 48 .

[2015-DSE-MATHS 2-42]

9. Let O be the origin. The coordinates of the points P and Q are (p, 0) and (0, q) respectively, where p and q are positive numbers. If the in-centre of ΔOPQ lies on the straight line $3x + 4y = 3p$, then $p : q$ =

A. 2 : 3 .
B. 4 : 3 .
C. 4 : 9 .
D. 7 : 24 .

[2017-DSE-MATHS 2-41]

10. It is given that a is a positive constant. The straight line $2x + 5y = a$ cuts the x-axis and the y-axis at the points P and Q respectively. Let R be a point lying on the y-axis such that the x-coordinates of the orthocenter of ΔPQR is 10. Find the y-coordinates of R.

A. -25
B. -4
C. 4
D. 25

[2018-DSE-MATHS 2-40]

11. If ΔABC is a right-angled triangle with $\angle ABC = 90°$, which of the following is/are true?

I. The orthocenter of ΔABC lies on AC.
II. The centroid of ΔABC lies inside ΔABC.
III. The in-centre of ΔABC lies outside ΔABC.

A. I only
B. II only
C. I and III only
D. II and III only

[2019-DSE-MATHS 2-41]

12. The equations of three sides of a triangle are $4x + 3y = 24$, $4x - 3y = 24$ and $x = a$, where a is a constant. If the x-coordinates of the in-centre of the triangle is 31, then $a =$

A. 15
B. 31
C. 45
D. 51

[2020-DSE-MATHS 2-40]

Slope of Straight Lines

1. The gradient of the straight line $(x + y + 1) + k(x - y - 1) = 0$ is

A. $\dfrac{1+k}{k-1}$.

B. $\dfrac{1+k}{1-k}$.

C. $\dfrac{1-k}{1+k}$.

D. $\dfrac{k-1}{1+k}$.

E. 1 .

[1977-CE-MATHS 2-36]

2. The slope of the straight line passing through (–3, 4) and (4, –3) is

A. 7 .

B. –7 .

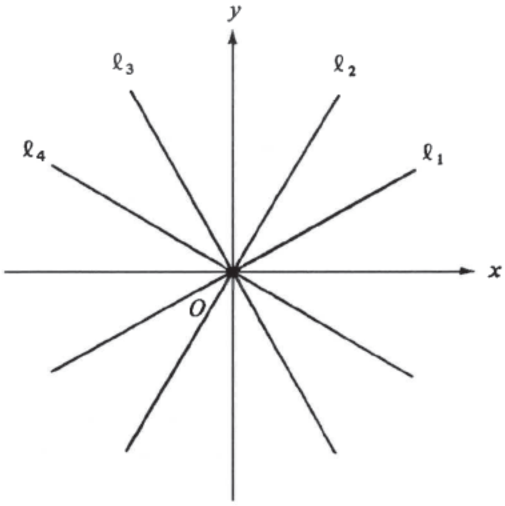
C. $\dfrac{1}{7}$.

D. 1 .

E. –1 .

[SP-CE-MATHS 2-42]

3. In the figure, the slopes of the straight lines ℓ_1, ℓ_2, ℓ_3 and ℓ_4 are m_1, m_2, m_3 and m_4 respectively. Which of the following is true?



A. $m_1 > m_2 > m_3 > m_4$

B. $m_2 > m_1 > m_3 > m_4$

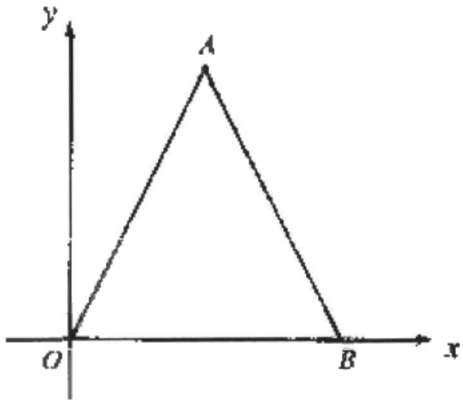
C. $m_1 > m_2 > m_4 > m_3$

D. $m_2 > m_1 > m_4 > m_3$

E. $m_4 > m_3 > m_2 > m_1$

[1990-CE-MATHS 2-29]

4. In the figure, $OA = AB$. If the slope of AB is m, find the slope of OA.



A. –1

B. $\dfrac{1}{m}$

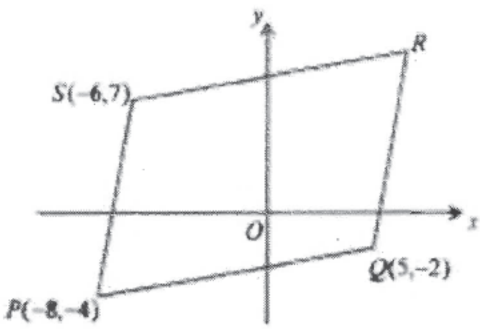
C. $-\dfrac{1}{m}$

D. m

E. $-m$

[1995-CE-MATHS 2-28]

5. In the figure, $PQRS$ is a parallelogram. Find the slope of PR.



A. $\dfrac{13}{15}$

B. $\dfrac{15}{13}$

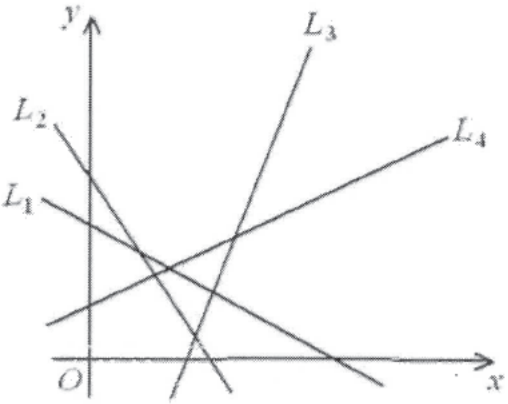
C. $\dfrac{9}{11}$

D. $\dfrac{11}{9}$

E. –5

[1998-CE-MATHS 2-33]

6. In the figure, L_1, L_2, L_3 and L_4 are straight lines. If m_1, m_2, m_3 and m_4 are the slopes of L_1, L_2, L_3 and L_4 respectively, which of the following must be true?



A. $m_1 < m_2 < m_3 < m_4$

B. $m_1 < m_2 < m_4 < m_3$

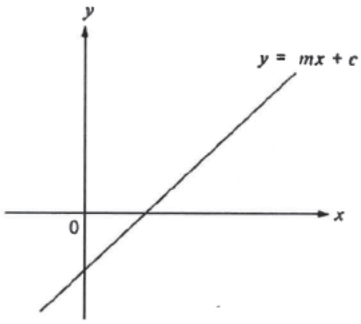
C. $m_2 < m_1 < m_3 < m_4$

D. $m_2 < m_1 < m_4 < m_3$

[2008-CE-MATHS 2-32]

Coefficients of Straight Lines

7. In the figure, the equation of the straight line is $y = mx + c$. Which one of the following is true?



A. $m > 0$ and $c > 0$

B. $m > 0$ and $c < 0$

C. $m < 0$ and $c > 0$

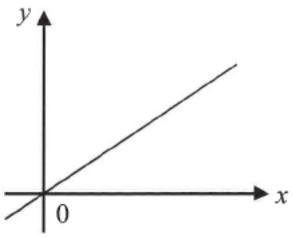
D. $m < 0$ and $c < 0$

E. $m > 0$ and $c = 0$

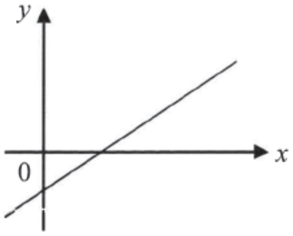
[1983-CE-MATHS 2-35]

8. If a, b and c are positive real numbers, which of the following graphs could represent the line $ax + by + c = 0$?

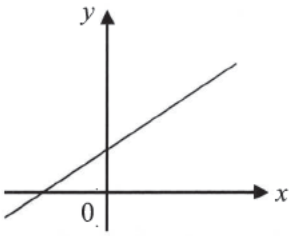
A.



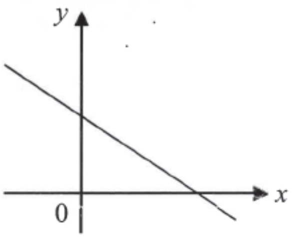
B.



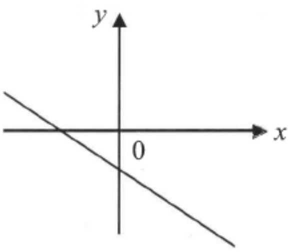
C.



D.



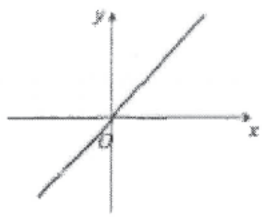
E.



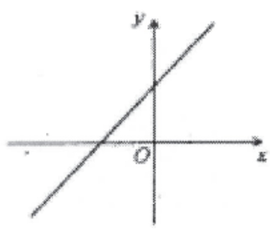
[1984-CE-MATHS 2-29]

9. If a, b and c are all positive, which of the following may represent the graph of $ax + by + c = 0$?

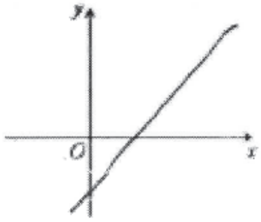
A.



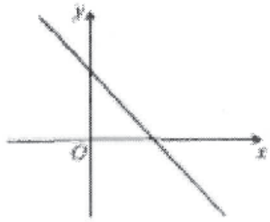
B.



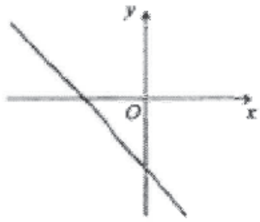
C.



D.



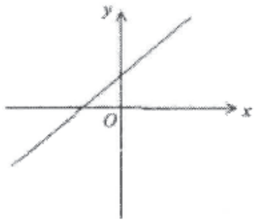
E.



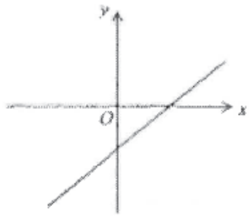
[1996-CE-MATHS 2-29]

10. If $a < 0$ and $b > 0$, which of the following may represent the graph of $y = ax + b$?

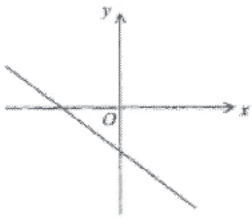
A.



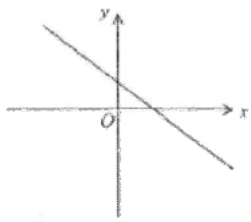
B.



C.



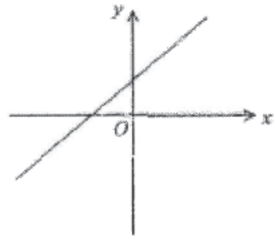
D.



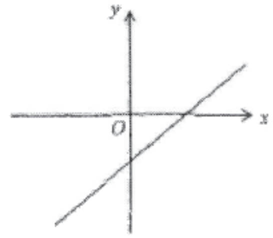
[2002-CE-MATHS 2-4]

11. If $a > 0$, $b > 0$ and $c < 0$, which of the following may represent the graph of the straight line $ax + by + c = 0$?

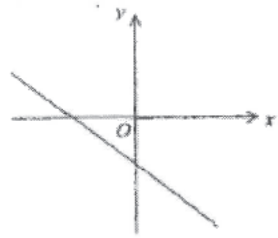
A.



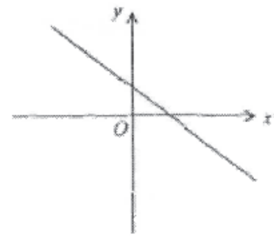
B.



C.



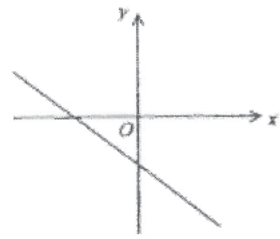
D.



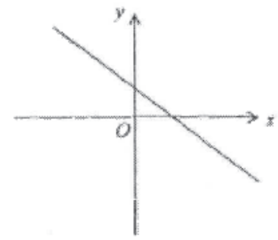
[2004-CE-MATHS 2-29]

12. If $k < 0$, which of the following may represent the graph of the straight line $x - y = k$?

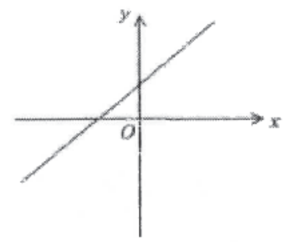
A.



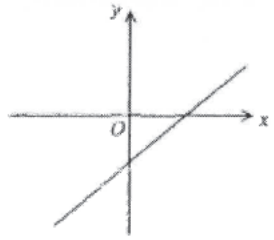
B.



C.

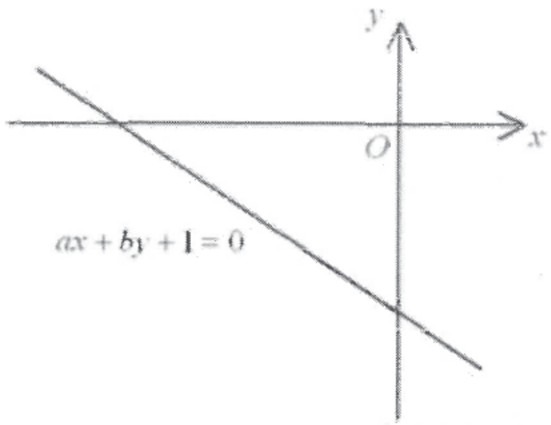


D.



[2006-CE-MATHS 2-28]

13.



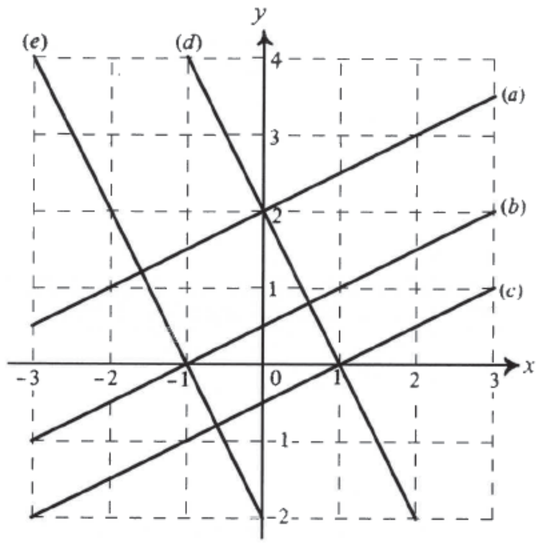
The figure shows the graph of the straight line $ax + by + 1 = 0$. Which of the following is true?

A. $a > 0$ and $b > 0$
B. $a > 0$ and $b < 0$
C. $a < 0$ and $b > 0$
D. $a < 0$ and $b < 0$

[2007-CE-MATHS 2-32]

Equations of Straight Lines

14.



Five straight lines (*a*), (*b*), (*c*), (*d*) and (*e*) are drawn in the figure above. Which one is the graph of $x - 2y = 1$?

A. (*a*)
B. (*b*)
C. (*c*)
D. (*d*)
E. (*e*)

[SP-CE-MATHS 2-14]

15. If the line $2x - 3y + c = 0$ passes through the point $(1, 1)$, then $c =$

A. -2 .
B. -1 .
C. 0 .
D. 1 .
E. 2 .

[1983-CE-MATHS 2-26]

16. The equation of the line passing through $(1, -1)$ and perpendicular to the x-axis is

A. $x - 1 = 0$.
B. $x + 1 = 0$.
C. $y - 1 = 0$.
D. $y + 1 = 0$.
E. $x + y = 0$.

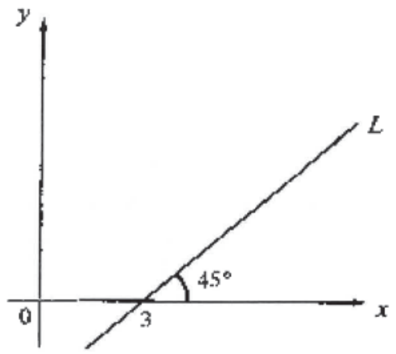
[1983-CE-MATHS 2-27]

17. The equation of the perpendicular bisector of the line joining $(1, 2)$ and $(7, 4)$ is

A. $3x + y + 15 = 0$.
B. $3x + y - 15 = 0$.
C. $3x - y + 9 = 0$.
D. $3x - y - 9 = 0$.
E. $x + 3y - 13 = 0$.

[1985-CE-MATHS 2-27]

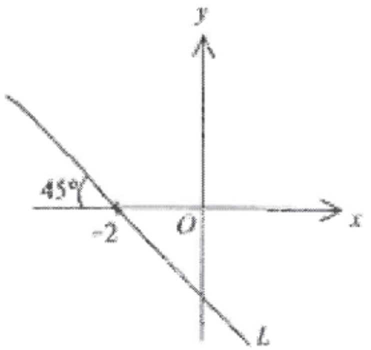
18. In the figure, the equation of the straight line L is



A. $x - 3 = 0$.
B. $x - y - 3 = 0$.
C. $x - y + 3 = 0$.
D. $x + y - 3 = 0$.
E. $x + y + 3 = 0$.

[1995-CE-MATHS 2-27]

19. In the figure, the equation of the straight line L is



A. $x + y + 2 = 0$.
B. $x + y - 2 = 0$.
C. $x - y + 2 = 0$.
D. $x - y - 2 = 0$.

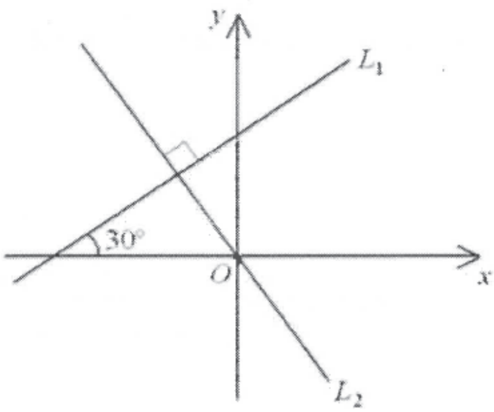
[2002-CE-MATHS 2-31]

20. If the straight line $5x - 3y = 30$ cuts the x-axis and the y-axis at A and B respectively, then the coordinates of the mid-point of AB are

A. $(3, -5)$.
B. $(-3, 5)$.
C. $(5, -3)$.
D. $(-5, 3)$.

[2006-CE-MATHS 2-30]

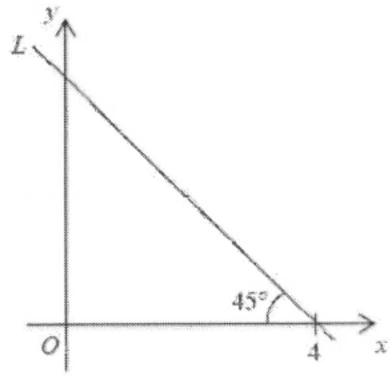
21. In the figure, the straight lines L_1 and L_2 are perpendicular to each other. Find the equation of L_2.



A. $x - \sqrt{3}y = 0$
B. $x + \sqrt{3}y = 0$
C. $\sqrt{3}x - y = 0$
D. $\sqrt{3}x + y = 0$

[2008-CE-MATHS 2-31]

22. In the figure, the equation of the straight line L is



A. $x + y = 4$.
B. $x - y = 4$.
C. $x + y = -4$.
D. $x - y = -4$.

[2009-CE-MATHS 2-32]

Parallel Lines

23. If the two lines $2x - y + 1 = 0$ and $ax + 3y - 1 = 0$ do not intersect, then $a =$

A. -6 .
B. -2 .
C. 2 .
D. 3 .
E. 6 .

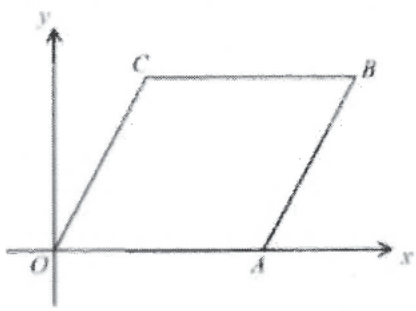
[1992-CE-MATHS 2-28]

24. Find the equation of the straight line passing through $(-1, 1)$ and parallel to $5x + 4y = 0$.

A. $4x - 5y + 9 = 0$
B. $4x + 5y + 1 = 0$
C. $5x - 4y + 9 = 0$
D. $5x + 4y - 1 = 0$
E. $5x + 4y + 1 = 0$

[1998-CE-MATHS 2-32]

25. In the figure, $OABC$ is a parallelogram. If the equation of OC is $2x - y = 0$ and the length of CB is 3, find the equation of AB.



A. $x - 2y - 3 = 0$
B. $2x - y - 3 = 0$
C. $2x - y + 3 = 0$
D. $2x - y - 6 = 0$
E. $2x - y + 6 = 0$

[1999-CE-MATHS 2-32]

26. Consider the three straight lines

$L_1: \ 6x + 4y - 3 = 0,$

$L_2: \ y = -\frac{3}{2}x + 4$ and

$L_3: \ 6x - 4y + 3 = 0.$

Which of the following is/are true?

(1) $L_1 // L_2$
(2) $L_2 // L_3$
(3) $L_1 \perp L_3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[2000-CE-MATHS 2-18]

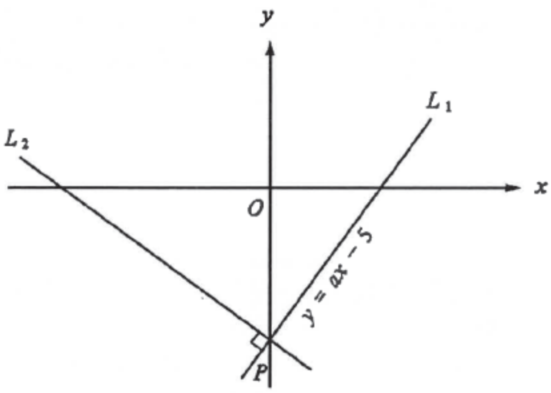
Perpendicular Lines

27. If the slopes of two perpendicular straight lines can be represented by two numbers m_1 and m_2, then we must have

A. $m_1 + m_2 = -1$.
B. $m_1 + m_2 = 1$.
C. $m_1 - m_2 = 0$.
D. $m_1 m_2 = 1$.
E. $m_1 m_2 = -1$.

[SP-CE-MATHS 2-43]

28. In the figure, L_1 and L_2 are two straight lines perpendicular to each other and intersecting at P on the y-axis. If the equation of L_1 is $y = ax - 5$, then the equation of L_2 is



A. $y = -\frac{1}{a}x - 5$.
B. $y = -\frac{1}{a}x + 5$.
C. $y = -ax - 5$.
D. $y = -ax + 5$.
E. $y = -\frac{1}{a}x$.

[1986-CE-MATHS 2-22]

29. The line $y = mx + c$ is perpendicular to the line $y = 3 - 2x$. Find m.

A. 2
B. $-\frac{1}{2}$
C. -2
D. $\frac{1}{2}$
E. $-\frac{1}{3}$

[1988-CE-MATHS 2-26]

30. The equation of the straight line perpendicular to $2x + y - 3 = 0$ and passing through $(1, -1)$ is

A. $x + 2y + 1 = 0$.
B. $x - 2y - 3 = 0$.
C. $-x + 2y - 1 = 0$.
D. $2x + y - 1 = 0$.
E. $2x - y - 3 = 0$.

[1989-CE-MATHS 2-28]

31. If the lines $y = mx + b$ and $\frac{x}{a} + \frac{y}{b} = 1$ are perpendicular, find m.

A. $\frac{a}{b}$
B. $\frac{b}{a}$
C. ab
D. $-\frac{a}{b}$
E. $-\frac{b}{a}$

[1990-CE-MATHS 2-28]

32. Let A and B be the points $(4, -7)$ and $(-6, 5)$ respectively. The equation of the line passing through the mid-point of AB and perpendicular to $3x - 4y + 14 = 0$ is

A. $3x - 4y - 1 = 0$.
B. $3x + 4y + 7 = 0$.
C. $4x - 3y + 1 = 0$.
D. $4x + 3y - 7 = 0$.
E. $4x + 3y + 7 = 0$.

[1991-CE-MATHS 2-27]

33. Find the equation of the straight line which passes through (3, –1) and is perpendicular to $2x - y + 1 = 0$.

A. $x + 2y - 1 = 0$
B. $x + 2y + 1 = 0$
C. $x - 2y - 5 = 0$
D. $2x + y - 5 = 0$
E. $2x - y - 7 = 0$

[1996-CE-MATHS 2-31]

34. Which of the following lines is perpendicular to the line $\frac{x}{2} + \frac{y}{3} = 1$?

A. $3x + 2y = 1$
B. $3x - 2y = 1$
C. $2x + 3y = 1$
D. $2x - 3y = 1$
E. $\frac{x}{2} - \frac{y}{3} = 1$

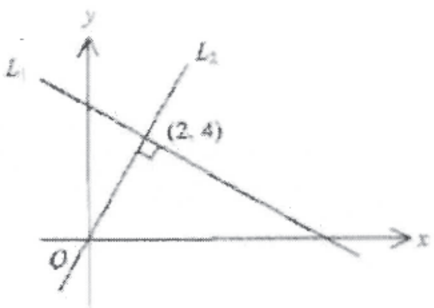
[1997-CE-MATHS 2-22]

35. If the straight lines $2x - 3y + 1 = 0$ and $5x + ky - 1 = 0$ are perpendicular to each other, find k.

A. $-\frac{15}{2}$
B. $-\frac{10}{3}$
C. $\frac{3}{10}$
D. $\frac{10}{3}$
E. $\frac{15}{2}$

[2001-CE-MATHS 2-6]

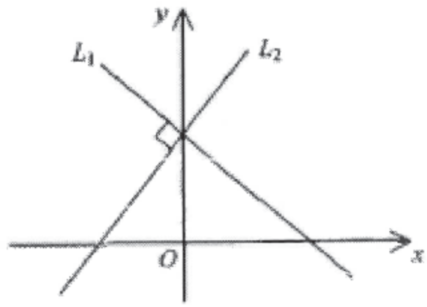
36. In the figure, the straight lines L_1 and L_2 intersect at (2, 4). Find the equation of L_1.



A. $x + 2y = 10$
B. $x - 2y = -6$
C. $2x + y = 8$
D. $2x - y = 0$

[2003-CE-MATHS 2-29]

37.



In the figure, L_1 and L_2 are two straight lines intersecting at a point on the y-axis. If the equation of L_1 is $x + 2y - 2 = 0$, then the equation of L_2 is

A. $2x - y + 1 = 0$.
B. $2x - y - 2 = 0$.
C. $2x + y + 1 = 0$.
D. $2x + y - 2 = 0$.

[2004-CE-MATHS 2-30]

38. If the equation of the straight line L is $x - 2y + 3 = 0$, then the equation of the straight line passing through the point (2, –1) and perpendicular to L is

A. $x + 2y + 3 = 0$.
B. $x + 2y - 3 = 0$.
C. $2x + y + 3 = 0$.
D. $2x + y - 3 = 0$.

[2005-CE-MATHS 2-33]

39. The straight line $4x + y - 2 = 0$ is perpendicular to the straight line

A. $4x + y - 9 = 0$.
B. $4x - y + 9 = 0$.
C. $x + 4y - 9 = 0$.
D. $x - 4y + 9 = 0$.

[2006-CE-MATHS 2-29]

40. Find the equation of the straight line which is perpendicular to the straight line $x + 2y + 3 = 0$ and passes through the point (1, 3).

A. $x + 2y - 7 = 0$
B. $x - 2y + 5 = 0$
C. $2x + y - 5 = 0$
D. $2x - y + 1 = 0$

[2007-CE-MATHS 2-31]

41. The straight line $2x + 7y = 5$ is perpendicular to the straight line

A. $2x + 7y + 5 = 0$.
B. $2x - 7y + 5 = 0$.
C. $7x + 2y + 5 = 0$.
D. $7x - 2y + 5 = 0$.

[2010-CE-MATHS 2-31]

42. If the straight line $x + 3y - 211 = 0$ is perpendicular to the straight line $kx - 3y + 211 = 0$, then $k =$

A. -9 .
B. -1 .
C. 1 .
D. 9 .

[2011-CE-MATHS 2-31]

Intersection of Lines

43. Two perpendicular lines $kx + y - 4 = 0$ and $x - 2y + 3 = 0$ intersect at the point (h, k). Find h and k.

A. $h = -7,\ k = -2$
B. $h = -2,\ k = \frac{1}{2}$
C. $h = 1,\ k = 2$
D. $h = -4,\ k = -\frac{1}{2}$
E. $h = -3,\ k = 2$

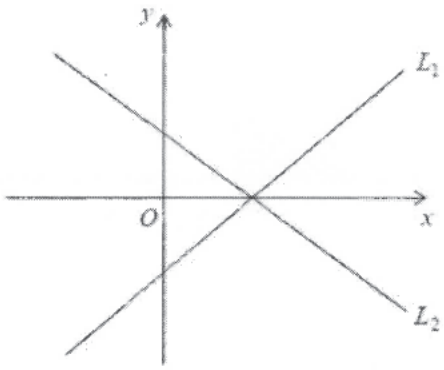
[1987-CE-MATHS 2-28]

44. If the straight lines $x - 2y + 5 = 0$ and $ax - y + 1 = 0$ intersect at $(1, b)$, find a and b.

A. $a = -4,\ b = -3$
B. $a = -1,\ b = 0$
C. $a = 1,\ b = 3$
D. $a = 2,\ b = -3$
E. $a = 2,\ b = 3$

[2001-CE-MATHS 2-33]

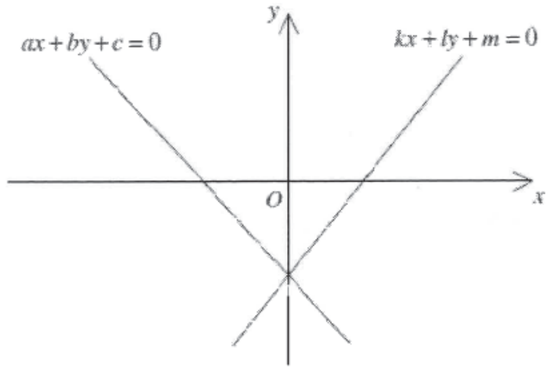
45. In the figure, the straight line $L_1 : y = ax + b$ and the straight line $L_2 : y = cx + d$ intersect at a point on the positive x-axis. Which of the following must be true?



A. $ab > 0$
B. $cd > 0$
C. $ac = bd$
D. $ad = bc$

[2009-CE-MATHS 2-33]

46.



In the figure, the two straight lines intersect at a point on the negative y-axis. Which of the following must be true?

(1) $ac > 0$

(2) $km > 0$

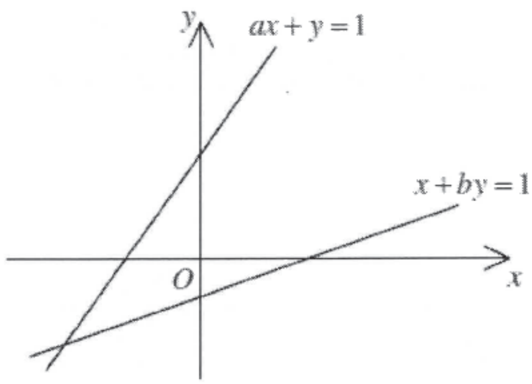
(3) $am = ck$

(4) $bm = cl$

A. (1) and (3) only
B. (1) and (4) only
C. (2) and (3) only
D. (2) and (4) only

[2010-CE-MATHS 2-32]

47. The figure shows the graph of $ax + y = 1$ and the graph of $x + by = 1$. Which of the following is true?



A. $a > 0$
B. $b > 0$
C. $ab < 1$
D. $ab > 1$

[2011-CE-MATHS 2-32]

Division of Points by Lines

48. $A(-4, 2)$ and $B(1, -3)$ are two points. C is a point on the y-axis such that $AC = CB$. Find the coordinates of C.

A. $(-\frac{3}{2}, -\frac{1}{2})$
B. $(-1, 0)$
C. $(1, 0)$
D. $(0, -1)$
E. $(0, 1)$

[1999-CE-MATHS 2-31]

49. $A(-1, -4)$ and $B(3, 4)$ are two points. The line $x - y = 0$ cuts AB at P so that $AP : PB = r : 1$. Find r.

A. 3
B. 2
C. 1
D. $\frac{1}{2}$
E. $\frac{1}{3}$

[2000-CE-MATHS 2-50]

50. $P(-10, -8)$ and $Q(4, 6)$ are two points. If R is a point on the x-axis such that $PR = RQ$, then the coordinates of R are

A. $(-4, 0)$.
B. $(-3, -1)$.
C. $(-3, 0)$.
D. $(-2, 0)$.

[2003-CE-MATHS 2-31]

51. $A(2, 5)$ and $B(6, -3)$ are two points. If P is a point lying on the straight line $x = y$ such that $AP = PB$, then the coordinates of P are

A. $(-2, -2)$.
B. $(-2, 4)$.
C. $(1, 1)$.
D. $(4, 1)$.

[2005-CE-MATHS 2-31]

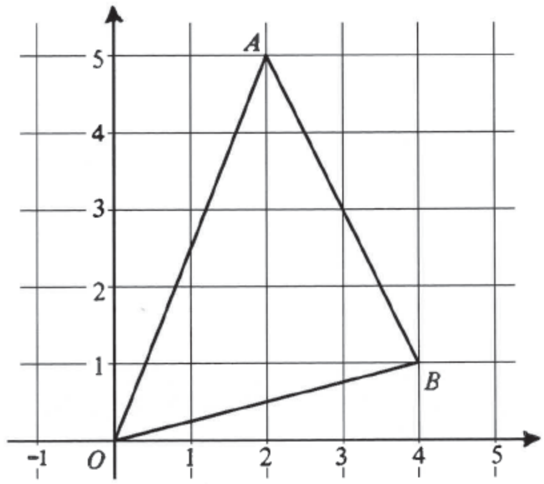
52. The coordinates of the points A and B are $(3, 9)$ and $(7, 1)$ respectively. If P is a point lying on the straight line $y = x + 1$ such that $AP = PB$, then the coordinates of P are

A. $(3, 2)$.
B. $(3, 4)$.
C. $(5, 5)$.
D. $(5, 6)$.

[2009-CE-MATHS 2-31]

Bounded Area

53. In the figure what is the area of ΔOAB?



A. 5
B. 9
C. 15
D. 18
E. 20

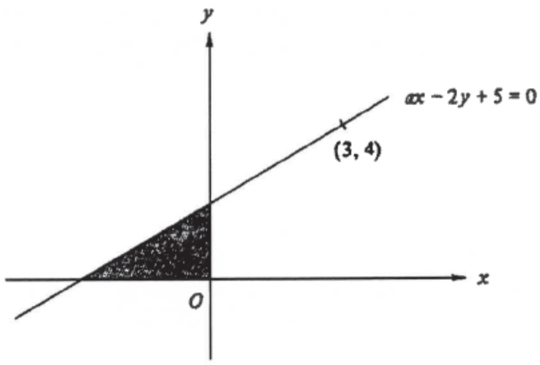
[SP-CE-MATHS 2-41]

54. The area of the triangle enclosed by the line $y = -3x + 12$, the x-axis and the y-axis is

A. 48 .
B. 36 .
C. 24 .
D. 13 .
E. 4 .

[1978-CE-MATHS 2-45]

55. In the figure, the line $ax - 2y + 5 = 0$ passes through the point $(3, 4)$. What is the area of the shaded part?



A. 6
B. $\frac{25}{4}$
C. 10
D. 12
E. $\frac{25}{2}$

[1989-CE-MATHS 2-29]

56. $A(0, 0)$, $B(5, 0)$ and $C(2, 6)$ are the vertices of a triangle. $P(9, 5)$, $Q(6, 6)$ and $R(2, -9)$ are three points. Which of the following triangles has/have area(s) greater than the area of ΔABC?

(1) ΔABP
(2) ΔABQ
(3) ΔABR

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

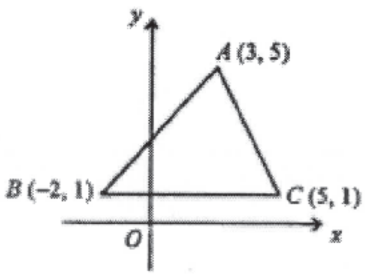
[1993-CE-MATHS 2-28]

57. In the figure, the shaded part is bounded by the axes, the lines $x = 3$ and $x + y = 5$. Find its area.

A. 10.5
B. 12
C. 15
D. 19.5
E. 21

[1994-CE-MATHS 2-27]

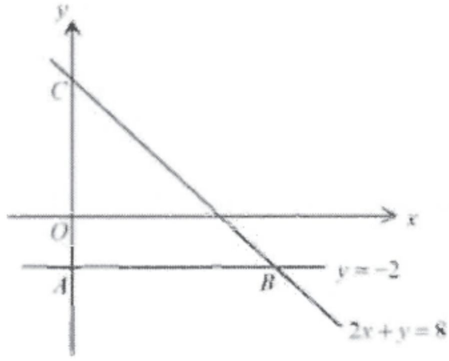
58. In the figure, find the area of ΔABC.



A. 6
B. 7.5
C. 14
D. 17.5
E. 28

[1997-CE-MATHS 2-21]

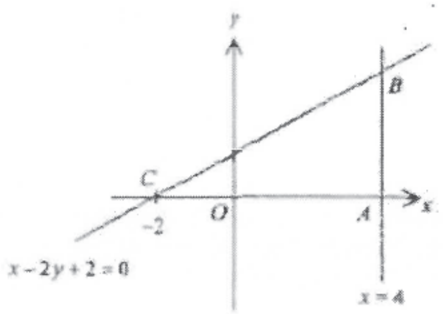
59. In the figure, find the area of ΔABC.



A. 12
B. 15
C. 16
D. 20
E. 25

[2000-CE-MATHS 2-17]

60. In the figure, the area of ΔABC is



A. 3 .
B. 8 .
C. 9 .
D. 18 .

[2002-CE-MATHS 2-32]

Family of Straight Lines

61. $(x + y) + k(x - 3) = 0$ represents a family of straight lines passing through a fixed point. The fixed point is

A. $(3, -3)$.
B. $(3, 0)$.
C. $(3, 3)$.
D. $(-3, 0)$.
E. $(-3, 3)$.

[1979-CE-MATHS 2-52]

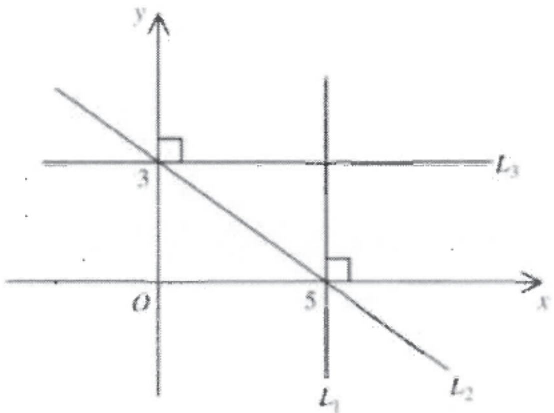
62. If the straight line $2x + y + k = 0$ passes through the point of intersection of the two straight lines $x + y - 3 = 0$ and $x - y + 1 = 0$, find k.

A. -4
B. -2
C. 2
D. 4

[2003-CE-MATHS 2-30]

HKDSE Problems

63.



In the figure, the x-intercepts of the straight lines L_1 and L_2 are 5 while the y-intercepts of the straight lines L_2 and L_3 are 3. Which of the following are true?

(1) The equation of L_1 is $x = 5$.

(2) The slope of L_2 is $\frac{3}{5}$.

(3) The point (2, 3) lies on L_3.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

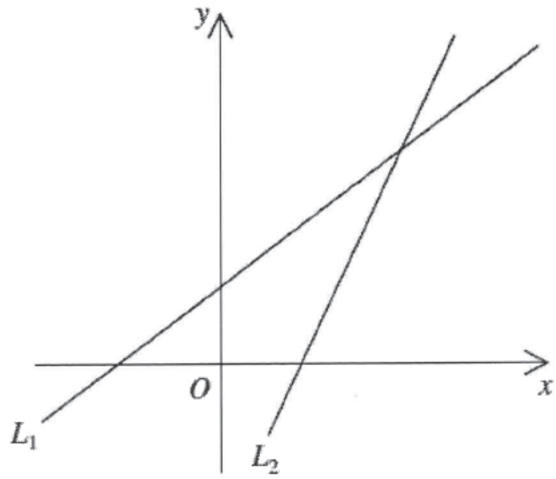
[PP-DSE-MATHS 2-7]

64. The coordinates of the points A and B are $(1, -3)$ and $(-5, 7)$ respectively. If P is a point lying on the straight line $y = x + 2$ such that $AP = PB$, then the coordinates of P are

A. $(-2, 0)$.
B. $(-2, 2)$.
C. $(0, 2)$.
D. $(3, 5)$.

[PP-DSE-MATHS 2-26]

65.



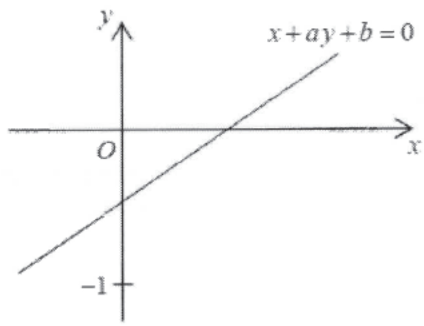
In the figure, the equations of the straight lines L_1 and L_2 are $ax + y = b$ and $cx + y = d$ respectively. Which of the following are true?

(1) $a < 0$
(2) $a < c$
(3) $b > d$
(4) $ad > bc$

A. (1), (2) and (3) only
B. (1), (2) and (4) only
C. (1), (3) and (4) only
D. (2), (3) and (4) only

[2012-DSE-MATHS 2-25]

66.



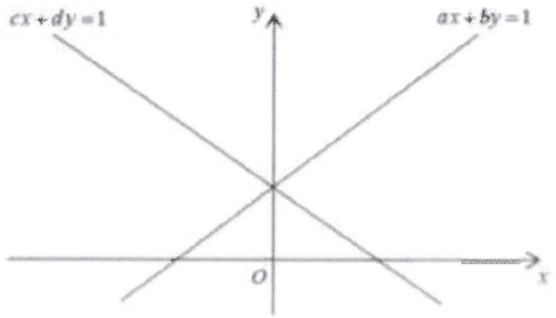
The figure shows the graph of the straight line $x + ay + b = 0$. Which of the following are true?

(1) $a < 0$
(2) $b < 0$
(3) $a < b$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2013-DSE-MATHS 2-14]

67.



In the figure, the two straight lines intersect at a point on the positive y-axis. Which of the following are true?

(1) $a < 0$

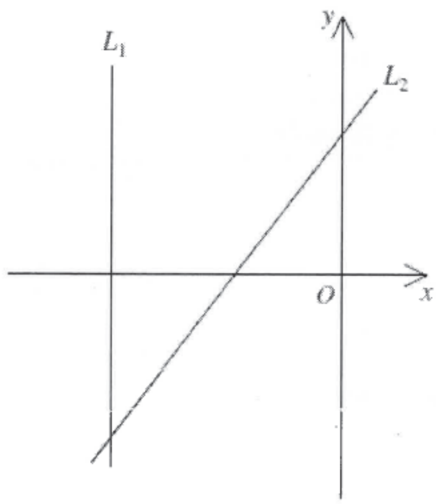
(2) $c > 0$

(3) $b = d$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2014-DSE-MATHS 2-25]

68.



In the figure, the equations of the straight lines L_1 and L_2 are $ax = 1$ and $bx + cy = 1$ respectively. Which of the following are true?

(1) $a < 0$

(2) $a < b$

(3) $c > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2015-DSE-MATHS 2-25]

69. If the straight lines $hx + ky + 15 = 0$ and $4x + 3y - 5 = 0$ are perpendicular to each other and intersect at a point on the x-axis, then $k =$

A. -12 .
B. -4 .
C. 3 .
D. 16 .

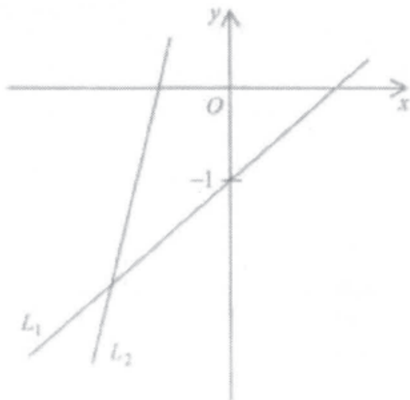
[2016-DSE-MATHS 2-25]

70. The coordinates of the points A and B are $(9, -2)$ and $(-1, 8)$ respectively. If C is a point lying on the straight line $x - 2y = 0$ such that $AC = BC$, then the x-coordinate of C is

A. 1 .
B. 2 .
C. 3 .
D. 4 .

[2016-DSE-MATHS 2-26]

71.



In the figure, the equations of the straight lines L_1 and L_2 are $x + my = n$ and $x + py = q$ respectively. Which of the following are true?

(1) $m < p$

(2) $n > q$

(3) $n + m < p + q$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

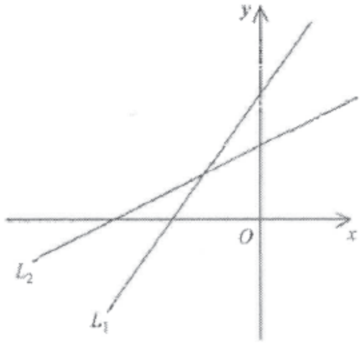
[2017-DSE-MATHS 2-23]

72. The straight line L is perpendicular to the straight line $9x - 5y + 45 = 0$. If the x-intercept of L is -3, then the equation of L is

A. $5x + 9y + 15 = 0$.
B. $5x + 9y + 27 = 0$.
C. $9x - 5y + 15 = 0$.
D. $9x - 5y + 27 = 0$.

[2017-DSE-MATHS 2-24]

73. In the figure, the equations of the straight line L_1 and L_2 are $3x + ay = b$ and $cx + y = d$ respectively. Which of the following is/are true?



I. $ac < 3$
II. $ad < b$
III. $bc < 3d$

A. II only
B. III only
C. I and II only
D. I and III only

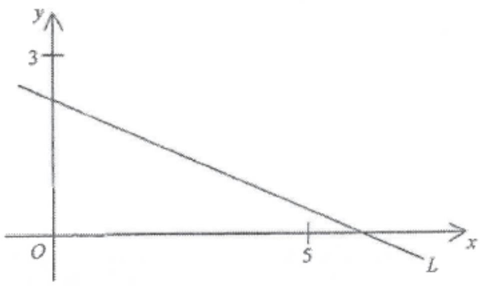
[2018-DSE-MATHS 2-6]

74. The equation of the straight line L_1 is $4x + 3y - 36 = 0$. The straight line L_2 is perpendicular to L_1 and intersects L_1 at a point lying on the y-axis. Find the area of the region bounded by L_1, L_2 and the x-axis.

A. 96
B. 108
C. 150
D. 192

[2018-DSE-MATHS 2-26]

75. In the figure, the equation of straight line L is $ax + by + 15 = 0$. Which of the following area true?



I. $a > b$
II. $a > -3$
III. $b > -5$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

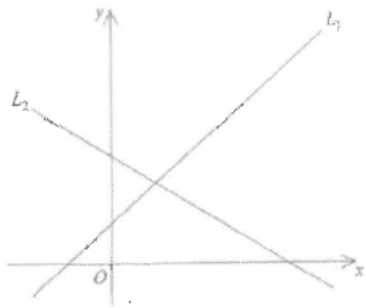
[2019-DSE-MATHS 2-23]

76. Find the constant k such that the straight line $3x + 2y + k = 0$ and $kx + 12y - 6 = 0$ are perpendicular to each other.

A. -8
B. -4
C. 4
D. 8

[2019-DSE-MATHS 2-24]

77. In the figure, the equations of the straight line L_1 and L_2 are $x + ay + b = 0$ and $bx + y + c = 0$ respectively. Which of the following are true?



I. $c < 0$
II. $ab < 1$
III. $ac < b$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2020-DSE-MATHS 2-8]

78. The equation of the straight line L is $kx + 4y - 2k = 0$, where k is a constant. If L is perpendicular to the straight line $6x - 9y + 4 = 0$, find the y-intercept of L.

A. -3
B. -2
C. 2
D. 3

[2020-DSE-MATHS 2-26]

1. Two circles are given by:

$$x^2 + y^2 - 8x - 2y - 7 = 0,$$
$$x^2 + y^2 + 8x + 2y + 7 = 0.$$

Which of the following is/are correct?

(1) The circles have the same centre.
(2) The circles have equal radius.
(3) The circles pass through the origin.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. None of (1), (2) nor (3)

[1977-CE-MATHS 2-39]

2. Which of the following points is the centre of the circle $x^2 + y^2 + 6x + 8y - 100 = 0$?

A. (0, 0)
B. (3, 4)
C. (6, 8)
D. (–3, –4)
E. (–6, –8)

[SP-CE-MATHS 2-44]

3. A circle, whose centre is (a, b), passes through the origin. Its equation is

A. $x^2 + y^2 + ax + by = 0$.
B. $x^2 + y^2 - ax - by = 0$.
C. $x^2 + y^2 + 2ax + 2by = 0$.
D. $x^2 + y^2 - 2ax - 2by = 0$.
E. $x^2 + y^2 - 2ax - 2by + a^2 + b^2 = 0$.

[1979-CE-MATHS 2-19]

4. A circle has its centre at (3, 4) and passes through the origin. Its equation is

A. $x^2 + y^2 = 25$.
B. $x^2 + y^2 - 3x - 4y = 0$.
C. $x^2 + y^2 - 6x - 8y = 0$.
D. $x^2 + y^2 + 6x + 8y = 0$.
E. $x^2 + y^2 - 6x - 8y + 25 = 0$.

[1983-CE-MATHS 2-28]

5. The line $x + y + k = 0$ (k being a constant) passes through the centre of the circle $x^2 + y^2 - 2x + 4y - 6 = 0$. $k =$

A. –2.
B. –1.
C. 0.
D. 1.
E. 2.

[1984-CE-MATHS 2-27]

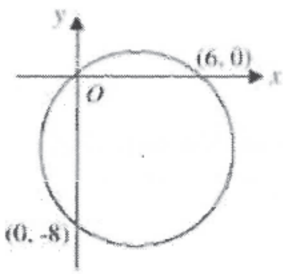
6. The equation of a circle is $x^2 + y^2 - 2x + 5y - 7 = 0$. Which of the following is/are true?

(1) The circle passes through the point (–1, 1).
(2) The centre of the circle lies in the second quadrant.
(3) The circle intersects the x-axis at two points.

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1984-CE-MATHS 2-28]

7. In the figure, the circle passes through (0, 0) and cuts the two axes at (6, 0) and (0, –8). Its equation is



A. $x^2 + y^2 - 3x + 4y = 0$.
B. $x^2 + y^2 + 3x - 4y = 0$.
C. $x^2 + y^2 + 6x - 8y = 0$.
D. $x^2 + y^2 - 6x + 8y = 0$.
E. $x^2 + y^2 - 6x - 8y = 0$.

[1985-CE-MATHS 2-28]

8. The equation of a circle is $x^2 + y^2 - 4x - 5 = 0$. Which of the following is/are true?

(1) The circle passes through the origin.
(2) The centre lies on the x-axis.
(3) The line $x - 5 = 0$ touches the circle.

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1985-CE-MATHS 2-29]

9. Which of the following represents a circle?

A. $2x^2 - 8y + 5 = 0$
B. $2x^2 + y^2 - 4x - 3y = 0$
C. $3x^2 + 3y^2 - 5x - 7 = 0$
D. $x^2 - y^2 - 7x + 6y + 1 = 0$
E. $x^2 + y^2 + 2xy + 7y - 1 = 0$

[1986-CE-MATHS 2-21]

10. Which of the following straight lines divide(s) the circle $(x-1)^2+(y+1)^2=1$ into two equal parts?

(1) $x-y-2=0$
(2) $x+y+2=0$
(3) $x-y+2=0$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1987-CE-MATHS 2-26]

11. The equation of a circle is $x^2+y^2-4x+2y+1=0$. Which of the following is/are true?

(1) The centre is $(-2, 1)$.
(2) The radius is 2 units.
(3) The circle intersects the y-axis at two distinct points.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

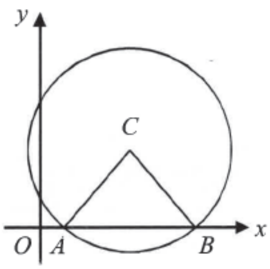
[1987-CE-MATHS 2-27]

12. Which of the following circles has the lines $x=1$, $x=5$, $y=4$ and $y=8$ as its tangents?

A. $(x-1)^2+(y-4)^2=4$
B. $(x-5)^2+(y-8)^2=4$
C. $(x-3)^2+(y-6)^2=4$
D. $(x-1)^2+(y-8)^2=4$
E. $(x-5)^2+(y-4)^2=4$

[1988-CE-MATHS 2-27]

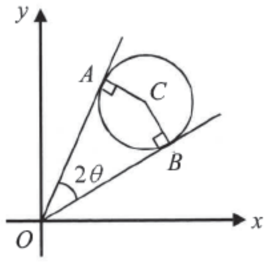
13. In the figure, C is the centre of the circle $x^2+y^2-8x-7y+12=0$. If the circle cuts the x-axis at A and B, find the area of ΔCAB.



A. $\frac{7}{4}$
B. $\frac{7}{2}$
C. 7
D. 8
E. 14

[1989-CE-MATHS 2-30]

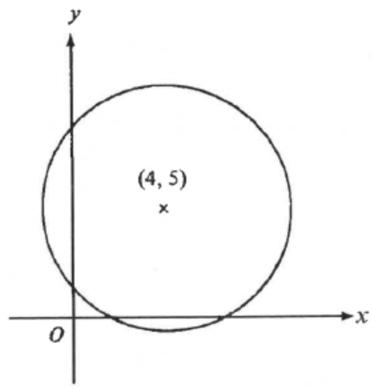
14. In the figure, C is the centre of the circle $x^2+y^2-6x-8y+21=0$. OA and OB are tangents. If $\angle AOB=2\theta$, find $\sin\theta$.



A. $\frac{\sqrt{21}}{5}$
B. $\frac{4}{5}$
C. $\frac{3}{5}$
D. $\frac{2}{\sqrt{21}}$
E. $\frac{2}{5}$

[1989-CE-MATHS 2-31]

15. In the figure, a circle cuts the x-axis at two points 6 units apart. If the circle has centre $(4, 5)$, then its equation is



A. $(x-4)^2+(y-5)^2=25$.
B. $(x-4)^2+(y-5)^2=34$.
C. $(x-4)^2+(y-5)^2=52$.
D. $(x+4)^2+(y+5)^2=34$.
E. $(x+4)^2+(y+5)^2=25$.

[1990-CE-MATHS 2-30]

16. The circle $x^2+y^2+4x+ky+4=0$ passes through the point $(1, 3)$. The radius of the circle is

A. $\sqrt{68}$.
B. $\sqrt{48}$.
C. $\sqrt{17}$.
D. 6.
E. 3.

[1991-CE-MATHS 2-26]

17. If $0 < k < h$, which of the following circles intersect(s) the y-axis?

(1) $(x-h)^2 + (y-k)^2 = k^2$
(2) $(x-h)^2 + (y-k)^2 = h^2$
(3) $(x-h)^2 + (y-k)^2 = h^2 + k^2$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1992-CE-MATHS 2-29]

18. If the line $y = mx + 3$ divides the circle $x^2 + y^2 - 4x - 2y - 5 = 0$ into two equal parts, find m.

A. $-\frac{1}{4}$
B. -1
C. 0
D. $\frac{5}{4}$
E. 2

[1992-CE-MATHS 2-30]

19. A circle of radius 1 touches both the positive x-axis and the positive y-axis. Which of the following is/are true?

(1) Its centre is in the first quadrant.
(2) Its centre lies on the line $x - y = 0$.
(3) Its centre lies on the line $x + y = 1$.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[1993-CE-MATHS 2-29]

20. What is the area of the circle $x^2 + y^2 - 10x + 6y - 2 = 0$?

A. 32π
B. 34π
C. 36π
D. 134π
E. 138π

[1993-CE-MATHS 2-30]

21. AB is a diameter of the circle $x^2 + y^2 - 2x - 2y - 18 = 0$. If A is $(3, 5)$, then B is

A. $(2, 3)$.
B. $(1, -1)$.
C. $(-1, -3)$.
D. $(-5, -7)$.
E. $(-7, -9)$.

[1994-CE-MATHS 2-28]

22. The equations of two circles are

$$x^2 + y^2 - 4x - 6y = 0,$$
$$x^2 + y^2 + 4x + 6y = 0.$$

Which of the following is/are true?

(1) The two circles have the same centre.
(2) The two circles have equal radii.
(3) The two circles pass through the origin.

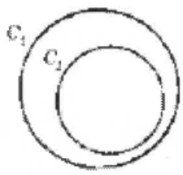
A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

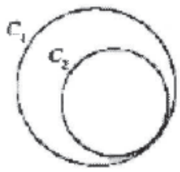
[1994-CE-MATHS 2-29]

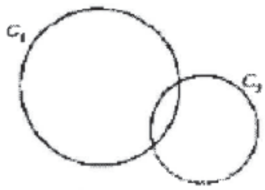
23. The table below shows the centres and the radii of two circles C_1 and C_2.

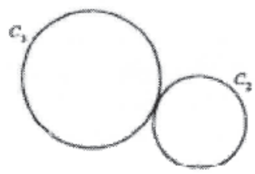
	centre	radius
C_1	$(2, 2)$	3
C_2	$(5, -2)$	2

Which of the following may represent the relative positions of C_1 and C_2?

A.


B.


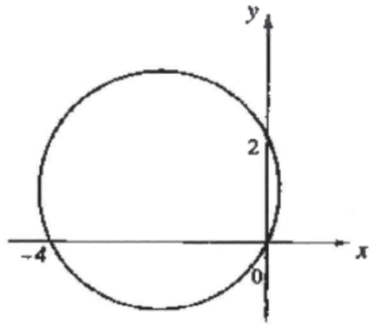
C.


D.


E.


[1995-CE-MATHS 2-29]

24. In the figure, the equation of the circle is



A. $x^2 + y^2 - 5 = 0$.
B. $x^2 + y^2 - 2x + y = 0$.
C. $x^2 + y^2 + 2x - y = 0$.
D. $x^2 + y^2 - 4x + 2y = 0$.
E. $x^2 + y^2 + 4x - 2y = 0$.

[1995-CE-MATHS 2-30]

25. The equation of the circle centred at (a, b) and tangential to the x-axis is

A. $x^2 + y^2 - 2ax - 2by + a^2 = 0$.
B. $x^2 + y^2 - 2ax - 2by + b^2 = 0$.
C. $x^2 + y^2 - 2ax - 2by + a^2 + b^2 = 0$.
D. $x^2 + y^2 + 2ax + 2by + a^2 = 0$.
E. $x^2 + y^2 + 2ax + 2by + b^2 = 0$.

[1996-CE-MATHS 2-30]

26. C_1: $x^2 + y^2 = 4$ and C_2: $x^2 + y^2 = 9$ are two circles. A chord AB of C_2 touches C_1. Find the length of AB.

A. $\sqrt{5}$
B. $2\sqrt{5}$
C. $\sqrt{65}$
D. $2\sqrt{65}$
E. 10

[1996-CE-MATHS 2-54]

27. The equation of a circle is given by $x^2 + y^2 - 4x + 6y - 3 = 0$. Which of the following statements is/are true?

(1) The centre of the circle is $(-2, 3)$.
(2) The radius of the circle is 4.
(3) The origin is inside the circle.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1997-CE-MATHS 2-45]

28. A circle has $(a, 0)$ and $(0, b)$ as the end points of a diameter. Which of the following points lie(s) on this circle?

(1) $(-a, -b)$
(2) $(0, 0)$
(3) (a, b)

A. (2) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1997-CE-MATHS 2-46]

29. The circle $x^2 + y^2 - 2x - 7y - 8 = 0$ intersects the x-axis at A and B. Find the length of AB.

A. 2
B. 6
C. 7
D. 9
E. $\sqrt{85}$

[1998-CE-MATHS 2-52]

30. The equations of two circles are

$x^2 + y^2 + ax - by = 0$ and
$x^2 + y^2 - ax + by = 0$.

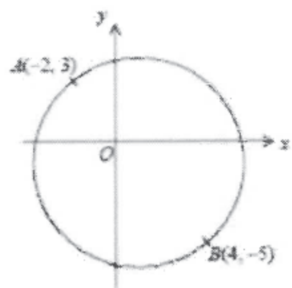
Which of the following must be true?

(1) The two circles have the same centre.
(2) The two circles have equal radii.
(3) The line joining the centres of the two circles passing through the origin.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1998-CE-MATHS 2-53]

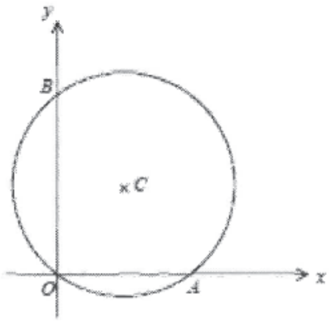
31. In the figure, find the equation of the circle with AB as a diameter.



A. $x^2 + y^2 - 2x + 2y - 23 = 0$
B. $x^2 + y^2 - 2x + 2y - 3 = 0$
C. $x^2 + y^2 + 2x - 2y - 23 = 0$
D. $x^2 + y^2 + 2x - 2y - 3 = 0$
E. $x^2 + y^2 - 25 = 0$

[1999-CE-MATHS 2-51]

32.



The figure shows a circle centred at C and passing through $O(0, 0)$, $A(6, 0)$ and $B(0, 8)$. Which of the following must be true?

(1) C lies on the line $\frac{x}{6} + \frac{y}{8} = 1$.
(2) The radius of the circle is 10.
(3) OC is perpendicular to AB.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1999-CE-MATHS 2-52]

33. Two circles with equations $(x+1)^2 + (y+1)^2 = 25$ and $(x-11)^2 + (y-8)^2 = 100$ touch each other externally at a point P. Find the coordinates of P.

A. $(-3, -2)$
B. $(\frac{7}{5}, \frac{4}{5})$
C. $(3, 2)$
D. $(5, \frac{7}{2})$
E. $(7, 5)$

[1999-CE-MATHS 2-53]

34. If the centre of the circle $x^2 + y^2 + kx + (k+1)y - 3 = 0$ lies on $x + y + 1 = 0$, find k.

A. $\frac{3}{2}$
B. $\frac{1}{2}$
C. 0
D. -1
E. $-\frac{3}{2}$

[2000-CE-MATHS 2-48]

35. If the straight line $y = mx + 1$ is tangent to the circle $(x-2)^2 + y^2 = 1$, then $m =$

A. $-\frac{4}{3}$.
B. 0.
C. $\frac{4}{3}$.
D. 0 or $-\frac{4}{3}$.
E. 0 or $\frac{4}{3}$.

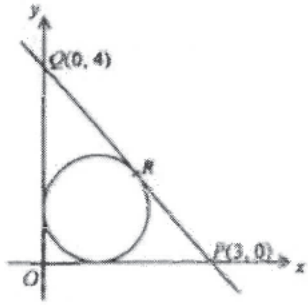
[2000-CE-MATHS 2-49]

36. Consider the circle $x^2 + y^2 - 8x - 6y + 21 = 0$. Find the equation of the chord whose mid-point is $(5, 2)$.

A. $9x + 5y - 55 = 0$
B. $3x + 4y - 23 = 0$
C. $x + y - 7 = 0$
D. $x - y + 3 = 0$
E. $x - y - 3 = 0$

[2001-CE-MATHS 2-53]

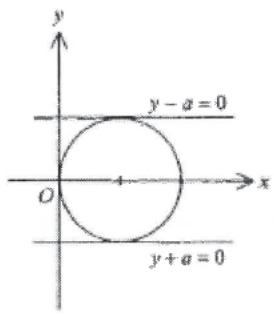
37. In the figure, the inscribed circle of ΔOPQ touches PQ at R. Find the coordinates of R.



A. $\left(\frac{3}{2}, 2\right)$
B. $\left(\frac{6}{5}, \frac{12}{5}\right)$
C. $\left(\frac{9}{5}, \frac{8}{5}\right)$
D. $\left(\frac{9}{7}, \frac{16}{7}\right)$
E. $\left(\frac{12}{7}, \frac{12}{7}\right)$

[2001-CE-MATHS 2-54]

38. In the figure, $x = 0$, $y - a = 0$ and $y + a = 0$ are tangents to the circle. The equation of the circle is



A. $x^2 + y^2 = a^2$.
B. $x^2 + y^2 - 2ax = 0$.
C. $x^2 + y^2 - 2ay = 0$.
D. $x^2 + y^2 + 2ax + 2ay + a^2 = 0$.

[2002-CE-MATHS 2-52]

39. The equation of a circle is given by $(x-a)^2 + (y+b)^2 = a^2 + b^2$, where $a > 0$ and $b > 0$. Which of the following must be true?

(1) The centre of the circle is $(a, -b)$.
(2) The circle passes through the origin.
(3) The circle cuts the x-axis at two distinct points.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2002-CE-MATHS 2-53]

40. The circle $(x-4)^2 + y^2 = 36$ intersects the positive x-axis and positive y-axis at A and B respectively. Find AB.

A. $\sqrt{30}$
B. $2\sqrt{30}$
C. $\sqrt{34}$
D. $2\sqrt{34}$

[2003-CE-MATHS 2-54]

41. If the straight line $x + y - 3 = 0$ divides the circle $x^2 + y^2 + 2x - ky - 4 = 0$ into two equal parts, then $k =$

A. -4.
B. 4.
C. -8.
D. 8.

[2004-CE-MATHS 2-52]

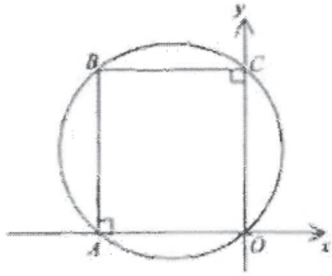
42. The equation of a circle is $x^2 + y^2 - 4x + 2y + 1 = 0$. Which of the following is/are true?

(1) The circle touches the y-axis.
(2) The origin lies outside the circle.
(3) The centre of the circle lies in the second quadrant.

A. (2) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only

[2004-CE-MATHS 2-53]

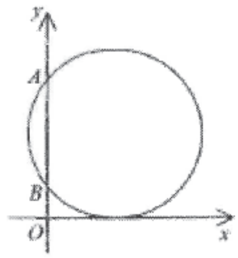
43. In the figure, O is the origin. If the equation of the circle passing through O, A, B and C is $(x+3)^2 + (y-4)^2 = 25$, then the area of the rectangle $OABC$ is



A. 36.
B. 48.
C. 50.
D. 64.

[2005-CE-MATHS 2-53]

44. In the figure, the circle passing through $A(0, 8)$ and $B(0, 2)$ touches the positive x-axis. The equation of the circle is



A. $x^2 + y^2 - 8x - 10y + 16 = 0$.
B. $x^2 + y^2 + 8x + 10y + 16 = 0$.
C. $x^2 + y^2 - 10x - 10y + 16 = 0$.
D. $x^2 + y^2 + 10x + 10y + 16 = 0$.

[2005-CE-MATHS 2-54]

45. Consider the circle $x^2 + y^2 - 4x + 6y - 40 = 0$. Find the slope of the diameter passing through the point $(1, 2)$.

A. -5
B. -3
C. $\frac{-1}{3}$
D. $\frac{-1}{5}$

[2006-CE-MATHS 2-50]

46. A circle C cuts the y-axis at A and B. If $AB = 8$ and the coordinates of the centre of C are $(-3, 5)$, then the equation of C is

A. $x^2 + y^2 + 6x - 10y = 0$.
B. $x^2 + y^2 - 6x + 10y = 0$.
C. $x^2 + y^2 + 6x - 10y + 9 = 0$.
D. $x^2 + y^2 - 6x + 10y + 9 = 0$.

[2006-CE-MATHS 2-51]

47. A circle C touches the y-axis. If the coordinates of the centre of C are $(-3, 4)$, then the equation of C is

A. $(x-3)^2 + (y+4)^2 = 9$.
B. $(x-3)^2 + (y+4)^2 = 16$.
C. $(x+3)^2 + (y-4)^2 = 9$.
D. $(x+3)^2 + (y-4)^2 = 16$.

[2007-CE-MATHS 2-51]

48. Let a be a constant. If the circle $x^2 + y^2 + ax - 6y - 3 = 0$ passes through the point $(-2, 3)$, then the area of the circle is

A. 8π.
B. 10π.
C. 16π.
D. 55π.

[2007-CE-MATHS 2-52]

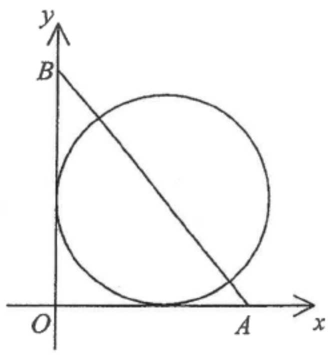
49. The equation of a circle is $x^2 + y^2 - 4x - 8y + 11 = 0$. Which of the following are true?

(1) The coordinates of the centre of the circle are $(2, 4)$.
(2) The radius of the circle is 3.
(3) The origin lies outside the circle.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2008-CE-MATHS 2-53]

50. In the figure, the circle touches the positive x-axis and the positive y-axis. The coordinates of the points A and B are $(21, 0)$ and $(0, 28)$ respectively. If AB passes through the centre of the circle, find the equation of the circle.



A. $x^2 + y^2 - 12x - 12y + 36 = 0$
B. $x^2 + y^2 - 21x - 28y + 196 = 0$
C. $x^2 + y^2 - 24x - 24y + 144 = 0$
D. $x^2 + y^2 - 42x - 56y + 441 = 0$

[2009-CE-MATHS 2-53]

51. Let O be the origin. If A and B are points lying on the x-axis and the y-axis respectively such that the equation of the circumcircle of ΔOAB is $x^2 + y^2 - 16x - 12y = 0$, then the equation of the straight line passing through A and B is

A. $3x + 4y - 48 = 0$.
B. $3x + 4y + 48 = 0$.
C. $4x + 3y - 48 = 0$.
D. $4x + 3y + 48 = 0$.

[2010-CE-MATHS 2-51]

52. A circle cuts the x-axis at P and Q such that $PQ = 6$. If the coordinates of the centre of the circle are $(-5, 2)$, find the equation of the circle.

A. $x^2 + y^2 - 10x + 4y - 5 = 0$
B. $x^2 + y^2 - 10x + 4y + 16 = 0$
C. $x^2 + y^2 + 10x - 4y - 5 = 0$
D. $x^2 + y^2 + 10x - 4y + 16 = 0$

[2010-CE-MATHS 2-52]

53. A circle C touches the x-axis and passes through the point $(-3, 1)$. If the centre of C lies on the y-axis, then the equation of C is

A. $x^2 + y^2 - 5y = 0$.
B. $x^2 + y^2 - 10y = 0$.
C. $x^2 + y^2 + 3x - y = 0$.
D. $x^2 + y^2 + 6x - 2y + 10 = 0$.

[2011-CE-MATHS 2-51]

HKDSE Problems

54. The equation of a circle is $2x^2 + 2y^2 + 8x - 12y + 3 = 0$. Which of the following are true?

(1) The coordinates of the centre of the circle are $(-2, 3)$.
(2) The radius of the circle is 7.
(3) The point $(2, 3)$ lies outside the circle.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

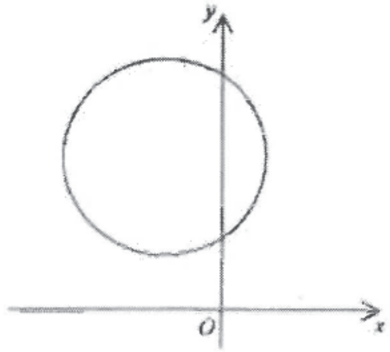
[PP-DSE-MATHS 2-27]

55. If the straight line $x - y = 0$ and the circle $x^2 + y^2 + 6x + ky - k = 0$ do not intersect with each other, find the range of values of k.

A. $2 < k < 18$
B. $-18 < k < -2$
C. $k < 2$ or $k > 18$
D. $k < -18$ or $k > -2$

[PP-DSE-MATHS 2-41]

56.



In the figure, the radius of the circle and the coordinates of the centre are r and (h, k) respectively. Which of the following are true?

(1) $h + k > 0$
(2) $r - h > 0$
(3) $r - k > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-26]

57. Find the range of values of k such that the circle $x^2 + y^2 + 2x - 4y - 13 = 0$ and the straight line $x - y + k = 0$ intersect at two distinct points.

A. $-9 < k < 3$
B. $-3 < k < 9$
C. $k < -9$ or $k > 3$
D. $k < -3$ or $k > 9$

[2012-DSE-MATHS 2-42]

58. The equation of the circle C is $2x^2 + 2y^2 - 4x + 8y - 5 = 0$. The coordinates of the points P and Q are $(-1, 2)$ and $(4, 0)$ respectively. Which of the following is/are true?

(1) The radius of C is 5.
(2) The mid-point of PQ lies outside C.
(3) If G is the centre of C, then $\angle PGQ$ is an acute angle.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2013-DSE-MATHS 2-25]

59. Find the range of values of k such that the circle $x^2 + y^2 + 2x - 2y - 7 = 0$ and the straight line $3x - 4y + k = 0$ intersect.

A. $-8 < k < 22$
B. $-8 \le k \le 22$
C. $k < -22$ or $k > 8$
D. $k \le -22$ or $k \ge 8$

[2013-DSE-MATHS 2-42]

60. If a diameter of the circle $x^2 + y^2 - 8x + ky - 214 = 0$ passes through the point $(6, -5)$ and the slope of the diameter is -4, then $k =$

A. -6 .
B. -4 .
C. 13 .
D. 70 .

[2014-DSE-MATHS 2-26]

61. If the straight line $x - y = k$ and the circle $x^2 + y^2 + 2x - 4y - 1 = 0$ intersect at A and B, then the x-coordinate of the mid-point of AB is

A. $1 + k$.
B. $1 - k$.
C. $\frac{1+k}{2}$.
D. $\frac{1-k}{2}$.

[2014-DSE-MATHS 2-42]

62. A circle C passes through the point $(0, 3)$. If the coordinates of the centre of C are $(-4, 3)$, then the equation of C is

A. $x^2 + y^2 - 8x + 6y + 9 = 0$.
B. $x^2 + y^2 - 8x + 6y + 16 = 0$.
C. $x^2 + y^2 + 8x - 6y + 9 = 0$.
D. $x^2 + y^2 + 8x - 6y + 16 = 0$.

[2015-DSE-MATHS 2-26]

63. Find the constant k such that the circle $x^2 + y^2 + 2x - 6y + k = 0$ and the straight line $x + y + 4 = 0$ intersect at only one point.

A. -16
B. -8
C. 8
D. 16

[2015-DSE-MATHS 2-41]

64. The equation of the circle C is $3x^2 + 3y^2 - 12x + 30y + 65 = 0$. Which of the following are true?

(1) The radius of C is 14.
(2) The origin lies outside C.
(3) The coordinates of the centre of C are $(2, -5)$.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2016-DSE-MATHS 2-27]

65. The straight line $2x - y - 6 = 0$ and the circle $x^2 + y^2 - 8y - 14 = 0$ intersect at P and Q. Find the y-coordinate of the mid-point of PQ.

A. -4
B. -2
C. 2
D. 4

[2016-DSE-MATHS 2-41]

66. The equations of the circles C_1 and C_2 are $x^2 + y^2 + 8x - 4y - 5 = 0$ and $2x^2 + 2y^2 + 8x - 4y - 5 = 0$ respectively. Let G_1 and G_2 be the centres of C_1 and C_2 respectively. Denote the origin by O. Which of the following is/are true?

(1) G_1, G_2 and O are collinear.
(2) The radii of C_1 and C_2 are equal.
(3) O is equidistant from G_1 and G_2.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2017-DSE-MATHS 2-26]

67. The equation of the circle C is $5x^2 + 5y^2 - 30x + 10y + 6 = 0$. Which of the following is true?

A. The origin lies inside C.
B. C lies in the second quadrant.
C. The circumference of C is less than
D. The coordinates of the centre of C are $(15,-5)$

[2018-DSE-MATHS 2-27]

68. Denote the circle $2x^2 + 2y^x + 4x - 12y + 15 = 0$ by C. Which of the following is/are true?

I. The area of C is 25π.
II. The point $(-3,3)$ lies outside C.
III. The centre of C lies in the fourth quadrant.

A. I only
B. II only
C. I and III only
D. II and III only

[2019-DSE-MATHS 2-27]

69. Let k be a constant. The straight line $3x - y - 2 = 0$ and the circle $5x^2 + 5y^2 + kx + 4y - 20 = 0$ intersect at the points P and Q. If the x-coordinates of the mid-point of PQ is 2, find k.

A. -152
B. -52
C. 148
D. 248

[2019-DSE-MATHS 2-37]

70. The equations of the circles C_1 and C_2 are $2x^2 + 2y^2 + 4x + 8y - 149 = 0$ and $x^2 + y^2 - 8x - 20y - 53 = 0$ respectively. Which of the following is/are true?

I. The centre of C_1 lies on C_2.
II. The radii of C_1 and C_2 are equal.
III. C_1 and C_2 intersect at two distinct points.

A. I only
B. II only
C. I and III only
D. II and III only

[2020-DSE-MATHS 2-27]

71. Find the range of values of c such that the circle $x^2 + y^2 - 6x + cy - 7 = 0$ and the straight line $x - y + 9 = 0$ intersect.

A. $-56 \leq c \leq 8$
B. $-8 \leq c \leq 56$
C. $c \leq -56$ or $c \geq 8$
D. $c \leq -8$ or $c \geq 56$

[2020-DSE-MATHS 2-41]

Trigonometric Ratios (Acute Angles)

1. If $\cos\theta = x$ and $0° < \theta < 90°$, then $\tan\theta =$

   A. $\dfrac{1}{\sqrt{1-x^2}}$.
   B. $\sqrt{1-x^2}$.
   C. $\dfrac{\sqrt{1-x^2}}{x}$.
   D. $\dfrac{x}{\sqrt{1-x^2}}$.
   E. $\pm\dfrac{x}{\sqrt{1-x^2}}$.

   [1980-CE-MATHS 2-17]

2. If $0° < \theta < 90°$ and $\sin\theta = \dfrac{k}{2}$, then $\cos\theta =$

   A. $1-\dfrac{k}{2}$.
   B. $\dfrac{2}{\sqrt{4+k^2}}$.
   C. $\dfrac{\sqrt{4+k^2}}{2}$.
   D. $\dfrac{2}{\sqrt{4-k^2}}$.
   E. $\dfrac{\sqrt{4-k^2}}{2}$.

   [1981-CE-MATHS 2-18]

3. If $\tan\theta = \dfrac{2ab}{a^2-b^2}$ and $0° < \theta < 90°$, then $\cos\theta =$

   A. $\dfrac{a^2+b^2}{a^2-b^2}$.
   B. $\dfrac{a^2-b^2}{a^2+b^2}$.
   C. $\dfrac{a^2-b^2}{\sqrt{a^2+b^2}}$.
   D. $\dfrac{\sqrt{a^2-b^2}}{a^2+b^2}$.
   E. $\sqrt{\dfrac{a^2-b^2}{a^2+b^2}}$.

   [1985-CE-MATHS 2-18]

4. If $0° < x < y < 90°$, which of the following must be true?

   (1) $\sin x < \sin y$
   (2) $\cos x < \cos y$
   (3) $\sin x < \cos y$

   A. (1) only
   B. (2) only
   C. (1) and (2) only
   D. (1) and (3) only
   E. (2) and (3) only

   [2001-CE-MATHS 2-17]

5. If $45° < \theta < 90°$, which of the following must be true?

   (1) $\tan\theta > \sin\theta$
   (2) $\tan\theta > \cos\theta$
   (3) $\cos\theta > \sin\theta$

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2002-CE-MATHS 2-22]

6. If θ is an acute angle and $\sin\theta = \cos\theta$, then $\cos\theta =$

   A. $\dfrac{1}{2}$.
   B. $\dfrac{\sqrt{2}}{2}$.
   C. $\dfrac{\sqrt{3}}{2}$.
   D. 1 .

   [2003-CE-MATHS 2-22]

7. If $0° < \theta < 45°$, which of the following must be true?

   (1) $\tan\theta < \cos\theta$
   (2) $\sin\theta < \tan\theta$
   (3) $\sin\theta < \cos\theta$

   A. (1) only
   B. (3) only
   C. (1) and (2) only
   D. (2) and (3) only

   [2006-CE-MATHS 2-22]

8. In ΔABC, $AB : BC : AC = 3 : 4 : 5$. Find $\tan A : \cos C$.

   A. 3 : 5
   B. 4 : 3
   C. 4 : 5
   D. 5 : 3

   [2009-CE-MATHS 2-25]

Trigonometric Ratios (Up to 360°)

9. If $\sin\theta = -\dfrac{5}{7}$ and $180° < \theta < 270°$, then $\tan\theta =$

   A. $\dfrac{\sqrt{7^2-5^2}}{5}$.
   B. $-\dfrac{\sqrt{7^2-5^2}}{5}$.

C. $\dfrac{5}{\sqrt{7^2-5^2}}$.

D. $-\dfrac{5}{\sqrt{7^2-5^2}}$.

E. $\dfrac{5}{\sqrt{7^2+5^2}}$.

[1977-CE-MATHS 2-21]

10. $1 + \cos 180° =$

A. 0.
B. 1.
C. 2.
D. $1 - 180°$.
E. $1 + 180°$.

[1977-CE-MATHS 2-22*]

11. $\tan 225° =$

A. -1.
B. 0.
C. 1.
D. $\sqrt{2}$.
E. $\dfrac{1}{\sqrt{2}}$.

[SP-CE-MATHS 2-31*]

12. If θ increases from 135° to 180°, then $\tan\theta$ increases from

A. negative infinity to -1.
B. 1 to infinity.
C. -1 to 0.
D. 0 to 1.
E. -1 to 1.

[SP-CE-MATHS 2-50]

13. In ΔABC, $\cos A = \dfrac{\sqrt{3}}{2}$ and $\cos B = \dfrac{\sqrt{2}}{2}$. Then $\cos 2(A+B) =$

A. $\sqrt{3}+\sqrt{2}$.
B. $\dfrac{1}{2}$.
C. $-\dfrac{1}{2}$.
D. $\dfrac{\sqrt{3}}{2}$.
E. $-\dfrac{\sqrt{3}}{2}$.

[SP-CE-MATHS A2-46]

14. $\sin 300° =$

A. 60°.
B. $\sin 60°$.
C. $-\sin 60°$.
D. $\cos 60°$.
E. $-\cos 60°$.

[1979-CE-MATHS 2-7]

15. If $\tan\theta$ and $\cos\theta$ are both negative, what are the possible quadrants in which θ could lie?

A. the first quadrant only
B. the second quadrant only
C. the third quadrant only
D. the fourth quadrant only
E. any of the four quadrant

[1979-CE-MATHS 2-16]

16. When θ increases from 180° to 270°, $\sin\theta$

A. increases from -1 to 0.
B. increases from 0 to 1.
C. decreases from 1 to 0.
D. decreases from 0 to -1.
E. decreases from 1 to -1.

[1979-CE-MATHS 2-40]

17. If $\tan x = -\dfrac{3}{4}$ and x is an angle in the second quadrant, what is the value of $\sin x + \cos x$?

A. $-\dfrac{7}{5}$
B. $-\dfrac{1}{5}$
C. $\dfrac{1}{5}$
D. 1
E. $\dfrac{7}{5}$

[1982-CE-MATHS 2-18]

18. If $\tan A = -\dfrac{5}{4}$, then $\dfrac{2\sin A - 3\cos A}{3\sin A + 2\cos A} =$

A. $-\dfrac{22}{7}$.
B. $-\dfrac{22}{23}$.
C. $-\dfrac{2}{23}$.
D. $\dfrac{2}{23}$.
E. $\dfrac{22}{7}$.

[1988-CE-MATHS 2-16]

19. If $\tan\theta = -\frac{4}{3}$ and θ lies in the second quadrant, then $\sin\theta - 2\cos\theta =$

A. 2 .
B. -2 .
C. $\frac{11}{5}$.
D. $\frac{2}{5}$.
E. $-\frac{2}{5}$.

[1990-CE-MATHS 2-18]

Range of Trigonometric Functions

20. What is the smallest possible value of

$$\sin x \cos y \ ?$$

A. -1
B. $-\frac{1}{2}$
C. 0
D. $\frac{1}{2}$
E. 1

[SP-CE-MATHS A2-45]

21. If $0^\circ \le \theta \le 360^\circ$, the minimum value of

$$1 + 2\cos\frac{\theta}{2}$$

is

A. -2 .
B. -1 .
C. 0 .
D. 1 .
E. 2 .

[1981-CE-MATHS 2-44]

22. If $0^\circ \le x \le 180^\circ$ and $\sin x \le \cos x$, what is the range of x?

A. $0^\circ \le x \le 45^\circ$
B. $0^\circ \le x \le 90^\circ$
C. $45^\circ \le x \le 90^\circ$
D. $45^\circ \le x \le 180^\circ$
E. $90^\circ \le x \le 180^\circ$

[1982-CE-MATHS 2-49*]

23. The maximum value of $\cos^2 3x$ is

A. 1 .
B. 2 .
C. 3 .
D. 6 .
E. 9 .

[1983-CE-MATHS 2-49]

24. The greatest value of $\frac{3}{4 + 2\cos\theta}$ is

A. 3 .
B. $\frac{3}{2}$.
C. $\frac{3}{4}$.
D. $\frac{3}{5}$.
E. $\frac{1}{2}$.

[1984-CE-MATHS 2-44]

25. If $0^\circ \le \theta \le 360^\circ$, then the largest value of $2\sin^2\theta + \cos^2\theta + 2$ is

A. 1 .
B. 2 .
C. 3 .
D. 4 .
E. 5 .

[1985-CE-MATHS 2-46]

26. If x and y can take any value between 0 and 360, what is the greatest value of $2\sin x^\circ - \cos y^\circ$?

A. 1
B. 2
C. 3
D. $\sqrt{5}$
E. It cannot be found.

[1988-CE-MATHS 2-47]

27. The least value of $9\cos^2\theta - 6\cos\theta + 1$ is

A. -4 .
B. 0 .
C. 1 .
D. 4 .
E. 16 .

[1989-CE-MATHS 2-15]

28. The greatest value of $1 - 2\sin\theta$ is

A. 5 .
B. 3 .
C. 1 .
D. 0 .
E. -1 .

[1992-CE-MATHS 2-18]

29. The largest value of $3\sin^2\theta + 2\cos^2\theta - 1$ is

A. 1 .
B. $\frac{3}{2}$.
C. 2 .
D. 3 .
E. 4 .

[1993-CE-MATHS 2-22]

30. The largest value of $(3\cos 2\theta - 1)^2 + 1$ is

A. 2 .
B. 5 .
C. 17 .
D. 26 .
E. 50 .

[1994-CE-MATHS 2-48]

31. The greatest value of $\dfrac{1}{2^{1-\sin x}}$ is

A. $\frac{1}{2}$.
B. $\frac{1}{4}$.
C. 1 .
D. 2 .
E. 4 .

[1995-CE-MATHS 2-18]

32. For $0° \le \theta < 90°$, the maximum value of $\dfrac{2}{3+\sin^2\theta}$ is

A. $\frac{2}{5}$.
B. $\frac{1}{2}$.
C. $\frac{2}{3}$.
D. 1 .

[2002-CE-MATHS 2-21]

33. For $0° \le x \le 90°$, the least value of $\dfrac{4}{2-\cos x}$ is

A. 0 .
B. 1 .
C. 2 .
D. 4 .

[2004-CE-MATHS 2-20]

34. For $0° \le \theta \le 90°$, the greatest value of $\dfrac{5-\sin\theta}{4+\sin\theta}$ is

A. $\frac{4}{5}$.
B. 1 .
C. $\frac{5}{4}$.
D. 2 .

[2005-CE-MATHS 2-20]

35. For $0° \le \theta \le 360°$, the least value of $\dfrac{2+\sin\theta}{2-\sin\theta}$ is

A. −1 .
B. $\frac{1}{3}$.
C. 1 .
D. 3 .

[2008-CE-MATHS 2-47]

HKDSE Problems

36. For $0° \le \theta \le 90°$, the least value of $\dfrac{30}{3\sin^2\theta + 2\sin^2(90° - \theta)}$ is

A. 5 .
B. 6 .
C. 10 .
D. 15 .

[PP-DSE-MATHS 2-23]

Trigonometric Relationships (1)

1. If $A + B = 180°$, which of the following is/are true?

   (1) $\sin A = \sin B$
   (2) $\cos A = \cos B$
   (3) $\tan A = \tan B$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1), (2) and (3)
   E. none of them

   [1982-CE-MATHS 2-19]

2. $\dfrac{\cos(90° - \theta)}{\tan(180° - \theta)} =$

   A. $\cos\theta$.
   B. $-\cos\theta$.
   C. $-\dfrac{\sin^2\theta}{\cos\theta}$.
   D. $-\dfrac{\cos^2\theta}{\sin\theta}$.
   E. $\dfrac{\sin^2\theta}{\cos\theta}$.

   [1983-CE-MATHS 2-17]

3. $\sin(180° + \theta) + \sin(\theta - 90°) =$

   A. $\sin\theta + \cos\theta$.
   B. $\sin\theta - \cos\theta$.
   C. $\cos\theta - \sin\theta$.
   D. $-\cos\theta - \sin\theta$.
   E. $2\sin\theta$.

   [1990-CE-MATHS 2-16]

4. $\dfrac{\sin(\theta - 90°)}{\tan(\theta + 180°)} =$

   A. $\cos\theta$.
   B. $-\cos\theta$.
   C. $\dfrac{\cos^2\theta}{\sin\theta}$.
   D. $-\dfrac{\cos^2\theta}{\sin\theta}$.
   E. $\dfrac{1}{\sin\theta}$.

   [1991-CE-MATHS 2-17]

5. If $A + B + C = 180°$, then $1 + \cos A \cos(B + C) =$

   A. 0 .
   B. $\sin^2 A$.
   C. $1 + \cos^2 A$.
   D. $1 + \sin A \cos A$.
   E. $1 - \sin A \cos A$.

   [1992-CE-MATHS 2-21]

6. $\dfrac{\sin(180° + \theta)}{\cos(90° - \theta)} =$

   A. $\tan\theta$.
   B. $-\tan\theta$.
   C. $\dfrac{1}{\tan\theta}$.
   D. 1 .
   E. -1 .

   [1994-CE-MATHS 2-18]

7. $\dfrac{\cos(90° - A)\sin(180° - A)}{\tan(360° - A)} =$

   A. $-\sin A \cos A$.
   B. $\sin A \cos A$.
   C. $-\cos^2 A$.
   D. $\cos^2 A$.
   E. $\sin^2 A$.

   [1997-CE-MATHS 2-40]

8. $\dfrac{\cos(90° - A)\cos(-A)}{\sin(360° - A)} =$

   A. $-\cos A$.
   B. $\cos A$.
   C. $\sin A$.
   D. $-\dfrac{\cos^2 A}{\sin A}$.
   E. $\dfrac{\cos^2 A}{\sin A}$.

   [1999-CE-MATHS 2-46]

9. If $\cos\theta = \dfrac{1}{k}$ and $0° < \theta < 90°$, then $\tan(\theta - 270°) =$

   A. $-\dfrac{k}{\sqrt{1-k^2}}$.
   B. $-\dfrac{1}{\sqrt{k^2-1}}$.
   C. $\dfrac{1}{\sqrt{k^2-1}}$.
   D. $-\sqrt{k^2-1}$.
   E. $\sqrt{k^2-1}$.

   [2000-CE-MATHS 2-51]

10. If $\sin\theta = \frac{3}{5}$ and θ lies in the first quadrant, then $\sin(90° - \theta) + \sin(180° + \theta) =$

A. $\frac{1}{5}$.
B. $\frac{-1}{5}$.
C. $\frac{7}{5}$.
D. $\frac{-7}{5}$.

[2002-CE-MATHS 2-46]

11. $[1 + \cos(180° + \theta)][1 - \cos(180° - \theta)] =$

A. $\sin^2\theta$.
B. $(1 - \cos\theta)^2$.
C. $(1 + \cos\theta)^2$.
D. $(1 - \cos\theta)(1 - \sin\theta)$.

[2002-CE-MATHS 2-47*]

12. $\dfrac{\tan(180° - \theta)}{\cos(90° - \theta)} =$

A. $\dfrac{1}{\cos\theta}$.
B. $\dfrac{-1}{\cos\theta}$.
C. $\dfrac{\sin\theta}{\cos^2\theta}$.
D. $\dfrac{-\sin\theta}{\cos^2\theta}$.

[2003-CE-MATHS 2-46]

13. If $A + B = 180°$, which of the following must be true?

(1) $\sin A = \sin B$
(2) $\cos A = \sin B$
(3) $\cos A = \cos B$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2004-CE-MATHS 2-47*]

14. $\sin(90° - x) + \cos(x + 180°) =$

A. 0.
B. $-2\cos x$.
C. $\sin x + \cos x$.
D. $\sin x - \cos x$.

[2005-CE-MATHS 2-45]

15. $2\sin(90° - \theta)\sin 60° - \cos 0°\cos\theta =$

A. $\sin\theta$.
B. $\sqrt{3}\sin\theta$.
C. $\sqrt{3}\cos\theta$.
D. $(\sqrt{3} - 1)\cos\theta$.

[2006-CE-MATHS 2-21]

16. If x and y are acute angles such that $x + y = 90°$, which of the following must be true?

(1) $\sin x = \cos y$
(2) $\sin(90° - x) = \cos(90° - y)$
(3) $\tan x \tan y = 1$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2007-CE-MATHS 2-20]

17. $\dfrac{\cos A}{\tan(90° - A)} =$

A. $\sin A$.
B. $\cos A$.
C. $\dfrac{1}{\sin A}$.
D. $\dfrac{1}{\cos A}$.

[2008-CE-MATHS 2-23]

18. If A and B are acute angles such that $A + B = 90°$, then $\cos^2 A + \sin^2 B =$

A. 1.
B. $2\sin^2 A$.
C. $2\cos^2 A$.
D. $2\cos^2 B$.

[2009-CE-MATHS 2-24]

19. If θ is an acute angle, then $\tan\theta + \tan(90° - \theta) =$

A. $2\tan\theta$.
B. $\sin\theta + \cos\theta$.
C. $\dfrac{1}{\tan\theta}$.
D. $\dfrac{1}{\sin\theta\cos\theta}$.

[2010-CE-MATHS 2-22]

20. If x, y and z are the angles of a triangle with $x + y = 90°$, which of the following are true?

(1) $\tan x \tan y = \sin z$
(2) $\cos y + \cos z = \sin x$
(3) $\sin^2 x + \sin^2 y = \sin^2 z$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2011-CE-MATHS 2-20]

Trigonometric Relationships (2)

21. If the expression $\dfrac{\dfrac{\cos x}{\sin x}-\dfrac{\sin x}{\cos x}}{\dfrac{\cos x}{\sin x}+\dfrac{\sin x}{\cos x}}$ is simplified, it becomes

A. $\cos^2 x - \sin^2 x$.
B. $(\cos x - \sin x)^2$.
C. $(\cos x + \sin x)^2$.
D. $\dfrac{\cos^2 x - \sin^2 x}{2\sin x\cos x}$.
E. $\left(\dfrac{\cos x - \sin x}{\cos x + \sin x}\right)^2$.

[1972-CE-MATHS B1-6]

22. $\dfrac{1}{1+\tan^2\theta}$ =

A. $\sin^2\theta$.
B. $\cos^2\theta$.
C. $\tan^2\theta$.
D. $1+\cos^2\theta$.
E. $1+\dfrac{1}{\tan^2\theta}$.

[SP-CE-MATHS 2-26]

23. $\left(\dfrac{1}{\sin\theta}+\dfrac{1}{\tan\theta}\right)(1-\cos\theta)$ =

A. $\sin\theta$.
B. $\cos\theta$.
C. $\sin^2\theta$.
D. $\cos\theta + 1$.
E. $\sin\theta + \tan\theta$.

[1978-CE-MATHS 2-3]

24. $\dfrac{1}{1-\sin\theta}+\dfrac{1}{1+\sin\theta}$ =

A. $2\sin^2\theta$.
B. $2\cos^2\theta$.
C. $2\tan^2\theta$.
D. $\dfrac{2}{\sin^2\theta}$.
E. $\dfrac{2}{\cos^2\theta}$.

[1979-CE-MATHS 2-6]

25. $\tan\theta + \dfrac{1}{\tan\theta}$ =

A. 1 .
B. $2\tan\theta$.
C. $\dfrac{2}{\tan\theta}$.
D. $\sin\theta\cos\theta$.
E. $\dfrac{1}{\sin\theta\cos\theta}$.

[1979-CE-MATHS 2-30]

26. $\dfrac{1}{\dfrac{1}{\sin\theta}-1}-\dfrac{1}{\dfrac{1}{\sin\theta}+1}$ =

A. $2\tan\theta$.
B. $2\tan^2\theta$.
C. $\dfrac{2}{\tan^2\theta}$.
D. $\dfrac{2\sin\theta}{\cos^2\theta}$.
E. $\dfrac{2\sin^2\theta}{\cos\theta}$.

[1980-CE-MATHS 2-16]

27. $\tan\theta\sin\theta - \dfrac{1}{\cos\theta}$ =

A. 0 .
B. $\cos\theta$.
C. $-\cos\theta$.
D. $\dfrac{-1}{\cos\theta}$.
E. $-\tan\theta\sin\theta$.

[1981-CE-MATHS 2-19]

28. $(\sin\theta+\cos\theta)^2 - 1$ =

A. 0 .
B. 1 .
C. $2\cos^2\theta$.
D. $2\sin\theta\cos\theta$.
E. $-2\sin\theta\cos\theta$.

[1982-CE-MATHS 2-17]

29. $\dfrac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\dfrac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}$ =

A. 2 .
B. $4\sin\theta\cos\theta$.
C. $\dfrac{2\sin\theta\cos\theta}{\sin^2\theta-\cos^2\theta}$.
D. $\dfrac{4\sin\theta\cos\theta}{\sin^2\theta-\cos^2\theta}$.
E. $\dfrac{2}{\sin^2\theta-\cos^2\theta}$.

[1982-CE-MATHS 2-45]

30. $\sin^2\theta - (\sin^2\theta\cos^4\theta + \sin^4\theta\cos^2\theta) =$

A. $\sin^4\theta$.
B. $\cos^4\theta$.
C. $-\sin^4\theta$.
D. $-\cos^4\theta$.
E. $\sin^2\theta\cos^2\theta$.

[1983-CE-MATHS 2-16]

31. $\dfrac{\tan^2\theta}{1+\tan^2\theta} + \cos^2\theta =$

A. 1 .
B. $\dfrac{1}{2} + \cos^2\theta$.
C. $\cos^2\theta$.
D. $1 + \tan^2\theta$.
E. $1 + \cos^2\theta$.

[1984-CE-MATHS 2-17]

32. $\tan\theta\left(\dfrac{1}{\sin\theta} - \sin\theta\right) =$

A. 1 .
B. $\cos\theta$.
C. $\sin\theta$.
D. $\dfrac{1}{\cos\theta}$.
E. $\dfrac{1}{\sin\theta}$.

[1985-CE-MATHS 2-17]

33. $\sin^4\theta - \cos^4\theta =$

A. -1 .
B. $1 - 2\cos^4\theta$.
C. $\sin\theta - \cos\theta$.
D. $\sin^2\theta - \cos^2\theta$.
E. $2\sin^4\theta - 1$.

[1986-CE-MATHS 2-16]

34. $\dfrac{1}{\dfrac{1}{\cos\theta} - 1} - \dfrac{1}{\dfrac{1}{\cos\theta} + 1} =$

A. $\dfrac{2}{\tan^2\theta}$.
B. $\dfrac{2}{\tan\theta}$.
C. $2\tan^2\theta$.
D. $\dfrac{2\cos\theta}{\sin^2\theta}$.
E. $\dfrac{2\cos^2\theta}{\sin\theta}$.

[1989-CE-MATHS 2-16]

35. $\left(\dfrac{1}{\cos\theta} + \tan\theta\right)(1 - \sin\theta) =$

A. $\sin\theta$.
B. $\cos\theta$.
C. $\cos^2\theta$.
D. $1 + \sin\theta$.
E. $\sin\theta\tan\theta$.

[1991-CE-MATHS 2-16]

36. $\dfrac{\cos\theta}{1-\sin^2\theta}\cdot\dfrac{1-\cos^2\theta}{\sin\theta} =$

A. $\sin\theta$.
B. $\cos\theta$.
C. $\tan\theta$.
D. $\dfrac{1}{\sin\theta}$.
E. $\dfrac{1}{\cos\theta}$.

[1993-CE-MATHS 2-19]

37. $\cos^4\theta - \sin^4\theta + 2\sin^2\theta =$

A. 0 .
B. 1 .
C. $(1 - \sin^2\theta)^2$.
D. $(1 - \cos^2\theta)^2$.
E. $(\cos^2\theta - \sin^2\theta)^2$.

[1993-CE-MATHS 2-20]

38. $\dfrac{\cos\theta}{\sin\theta + 1} - \dfrac{\cos\theta}{\sin\theta - 1} =$

A. $\dfrac{2}{\cos\theta}$.
B. $-\dfrac{2}{\cos\theta}$.
C. 0 .
D. $2\tan\theta$.
E. $-2\tan\theta$.

[1994-CE-MATHS 2-16]

39. $\dfrac{\cos^2\theta}{1+\sin\theta} - 1 =$

A. $-\sin\theta$.
B. $\sin\theta$.
C. $\sin\theta - 2$.
D. $-\dfrac{\sin\theta(1-\sin\theta)}{1+\sin\theta}$.
E. $\dfrac{\sin\theta(1-\sin\theta)}{1+\sin\theta}$.

[1995-CE-MATHS 2-16]

40. $\dfrac{\dfrac{1}{\cos\theta} - \cos\theta}{\tan^2\theta} =$

A. $\sin\theta$.
B. $\cos\theta$.
C. $\cos^2\theta$.
D. $\dfrac{1}{\cos\theta}$.
E. $\dfrac{1}{\tan\theta}$.

[1996-CE-MATHS 2-20]

41. $\dfrac{1+\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{1+\sin\theta} =$

A. 1 .
B. $2(1+\sin\theta)$.
C. $\dfrac{2}{\cos\theta}$.
D. $\dfrac{2}{\cos\theta\,(1+\sin\theta)}$.
E. $\dfrac{1+\sin\theta+\cos\theta}{\cos\theta\,(1+\sin\theta)}$.

[1998-CE-MATHS 2-44]

42. If $\tan(90° - \theta) = 2$, then $\dfrac{\sin^3\theta + \sin\theta\cos^2\theta}{\cos\theta}$ =

A. 2 .
B. $\dfrac{1}{2}$.
C. $\dfrac{1}{\sqrt{5}}$.
D. $-\dfrac{1}{2}$.
E. -2 .

[2001-CE-MATHS 2-43]

43. $\dfrac{\cos\theta - \dfrac{1}{\cos\theta}}{\sin\theta} =$

A. $-\tan\theta$.
B. $\tan\theta$.
C. $\dfrac{-\sin^3\theta}{\cos\theta}$.
D. $\dfrac{\cos\theta - 1}{\sin\theta\cos\theta}$.

[2004-CE-MATHS 2-46]

44. $\dfrac{\cos A}{\sin A} + \dfrac{\sin A}{\cos A} =$

A. 1 .
B. $1 + \tan^2 A$.
C. $\sin A\cos A$.
D. $\dfrac{1}{\sin A\cos A}$.

[2007-CE-MATHS 2-21]

Harder Trigonometric Relationships

45. If $R\sin\theta = 2$ and $R\cos\theta = 3$, then $R^2 =$

A. 1 .
B. 5 .
C. 6 .
D. 13 .
E. 25 .

[1978-CE-MATHS 2-10]

46. Given that $\sin\theta - \cos\theta = \dfrac{1}{2}$, what is the value of $\sin\theta\cos\theta$?

A. $\dfrac{1}{2}$
B. $\dfrac{1}{4}$
C. $\dfrac{3}{8}$
D. $\dfrac{3}{4}$
E. it cannot be determined

[1981-CE-MATHS 2-43]

47. If $\sin\theta\cos\theta = \dfrac{1}{4}$, then $(\sin\theta + \cos\theta)^2 =$

A. 2 .
B. $\dfrac{3}{2}$.
C. 1 .
D. $\dfrac{1}{2}$.
E. $\dfrac{1}{4}$.

[1986-CE-MATHS 2-14]

48. $\cos 90° + \cos 180° + \cos 270° + \cos 360° + \ldots + \cos 1800° =$

A. 0 .
B. 1 .
C. -1 .
D. 10 .
E. -10 .

[1991-CE-MATHS 2-47*]

49. $\sin^2 1° + \sin^2 3° + \sin^2 5° + ... + \sin^2 87° + \sin^2 89° =$

A. 22 .
B. 22.5 .
C. 44.5 .
D. 45 .

[2005-CE-MATHS 2-46]

50. $\cos^2 1° + \cos^2 2° + \cos^2 3° + ... + \cos^2 89° + \cos^2 90° =$

A. 44 .
B. 44.5 .
C. 45 .
D. 45.5 .

[2010-CE-MATHS 2-46]

HKDSE Problems

51. $\dfrac{\sin\theta}{\cos 60°} + \dfrac{\cos(270° - \theta)}{\tan 45°} =$

A. $\sin\theta$.
B. $3\sin\theta$.
C. $2\sin\theta - \cos\theta$.
D. $2\sin\theta + \cos\theta$.

[SP-DSE-MATHS 2-19]

52. $\dfrac{\cos 60°}{1 - \cos(90° - \theta)} + \dfrac{\cos 240°}{1 - \cos(270° - \theta)} =$

A. $\dfrac{1}{\cos^2\theta}$.
B. $\dfrac{\cos\theta}{\tan\theta}$.
C. $\dfrac{\tan\theta}{\cos\theta}$.
D. $\dfrac{1}{\cos\theta\tan\theta}$.

[2012-DSE-MATHS 2-19]

53. For $0° < x < 90°$, which of the following must be true?

(1) $\tan x \tan(90° - x) = 1$
(2) $\sin x - \sin(90° - x) < 0$
(3) $\cos x + \cos(90° - x) > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2013-DSE-MATHS 2-23]

54. $\left(\cos(90° + \theta) + 1\right)\left(\sin(360° - \theta) - 1\right) =$

A. $-\cos^2\theta$.
B. $-\sin^2\theta$.
C. $\cos^2\theta$.
D. $\sin^2\theta$.

[2014-DSE-MATHS 2-19]

55. $\dfrac{\cos 180°}{1 + \sin(90° + \theta)} + \dfrac{\cos 360°}{1 + \sin(270° + \theta)} =$

A. 0 .
B. $\dfrac{2}{\cos\theta}$.
C. $\dfrac{2\cos\theta}{\sin^2\theta}$.
D. $\dfrac{2\sin\theta}{\cos^2\theta}$.

[2015-DSE-MATHS 2-19]

Trigonometric Equations

1. The number of solutions of the equation $\cos x = \tan x$ for $0° \le x \le 360°$ is

   A. 0 .
   B. 1 .
   C. 2 .
   D. 3 .
   E. 4 .

[1972-CE-MATHS B1-7]

2. If $0° \le x° \le 360°$, the solution set of $\cos^2 x° - 3\sin^2 x° = 0$ is

   A. {30, 120} .
   B. {60, 240} .
   C. {30, 120, 210, 300} .
   D. {60, 150, 240, 330} .
   E. {30, 150, 210, 330} .

[1977-CE-MATHS 2-32]

3. If θ is an acute angle, and $\cos\theta \doteq 0.4300$, then $\theta =$

   A. 64.42° .
   B. 64.47° .
   C. 64.50° .
   D. 64.53° .
   E. 64.58° .

[1978-CE-MATHS A2-46*]

4. If $0° \le \theta \le 90°$ and $\sin\theta = \cos 5\theta$, then θ could be

   A. 15° .
   B. 22½° .
   C. 30° .
   D. 45° .
   E. 60° .

[SP-CE-MATHS 2-49]

5. What is the solution of the equation

   $$\sin\theta(\sin\theta - \sqrt{2}) = 0,$$

   where $0° \le \theta \le 90°$?

   A. $\theta = 0°$ only
   B. $\theta = 30°$ only
   C. $\theta = 45°$ only
   D. $\theta = 0°$ or $\theta = 30°$
   E. $\theta = 0°$ or $\theta = 45°$

[1978-CE-MATHS 2-21]

6. Given that $0° \le \theta \le 360°$, if $\sqrt{2}\sin\theta = 1$ and $\sqrt{2}\cos\theta = -1$, then $\theta =$

   A. 45° only .
   B. 135° only .
   C. 225° only .
   D. 315° only .
   E. 45° or 135° or 225° or 315° .

[1978-CE-MATHS 2-22]

7. What is the solution of the equation

   $$(\sin\theta - 2)(\cos\theta + 1) = 0,$$

   where $0° \le \theta \le 360°$?

   A. $\theta = 30°$ only
   B. $\theta = 90°$ only
   C. $\theta = 180°$ only
   D. $\theta = 30°$ or $150°$
   E. $\theta = 30°$ or $150°$ or $180°$

[1979-CE-MATHS 2-31]

8. If $0° \le \theta < 360°$, which of the following equations has exactly one root?

   A. $\sin\theta = -1$
   B. $\sin\theta = -\frac{1}{2}$
   C. $\sin\theta = 0$
   D. $\sin\theta = \frac{1}{2}$
   E. $\sin\theta = 2$

[1980-CE-MATHS 2-18]

9. If $0° \le \theta \le 360°$, the number of roots of the equation

   $$2\sin\theta\cos\theta - \cos\theta = 0$$

   is

   A. 0 .
   B. 1 .
   C. 2 .
   D. 3 .
   E. 4 .

[1981-CE-MATHS 2-20]

10. How many roots has the equation

    $$\sin\theta + \sin^2\theta = \cos^2\theta$$

    where $0° \le \theta \le 360°$?

    A. 0
    B. 1
    C. 2
    D. 3
    E. 4

[1982-CE-MATHS 2-48]

11. If $0° \le \theta < 360°$, the number of roots of the equation

$$4\sin^2\theta\cos\theta = \cos\theta$$

is

A. 2.
B. 3.
C. 4.
D. 5.
E. 6.

[1983-CE-MATHS 2-48]

12. If $0° \le \theta < 360°$, the number of roots of the equation

$$2\sin\theta + \frac{1}{\sin\theta} = 3$$

is

A. 0.
B. 1.
C. 2.
D. 3.
E. 4.

[1984-CE-MATHS 2-45]

13. Let p be a positive constant such that $p\sin\theta = \sqrt{3}$ and $p\cos\theta = 1$. Find all the values of θ in the interval 0° to 360°.

A. 60°
B. 30°
C. 60°, 240°
D. 30°, 210°
E. cannot be determined

[1986-CE-MATHS 2-44*]

14. How many different values of x between 0° and 360° will satisfy the equation $(\sin x + 1)(2\sin x + 1) = 0$?

A. 0
B. 1
C. 2
D. 3
E. 4

[1987-CE-MATHS 2-49]

15. If $0° \le x < 360°$, the number of points of intersection of the graphs of $y = \sin x$ and $y = 1 + \cos x$ is

A. 0.
B. 1.
C. 2.
D. 3.
E. 4.

[1987-CE-MATHS 2-50]

16. Given that $\sin\theta\cos\theta > 0$, which of the following is/are true?

(1) $0° < \theta < 90°$
(2) $90° < \theta < 180°$
(3) $180° < \theta < 270°$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[1988-CE-MATHS 2-14]

17. Given that $0° \le \theta \le 180°$, how many roots has the equation $(\sin\theta + 1)(\tan\theta + 3) = 0$?

A. 0
B. 1
C. 2
D. 3
E. 4

[1989-CE-MATHS 2-18]

18. If $2\sin^2\theta - \sin\theta\cos\theta - \cos^2\theta = 0$, then $\tan\theta =$

A. 1 or $\frac{1}{2}$.
B. -1 or $\frac{1}{2}$.
C. 1 or $-\frac{1}{2}$.
D. -1 or $-\frac{1}{2}$.
E. 1 or -2.

[1989-CE-MATHS 2-46]

19. If $0° \le x < 360°$, which of the following equations has only one root?

A. $\sin x = 0$
B. $\sin x = \frac{1}{2}$
C. $\sin x = 2$
D. $\cos x = 0$
E. $\cos x = -1$

[1990-CE-MATHS 2-17]

20. If $\sin\theta$ and $\cos\theta$ are the roots of the equation $x^2 + k = 0$, then $k =$

A. -1.
B. $-\frac{1}{2}$.
C. $-\frac{1}{4}$.
D. $\frac{1}{4}$.
E. $\frac{1}{2}$.

[1990-CE-MATHS 2-44]

21. If $0° \le \theta < 360°$, how many roots does the equation $\tan\theta + 2\sin\theta = 0$ have?

A. 1
B. 2
C. 3
D. 4
E. 5

[1991-CE-MATHS 2-18*]

22. In which two quadrants will the solution(s) of $\sin\theta\cos\theta < 0$ lie?

A. In quadrants I and II only
B. In quadrants I and III only
C. In quadrants II and III only
D. In quadrants II and IV only
E. In quadrants III and IV only

[1992-CE-MATHS 2-20]

23. Which of the following equations has/have solutions?

(1) $2\cos^2\theta - \sin^2\theta = 1$
(2) $2\cos^2\theta - \sin^2\theta = 2$
(3) $2\cos^2\theta - \sin^2\theta = 3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1992-CE-MATHS 2-23]

24. Solve $\tan^4\theta + 2\tan^2\theta - 3 = 0$ for $0° \le \theta < 360°$.

A. 45°, 135° only
B. 45°, 225° only
C. 45°, 60°, 225°, 240°
D. 45°, 120°, 225°, 300°
E. 45°, 135°, 225°, 315°

[1993-CE-MATHS 2-45]

25. If $0° \le x \le 360°$, how many roots does the equation $\sin x(\cos x + 2) = 0$ have?

A. 0
B. 1
C. 2
D. 3
E. 4

[1994-CE-MATHS 2-47]

26. If $0° < x < 360°$, solve $\sin x = \frac{1}{3}$ correct to 3 significant figures.

A. 18.7° or 161°
B. 18.7° or 199°
C. 19.5° or 160°
D. 19.5° or 199°
E. 19.5° or 340°

[1995-CE-MATHS 2-17*]

27. If $0° \le x \le 360°$, the number of points of intersection of the graphs of $y = \sin x$ and $y = \tan x$ is

A. 1 .
B. 2 .
C. 3 .
D. 4 .
E. 5 .

[1995-CE-MATHS 2-49]

28. If $0° \le \theta \le 360°$, solve $2\sin\theta = -\sqrt{3}$.

A. 120° or 240°
B. 120° or 300°
C. 150° or 330°
D. 210° or 330°
E. 240° or 300°

[1996-CE-MATHS 2-19]

29. If $0° \le x \le 180°$, solve $2\sin x + 3\cos x = 0$ correct to 3 significant figures.

A. 33.7°
B. 56.3°
C. 124°
D. 146°
E. no solution

[1996-CE-MATHS 2-22*]

30. For $0° \le \theta \le 360°$, how many roots does the equation $\tan\theta(\tan\theta - 2) = 0$ have?

A. 1
B. 2
C. 3
D. 4
E. 5

[1997-CE-MATHS 2-43*]

31. For $0° \le x \le 360°$, how many roots does the equation $3\sin^2 x + 2\sin x - 1 = 0$ have?

A. 0
B. 1
C. 2
D. 3
E. 4

[1998-CE-MATHS 2-47]

32. If $0° \le \theta \le 360°$, solve $(\cos\theta - 3)(3\sin\theta - 2) = 0$ correct to 3 significant figures.

A. 41.8° or 70.5°
B. 41.8° or 138°
C. 41.8° or 222°
D. 41.8° or 356°
E. 42.0° or 138°

[1999-CE-MATHS 2-47*]

33. For $0° \le x \le 360°$, how many roots does the equation $\cos^3 x = \cos x$ have?

A. 2
B. 3
C. 4
D. 5
E. 6

[2001-CE-MATHS 2-42]

34. For $0° \le x \le 360°$, how many roots does the equitation $\tan x = 2\sin x$ have?

A. 2
B. 3
C. 4
D. 5

[2002-CE-MATHS 2-48]

35. For $0° \le \theta < 360°$, how many roots does the equation $2\cos^2\theta - 5\sin\theta - 4 = 0$ have?

A. 1
B. 2
C. 3
D. 4

[2003-CE-MATHS 2-45]

36. For $0° \le x \le 360°$, how many distinct roots does the equation $\cos x(\sin x - 1) = 0$ have?

A. 2
B. 3
C. 4
D. 5

[2005-CE-MATHS 2-44]

37. For $0° < x < 360°$, how many roots does the equation $3\cos^2 x - 4\cos x + 1 = 0$ have?

A. 2
B. 3
C. 4
D. 5

[2006-CE-MATHS 2-44]

38. Solve the equation $\sin\theta = \sqrt{3}\cos\theta$, where $0° \le \theta \le 90°$.

A. $\theta = 0°$
B. $\theta = 30°$
C. $\theta = 45°$
D. $\theta = 60°$

[2007-CE-MATHS 2-22]

39. For $0° \le \theta < 360°$, how many roots does the equation $3\sin^2\theta + 2\sin\theta - 1 = 0$ have?

A. 2
B. 3
C. 4
D. 5

[2008-CE-MATHS 2-45]

40. For $0° \le x \le 360°$, how many roots does the equation $\cos^2 x - \sin^2 x = 1$ have?

A. 2
B. 3
C. 4
D. 5

[2009-CE-MATHS 2-45]

HKDSE Problems

41. For $0° \le x \le 360°$, how many roots does the equation $7\sin^2 x = \sin x$ have?

A. 2
B. 3
C. 4
D. 5

[2014-DSE-MATHS 2-39]

42. For $0° \le x < 360°$, how many roots does the equation $\cos^2 x - \sin x = 1$ have?

A. 2
B. 3
C. 4
D. 5

[2015-DSE-MATHS 2-38]

43. For $0° \le \theta \le 360°$, how many roots does the equation $5\sin^2\theta + \sin\theta - 4 = 0$ have?

A. 2
B. 3
C. 4
D. 5

[2016-DSE-MATHS 2-38]

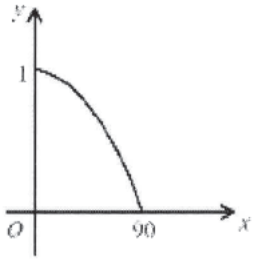
44. For $0° \leq x < 360°$, how many roots does the equation $6\cos^2 x = \cos x + 5$ have?

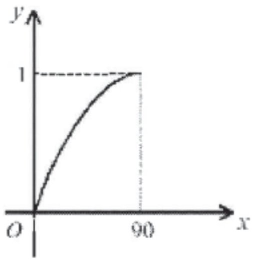
A. 2
B. 3
C. 4
D. 5

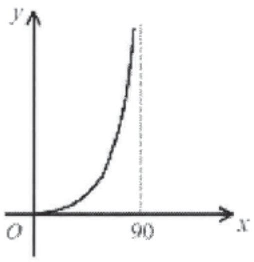
[2018-DSE-MATHS 2-38]

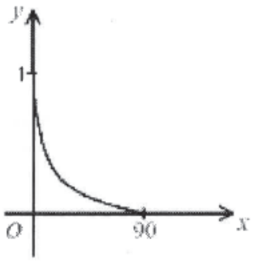
Trigonometric Graphs

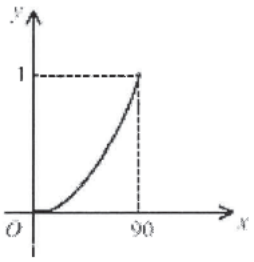
1. Which of the following may represent the graph of $y = \cos x°$ for $0 \le x \le 90$?

A.


B.


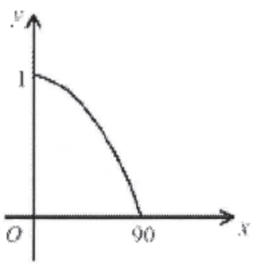
C.


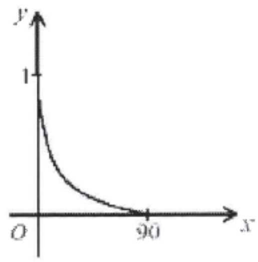
D.


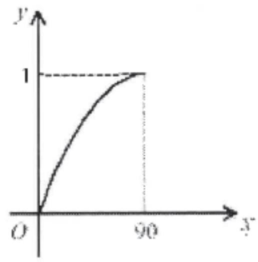
E.


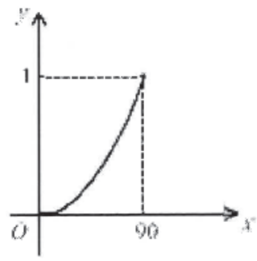
[1999-CE-MATHS 2-16]

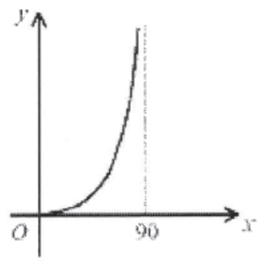
2. Which of the following may represent the graph of $y = \tan x°$ for $0 \le x \le 90$?

A.


B.


C.


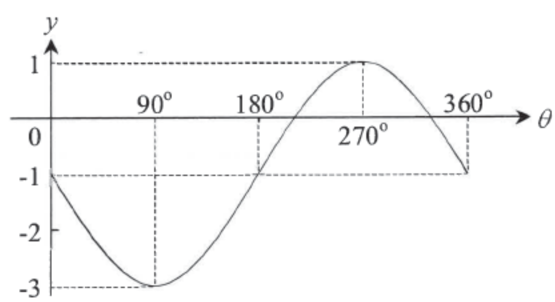
D.


E.


[2000-CE-MATHS 2-11]

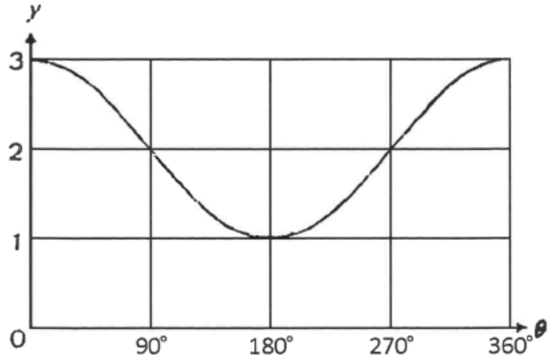
Vertical Transformations of Graphs

3. The figure shows the graph of $y = a \sin\theta + c$. Find a.



A. –3
B. –2
C. –1
D. 1
E. 2

[1977-CE-MATHS 2-25]

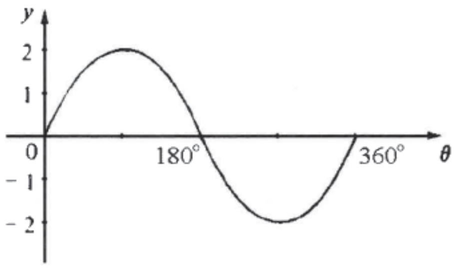
4. 

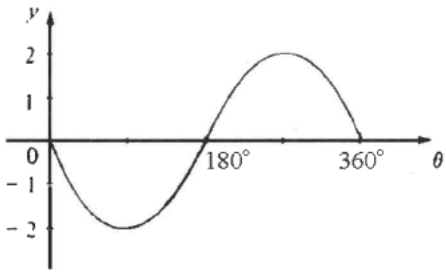
The sketch above could be the graph of

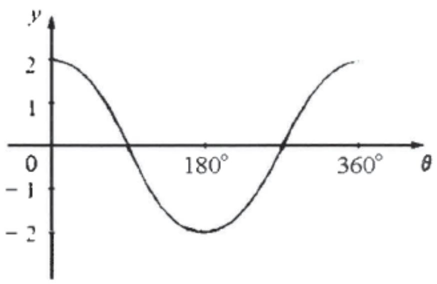
A. $y = 2 + \sin\theta$.
B. $y = 3 + \sin\theta$.
C. $y = 2 + \cos\theta$.
D. $y = 3 + \cos\theta$.
E. $y = 3\cos\theta$.

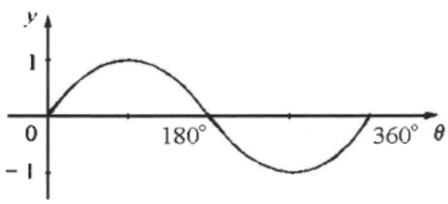
[1978-CE-MATHS 2-34*]

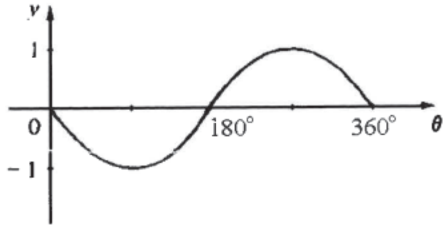
5. Which of the following is the graph of $y = 2\sin\theta$ for $0° \le \theta \le 360°$?

A. 

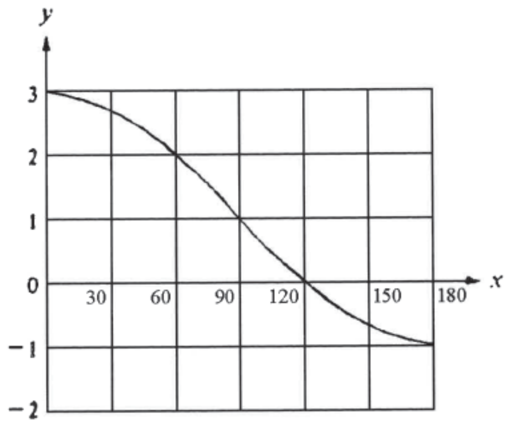
B. 

C. 

D. 

E. 

[1980-CE-MATHS 2-46*]

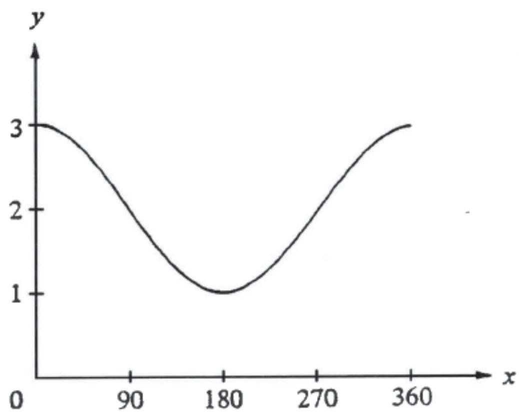
6. 

The above figure shows the graph of $y = a\cos x° + 1$ for $0 \le x \le 180$. $a =$

A. −1 .
B. 0 .
C. 1 .
D. 2 .
E. 3 .

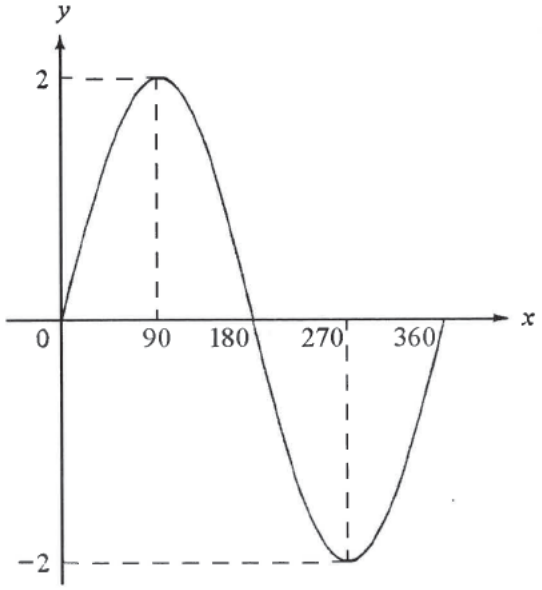
[1982-CE-MATHS 2-44*]

7. The figure shows the graph of



A. $y = 3\cos x°,\ 0 \le x \le 360$.
B. $y = 3\sin x°,\ 0 \le x \le 360$.
C. $y = 2 + \sin x°,\ 0 \le x \le 360$.
D. $y = 2 + \cos x°,\ 0 \le x \le 360$.
E. $y = 3 + \sin x°,\ 0 \le x \le 360$.

[1985-CE-MATHS 2-45]

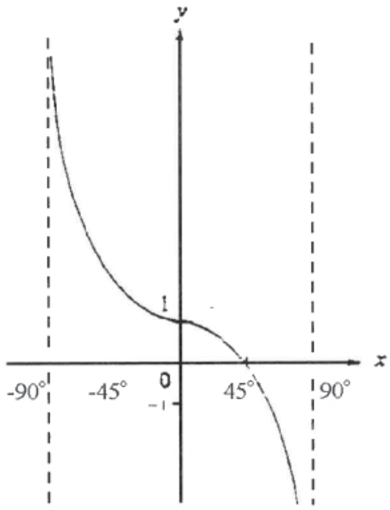
8. 

Which of the following functions may be represented by the above graph in the interval 0 to 360?

A. $y = \cos 2x°$
B. $y = 2\cos x°$
C. $y = \frac{1}{2}\cos 2x°$
D. $y = \sin 2x°$
E. $y = 2\sin x°$

[1986-CE-MATHS 2-15*]

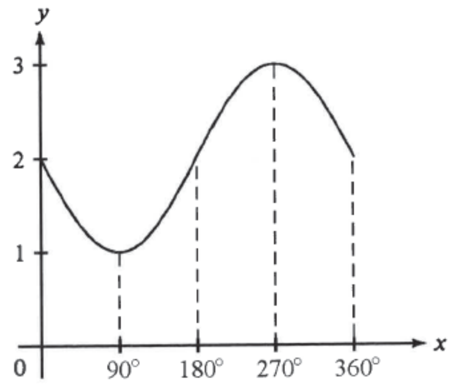
9. The figure shows the graph of the function



A. $y = -\tan x$.
B. $y = 1 - \tan x$.
C. $y = 1 + \tan x$.
D. $y = \cos x - \sin x$.
E. $y = \cos x + \sin x$.

[1988-CE-MATHS 2-48*]

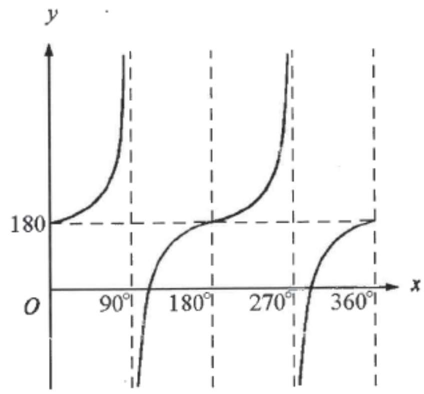
10. The figure shows the graph of the function



A. $y = 2\cos x$.
B. $y = 2 - \sin x$.
C. $y = 2 + \sin x$.
D. $y = 2 - \cos x$.
E. $y = 2 + \cos x$.

[1991-CE-MATHS 2-48*]

11. The figure shows the graph of the function

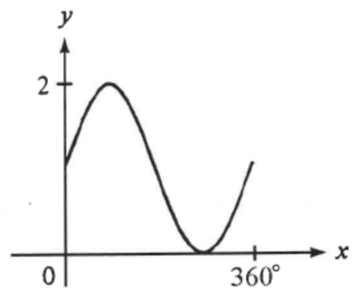


A. $\tan(x + 180°)$.
B. $\tan(x - 180°)$.
C. $180\tan x$.
D. $180 + \tan x$.
E. $180 - \tan x$.

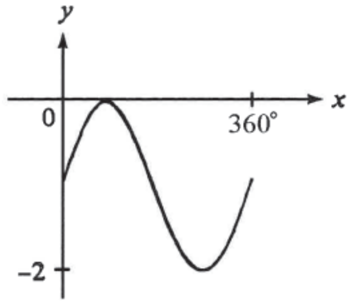
[1992-CE-MATHS 2-22*]

12. Which of the following figures shows the graph of $y = 1 + \sin x$?

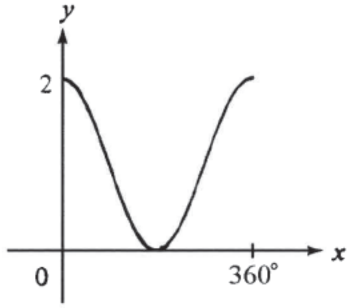
A.



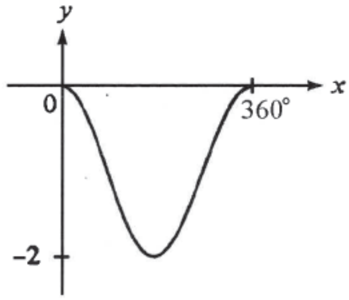
B.



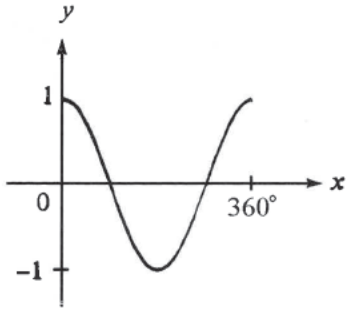
C.



D.

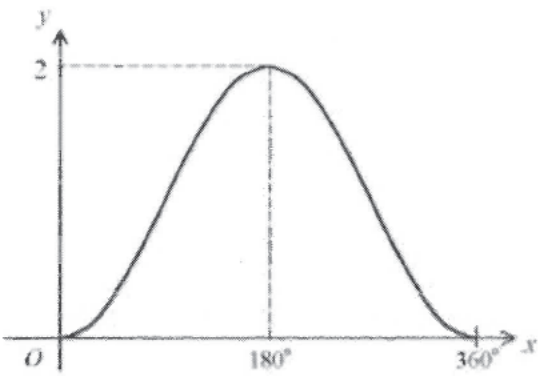


E.



[1994-CE-MATHS 2-17*]

13. The figure shows the graph of the function



A. $y = \sin \dfrac{x}{2}$.

B. $y = 2 \sin x$.

C. $y = 1 + \sin x$.

D. $y = 1 + \cos x$.

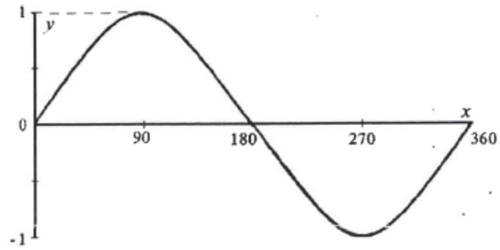
E. $y = 1 - \cos x$.

[2001-CE-MATHS 2-44*]

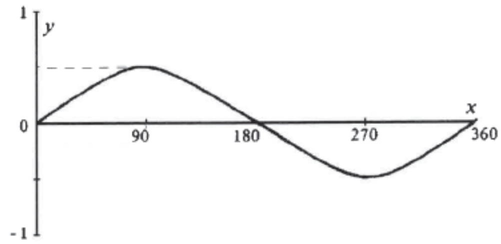
Horizontal Transformations of Graphs

14. Which one of the following sketches is the graph of $y = \sin \dfrac{x^\circ}{2}$?

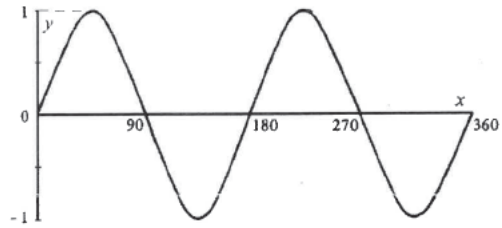
A.



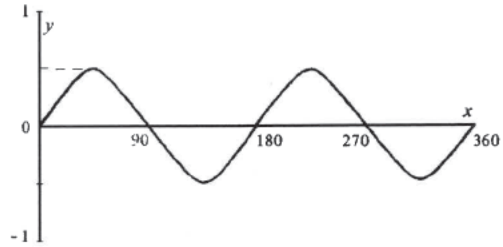
B.



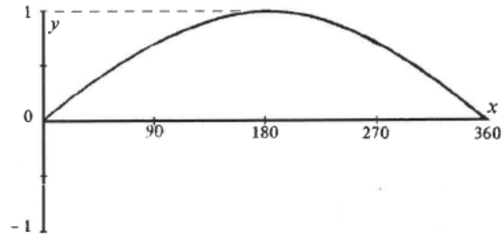
C.



D.

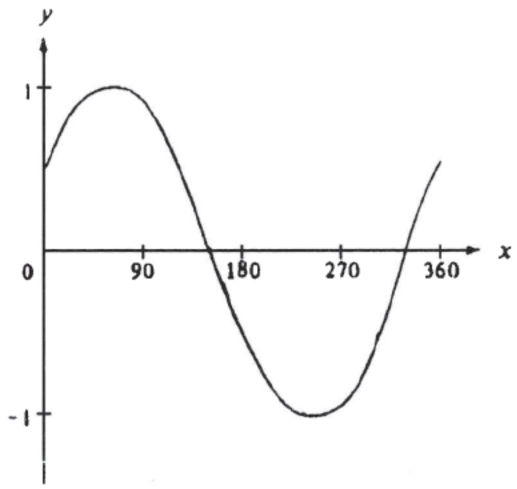


E.



[SP-CE-MATHS 2-28]

15.



The figure above shows the graph of

A. $y = \sin(x° + 30°)$.

B. $y = \sin(x° - 30°)$.

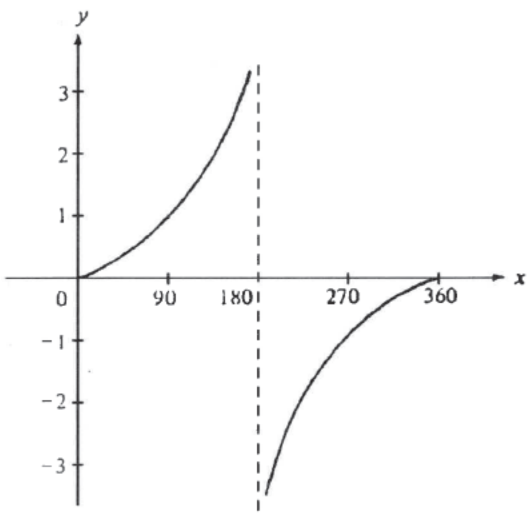
C. $y = \sin(x° + 150°)$.

D. $y = \sin(x° - 150°)$.

E. $y = \sin(x° + 60°)$.

[1981-CE-MATHS 2-45]

16.



The figure above shows the graph of a tangent function from 0° to 360°. The function is

A. $y = \tan\frac{x°}{2}$.

B. $y = \tan x°$.

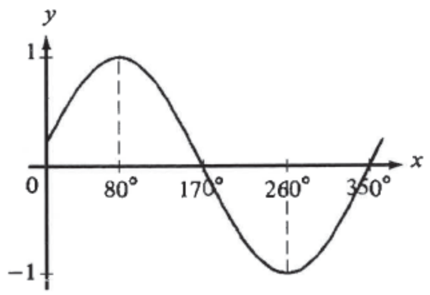
C. $y = \tan 2x°$.

D. $y = \tan(x - 90)°$.

E. $y = \tan(x + 90)°$.

[1983-CE-MATHS 2-50]

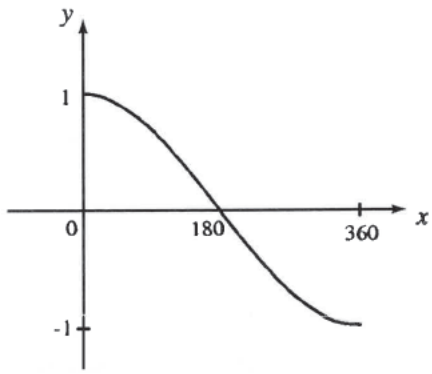
17. The figure shows the graph of the function



A. $y = \sin(350° - x)$.
B. $y = \sin(x + 10°)$.
C. $y = \cos(x + 10°)$.
D. $y = \sin(x - 10°)$.
E. $y = \cos(x - 10°)$.

[1993-CE-MATHS 2-46]

18. The figure shows the graph of the function



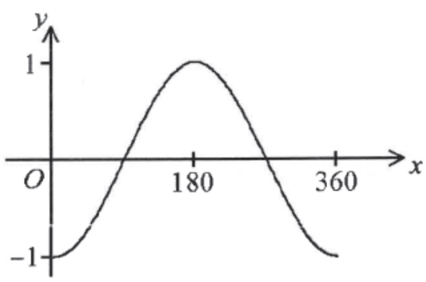
A. $y = \cos\frac{x°}{2}$.

B. $y = \frac{1}{2}\cos x°$.

C. $y = \cos x°$.
D. $y = 2\cos x°$.
E. $y = \cos 2x°$.

[1995-CE-MATHS 2-50]

19. The figure shows the graph of the function

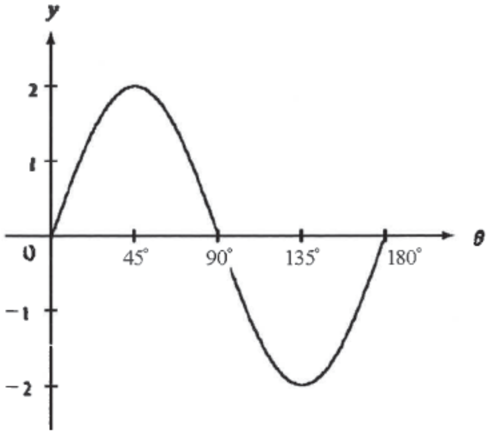


A. $y = \cos x°$.
B. $y = \cos(-x°)$.
C. $y = \cos(90° - x°)$.
D. $y = \cos(90° + x°)$.
E. $y = \cos(180° - x°)$.

[1998-CE-MATHS 2-45*]

Miscellaneous Transformations of Graphs

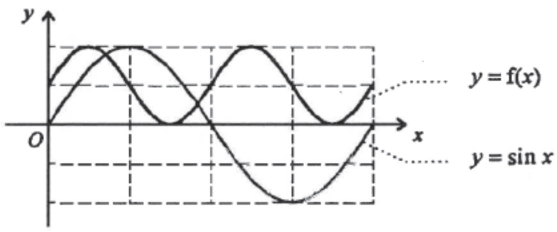
20. The figure shows the graph of $y = a \sin k\theta$. What are the values of the constants a and k?



A. $a = 1$ and $k = 1$
B. $a = 1$ and $k = 2$
C. $a = 1$ and $k = \frac{1}{2}$
D. $a = 2$ and $k = 2$
E. $a = 2$ and $k = \frac{1}{2}$

[1984-CE-MATHS 2-51*]

21. In the figure, $f(x) =$



A. $\sin\frac{x}{2} + \frac{1}{2}$.

B. $\sin 2x + \frac{1}{2}$.

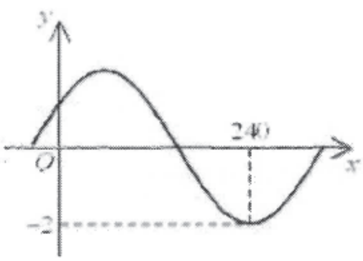
C. $\frac{1}{2}\sin\frac{x}{2} + \frac{1}{2}$.

D. $\frac{1}{2}\sin x + \frac{1}{2}$.

E. $\frac{1}{2}\sin 2x + \frac{1}{2}$.

[1997-CE-MATHS 2-44]

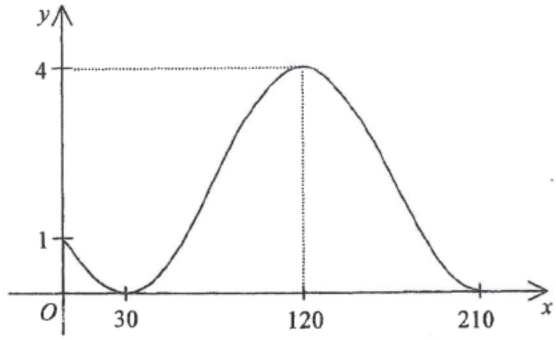
22. Let k be a constant and $-90° < \theta < 90°$. If the figure shows the graph of $y = k\sin(x° + \theta)$, then



A. $k = -2$ and $\theta = -30°$.
B. $k = -2$ and $\theta = 30°$.
C. $k = 2$ and $\theta = -30°$.
D. $k = 2$ and $\theta = 30°$.

[2007-CE-MATHS 2-46]

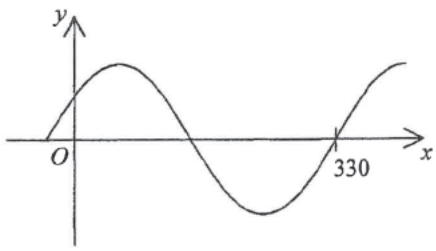
23. Let a and b be constants. If the figure shows the graph of $y = a\cos(2x° + 120°) + b$, then



A. $a = 1$ and $b = 3$.
B. $a = 2$ and $b = 2$.
C. $a = 3$ and $b = 1$.
D. $a = 4$ and $b = 0$.

[2008-CE-MATHS 2-46]

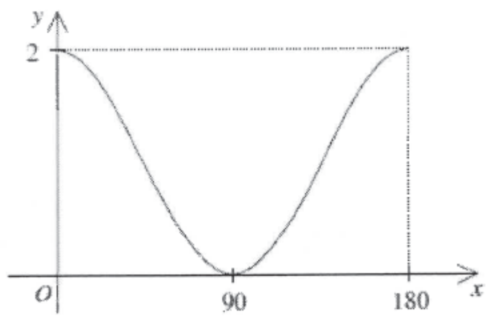
24. Let $-90° \le \theta < 90°$. If the figure shows the graph of $y = 7\sin(x° + \theta)$, then



A. $\theta = -60°$.
B. $\theta = -30°$.
C. $\theta = 30°$.
D. $\theta = 60°$.

[2009-CE-MATHS 2-46]

25. The figure shows



A. the graph of $y = 1 + \cos\dfrac{x^\circ}{2}$.

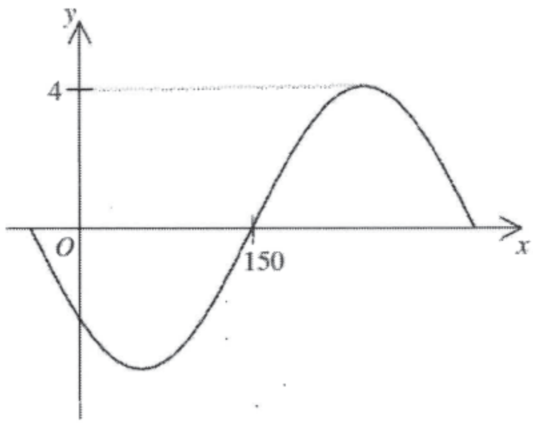
B. the graph of $y = 1 + \cos 2x^\circ$.

C. the graph of $y = 2 + \sin\dfrac{x^\circ}{2}$.

D. the graph of $y = 2 + \sin 2x^\circ$.

[2010-CE-MATHS 2-45]

26. Let a be a constant and $-90^\circ < \theta < 90^\circ$. If the figure shows the graph of $y = a\cos(x^\circ + \theta)$, then



A. $a = 4$ and $\theta = 60^\circ$.

B. $a = 4$ and $\theta = -60^\circ$.

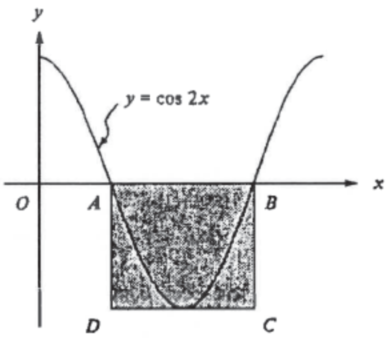
C. $a = -4$ and $\theta = 60^\circ$.

D. $a = -4$ and $\theta = -60^\circ$.

[2011-CE-MATHS 2-46]

Coordinates / Area in Graphs

27. The figure shows the graph of $y = \cos 2x^\circ$, where $0 \le x \le 180$. The area of the rectangle $ABCD$ is



A. 90 .

B. 45 .

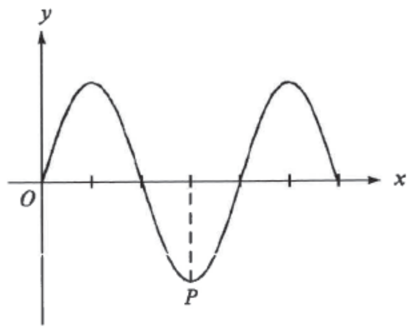
C. 180 .

D. 135 .

E. 360 .

[1989-CE-MATHS 2-17*]

28. The figure shows the graph of $y = 3\sin 2x^\circ$. The point P is



A. (240, –3) .

B. (135, –3) .

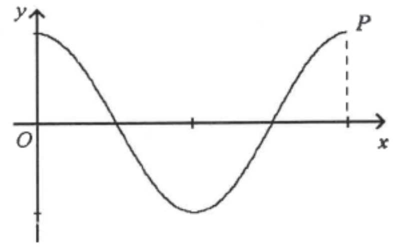
C. (240, –1) .

D. (135, –1) .

E. (270, –1) .

[1990-CE-MATHS 2-45*]

29. The figure shows the graph of $y = \dfrac{1}{2}\cos 2x^\circ$. The point P is



A. (90, 2) .

B. $(180, \frac{1}{2})$.

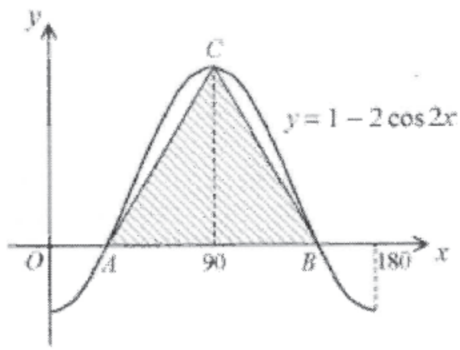
C. (180, 1) .

D. $(360, \frac{1}{2})$.

E. (360, 1) .

[1996-CE-MATHS 2-21*]

30. In the figure, the area of ΔABC is



A. 60 .

B. 120 .

C. 180 .

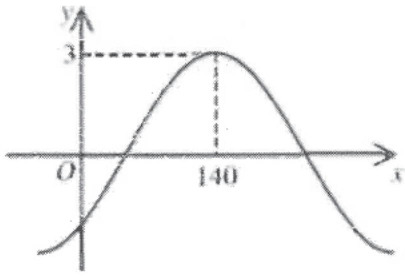
D. 240 .

E. 360 .

[2000-CE-MATHS 2-53*]

HKDSE Problems

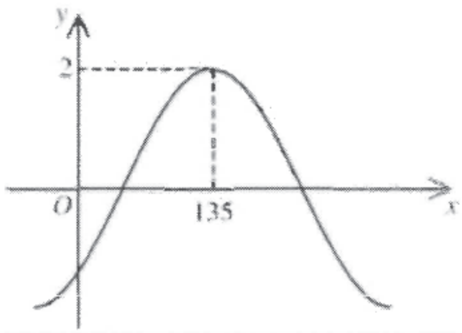
31. Let a be a constant and $-90° < b < 90°$. If the figure shows the graph of $y = a\cos(x° + b)$, then



A. $a = -3$ and $b = -40°$.
B. $a = -3$ and $b = 40°$.
C. $a = 3$ and $b = -40°$.
D. $a = 3$ and $b = 40°$.

[SP-DSE-MATHS 2-42]

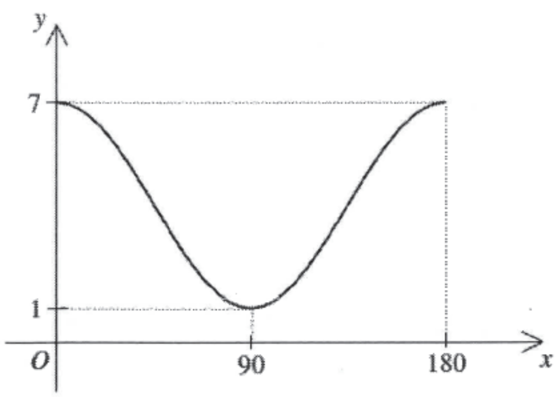
32. Let a be a constant and $-90° < \theta < 90°$. If the figure shows the graph of $y = a\sin(x° + \theta)$, then



A. $a = -2$ and $\theta = -45°$.
B. $a = -2$ and $\theta = 45°$.
C. $a = 2$ and $\theta = -45°$.
D. $a = 2$ and $\theta = 45°$.

[PP-DSE-MATHS 2-38]

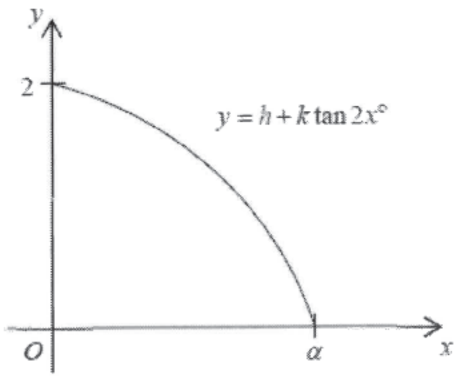
33. The figure shows



A. the graph of $y = 1 + 3\cos\frac{x°}{2}$.
B. the graph of $y = 1 + 3\cos 2x°$.
C. the graph of $y = 4 + 3\cos\frac{x°}{2}$.
D. the graph of $y = 4 + 3\cos 2x°$.

[2012-DSE-MATHS 2-39]

34.



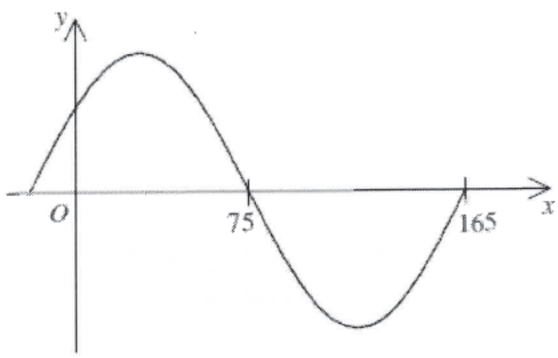
Let h and k be constants. The figure shows the graph of $y = h + k\tan 2x°$, where $0 \le x \le \alpha$. Which of the following are true?

(1) $h > 0$
(2) $k < 0$
(3) $\tan\alpha° = \frac{1}{k}$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2013-DSE-MATHS 2-39]

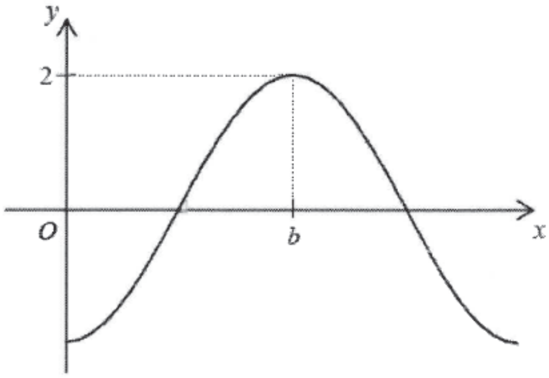
35. Let k be a positive constant and $-180° < \theta < 180°$. If the figure shows the graph of $y = \sin(kx° + \theta)$, then



A. $k = \frac{1}{2}$ and $\theta = -30°$.
B. $k = \frac{1}{2}$ and $\theta = 30°$.
C. $k = 2$ and $\theta = -30°$.
D. $k = 2$ and $\theta = 30°$.

[2015-DSE-MATHS 2-39]

36. Let a and b be constants. If the figure shows the graph of $y = a\cos 2x°$, then

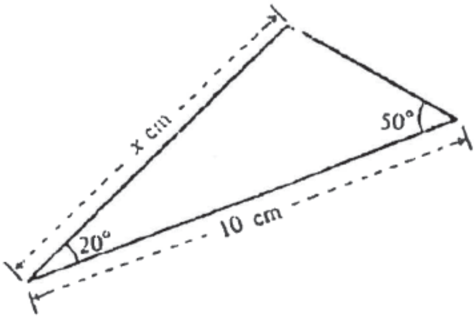


A. $a = -2$ and $b = 90$.
B. $a = -2$ and $b = 360$.
C. $a = 2$ and $b = 90$.
D. $a = 2$ and $b = 360$.

[2016-DSE-MATHS 2-37]

Sine Formula

1. In the figure, $x =$

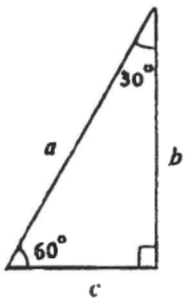


A. $10\sin 20°$.
B. $10\dfrac{\sin 20°}{\sin 70°}$.
C. $10\dfrac{\sin 20°}{\sin 50°}$.
D. $10\dfrac{\sin 50°}{\sin 20°}$.
E. $10\dfrac{\sin 50°}{\sin 70°}$.

[1978-CE-MATHS A2-51]

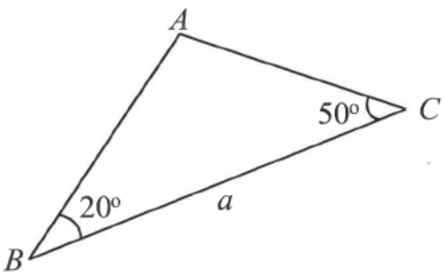
2. In the figure, $a : b : c =$

A. $3 : 2 : 1$.
B. $9 : 4 : 1$.
C. $2 : \sqrt{3} : 1$.
D. $\sqrt{3} : \sqrt{2} : 1$.
E. $\sqrt{3} : 2 : 1$.



[1980-CE-MATHS 2-19]

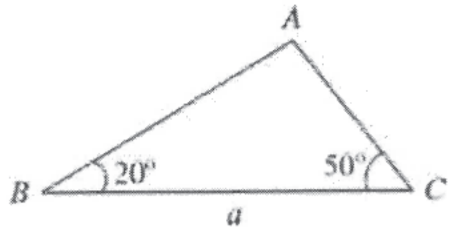
3. In the figure, $BC = a$, $AB =$



A. $a\sin 20°$.
B. $\dfrac{a\sin 20°}{\sin 70°}$.
C. $\dfrac{a\sin 20°}{\sin 50°}$.
D. $\dfrac{a\sin 50°}{\sin 20°}$.
E. $\dfrac{a\sin 50°}{\sin 70°}$.

[1983-CE-MATHS 2-46]

4. In the figure, $BC = a$. $AB =$

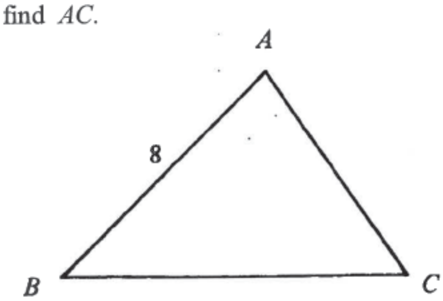


A. $\dfrac{5}{11}a$.
B. $a\sin 50°$.
C. $\dfrac{a\sin 70°}{\sin 50°}$.
D. $\dfrac{a\sin 50°}{\sin 70°}$.
E. $\dfrac{a\sin 50°}{\sin 20°}$.

[1988-CE-MATHS 2-23]

5. In the figure, $\sin A : \sin B : \sin C = 4 : 5 : 6$. If $AB = 8$, find AC.

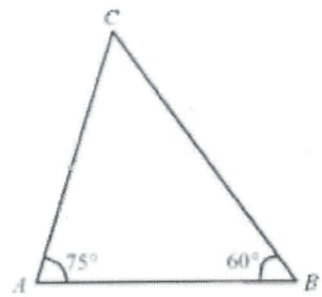
A. $5\frac{1}{3}$
B. $6\frac{2}{3}$
C. $9\frac{3}{5}$
D. 10
E. 12



[1994-CE-MATHS 2-49]

6. In the figure, $\dfrac{AC}{AB} =$

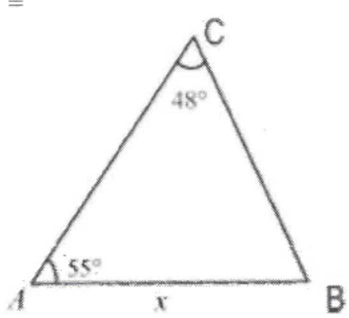
A. $\dfrac{4}{3}$.
B. $\dfrac{5}{4}$.
C. $\dfrac{\sqrt{2}}{2}$.
D. $\dfrac{\sqrt{6}}{2}$.
E. $\dfrac{\sqrt{6}}{3}$.



[1999-CE-MATHS 2-18]

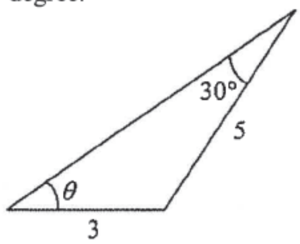
7. In the figure, $AC =$

A. $\dfrac{x\sin 77°}{\sin 48°}$.
B. $\dfrac{x\sin 55°}{\sin 48°}$.
C. $\dfrac{x\sin 48°}{\sin 77°}$.
D. $\dfrac{x\sin 77°}{\sin 55°}$.



[2002-CE-MATHS 2-16]

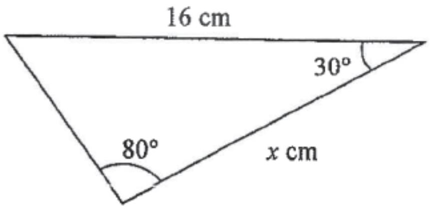
8. In the figure, θ is an acute angle. Find θ correct to the nearest degree.



A. 35°
B. 50°
C. 56°
D. 57°

[2005-CE-MATHS 2-21]

9. In the figure, find x correct to the nearest integer.

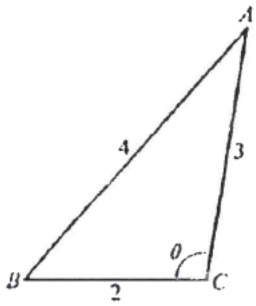


A. 14
B. 15
C. 16
D. 17

[2007-CE-MATHS 2-47]

Cosine Formula

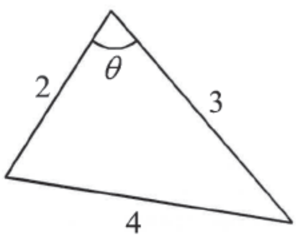
10. In ΔABC, $AB = 4$, $BC = 2$ and $CA = 3$. $\cos\theta =$



A. $-\frac{1}{4}$.
B. $-\frac{1}{2}$.
C. $\frac{1}{4}$.
D. $\frac{1}{2}$.
E. $\frac{3}{4}$.

[1978-CE-MATHS A2-52]

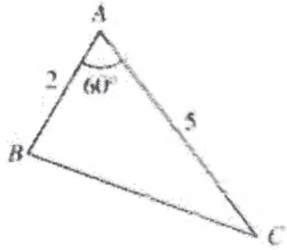
11. In the figure, $\cos\theta =$



A. $-\frac{1}{4}$.
B. $-\frac{1}{2}$.
C. $\frac{1}{4}$.
D. $\frac{1}{2}$.
E. $\frac{3}{4}$.

[1984-CE-MATHS 2-19]

12. In the figure, $AB = 2$ and $AC = 5$, $BC =$



A. $\sqrt{39}$.
B. $\sqrt{29}$.
C. $\sqrt{24}$.
D. $\sqrt{20}$.
E. $\sqrt{19}$.

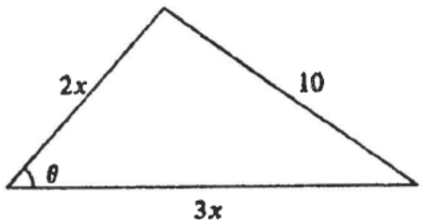
[1985-CE-MATHS 2-19]

13. In ΔABC, if $AB : BC : CA = 4 : 5 : 6$, then $\cos A =$

A. $\frac{1}{8}$.
B. $\frac{1}{5}$.
C. $\frac{3}{10}$.
D. $\frac{9}{16}$.
E. $\frac{3}{4}$.

[1987-CE-MATHS 2-51]

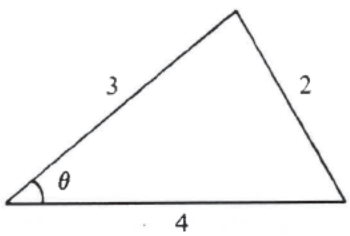
14. In the figure, if $\cos\theta = \frac{3}{4}$, find the value of x.



A. 2
B. 3
C. 4
D. 5
E. 6

[1989-CE-MATHS 2-48]

15. In the figure, find $\cos\theta$.

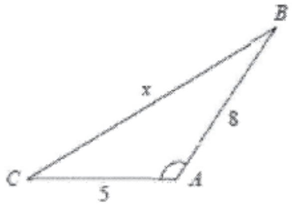


A. $-\frac{1}{4}$
B. $\frac{11}{16}$
C. $\frac{3}{4}$
D. $\frac{7}{8}$
E. $\frac{\sqrt{77}}{9}$

[1992-CE-MATHS 2-19]

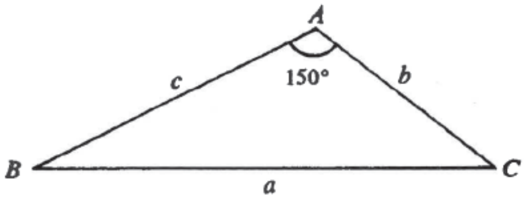
16. In the figure, $\cos A = -\frac{4}{5}$. Find a.

A. $\sqrt{153}$
B. $\sqrt{137}$
C. $\sqrt{89}$
D. $\sqrt{41}$
E. $\sqrt{25}$



[1993-CE-MATHS 2-21]

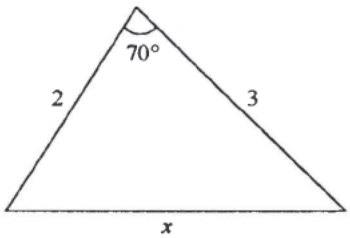
17. According to the figure, which of the following must be true?



A. $a^2 = b^2 + c^2 - \sqrt{3}bc$
B. $a^2 = b^2 + c^2 - bc$
C. $a^2 = b^2 + c^2 + \frac{\sqrt{3}}{2}bc$
D. $a^2 = b^2 + c^2 + bc$
E. $a^2 = b^2 + c^2 + \sqrt{3}bc$

[1995-CE-MATHS 2-19]

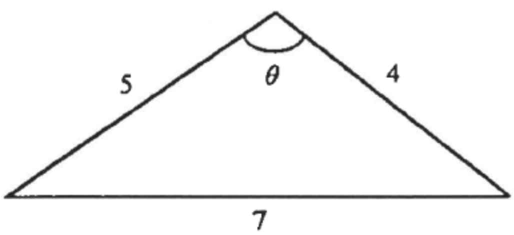
18. In the figure, find x correct to 3 significant figures.



A. 2.71
B. 2.98
C. 3.31
D. 3.88
E. 4.14

[1996-CE-MATHS 2-24]

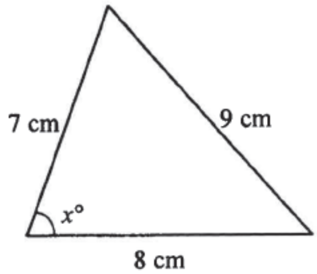
19. In the figure, find θ correct to the nearest degree.



A. 78°
B. 91°
C. 102°
D. 114°
E. 125°

[1997-CE-MATHS 2-13]

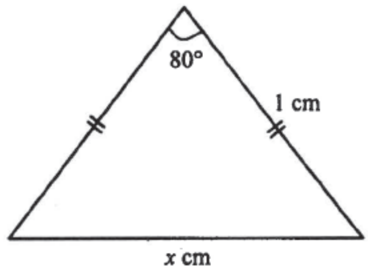
20. In the figure, find x correct to 3 significant figures.



A. 48.2
B. 55.1
C. 58.4
D. 67.5
E. 73.4

[1998-CE-MATHS 2-25]

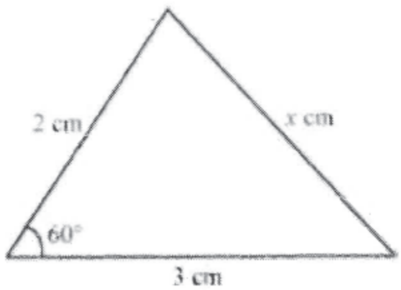
21. In the figure, find x correct to 3 significant figures.



A. 1.28
B. 1.29
C. 1.35
D. 1.53
E. 1.65

[1999-CE-MATHS 2-17]

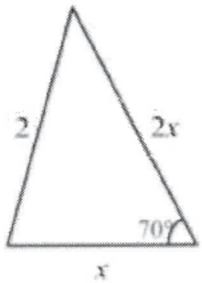
22. In the figure, find x correct to 3 significant figures.



A. 2.65
B. 2.79
C. 3.16
D. 4.00
E. 4.36

[2001-CE-MATHS 2-7]

23. In the figure, find x correct to 3 significant figures.

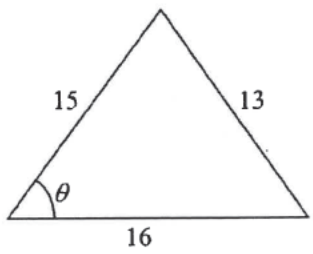


A. 0.963
B. 1.05
C. 1.10
D. 1.57

[2002-CE-MATHS 2-23]

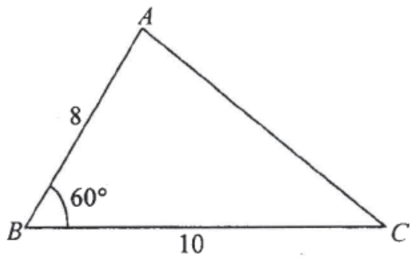
24. In the figure, $\cos\theta =$

A. $\frac{15}{16}$.
B. $\frac{13}{20}$.
C. $\frac{25}{52}$.
D. $\frac{23}{65}$.



[2003-CE-MATHS 2-24]

25. In the figure, find AC correct to 2 decimal places.

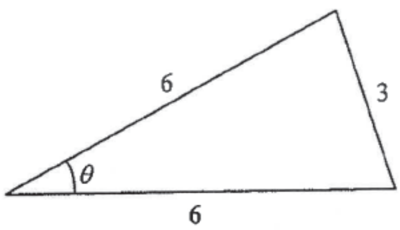


A. 5.04
B. 9.17
C. 11.14
D. 15.62

[2004-CE-MATHS 2-21]

26. In the figure, $\cos\theta =$

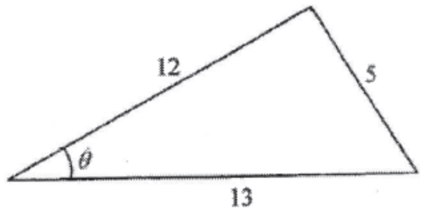
A. $\frac{1}{8}$.
B. $\frac{1}{4}$.
C. $\frac{7}{8}$.
D. $\frac{7}{4}$.



[2005-CE-MATHS 2-22]

27. In the figure, $\tan\theta =$

A. $\frac{5}{12}$.
B. $\frac{5}{13}$.
C. $\frac{12}{13}$.
D. $\frac{13}{12}$.



[2008-CE-MATHS 2-24]

Solving Triangles

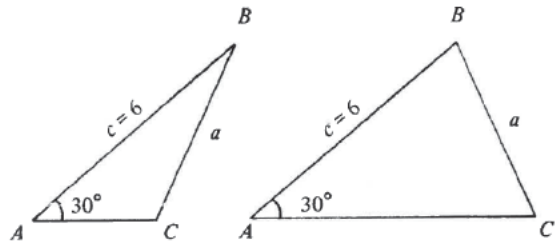
28. In ΔABC, $BC = a$, $AC = b$, $AB = c$ and $a > b > c$. Which of the following must be true?

(1) $\angle A > \angle B > \angle C$
(2) $b + c > a$
(3) $\angle B + \angle C > \angle A$

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1984-CE-MATHS 2-52]

29. In ΔABC, $\angle A = 30°$, $c = 6$. If it is possible to draw two distinct triangles as shown in the figure, find the range of values of a.



A. $0 < a < 3$
B. $0 < a < 6$
C. $3 < a < 6$
D. $a > 3$
E. $a > 6$

[1992-CE-MATHS 2-49]

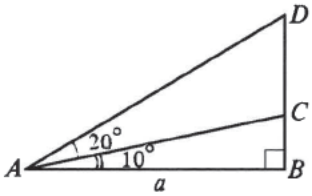
30. How many different triangles can be constructed so that the lengths of the three sides are x cm, $2x$ cm and 12 cm, where x is an integer?

A. 5
B. 7
C. 9
D. 11

[2002-CE-MATHS 2-42]

Area of Plane Figures

31. In the figure, $AB = a$. The area of ΔADC is



A. $\frac{1}{2}a^2 \sin 20°$.

B. $\frac{1}{2}a^2 \tan 20°$.

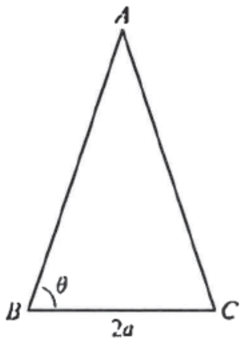
C. $\frac{1}{2}a^2 \tan 30°$.

D. $\frac{1}{2}a^2 (\sin 30° - \sin 10°)$.

E. $\frac{1}{2}a^2 (\tan 30° - \tan 10°)$.

[SP-CE-MATHS 2-32]

32. In ΔABC, $AB = AC$ and $BC = 2a$. What is the area of ΔABC?



A. $\frac{1}{2}a^2 \tan\theta$

B. $a^2 \tan\theta$

C. $2a^2 \tan\theta$

D. $\frac{a^2}{\tan\theta}$

E. $a^2 \sin\theta \cos\theta$

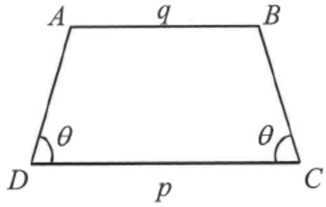
[1978-CE-MATHS 2-20]

33. A side of a rhombus is 10 cm and one of its angle is 150°. What is its area?

A. 25 cm^2
B. 50 cm^2
C. 100 cm^2
D. 150 cm^2
E. 200 cm^2

[1979-CE-MATHS 2-15]

34. In the figure, $ABCD$ is a trapezium in which $AB // DC$ and $\angle C = \angle D = \theta$. If $CD = p$ and $AB = q$, then the area of the trapezium is



A. $\frac{1}{2}(p+q)^2 \tan\theta$.

B. $\frac{1}{4}(p^2+q^2) \tan\theta$.

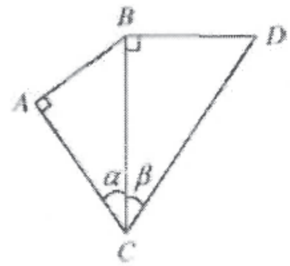
C. $\frac{1}{2}(p^2-q^2) \tan\theta$.

D. $\frac{1}{4}(p^2-q^2) \tan\theta$.

E. $\frac{(p^2-q^2)}{4\tan\theta}$.

[1983-CE-MATHS 2-44]

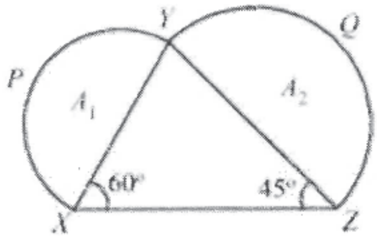
35. In the figure, $\angle CAB = \angle CBD = 90°$. $BC = 2$. The area of quadrilateral $ABCD$ =



A. $2\sin(\alpha+\beta)$.
B. $2(\tan\alpha + \tan\beta)$.
C. $2(\sin\alpha\cos\alpha + \sin\beta\cos\beta)$.
D. $2(\tan\alpha + \sin\beta\cos\beta)$.
E. $2(\sin\alpha\cos\alpha + \tan\beta)$.

[1985-CE-MATHS 2-49]

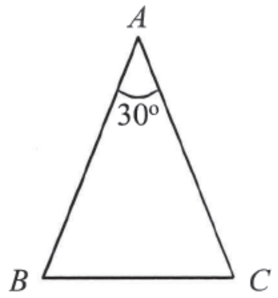
36. In the figure, XPY and YQZ are semi-circles with areas A_1 and A_2 respectively. $\angle YXZ$ = 60° and $\angle YZX = 45°$. The ratio $A_1 : A_2$ =



A. $\sqrt{2} : \sqrt{3}$.
B. $\sqrt{2} : 3$.
C. $2 : 3$.
D. $2 : \sqrt{3}$.
E. $\sqrt{3} : \sqrt{2}$.

[1991-CE-MATHS 2-19]

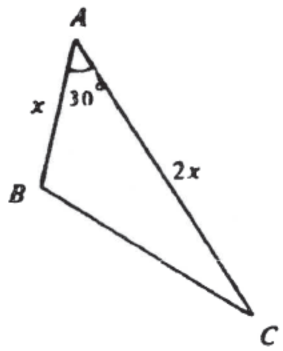
37. In the figure, $AB = AC$. If the area of ΔABC is 64 cm^2, then $AB =$



A. 32 cm .
B. $16\sqrt{2}$ cm .
C. 16 cm .
D. $8\sqrt{2}$ cm .
E. 4 cm .

[1983-CE-MATHS 2-21]

38. In the figure, $AB = x$ and $AC = 2x$. The area of ΔABC is 16. x (correct to 2 decimal places) is



A. 2.83 .
B. 4.00 .
C. 4.30 .
D. 5.66 .
E. 6.08 .

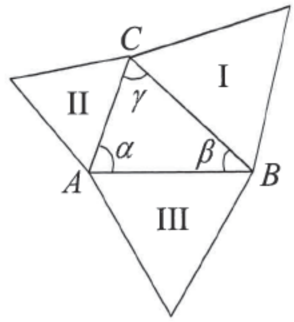
[1984-CE-MATHS 2-21]

39. In ΔABC, $\angle A = 30°$, $AB = 6$ cm. If the area of ΔABC is 15 cm^2, $AC =$

A. 2.5 cm
B. 5 cm
C. 10 cm
D. 12 cm
E. 15 cm

[1985-CE-MATHS 2-20]

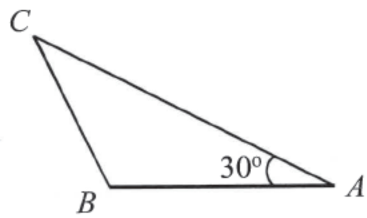
40. In the figure, I, II and III are equilateral triangles. Area of I : Area of II : Area of III =



A. $\alpha : \beta : \gamma$.
B. $\sin\alpha : \sin\beta : \sin\gamma$.
C. $\sin^2\alpha : \sin^2\beta : \sin^2\gamma$.
D. $\cos\alpha : \cos\beta : \cos\gamma$.
E. $\cos^2\alpha : \cos^2\beta : \cos^2\gamma$.

[1987-CE-MATHS 2-25]

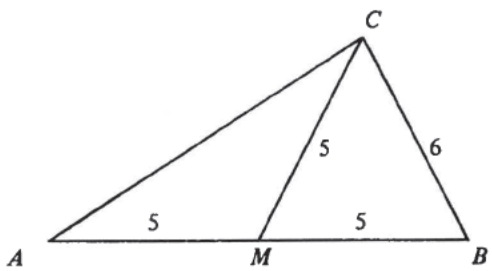
41. In the figure, the area of ΔABC is 15 cm^2 and $\angle A = 30°$. AC is longer than AB by 4 cm. $AC =$



A. 6 cm .
B. 8.8 cm .
C. 10 cm .
D. 11.5 cm .
E. 14 cm .

[1988-CE-MATHS 2-19]

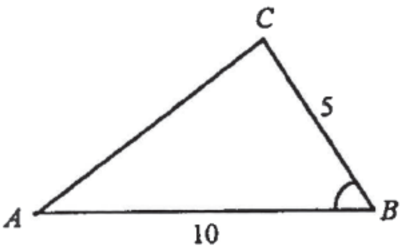
42. In the figure, $AM = MB = MC = 5$ and $BC = 6$. The area of triangle $ABC =$



A. 12 .
B. 16 .
C. 24 .
D. 30 .
E. 48 .

[1990-CE-MATHS 2-39]

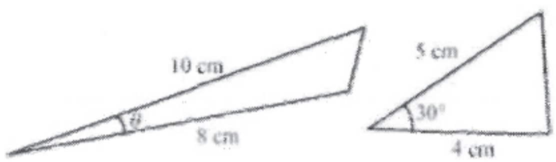
43. In the figure, the area of ΔABC is 18. Find $\angle ABC$ correct to the nearest degree.



A. 30°
B. 44°
C. 46°
D. 60°
E. 69°

[1997-CE-MATHS 2-15]

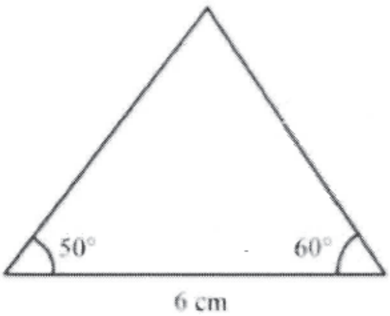
44. In the figure, the areas of the two triangles are equal. Find θ.



A. 7.2° (correct to the nearest 0.1°)
B. 7.5° (correct to the nearest 0.1°)
C. 14.5° (correct to the nearest 0.1°)
D. 15°
E. 30°

[2000-CE-MATHS 2-13]

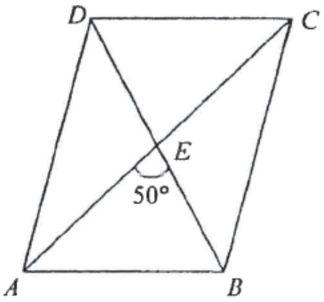
45. In the figure, find the area of the triangle correct to the nearest 0.1 cm^2.



A. 7.3 cm^2
B. 10.7 cm^2
C. 12.7 cm^2
D. 15.0 cm^2
E. 19.1 cm^2

[2000-CE-MATHS 2-26]

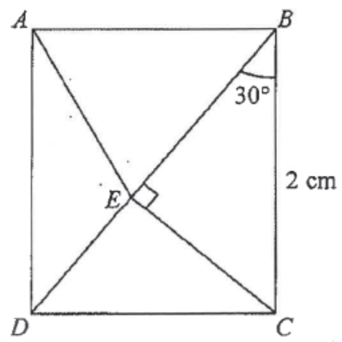
46. The figure shows a parallelogram $ABCD$ with its diagonals meeting at E. If $AE = 3$ cm and $BE = 2$ cm, find the area of the parallelogram correct to the nearest 0.1 cm^2.



A. 2.3 cm^2
B. 7.7 cm^2
C. 9.2 cm^2
D. 18.3 cm^2

[2002-CE-MATHS 2-18]

47. In the figure, $ABCD$ is a rectangle. If BED is a straight line, then the area of ΔABE is



A. $\frac{\sqrt{3}}{6}$ cm^2.

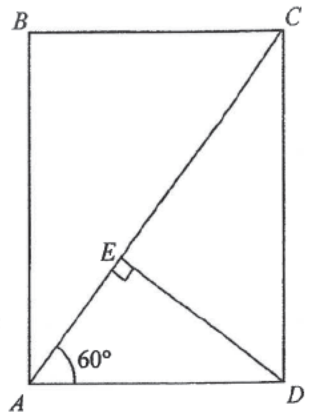
B. $\frac{\sqrt{3}}{2}$ cm^2.

C. $\frac{2\sqrt{3}}{3}$ cm^2.

D. $\sqrt{3}$ cm^2.

[2005-CE-MATHS 2-23]

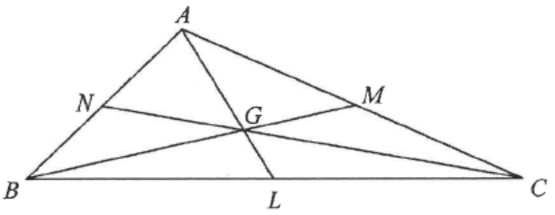
48. In the figure, $ABCD$ is a rectangle. It is given that E is the foot of the perpendicular from D to AC. If the area of ΔADE is 1 cm^2, then the area of ΔABC is



A. 3 cm^2 .
B. 4 cm^2 .
C. 5 cm^2 .
D. $2\sqrt{3}\text{ cm}^2$.

[2009-CE-MATHS 2-22]

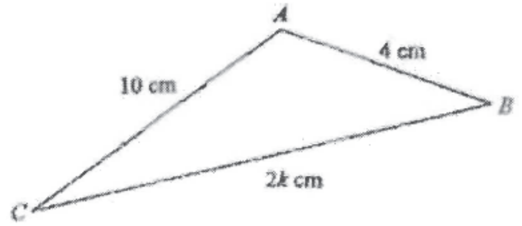
49. In the figure, G is the centroid of ΔABC. AG, BG and CG are produced to meet BC, AC and AB at L, M and N respectively. If BL = 13 cm, BN = 5 cm and CM = 12 cm, find the area of ΔABC.



A. 60 cm^2
B. 120 cm^2
C. 180 cm^2
D. 240 cm^2

[2009-CE-MATHS 2-51]

50. In the figure, the area of ΔABC =

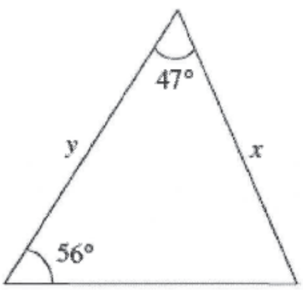


A. $\sqrt{(k^2-9)(49-k^2)}\text{ cm}^2$.
B. $\sqrt{(k^2-9)(49+k^2)}\text{ cm}^2$.
C. $\sqrt{(k^2+9)(49-k^2)}\text{ cm}^2$.
D. $\sqrt{(k^2+9)(49+k^2)}\text{ cm}^2$.

[2011-CE-MATHS 2-47]

HKDSE Problems

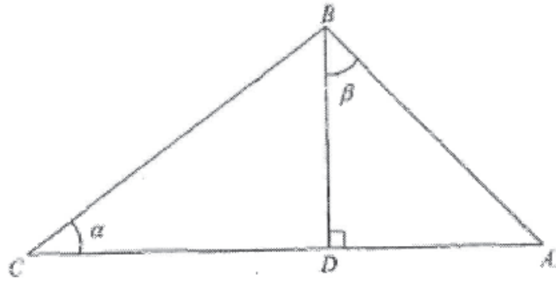
51. In the figure, y =



A. $\frac{x\sin 77°}{\sin 56°}$.
B. $\frac{x\sin 47°}{\sin 56°}$.
C. $\frac{x\sin 56°}{\sin 77°}$.
D. $\frac{x\sin 77°}{\sin 47°}$.

[SP-DSE-MATHS 2-38]

52. In the figure, D is a point lying on AC such that BD is perpendicular to AC. If $BC = \ell$, then AB =



A. $\frac{\ell\sin\alpha}{\cos\beta}$.
B. $\frac{\ell\sin\beta}{\cos\alpha}$.
C. $\frac{\ell\cos\alpha}{\sin\beta}$.
D. $\frac{\ell\cos\beta}{\sin\alpha}$.

[2012-DSE-MATHS 2-18]

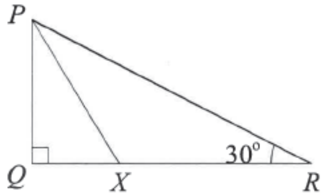
53. In ΔABC, $AB : BC : AC = 8 : 15 : 17$. Find $\cos A : \cos C$.

A. 8 : 15
B. 8 : 17
C. 15 : 8
D. 15 : 17

[2013-DSE-MATHS 2-22]

Simple Problems with Right Angles

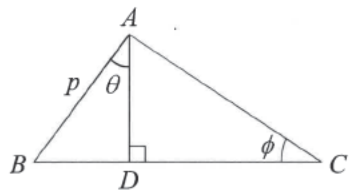
1. In the figure, ΔPQR is a right-angled triangle, and PX bisects $\angle QPR$. $QX : XR =$



A. $1 : \sqrt{3}$.
B. $1 : 1$.
C. $1 : 2$.
D. $\sqrt{3} : 2$.
E. $1 : 3$.

[1977-CE-MATHS 2-20]

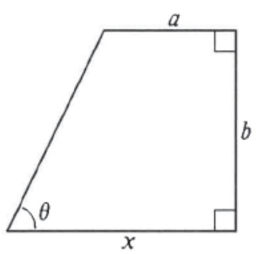
2. In ΔABC, $AD \perp BC$ and $AB = p$. Find AC in terms of p, θ and ϕ.



A. $\dfrac{p\cos\theta}{\sin\phi}$
B. $\dfrac{p\cos\theta}{\cos\phi}$
C. $p\cos\theta\tan\phi$
D. $p\sin\theta\tan\phi$
E. $p\cos\theta\cos\phi$

[1977-CE-MATHS 2-23]

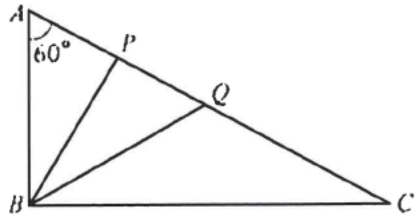
3. In the figure, $x =$



A. $a + b\sin\theta$.
B. $a + b\cos\theta$.
C. $a + b\tan\theta$.
D. $a + \dfrac{b}{\cos\theta}$.
E. $a + \dfrac{b}{\tan\theta}$.

[SP-CE-MATHS 2-25]

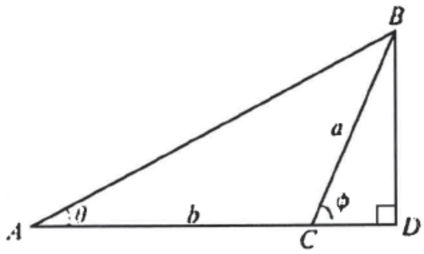
4. In ΔABC, $\angle ABC = 90°$ and $\angle A = 60°$. If BP and BQ divide $\angle ABC$ into 3 equal parts, then $AP : PQ : QC =$



A. $1 : 1 : \sqrt{3}$.
B. $1 : 1 : 2$.
C. $1 : \sqrt{3} : \sqrt{3}$.
D. $1 : \sqrt{3} : 2$.
E. $1 : 2 : 2$.

[1978-CE-MATHS 2-27]

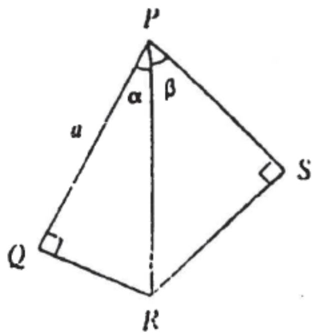
5. C is a point on the side AD of ΔABD which is right-angled at D. If $BC = a$ and $AC = b$, then $\tan\theta =$



A. $\dfrac{a}{b}$.
B. $\dfrac{a\tan\phi}{b}$.
C. $\dfrac{a\sin\phi}{b + a\cos\phi}$.
D. $\dfrac{a\sin\phi}{b - a\cos\phi}$.
E. $\dfrac{a\sin\phi}{a\cos\phi - b}$.

[1978-CE-MATHS 2-35]

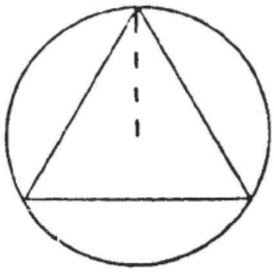
6. In quadrilateral $PQRS$, $\angle Q = \angle S = 90°$ and $PQ = a$. Then $RS =$



A. $\dfrac{a\sin\beta}{\cos\alpha}$.
B. $\dfrac{a\cos\alpha}{\sin\beta}$.
C. $\dfrac{a\cos\beta}{\sin\alpha}$.
D. $\dfrac{a\sin\beta}{\sin\alpha}$.
E. $\dfrac{a\tan\beta}{\cos\alpha}$.

[1979-CE-MATHS 2-29]

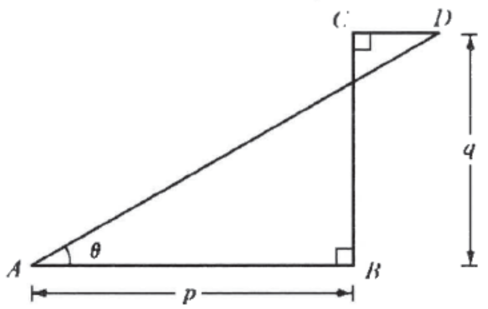
7. The radius of the circumcircle of an equilateral triangle is r cm. What is the length of a side of the triangle?



A. $r(1+\sin 30°)$ cm
B. $r\sin 30°$ cm
C. $r\cos 30°$ cm
D. $2r\sin 30°$ cm
E. $2r\cos 30°$ cm

[1979-CE-MATHS 2-41]

8. In the figure, $\angle B = \angle C = 90°$. If $AB = p$ and $BC = q$, then $CD =$

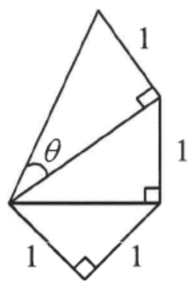


A. $p + q\tan\theta$.
B. $p + \frac{q}{\tan\theta}$.
C. $p + q\cos\theta$.
D. $-p + q\tan\theta$.
E. $-p + \frac{q}{\tan\theta}$.

[1980-CE-MATHS 2-43]

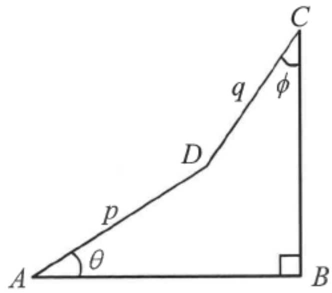
9. In the figure, $\cos\theta =$

A. $\frac{1}{2}$.
B. $\frac{2}{3}$.
C. $\frac{3}{4}$.
D. $\frac{\sqrt{3}}{2}$.
E. $\frac{\sqrt{3}}{4}$.



[1981-CE-MATHS 2-22]

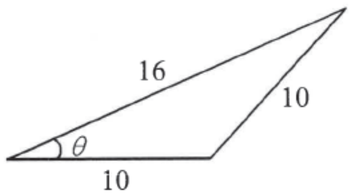
10. In the figure, $AD = p$, $DC = q$, $\angle B = 90°$. $AB =$



A. $p\sin\theta + q\sin\phi$.
B. $p\cos\theta + q\cos\phi$.
C. $p\sin\theta + q\cos\phi$.
D. $p\cos\theta + q\sin\phi$.
E. $(p+q)(\cos\theta + \cos\phi)$.

[1981-CE-MATHS 2-23]

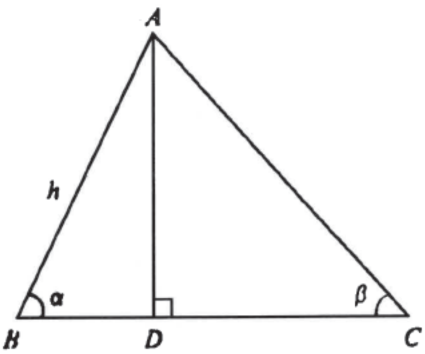
11. In the figure, $\sin\theta =$



A. 0.5.
B. 0.6.
C. 0.625.
D. 0.75.
E. 0.8.

[1981-CE-MATHS 2-48]

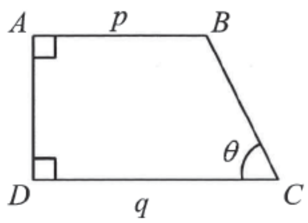
12. In the figure, $AD \perp BC$. $CD =$



A. $h\sin\alpha\tan\beta$.
B. $h\cos\alpha\tan\beta$.
C. $h\tan\alpha\sin\beta$.
D. $\frac{h\cos\alpha}{\tan\beta}$.
E. $\frac{h\sin\alpha}{\tan\beta}$.

[1981-CE-MATHS 2-49]

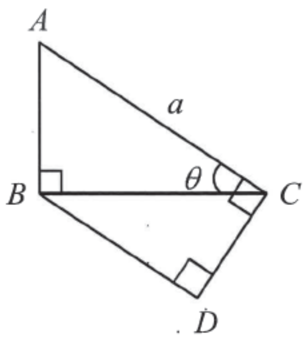
13. In the figure, $AB = p$, $DC = q$ and $\angle A = \angle D = 90°$. $BC =$



A. $(q-p)\sin\theta$.
B. $(q-p)\cos\theta$.
C. $(q-p)\tan\theta$.
D. $\dfrac{q-p}{\sin\theta}$.
E. $\dfrac{q-p}{\cos\theta}$.

[1983-CE-MATHS 2-18]

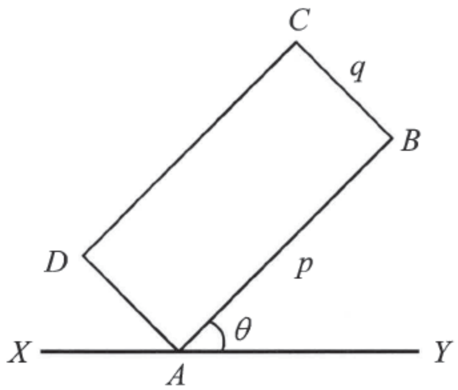
14. In the figure, $\angle ABC = \angle ACD = \angle BDC = 90°$. $AC = a$, $CD =$



A. $a\sin^2\theta$.
B. $a\cos^2\theta$.
C. $a\tan\theta$.
D. $a\sin\theta\cos\theta$.
E. $\dfrac{a\cos\theta}{\sin\theta}$.

[1983-CE-MATHS 2-19]

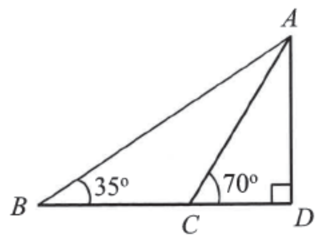
15. In the figure, $ABCD$ is a rectangle. $AB = p$ and $BC = q$. If $\angle BAY = \theta$, the distance of C from the line XAY is



A. $(p+q)\sin\theta$.
B. $(p+q)\cos\theta$.
C. $\sqrt{p^2+q^2}\sin\theta$.
D. $p\cos\theta + q\sin\theta$.
E. $p\sin\theta + q\cos\theta$.

[1983-CE-MATHS 2-47]

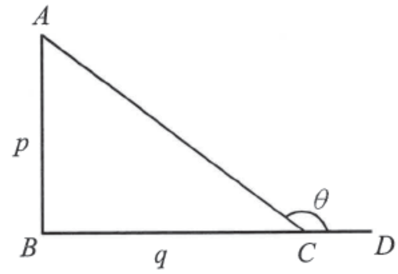
16. In the figure, BCD is a straight line. $\angle ADC = 90°$ and $BC = 10$. $AD =$



A. $10\cos 70°$.
B. $10\sin 70°$.
C. $10\tan 70°$.
D. $\dfrac{10\sin 20°}{\sin 55°}$.
E. $\dfrac{10\tan 20°}{\sin 55°}$.

[1984-CE-MATHS 2-18]

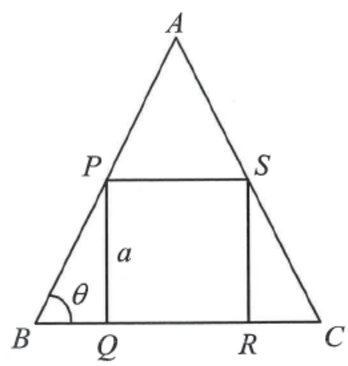
17. In the figure, $\angle B = 90°$ and BCD is a straight line. If $AB = p$ and $BC = q$, then $\cos\theta =$



A. $\dfrac{p}{q}$.
B. $\dfrac{p}{\sqrt{p^2+q^2}}$.
C. $\dfrac{q}{\sqrt{p^2+q^2}}$.
D. $\dfrac{-p}{\sqrt{p^2+q^2}}$.
E. $\dfrac{-q}{\sqrt{p^2+q^2}}$.

[1984-CE-MATHS 2-46]

18. In the figure, $PQRS$ is a square inscribed in ΔABC. $AB = AC$ and $PQ = a$. $AB =$



A. $a(\sin\theta + \frac{1}{2}\cos\theta)$.

B. $a(\cos\theta + \frac{1}{2}\sin\theta)$.

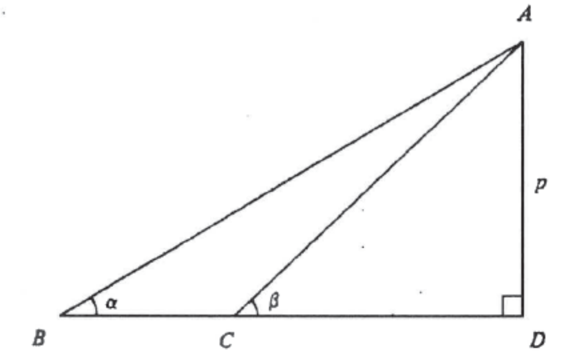
C. $a(\frac{1}{\sin\theta} + \frac{1}{2\cos\theta})$.

D. $a(\frac{1}{\cos\theta} + \frac{1}{2\sin\theta})$.

E. $\frac{2a}{\sin\theta}$.

[1984-CE-MATHS 2-48]

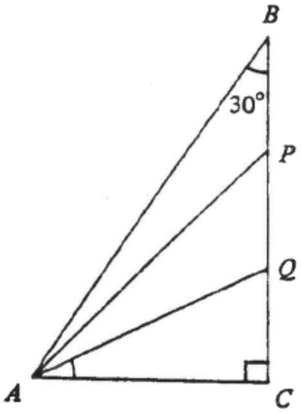
19. In the figure, BCD is a straight line. $AD \perp BD$. If $AD = p$, then $BC =$



A. $p\tan(\beta - \alpha)$.
B. $p(\tan\alpha - \tan\beta)$.
C. $p(\tan\beta - \tan\alpha)$.
D. $p(\frac{1}{\tan\alpha} - \frac{1}{\tan\beta})$.
E. $p(\frac{1}{\tan\beta} - \frac{1}{\tan\alpha})$.

[1985-CE-MATHS 2-47]

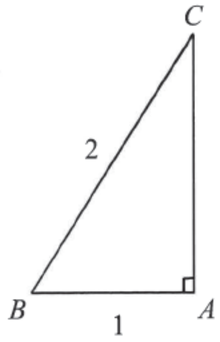
20. In the figure, $\angle C = 90°$. P and Q are points on BC such that $BP = PQ = QC$. $\angle CAQ =$



A. 30°.
B. 25°.
C. 22°.
D. 20°.
E. 15°.

[1985-CE-MATHS 2-50]

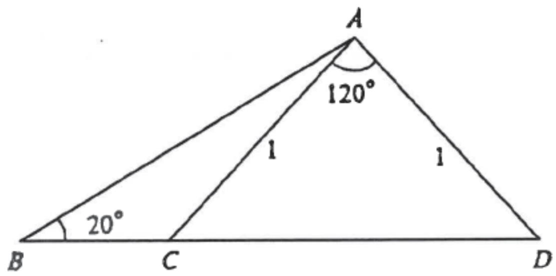
21. In the figure, $\angle A : \angle B : \angle C =$



A. $2 : \sqrt{3} : 1$.
B. $4 : 3 : 1$.
C. $3 : 2 : 1$.
D. $\sqrt{3} : \sqrt{2} : 1$.
E. $1 : 2 : \sqrt{3}$.

[1986-CE-MATHS 2-17]

22. In the figure, $AC = AD = 1$, $\angle ABD = 20°$ and $\angle CAD = 120°$, find AB.



A. $2\cos 20°$.

B. $\frac{1}{2\sin 20°}$.

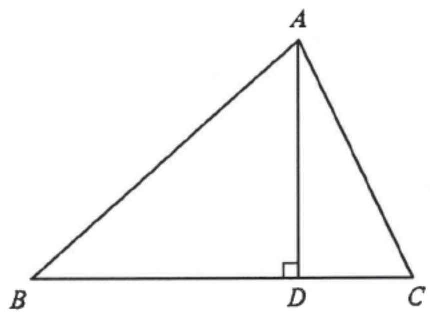
C. $\frac{\sqrt{3}}{2\sin 20°}$.

D. $\sqrt{3}\cos 20°$.

E. $2\sin 20°$.

[1986-CE-MATHS 2-19]

23. In the figure, $BD : DC =$



A. $\sin C : \sin B$.
B. $\cos C : \cos B$.
C. $\tan C : \tan B$.
D. $\sin B : \sin C$.
E. $\cos B : \cos C$.

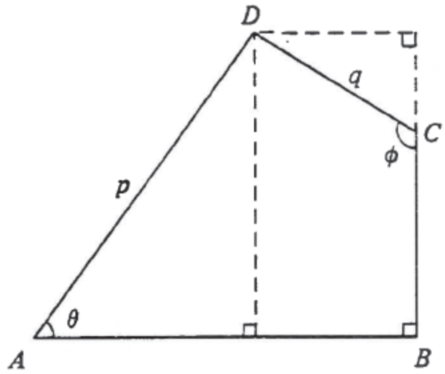
[1986-CE-MATHS 2-46]

24. A rectangle is 6 cm long and 8 cm wide. The acute angle between its diagonals, correct to the nearest degree, is

A. $37°$.
B. $41°$.
C. $49°$.
D. $74°$.
E. $83°$.

[1987-CE-MATHS 2-19]

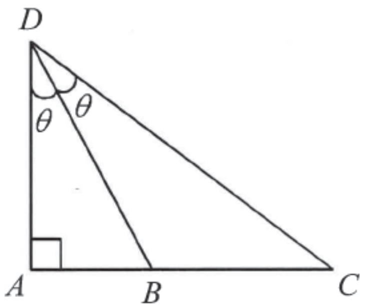
25. In the figure, $AD = p$, $CD = q$ and $\angle B = 90°$. $BC =$



A. $p \sin\theta - q \sin\phi$.
B. $p \sin\theta - q \cos\phi$.
C. $p \cos\theta - q \sin\phi$.
D. $p \sin\theta + q \cos\phi$.
E. $p \cos\theta + q \sin\phi$.

[1987-CE-MATHS 2-46]

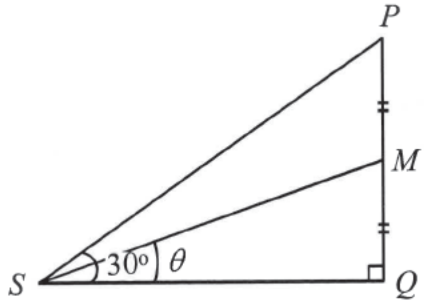
26. In the figure, $\frac{AC}{AB} =$



A. 2
B. $\tan\theta$
C. $\frac{\tan 2\theta}{\tan\theta}$
D. $\frac{\sin 2\theta}{\sin\theta}$
E. $\frac{\cos 2\theta}{\cos\theta}$

[1988-CE-MATHS 2-17]

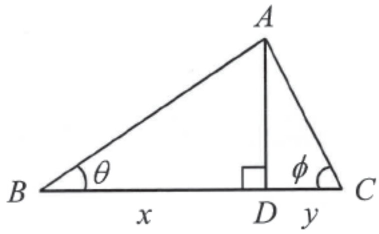
27. In the figure, M is the mid-point of PQ and $\angle PSQ = 30°$. Find $\tan\theta$.



A. 0.268
B. $\frac{\sqrt{3}}{6}$
C. $\frac{\sqrt{3}}{2}$
D. $\frac{\sqrt{3}}{4}$
E. $\frac{\sqrt{3}}{8}$

[1988-CE-MATHS 2-20]

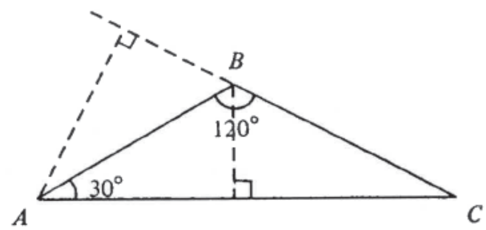
28. In the figure, $AD \perp BC$. Find $\frac{x}{y}$.



A. $\frac{\sin\phi}{\sin\theta}$
B. $\frac{\cos\phi}{\cos\theta}$
C. $\frac{\tan\phi}{\tan\theta}$
D. $\frac{\cos\theta}{\cos\phi}$
E. $\frac{\tan\theta}{\tan\phi}$

[1989-CE-MATHS 2-19]

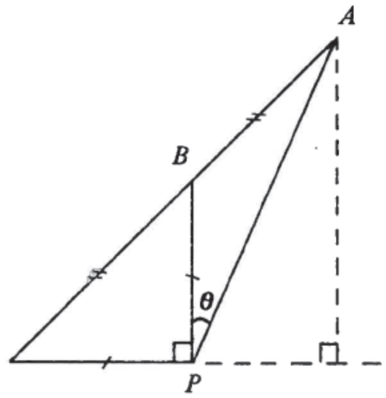
29. In the figure, $\angle A = 30°$ and $\angle B = 120°$. The ratio of the altitudes of the triangle ABC from A and from B is



A. $2:1$.
B. $\sqrt{3}:1$.
C. $\sqrt{2}:1$.
D. $1:\sqrt{2}$.
E. $1:\sqrt{3}$.

[1991-CE-MATHS 2-20]

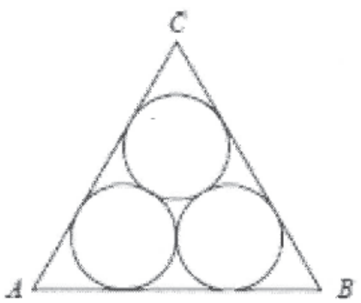
30. In the figure, $AB = BC$, $BP = CP$ and $BP \perp CP$. Find $\tan\theta$.



A. $\frac{1}{4}$
B. $\frac{1}{3}$
C. $\frac{1}{2}$
D. $\frac{1}{\sqrt{3}}$
E. $\frac{\sqrt{3}}{2}$

[1993-CE-MATHS 2-23]

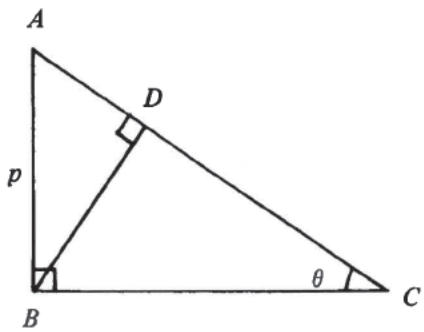
31. In the figure, ABC is an equilateral triangle and the radii of the three circles are each equal to 1. Find the perimeter of the triangle.



A. 12
B. $3(1 + \tan 30°)$
C. $6(1 + \tan 30°)$
D. $3(1 + \frac{1}{\tan 30°})$
E. $6(1 + \frac{1}{\tan 30°})$

[1993-CE-MATHS 2-47]

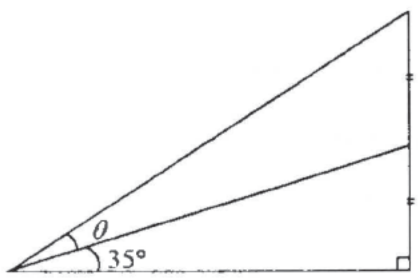
32. In the figure, $AB = p$, $\angle ACB = \theta$. Find CD.



A. $p \sin\theta$
B. $p \cos\theta$
C. $\frac{p \sin\theta}{\cos^2\theta}$
D. $\frac{p \sin^2\theta}{\cos\theta}$
E. $\frac{p \cos^2\theta}{\sin\theta}$

[1994-CE-MATHS 2-50]

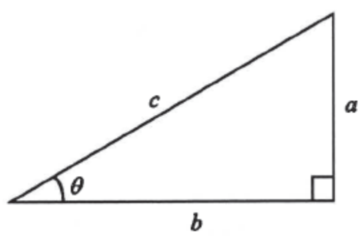
33. In the figure, find θ correct to the nearest degree.



A. 16°
B. 19°
C. 26°
D. 35°
E. 36°

[1996-CE-MATHS 2-47]

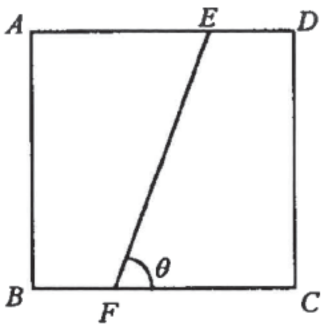
34. In the figure, $\sin\theta + \tan\theta =$



A. $\frac{a}{c} + \frac{a}{b}$.
B. $\frac{a}{c} + \frac{b}{a}$.
C. $\frac{b}{c} + \frac{a}{b}$.
D. $\frac{b}{c} + \frac{b}{a}$.
E. $\frac{c}{a} + \frac{a}{b}$.

[1997-CE-MATHS 2-12]

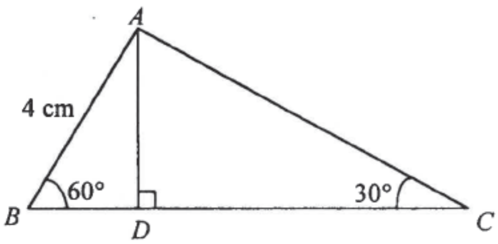
35. In the figure, the square sandwich $ABCD$ is cut into two equal halves along EF so that $AE : ED = 2 : 1$. Find θ correct to the nearest degree.



A. 56°
B. 63°
C. 64°
D. 71°
E. 72°

[1997-CE-MATHS 2-14]

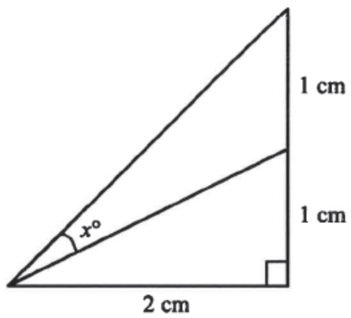
36. In the figure, find CD.



A. 6 cm
B. 4 cm
C. $4\sqrt{3}$ cm
D. $2\sqrt{3}$ cm
E. $\frac{2\sqrt{3}}{3}$ cm

[1998-CE-MATHS 2-24]

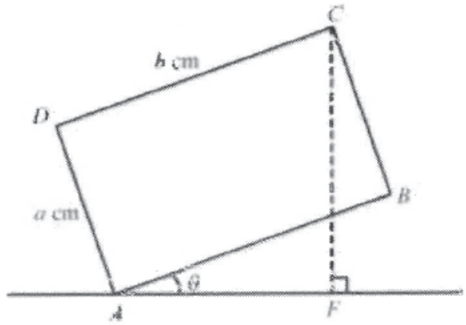
37. In the figure, find x correct to 1 decimal place.



A. 15.0
B. 18.4
C. 22.5
D. 24.1
E. 26.6

[1999-CE-MATHS 2-19]

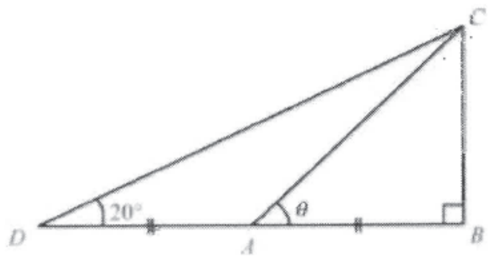
38. In the figure, $ABCD$ is a rectangle. Find CF.



A. $(a + b) \sin\theta$ cm
B. $(a + b) \cos\theta$ cm
C. $(a \sin\theta + b \cos\theta)$ cm
D. $(a \cos\theta + b \sin\theta)$ cm
E. $\sqrt{a^2 + b^2} \sin 2\theta$ cm

[2000-CE-MATHS 2-28]

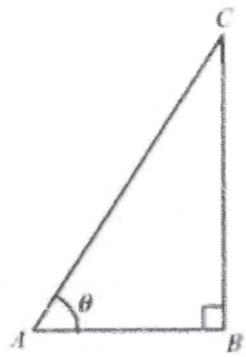
39. In the figure, DAB is a straight line. $\tan\theta =$



A. $2 \tan 20°$.
B. $\frac{1}{2} \tan 20°$.
C. $\frac{2}{\tan 20°}$.
D. $\frac{1}{2 \tan 20°}$.
E. $\tan 40°$.

[2000-CE-MATHS 2-29]

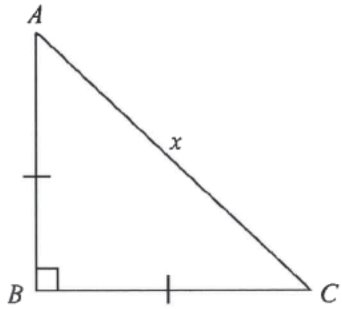
40. The figure shows a right-angled triangle where $AB : BC = 3 : 4$. Find $\sin\theta$.



A. $\frac{5}{3}$
B. $\frac{3}{4}$
C. $\frac{5}{4}$
D. $\frac{3}{5}$
E. $\frac{4}{5}$

[2001-CE-MATHS 2-4]

41. In the figure, $AB =$



A. $\frac{x}{2}$.

B. $\frac{\sqrt{2}}{2}x$.

C. $\frac{\sqrt{3}}{2}x$.

D. $\sqrt{2}x$.

[2003-CE-MATHS 2-26]

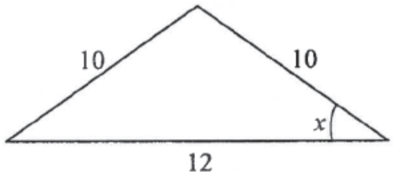
42. In the figure, $\sin x =$

A. $\frac{4}{3}$.

B. $\frac{3}{4}$.

C. $\frac{3}{5}$.

D. $\frac{4}{5}$.



[2004-CE-MATHS 2-22]

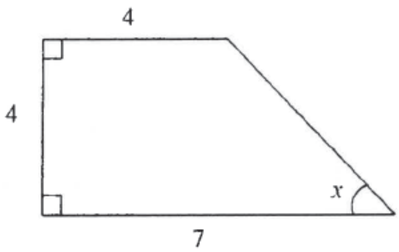
43. In the figure, $\sin x =$

A. $\frac{3}{7}$.

B. $\frac{3}{5}$.

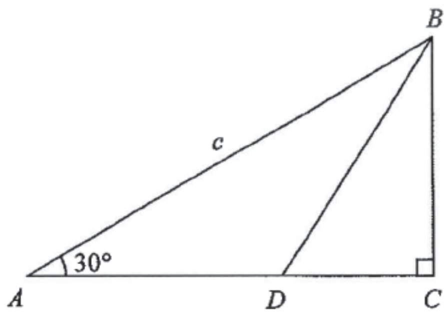
C. $\frac{4}{5}$.

D. $\frac{4}{3}$.



[2006-CE-MATHS 2-23]

44. In the figure, ABC is a right-angled triangle. BD is the angle bisector of $\angle ABC$. If $AB = c$, then $CD =$



A. $\frac{c}{\sqrt{3}}$.

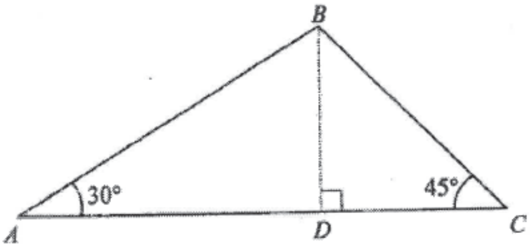
B. $\frac{c}{2\sqrt{3}}$.

C. $\frac{\sqrt{3}c}{2}$.

D. $\frac{\sqrt{3}c}{4}$.

[2007-CE-MATHS 2-23]

45. In the figure, D is a point lying on AC such that BD is perpendicular to AC. Find $AD : DC$.



A. $1 : \sqrt{2}$

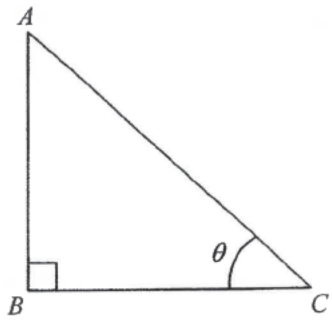
B. $\sqrt{2} : 1$

C. $\sqrt{3} : 1$

D. $\sqrt{3} : \sqrt{2}$

[2008-CE-MATHS 2-22]

46. In the figure, $2AB = 3BC$. Find θ correct to the nearest degree.



A. 34°

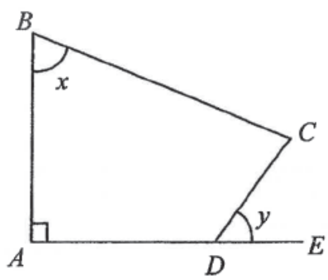
B. 42°

C. 48°

D. 56°

[2009-CE-MATHS 2-21]

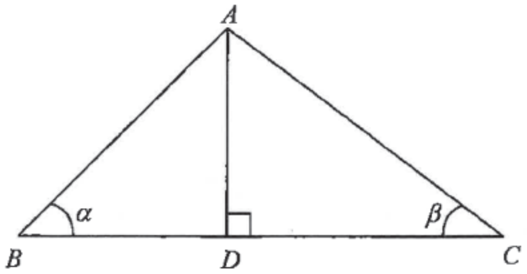
47. In the figure, ADE is a straight line. If $\angle ABC = x$ and $\angle CDE = y$, then $AD =$



A. $BC \sin x - CD \sin y$.
B. $BC \sin x - CD \cos y$.
C. $BC \cos x - CD \sin y$.
D. $BC \cos x - CD \cos y$.

[2009-CE-MATHS 2-23]

48. In the figure, D is a point lying on BC such that AD is perpendicular to BC. Find $\frac{AC}{BD}$.

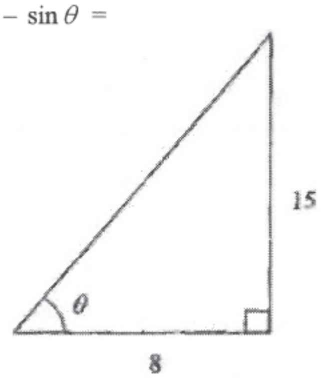


A. $\frac{\tan\beta}{\tan\alpha}$.
B. $\frac{\tan\alpha}{\sin\beta}$.
C. $\tan\alpha \tan\beta$.
D. $\tan\alpha \sin\beta$.

[2010-CE-MATHS 2-21]

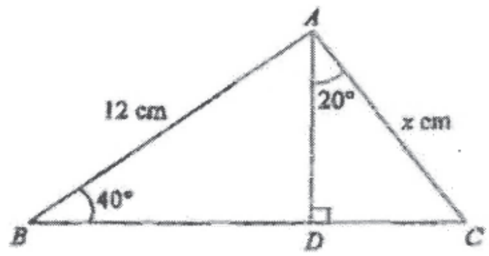
49. In the figure, $\cos\theta - \sin\theta =$

A. $\frac{3}{5}$.
B. $\frac{-3}{5}$.
C. $\frac{7}{17}$.
D. $\frac{-7}{17}$.



[2011-CE-MATHS 2-21]

50. In the figure, D is a point lying on BC such that AD is perpendicular to BC. Find x correct to 2 decimal places.

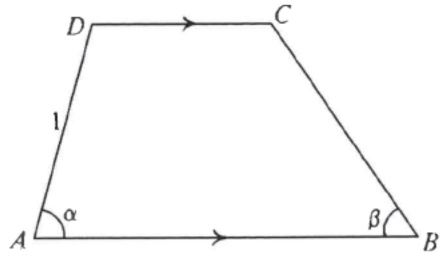


A. 6.86
B. 7.25
C. 8.21
D. 9.78

[2011-CE-MATHS 2-22]

2-Dimensional Problems

51. In trapezium $ABCD$, $AB // DC$. If $AD = 1$, then $BC =$

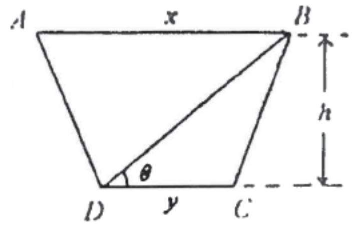


A. $\frac{\sin\alpha}{\sin\beta}$.
B. $\frac{\sin\beta}{\sin\alpha}$.
C. $\sin\alpha \sin\beta$.
D. $\frac{\cos\alpha}{\cos\beta}$.
E. $\frac{\cos\beta}{\cos\alpha}$.

[SP-CE-MATHS A2-43]

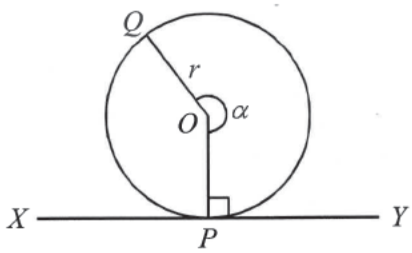
52. In the figure, $ABCD$ is an isosceles trapezium in which $AB > DC$. The height of the trapezium is h, $AB = x$ and $DC = y$. Then $\tan\theta =$

A. $\frac{h}{x+y}$.
B. $\frac{x+y}{h}$.
C. $\frac{2h}{x+y}$.
D. $\frac{x+y}{2h}$.
E. $\frac{h}{2x+2y}$.



[1979-CE-MATHS 2-42]

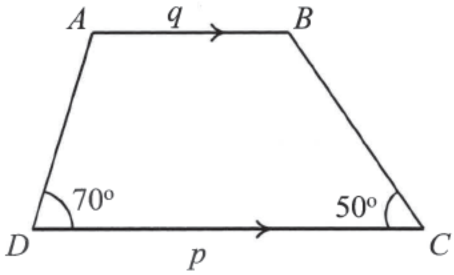
53. In the figure, O is the centre of the circle and its radius is r. XY touches the circle at P. Find the distance of Q from XY.



A. $r(1 - \sin\alpha)$
B. $r(1 + \sin\alpha)$
C. $r(1 - \cos\alpha)$
D. $r(1 + \cos\alpha)$
E. $r(2 - \sin\alpha)$

[1980-CE-MATHS 2-45]

54. In the figure, $AB \parallel DC$. $AB = q$ and $DC = p$. $BC =$



A. $\dfrac{(p+q)\sin 50^\circ}{2\sin 70^\circ}$.

B. $\dfrac{(p+q)\sin 70^\circ}{2\sin 50^\circ}$.

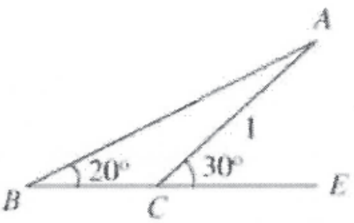
C. $\dfrac{(p-q)\sin 70^\circ}{\sin 60^\circ}$.

D. $\dfrac{(p-q)\sin 70^\circ}{\sin 50^\circ}$.

E. $\dfrac{(p-q)\sin 50^\circ}{\sin 70^\circ}$.

[1984-CE-MATHS 2-49]

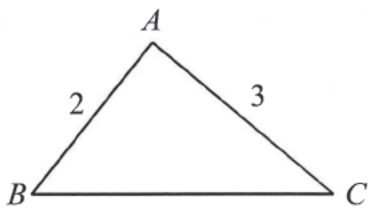
55. In the figure, BCX is a straight line. $AC = 1$, $AB =$



A. $2\sin 20^\circ$.
B. $2\cos 20^\circ$.
C. $\sqrt{2}\cos 20^\circ$.
D. $\dfrac{1}{2\sin 20^\circ}$.
E. $\dfrac{\sqrt{3}}{2\sin 20^\circ}$.

[1985-CE-MATHS 2-21]

56. In the figure, $AB = 2$, $AC = 3$ and $\sin B = \dfrac{3}{4}$, then $\cos^2 C =$



A. $\dfrac{9}{16}$.

B. $\dfrac{9}{13}$.

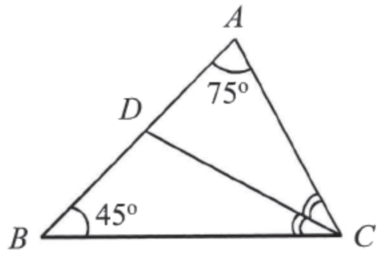
C. $\dfrac{1}{4}$.

D. $\dfrac{1}{2}$.

E. $\dfrac{3}{4}$.

[1986-CE-MATHS 2-45]

57. In the figure, $\angle A = 75^\circ$, $\angle B = 45^\circ$ and CD bisects $\angle ACB$. $\dfrac{BD}{CD} =$



A. $\dfrac{2}{3}$.

B. $\dfrac{1}{\sqrt{2}}$.

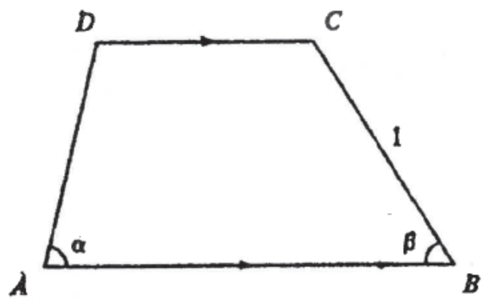
C. $\sqrt{2}$.

D. $\sqrt{\dfrac{2}{3}}$.

E. $\sqrt{\dfrac{3}{2}}$.

[1987-CE-MATHS 2-18]

58. In the figure, $ABCD$ is a trapezium with $AB \parallel DC$. If $BC = 1$, then $AD =$



A. $\dfrac{\sin\beta}{\sin\alpha}$.

B. $\dfrac{\sin\alpha}{\sin\beta}$.

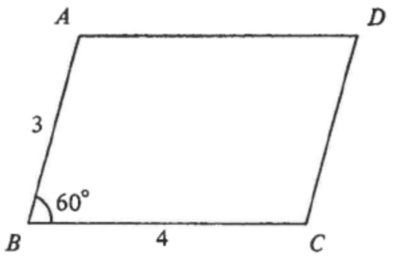
C. $\sin\alpha\sin\beta$.

D. $\dfrac{\cos\beta}{\cos\alpha}$.

E. $\dfrac{\cos\alpha}{\cos\beta}$.

[1989-CE-MATHS 2-50]

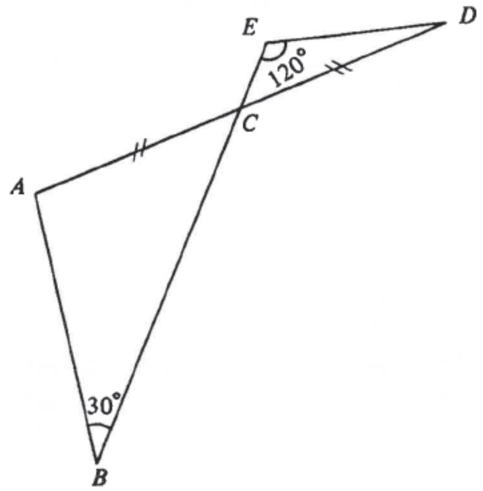
59. In the figure, $ABCD$ is a parallelogram. $BD =$



A. 5 .
B. 7 .
C. $\sqrt{13}$.
D. $\sqrt{27}$.
E. $\sqrt{37}$.

[1990-CE-MATHS 2-46]

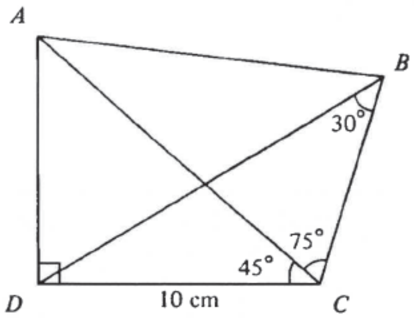
60. In the figure, $AC = CD$, $\angle ABC = 30°$ and $\angle CED = 120°$. $\frac{AB}{DE} =$



A. $\frac{1}{\sqrt{2}}$.
B. $\frac{1}{\sqrt{3}}$.
C. $\sqrt{2}$.
D. $\sqrt{3}$.
E. 2 .

[1990-CE-MATHS 2-49]

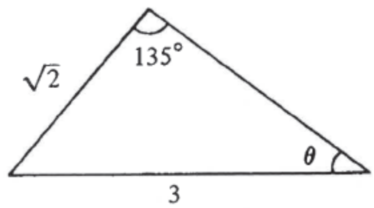
61. In the figure, find the length of AB, correct to nearest cm.



A. 14 cm
B. 15 cm
C. 16 cm
D. 17 cm
E. 18 cm

[1991-CE-MATHS 2-50]

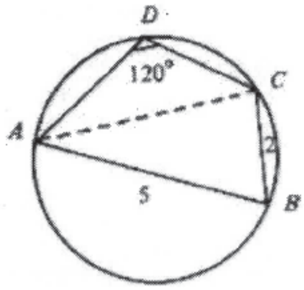
62. In the figure, find $\tan\theta$.



A. $\frac{1}{3}$
B. $\frac{1}{\sqrt{8}}$
C. $\frac{3}{8}$
D. $\sqrt{\frac{2}{7}}$
E. $\frac{1}{\sqrt{2}}$

[1992-CE-MATHS 2-46]

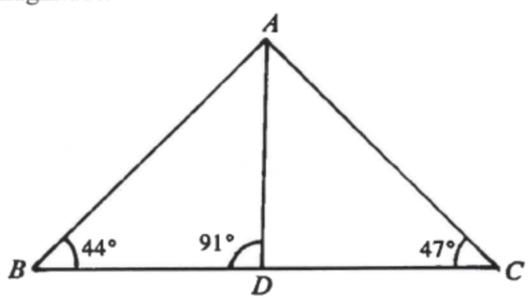
63. In the figure, $ABCD$ is a cyclic quadrilateral with $AB = 5$, $BC = 2$ and $\angle ADC = 120°$. Find AC.



A. $\sqrt{19}$
B. $\sqrt{21}$
C. $2\sqrt{6}$
D. $\sqrt{34}$
E. $\sqrt{39}$

[1994-CE-MATHS 2-19]

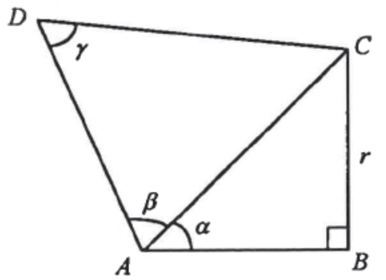
64. In the figure, BDC is a straight line. Arrange AD, BD and DC in ascending order of magnitude.



A. $AD < BD < DC$
B. $AD < DC < BD$
C. $DC < AD < BD$
D. $DC < BD < AD$
E. $BD < AD < DC$

[1995-CE-MATHS 2-21]

65. In the figure, $CD =$



A. $\frac{r\sin\beta}{\sin\alpha\sin\gamma}$.

B. $\frac{r\sin\beta}{\cos\alpha\sin\gamma}$.

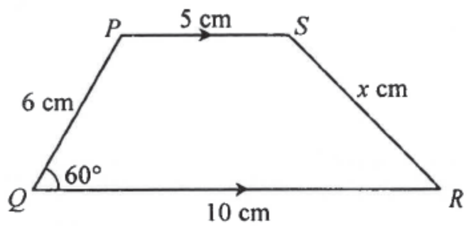
C. $\frac{r\sin\alpha\sin\beta}{\sin\gamma}$.

D. $\frac{r\cos\alpha\sin\beta}{\sin\gamma}$.

E. $\frac{r\sin\beta}{\sin\alpha}$.

[1997-CE-MATHS 2-42]

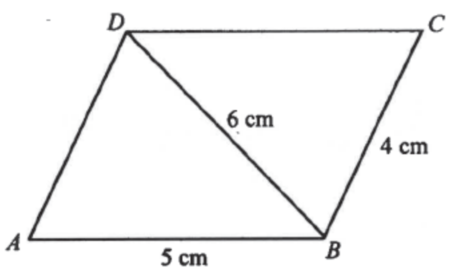
66. In the figure, $PQRS$ is a trapezium. Find x correct to 3 significant figures.



A. 3.01
B. 5.57
C. 5.77
D. 6.00
E. 9.54

[1998-CE-MATHS 2-26]

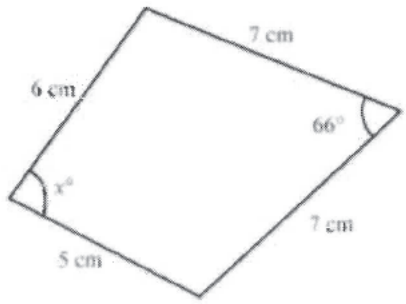
67. In the figure, $ABCD$ is a parallelogram. Find $\angle ABC$ correct to the nearest degree.



A. 83°
B. 97°
C. 104°
D. 124°
E. 139°

[1999-CE-MATHS 2-20]

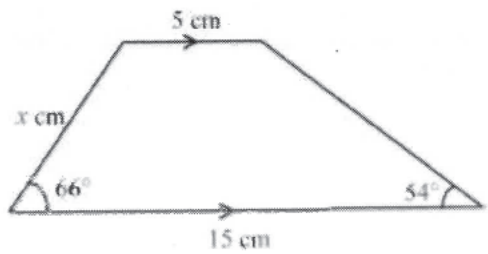
68. In the figure, find x correct to 3 significant figures.



A. 63.8
B. 78.5
C. 84.5
D. 87.3
E. 89.1

[2000-CE-MATHS 2-27]

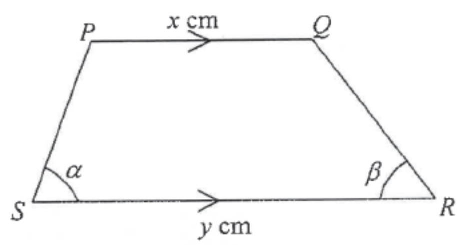
69. In the figure, find x correct to 3 significant figures.



A. 8.86
B. 9.34
C. 9.48
D. 10.7
E. 11.3

[2001-CE-MATHS 2-30]

70. In the figure, $PQ = x$ cm and $SR = y$ cm. Find PS.



A. $\frac{y-x}{2\cos\alpha}$ cm

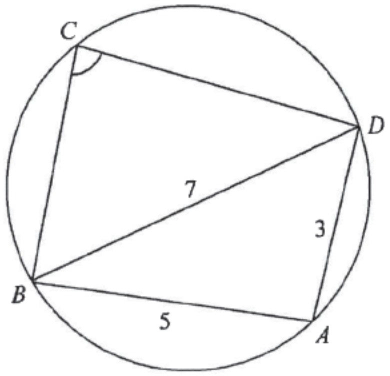
B. $\frac{y}{2\cos(\alpha+\beta)}$ cm

C. $\frac{x\sin\beta}{\sin\alpha}$ cm

D. $\frac{(y-x)\sin\beta}{\sin(\alpha+\beta)}$ cm

[2003-CE-MATHS 2-49]

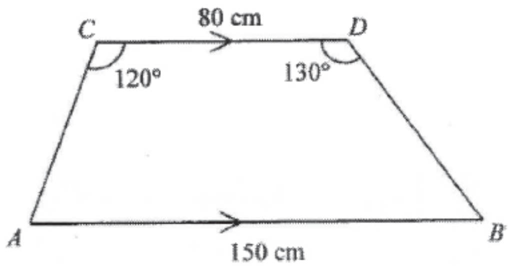
71. In the figure, A, B, C and D are points lying on the circle. If $AB = 5$, $AD = 3$ and $BD = 7$, then $\angle BCD =$



A. 60°.
B. 85°.
C. 95°.
D. 120°.

[2007-CE-MATHS 2-48]

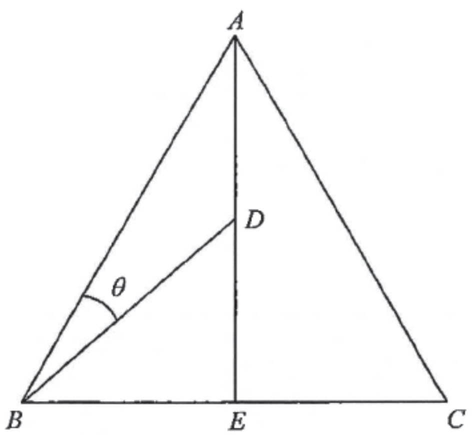
72. In the figure, $AB // CD$, $AB = 150$ cm and $CD = 80$ cm. Find BD correct to the nearest cm.



A. 60 cm
B. 62 cm
C. 64 cm
D. 65 cm

[2008-CE-MATHS 2-48]

73. In the figure, AD is produced to meet BC at E. If $AB = BC = AC$, $BE = CE$ and $AD = DE$ find $\sin\theta$.



A. $\frac{\sqrt{3}}{5}$

B. $\frac{\sqrt{3}}{10}$

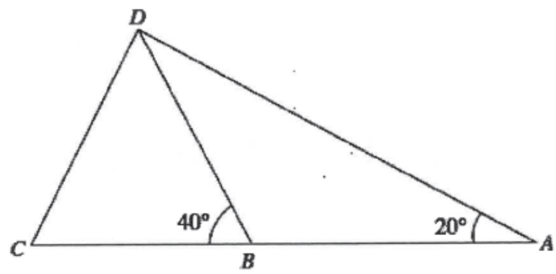
C. $\frac{\sqrt{21}}{7}$

D. $\frac{\sqrt{21}}{14}$

[2010-CE-MATHS 2-47]

HKDSE Problems

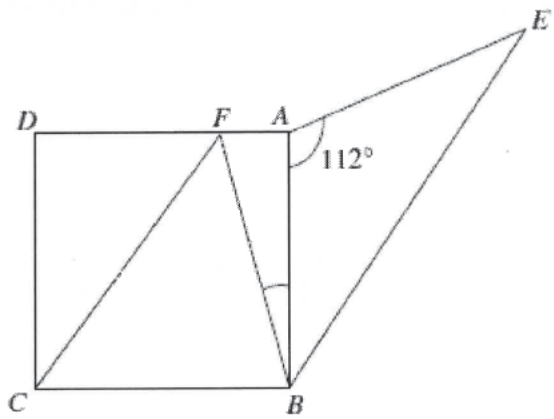
74. In the figure, ABC is a straight line. If $BD = CD$ and $AB = 10$ cm, find BC correct to the nearest cm.



A. 8 cm
B. 13 cm
C. 14 cm
D. 15 cm

[SP-DSE-MATHS 2-24]

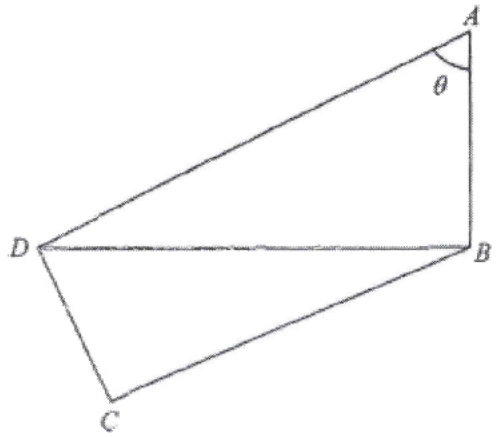
75. In the figure, $ABCD$ is a square. F is a point lying on AD such that $CF // BE$. If $AB = AE$, find $\angle ABF$ correct to the nearest degree.



A. 17°
B. 18°
C. 22°
D. 26°

[PP-DSE-MATHS 2-22]

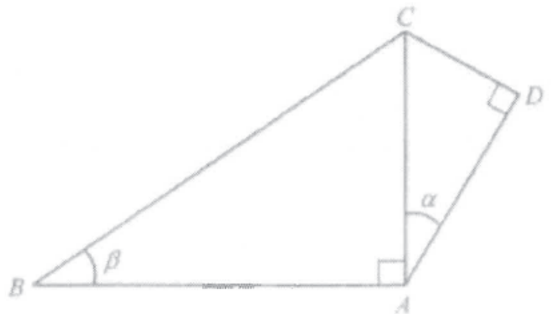
76. In the figure, $\angle ABD = \angle ADC = \angle BCD = 90^\circ$. If $AB = \ell$, then $CD =$



A. $\ell \sin\theta$.
B. $\ell \cos\theta$.
C. $\ell \sin\theta \tan\theta$.
D. $\dfrac{\ell \tan\theta}{\cos\theta}$.

[2014-DSE-MATHS 2-18]

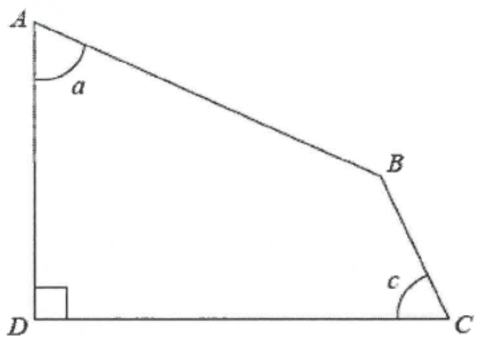
77. In the figure, $\dfrac{AD}{AB} =$



A. $\cos\alpha \tan\beta$.
B. $\sin\alpha \tan\beta$.
C. $\dfrac{\cos\alpha}{\tan\beta}$.
D. $\dfrac{\sin\alpha}{\tan\beta}$.

[2015-DSE-MATHS 2-18]

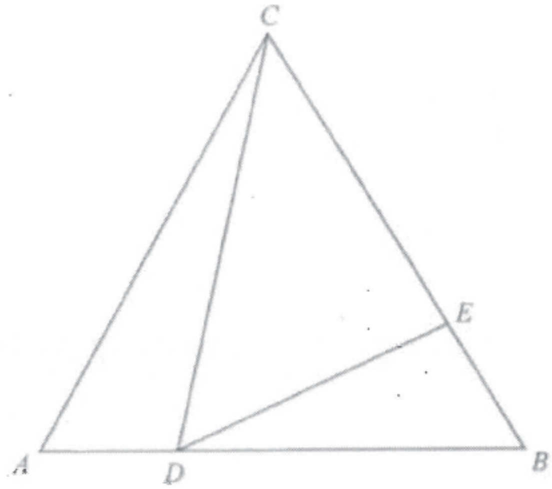
78. In the figure, $AD =$



A. $AB \cos a + BC \cos c$.
B. $AB \cos a + BC \sin c$.
C. $AB \sin a + BC \cos c$.
D. $AB \sin a + BC \sin c$.

[2016-DSE-MATHS 2-21]

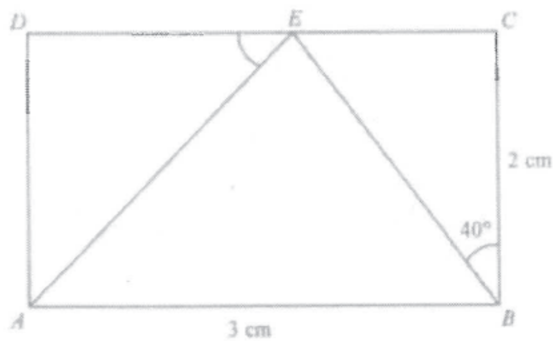
79. In the figure, ABC is an equilateral triangle of side 16 cm. D and E are points lying on AB and BC respectively such that $AD = 4$ cm and $\angle CDE = 60^\circ$. Find CE.



A. 9 cm
B. 10 cm
C. 12 cm
D. 13 cm

[2017-DSE-MATHS 2-17]

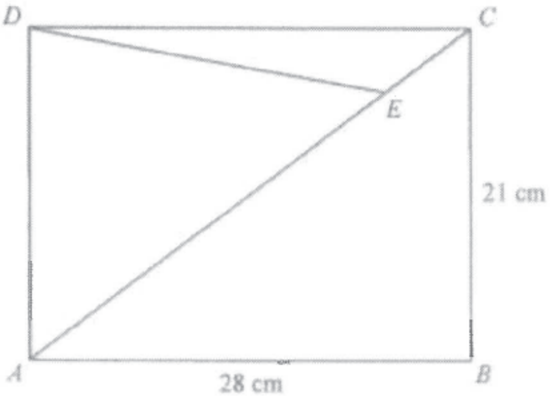
80. In the figure, $ABCD$ is a rectangle. If E is a point lying on CD such that $\angle CBE = 40^\circ$, find $\angle AED$ correct to the nearest degree.



A. 33°
B. 43°
C. 47°
D. 57°

[2017-DSE-MATHS 2-22]

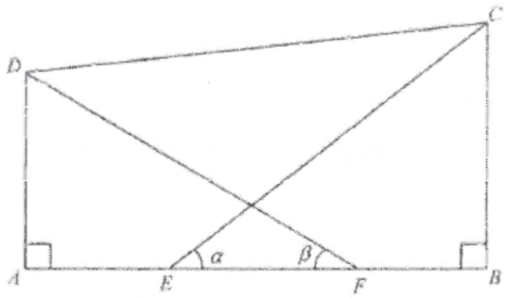
81. In the figure, $ABCD$ is a rectangle. If E is a point lying on AC such that $AE = 30$ cm, then $DE =$



A. $3\sqrt{65}$ cm.
B. $5\sqrt{29}$ cm.
C. $\sqrt{641}$ cm.
D. $\sqrt{697}$ cm.

[2017-DSE-MATHS 2-38]

82. In the figure, $ABCD$ is a trapezium with $\angle ABC = \angle BAD = 90°$. E and F are points lying on AB such that E and F divide AB into three equal parts. Which of the following must be true?

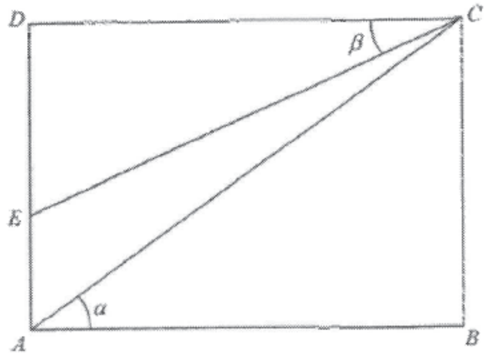


I. $AF \sin\alpha = BE \sin\beta$
II. $CE \cos\alpha = DF \cos\beta$
III. $AD \tan\alpha = BC \tan\beta$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2018-DSE-MATHS 2-21]

83. In the figure, $ABCD$ is a rectangle. E is a point lying on AD. Find $\frac{CE}{AC}$.



A. $\frac{\sin\alpha}{\sin\beta}$
B. $\frac{\cos\alpha}{\cos\beta}$
C. $\sin\alpha \sin\beta$
D. $\cos\alpha \cos\beta$

[2019-DSE-MATHS 2-22]

Bearings

1. If the bearing of B from A is S30°W, then the bearing of A from B is

   A. N30°E .
   B. N60°W .
   C. N60°E .
   D. S30°W .
   E. S30°E .

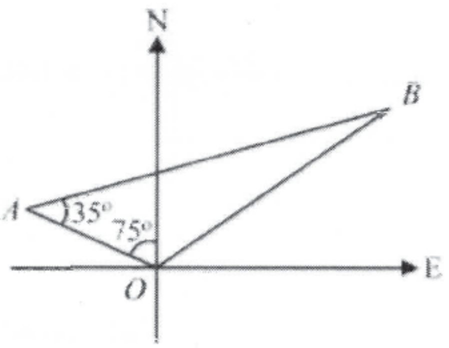
[1980-CE-MATHS 2-15]

2. The bearing of a lighthouse as observed from an ocean liner is N37°E, the bearing of the ocean linear as observed from the light house is

   A. N37°E .
   B. N53°W .
   C. S37°E .
   D. S37°W .
   E. S53°W .

[1986-CE-MATHS 2-20]

3. In the figure, A and B are the positions of two boats. The bearing of B from A is



   A. N55°E .
   B. N70°E .
   C. N20°E .
   D. S35°E .
   E. S75°E .

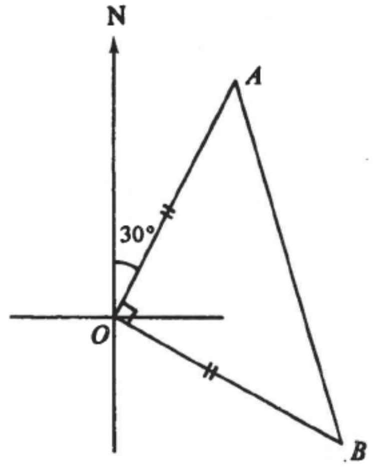
[1991-CE-MATHS 2-29]

4. The bearing of A from B is 075°. What is the bearing of B from A?

   A. 015°
   B. 075°
   C. 105°
   D. 195°
   E. 255°

[1994-CE-MATHS 2-11]

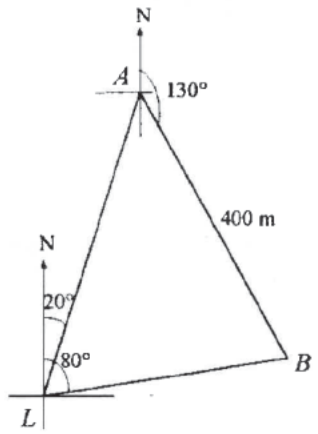
5. In the figure, the bearing of B from A is



   A. 015° .
   B. 045° .
   C. 075° .
   D. 165° .
   E. 345° .

[1995-CE-MATHS 2-20]

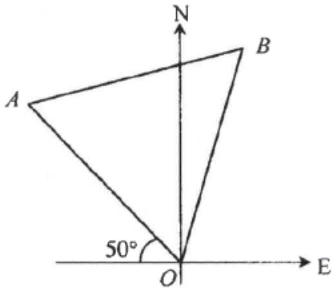
6. In the figure, the bearings of two ships A and B from a lighthouse L are 020° and 080° respectively. B is 400 m and at a bearing of 130° from A. Find the distance of B from L.



   A. 400 m
   B. $\dfrac{400}{\sin 60°}$ m
   C. $\dfrac{400 \sin 50°}{\sin 60°}$ m
   D. $\dfrac{400 \sin 70°}{\sin 60°}$ m
   E. $\dfrac{400 \sin 70°}{\sin 80°}$ m

[1996-CE-MATHS 2-48]

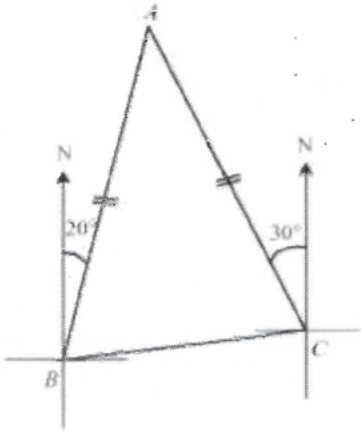
7. In the figure, OAB is an equilateral triangle. Find the bearing of B from A.



A. 10°.
B. 80°.
C. 170°.
D. 260°.
E. 350°.

[1998-CE-MATHS 2-18]

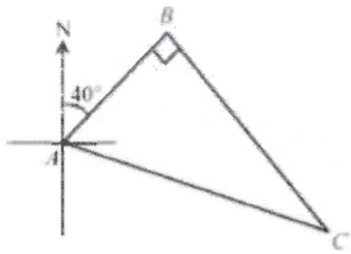
8. In the figure, the bearing of B from C is



A. N 5° E.
B. N 65° E.
C. N 85° E.
D. S 5° W.
E. S 85° W.

[1999-CE-MATHS 2-15]

9. According to the figure, the bearing of B from C is



A. 050°.
B. 130°.
C. 140°.
D. 310°.
E. 320°.

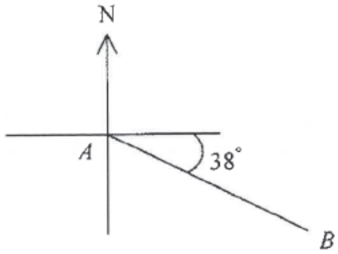
[2000-CE-MATHS 2-30]

10. Ship A is 8 km due north of a light house L and ship B is 6 km due east of L. Find the bearing of B from A.

A. N 53.1° W (correct to the nearest 0.1°)
B. N 36.9° W (correct to the nearest 0.1°)
C. N 36.9° E (correct to the nearest 0.1°)
D. S 53.1° E (correct to the nearest 0.1°)
E. S 36.9° E (correct to the nearest 0.1°)

[2001-CE-MATHS 2-31]

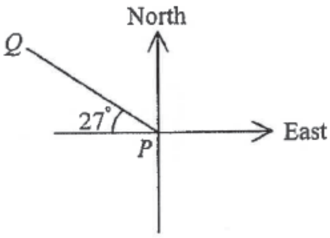
11. In the figure, the bearing of A from B is



A. N 38° W.
B. N 52° W.
C. S 38° E.
D. S 52° E.

[2003-CE-MATHS 2-23]

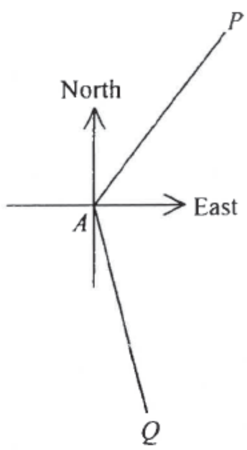
12. In the figure, the bearing of P from Q is



A. N 27° W.
B. S 27° E.
C. N 63° W.
D. S 63° E.

[2005-CE-MATHS 2-15]

13. In the figure, $PA = QA$. If the bearings of P and Q from A are N 42° E and S 28° E respectively, then the bearing of P from Q is



A. N 7° E .
B. N 27° E .
C. N 35° E .
D. N 55° E .

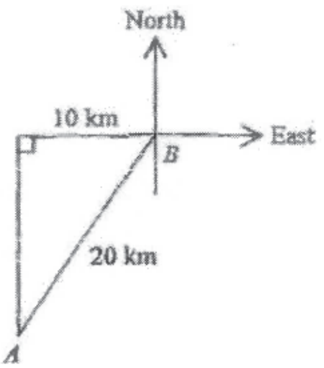
[2006-CE-MATHS 2-16]

14. A and B are two points on a map. If the bearing of A from B is 110°, then the bearing of B from A is

A. 070° .
B. 250° .
C. 290° .
D. 340° .

[2007-CE-MATHS 2-15]

15. In the figure, the bearing of B from A is



A. 030° .
B. 060° .
C. 210° .
D. 240° .

[2011-CE-MATHS 2-15]

Elevation & Depression

16. A vertical flagstaff of length h metres casts a shadow of $\frac{h}{3}$ metres on the horizontal ground. The elevation of the sun is

A. 18.43° .
B. 19.47° .
C. 53.13° .
D. 70.53° .
E. 71.57° .

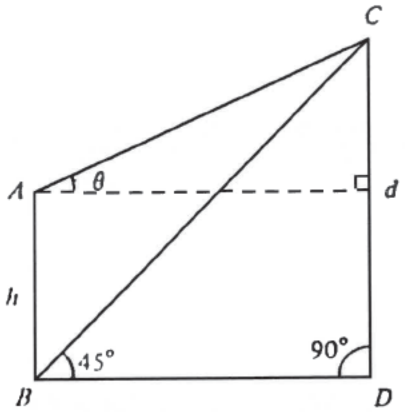
[1977-CE-MATHS 2-27]

17. From the top of a lighthouse, h metres high, the angle of depression of a boat is 20°. How far is the boat from the base of the lighthouse, which is at sea-level?

A. $h \sin 20°$ m
B. $h \cos 20°$ m
C. $h \tan 20°$ m
D. $\frac{h}{\sin 20°}$ m
E. $\frac{h}{\tan 20°}$ m

[1982-CE-MATHS 2-20]

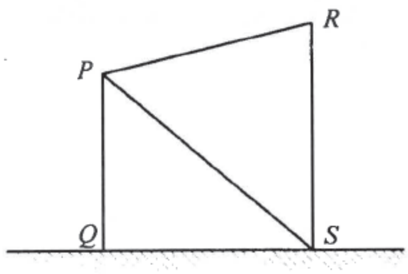
18. AB and CD are two buildings of heights h and d respectively. The angles of elevation of C from A and B are respectively θ and 45°. $d =$



A. $h(1 - \tan\theta)$.
B. $h(1 + \tan\theta)$.
C. $h \tan\theta$.
D. $\frac{h}{1 + \tan\theta}$.
E. $\frac{h}{1 - \tan\theta}$.

[1982-CE-MATHS 2-46]

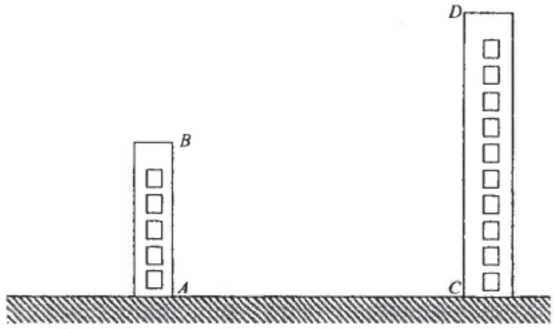
19. In the figure, PQ and RS are two vertical poles standing on the horizontal ground. The angle of elevation of R from P is 20° and the angle of depression of S from P is 40°. If $RS = 5$ m, then $PR =$



A. $\frac{5 \sin 40°}{\sin 70°}$ m .
B. $\frac{5 \sin 50°}{\sin 60°}$ m .
C. $\frac{5 \sin 60°}{\sin 50°}$ m .
D. $\frac{5 \sin 70°}{\sin 40°}$ m .
E. $\frac{5}{\sin 50° \sin 60°}$ m .

[1998-CE-MATHS 2-27]

20. In the figure, AB and CD are the heights of two buildings on the same level ground. If $AB = 9$ m, $AC = 20$ m and the angle of depression of A from D is 50°, find the angle of elevation of D from B correct to the nearest 0.1°.



A. 21.3°
B. 24.2°
C. 36.6°
D. 53.4°

[2002-CE-MATHS 2-24]

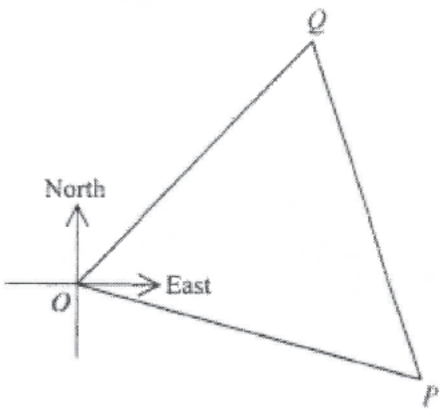
21. If the angle of elevation of P from Q is 40°, then the angle of depression of Q from P is

A. 40° .
B. 50° .
C. 130° .
D. 140° .

[2009-CE-MATHS 2-16]

HKDSE Problems

22. In the figure, the bearing of P from O is S 86° E and the bearing of Q from O is N 32° E. If P and Q are equidistant from O, then the bearing of P from Q is



A. N 24° W .
B. N 27° W .
C. S 24° E .
D. S 27° E .

[2013-DSE-MATHS 2-20]

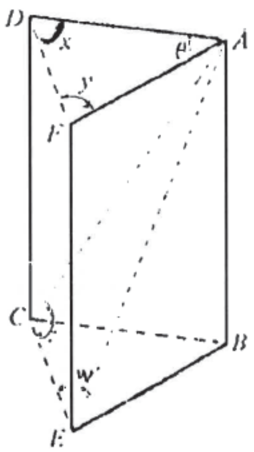
23. A ship is 50 km due west of a lighthouse. If the ship moves in the direction $S60°E$, find the shortest distance between the ship and the lighthouse.

A. 20 km
B. 25 km
C. 43 km
D. 87 km

[2020-DSE-MATHS 2-23]

Angles & Lines in 3-Dimensional Figures

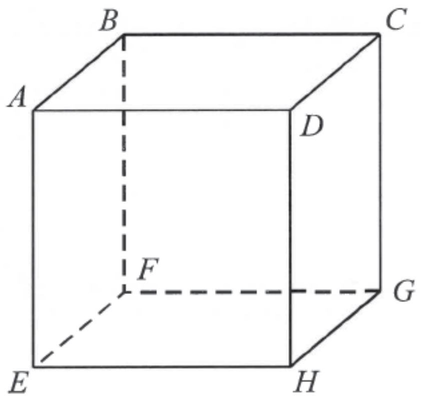
1. The figure represents a rectangular door $ABCD$ turning through an angle θ and coming to a new position $ABEF$. Which of the angles x, y, z and w is a right angle?



A. x (i.e. $\angle ADF$)
B. y (i.e. $\angle AFD$)
C. z (i.e. $\angle ACE$)
D. w (i.e. $\angle AEC$)
E. None of them

[1978-CE-MATHS 2-9]

2.



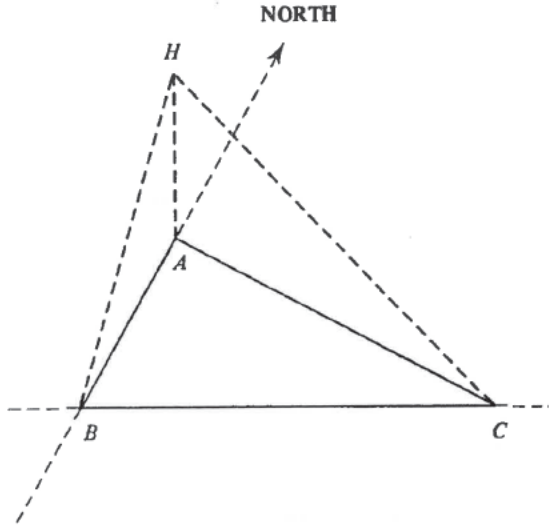
In the figure, $ABCDEFGH$ is a cube. Which of the following is a right angle / are right angles?

(1) $\angle DHG$
(2) $\angle AHG$
(3) $\angle BEH$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (1), (2) and (3)

[1988-CE-MATHS 2-15]

3.



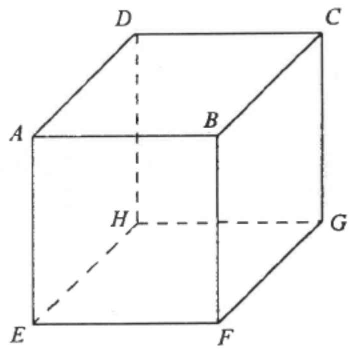
In the figure, A, B and C are three points on the same horizontal plane. A is due north of B, C is due east of B and H is a point vertically above A. Which of the following angles is/are 90°?

(1) $\angle HAC$
(2) $\angle ABC$
(3) $\angle HBC$

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1990-CE-MATHS 2-47]

4.

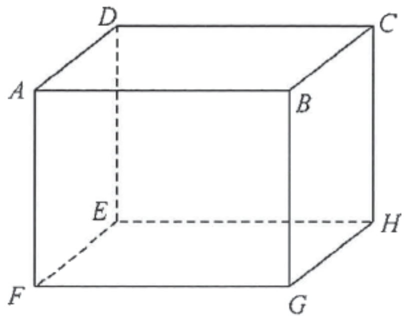


The figure shows a cube. Which of the following is/are equal to $\angle AGE$?

(1) $\angle AGF$
(2) $\angle BDF$
(3) $\angle DEG$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1996-CE-MATHS 2-23]

5. 

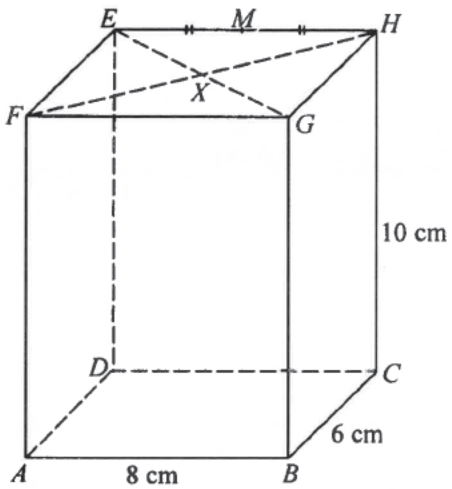
The figure shows a cuboid. Which of the following are right angles?

(1) $\angle CAF$
(2) $\angle DHG$
(3) $\angle AGC$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2003-CE-MATHS 2-48]

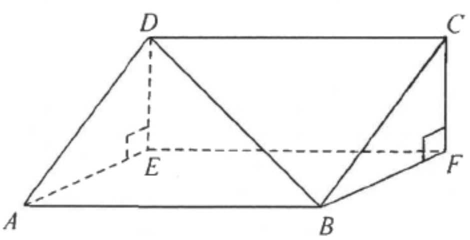
6. In the figure, $ABCDEFGH$ is a rectangular block. EG and FH meet at X. M is the mid-point of EH. Which of the following makes the greatest angle with the plane $ABCD$?



A. AG
B. AH
C. AM
D. AX

[2004-CE-MATHS 2-49]

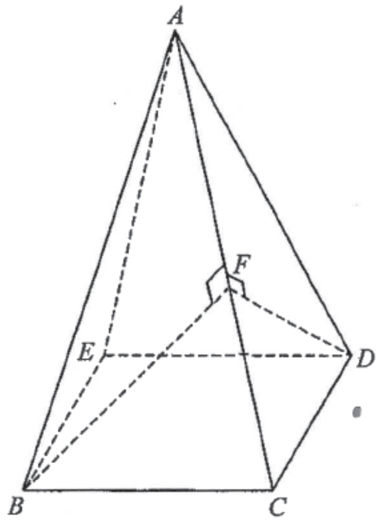
7. The figure shows a right prism $ABCDEF$ with a right-angled triangle as the cross-section. The angle between BD and the plane $CDEF$ is



A. $\angle BDE$.
B. $\angle BDF$.
C. $\angle DBE$.
D. $\angle DBF$.

[2006-CE-MATHS 2-24]

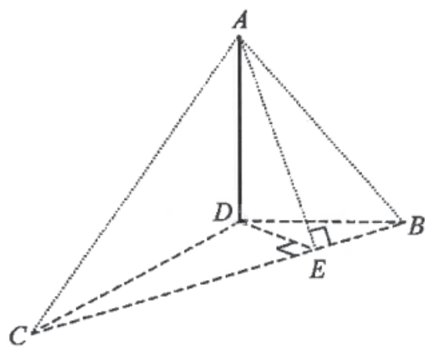
8. In the figure, $ABCDE$ is a right pyramid with the square base $BCDE$. F is a point lying on AC such that BF and DF are perpendicular to AC. The angle between the plane ABC and the plane ACD is



A. $\angle ACB$.
B. $\angle BAD$.
C. $\angle BCD$.
D. $\angle BFD$.

[2007-CE-MATHS 2-24]

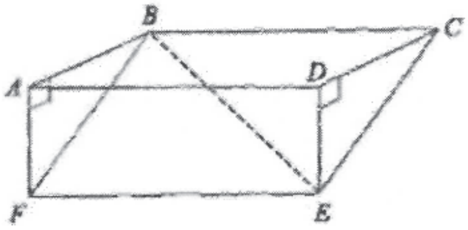
9. In the figure, AD is a vertical pole standing on the horizontal ground BCD. If E is a point lying on BC such that DE and AE are perpendicular to BC, then the angle between the plane ABC and the horizontal ground is



A. $\angle ABD$.
B. $\angle ABE$.
C. $\angle ACD$.
D. $\angle AED$.

[2010-CE-MATHS 2-28]

10. The figure shows a right prism *ABCDEF* with a right-angled triangle as the cross-section. The angle between *BE* and the plane *ABCD* is



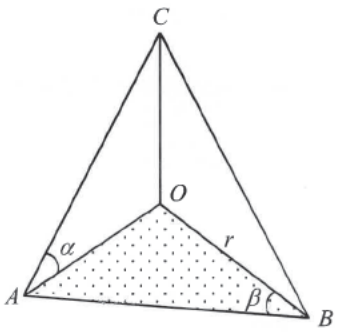
A. $\angle ABE$.
B. $\angle CBE$.
C. $\angle DBE$.
D. $\angle EBF$.

[2011-CE-MATHS 2-24]

3-Dimensional Problems

11. In the figure, *OAB* is a right-angled triangle in a horizontal plane with $\angle AOB = 90°$. *OC* is a vertical line. If $OB = r$, $AC =$

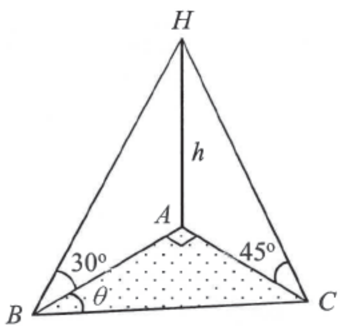
A. $\dfrac{r \sin\beta}{\tan\alpha}$.
B. $\dfrac{r \tan\alpha}{\cos\beta}$.
C. $\dfrac{r \sin\beta}{\sin\alpha}$.
D. $\dfrac{r \cos\beta}{\tan\alpha}$.
E. $\dfrac{r \tan\beta}{\cos\alpha}$.



[1982-CE-MATHS 2-21]

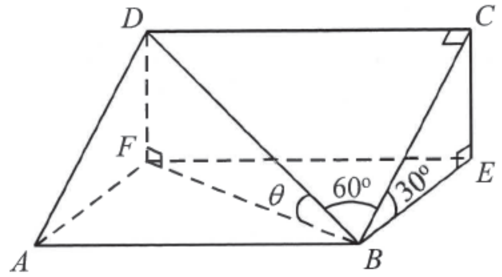
12. In the figure, ΔABC lies in a horizontal plane. $\angle BAC = 90°$. *HA* is vertical and $HA = h$. $\tan\theta =$

A. 1 .
B. $\tan 30°$.
C. $\dfrac{1}{\tan 30°}$.
D. $h \tan 30°$.
E. $\dfrac{h}{\tan 30°}$.



[1984-CE-MATHS 2-20]

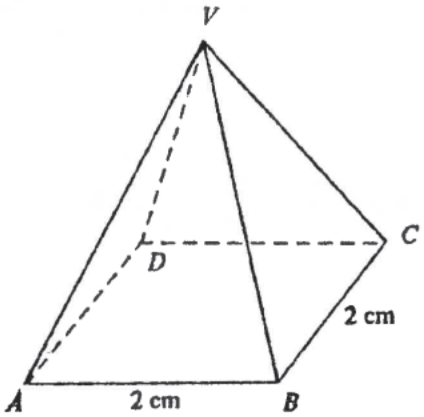
13. In the figure, *ABCD* is a rectangle inclined at an angle of 30° to the horizontal plane *ABEF*. $\angle CBD = 60°$. Let θ be the inclination of *BD* to the horizontal plane. $\sin\theta =$



A. $\dfrac{1}{4}$.
B. $\dfrac{1}{2}$.
C. $\dfrac{\sqrt{3}}{2}$.
D. $\dfrac{\sqrt{3}}{3}$.
E. $\dfrac{\sqrt{3}}{4}$.

[1987-CE-MATHS 2-48]

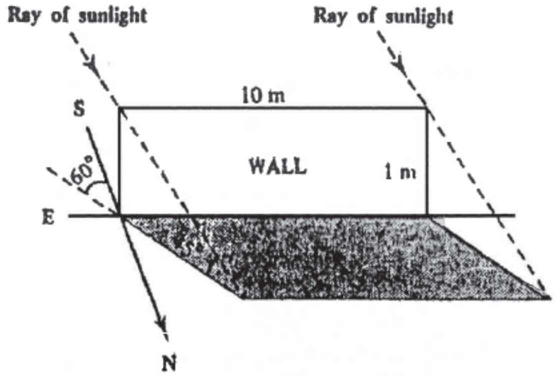
14. In the figure, *VABCD* is a right pyramid of height 3 cm. The base *ABCD* is a square of side 2 cm. Let θ be the angle between the face *VBC* and the base. Find $\tan\theta$.



A. $\dfrac{1}{3}$
B. $\dfrac{\sqrt{2}}{3}$
C. $\dfrac{3}{2}$
D. $\dfrac{3\sqrt{2}}{2}$
E. 3

[1989-CE-MATHS 2-47]

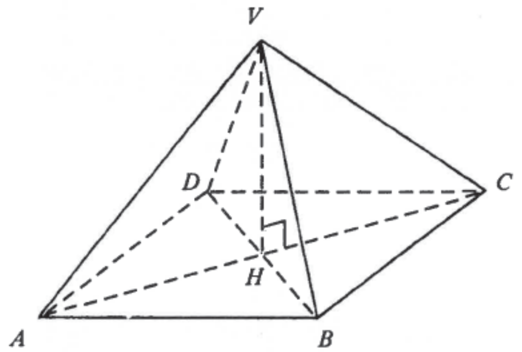
15. A vertical rectangular wall on the horizontal ground, 1 m high and 10 m long, runs east and west as shown in the figure. If the sun bears S60°E at an elevation of 45°, find the area of the shadow of the wall on the ground.



A. $\frac{5}{2}$ m^2
B. 5 m^2
C. $5\sqrt{2}$ m^2
D. $5\sqrt{3}$ m^2
E. 10 m^2

[1989-CE-MATHS 2-49]

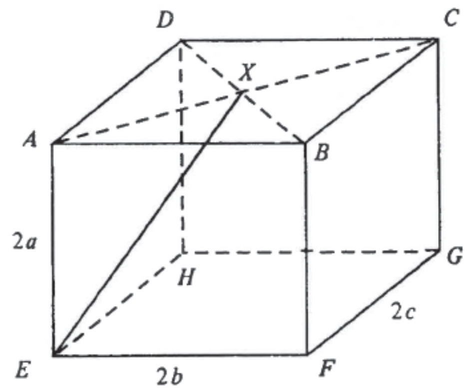
16. The figure shows a right pyramid with a square base. VAB, VBC, VCD and VDA are equilateral triangles. Find $\sin \angle VAH$.



A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. $\frac{1}{\sqrt{2}}$
D. $\frac{1}{\sqrt{3}}$
E. $\frac{\sqrt{3}}{2}$

[1990-CE-MATHS 2-19]

DIRECTIONS : Questions 17 and 18 refer to the figure below, which shows a cuboid $ABCDEFGH$ with $AE = 2a$, $EF = 2b$ and $FG = 2c$. AC and BD intersect at X.



17. $XE =$

A. $\sqrt{a^2+b^2+c^2}$.
B. $\sqrt{a^2+b^2+(2c)^2}$.
C. $\sqrt{a^2+(2b)^2+c^2}$.
D. $\sqrt{(2a)^2+b^2+c^2}$.
E. $2\sqrt{a^2+b^2+c^2}$.

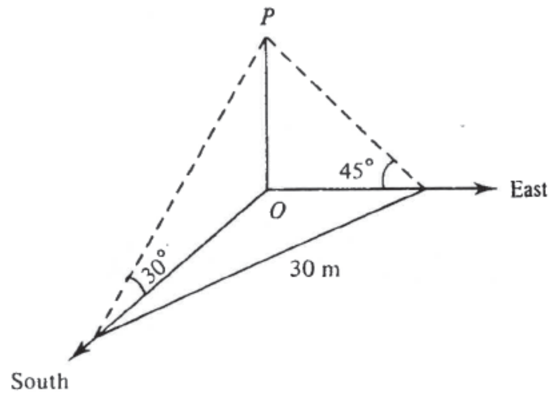
[1991-CE-MATHS 2-45]

18. If the angle between XE and the plane $EFGH$ is θ, then $\tan\theta =$

A. $\frac{a}{b}$.
B. $\frac{2a}{b}$.
C. $\frac{\sqrt{(2a)^2+c^2}}{b}$.
D. $\frac{a}{\sqrt{b^2+c^2}}$.
E. $\frac{2a}{\sqrt{b^2+c^2}}$.

[1991-CE-MATHS 2-46]

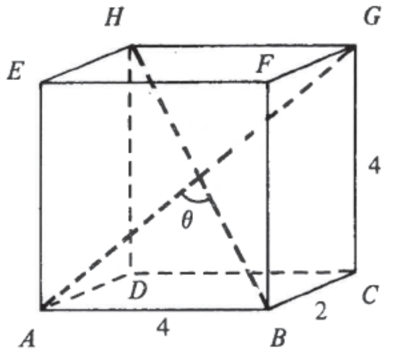
19. In the figure, the height of the vertical pole PO is



A. 7.5 m .
B. 15 m .
C. $15\sqrt{2}$ m .
D. $15\sqrt{3}$ m .
E. 45 m .

[1991-CE-MATHS 2-49]

20. In the figure, if θ is the angle between the diagonals AG and BH of the cuboid, then



A. $\sin\frac{\theta}{2} = \frac{2}{3}$.

B. $\sin\frac{\theta}{2} = \frac{3}{4}$.

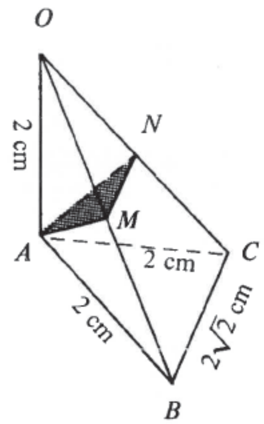
C. $\sin\frac{\theta}{2} = \frac{1}{3}$.

D. $\sin\theta = \frac{2}{3}$.

E. $\sin\theta = \frac{3}{4}$.

[1992-CE-MATHS 2-47]

21. In the figure, OA is perpendicular to the plane ABC. $OA = AB = AC = 2$ cm and $BC = 2\sqrt{2}$ cm. If M and N are the mid-points of OB and OC respectively, find the area of ΔAMN.



A. $\frac{1}{2}$ cm^2

B. 1 cm^2

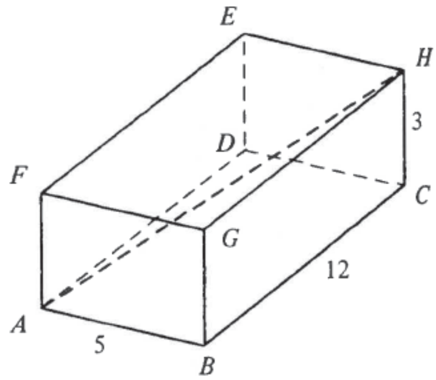
C. $\sqrt{2}$ cm^2

D. $\frac{\sqrt{3}}{2}$ cm^2

E. $\sqrt{3}$ cm^2

[1992-CE-MATHS 2-48]

22. In the figure, $ABCDEFGH$ is a cuboid. The diagonal AH makes an angle θ with the base $ABCD$. Find $\tan\theta$.



A. $\frac{3}{5}$

B. $\frac{3}{12}$

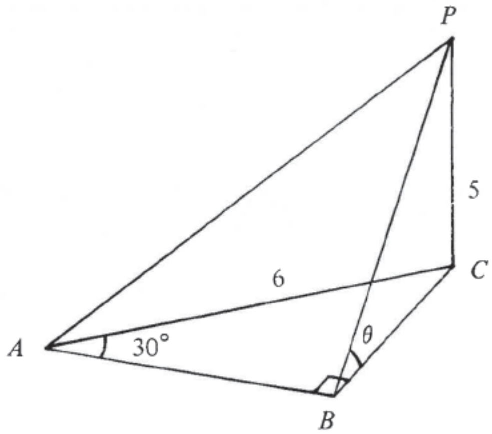
C. $\frac{3}{13}$

D. $\frac{3}{\sqrt{178}}$

E. $\frac{\sqrt{153}}{5}$

[1993-CE-MATHS 2-48]

23. In the figure, PC is a vertical pole standing on the horizontal plane ABC. If $\angle ABC = 90°$, $\angle BAC = 30°$, $AC = 6$ and $PC = 5$, find $\tan\theta$.



A. $\frac{3}{5}$

B. $\frac{5}{6}$

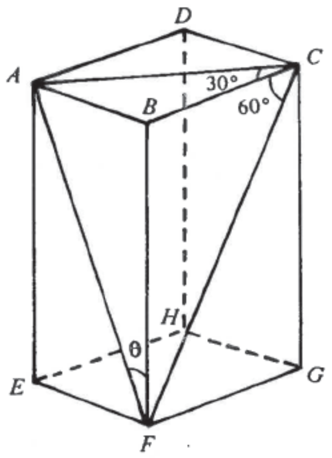
C. $\frac{5}{3}$

D. $\frac{3\sqrt{3}}{5}$

E. $\frac{5\sqrt{3}}{9}$

[1994-CE-MATHS 2-20]

24. In the figure, *ABCDEFGH* is a cuboid. $\tan\theta =$



A. $\frac{1}{3}$.

B. $\frac{1}{\sqrt{3}}$.

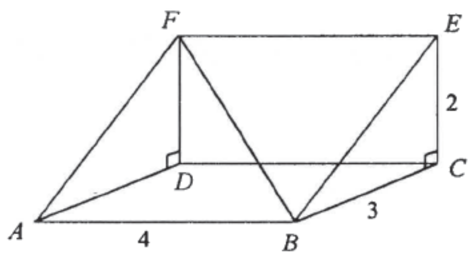
C. 1 .

D. $\sqrt{3}$.

E. 3 .

[1995-CE-MATHS 2-51]

25. The figure shows a right prism with a right-angled triangle as the cross-section. Find the angle between the line *BF* and the plane *ABCD* correct to the nearest degree.



A. 22°

B. 34°

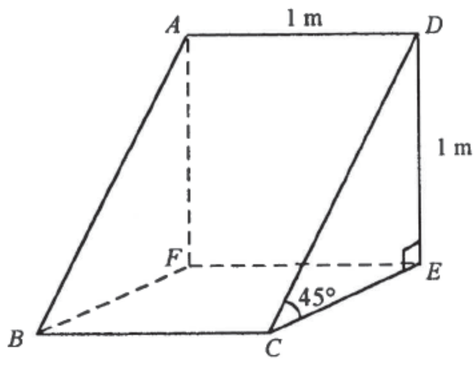
C. 37°

D. 42°

E. 56°

[1996-CE-MATHS 2-49]

26. In the figure, *ABCD* is a rectangle inclined at an angle of 45° to the horizontal plane *BCEF*. Find the inclination of *AC* to the horizontal plane correct to the nearest degree.



A. 27°

B. 30°

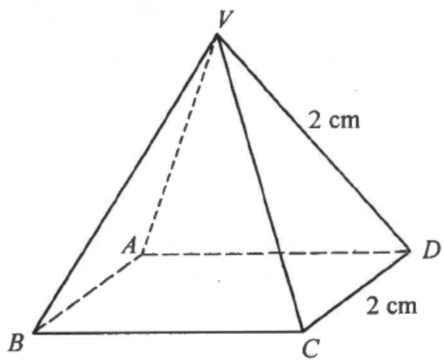
C. 35°

D. 45°

E. 55°

[1997-CE-MATHS 2-41]

27. The figure shows a right pyramid with a square base *ABCD*. Let θ be the angle between the planes *VAB* and *VCD*. Find $\sin\frac{\theta}{2}$.



A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

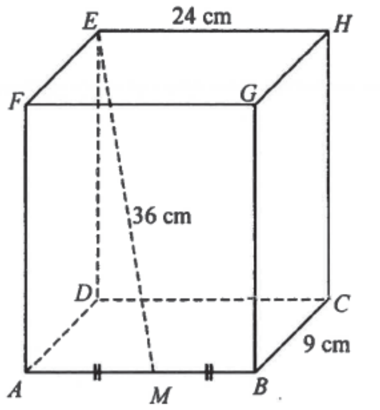
C. $\frac{1}{\sqrt{3}}$

D. $\frac{1}{\sqrt{5}}$

E. $\frac{2}{\sqrt{5}}$

[1998-CE-MATHS 2-48]

28. In the figure, $ABCDEFGH$ is a rectangular block. Find the inclination of EM to the plane $ABCD$ correct to the nearest degree.



A. 23°

B. 25°

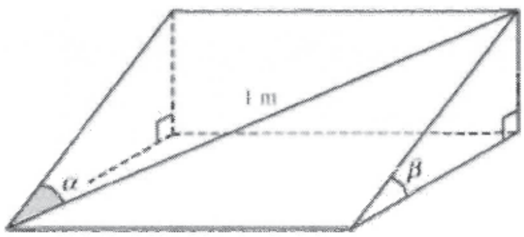
C. 65°

D. 71°

E. 75°

[1999-CE-MATHS 2-49]

29. The figure shows a right triangular prism. Find its volume.



A. $\frac{1}{3}\sin^2\alpha\cos\alpha\sin\beta\cos\beta\ \text{m}^3$

B. $\frac{1}{3}\sin\alpha\cos^2\alpha\sin\beta\cos\beta\ \text{m}^3$

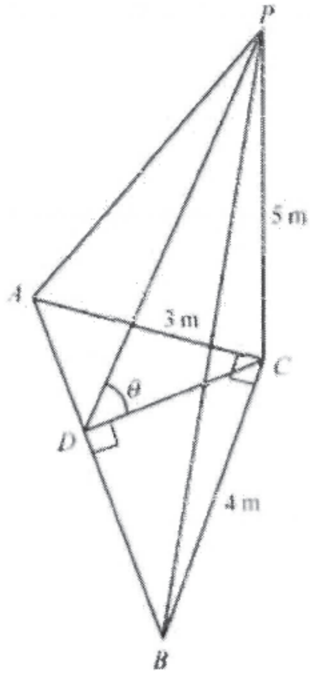
C. $\frac{1}{2}\sin\alpha\cos\alpha\sin\beta\cos\beta\ \text{m}^3$

D. $\frac{1}{2}\sin^2\alpha\cos\alpha\sin\beta\cos\beta\ \text{m}^3$

E. $\frac{1}{2}\sin\alpha\cos^2\alpha\sin\beta\cos\beta\ \text{m}^3$

[2000-CE-MATHS 2-52]

30. In the figure, PC is a vertical pole standing on the horizontal ground ABC. D is a point on line AB. If $\angle BCA = \angle CDB = 90°$, $AC = 3$ m, $BC = 4$ m and $PC = 5$ m, find $\tan\theta$.



A. $\frac{12}{25}$

B. $\frac{16}{25}$

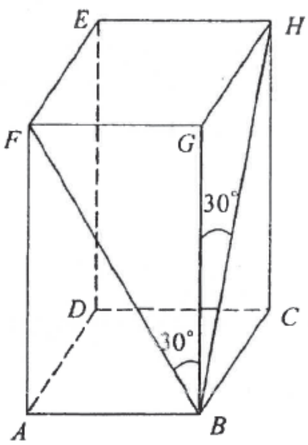
C. $\frac{25}{16}$

D. $\frac{25}{12}$

E. $\frac{25}{9}$

[2001-CE-MATHS 2-51]

31. In the figure, $ABCDEFGH$ is a rectangular block with a square base $ABCD$. Find $\angle FBH$ correct to the nearest degree.



A. 21°

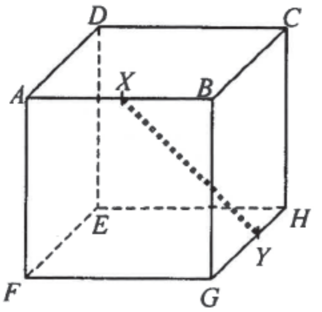
B. 41°

C. 45°

D. 60°

[2002-CE-MATHS 2-49]

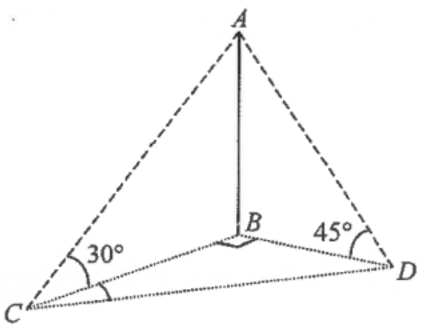
32. The figure shows the cube *ABCDEFGH* of side 2 cm. *X* and *Y* are the mid-points of *AB* and *GH* respectively. Find *XY*.



A. 3 cm
B. $2\sqrt{2}$ cm
C. $\sqrt{5}$ cm
D. $\sqrt{6}$ cm

[2004-CE-MATHS 2-48]

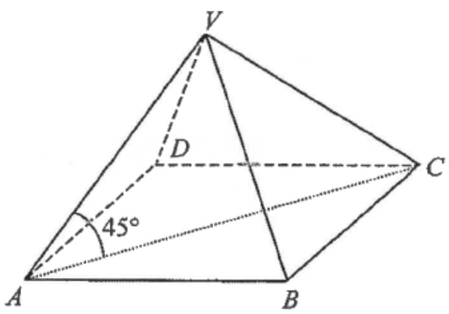
33. In the figure, *B*, *C* and *D* are three points on a horizontal plane such that $\angle CBD = 90°$. If *AB* is a vertical pole, then $\angle BCD =$



A. 15°.
B. 30°.
C. 45°.
D. 60°.

[2005-CE-MATHS 2-47]

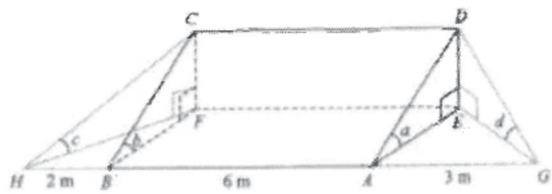
34. In the figure, *VABCD* is a right pyramid with a square base. If the angle between *VA* and the base is 45°, then $\angle AVB =$



A. 45°.
B. 60°.
C. 75°.
D. 90°.

[2005-CE-MATHS 2-48]

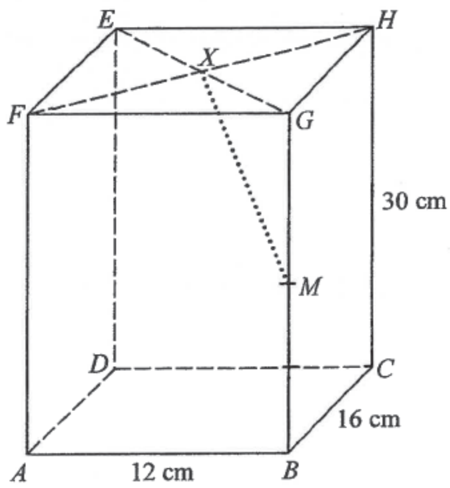
35. The figure shows a right prism *ABCDEF* with a right-angled triangle as the cross-section. *A*, *B*, *E* and *F* lie on the horizontal ground. *G* and *H* are two points on the horizontal ground so that *G*, *A*, *B* and *H* are collinear. It is given that $AB = 6$ m, $AG = 3$ m and $BH = 2$ m. If $\angle DAE = a$, $\angle CBF = b$, $\angle CHF = c$ and $\angle DGE = d$, which of the following must be true?



A. $a < d < c$
B. $c < a < d$
C. $c < d < b$
D. $d < c < b$

[2008-CE-MATHS 2-49]

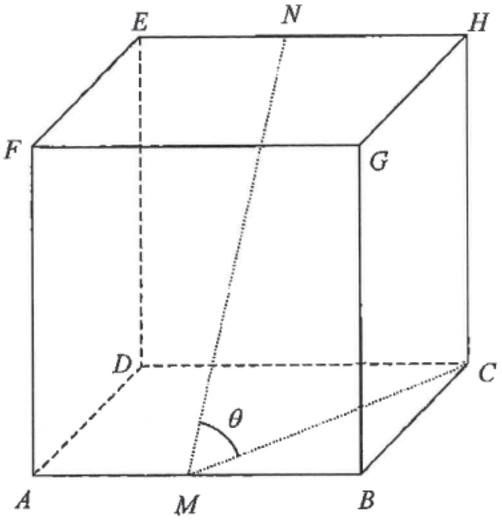
36. In the figure, *ABCDEFGH* is a rectangular block. *EG* and *FH* intersect at *X*. *M* is the mid-point of *BG*. If the angle between *MX* and the plane *BCHG* is θ, then $\tan\theta =$



A. $\frac{2}{3}$.
B. $\frac{6}{17}$.
C. $\frac{2}{\sqrt{29}}$.
D. $\frac{8}{\sqrt{261}}$.

[2009-CE-MATHS 2-47]

37. In the figure, $ABCDEFGH$ is a cube. If M and N are the mid-points of AB and EH respectively, then $\cos\theta =$



A. $\frac{\sqrt{6}}{4}$.

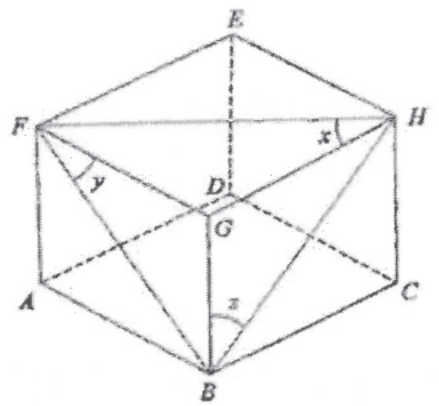
B. $\frac{\sqrt{6}}{5}$.

C. $\frac{\sqrt{10}}{4}$.

D. $\frac{\sqrt{10}}{5}$.

[2010-CE-MATHS 2-48]

38. In the figure, $ABCDEFGH$ is a cuboid. If $\angle FHG = x$, $\angle BFG = y$ and $\angle HBG = z$, then $\tan z =$



A. $\tan x \tan y$.

B. $\frac{1}{\tan x \tan y}$.

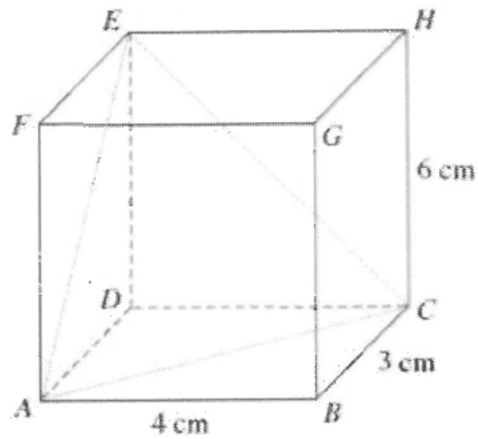
C. $\frac{\tan x}{\tan y}$.

D. $\frac{\tan y}{\tan x}$.

[2011-CE-MATHS 2-50]

HKDSE Problems

39. The figure shows a cuboid $ABCDEFGH$. If the angle between the triangle ACE and the plane $ABCD$ is θ, then $\tan\theta =$



A. 2.

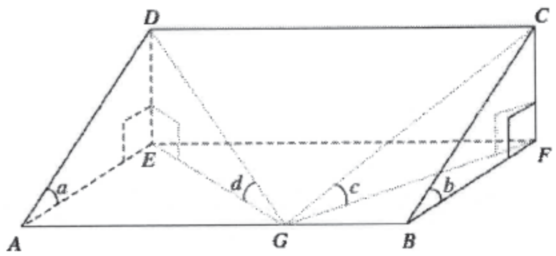
B. $\frac{3}{2}$.

C. $\frac{5}{2}$.

D. $\frac{12}{5}$.

[SP-DSE-MATHS 2-40]

40. The figure shows a right prism $ABCDEF$ with a right-angled triangle as the cross-section. A, B, E and F lie on the horizontal ground. G is a point lying on AB such that $AG : GB = 5 : 3$. If $\angle DAE = a$, $\angle CBF = b$, $\angle CGF = c$ and $\angle DGE = d$, which of the following is true?



A. $a > c > d$

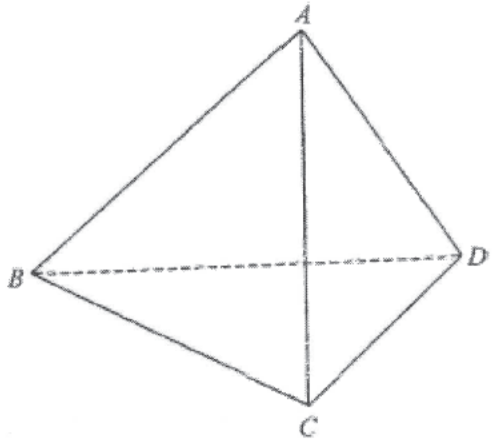
B. $a > d > c$

C. $c > b > d$

D. $c > d > b$

[PP-DSE-MATHS 2-39]

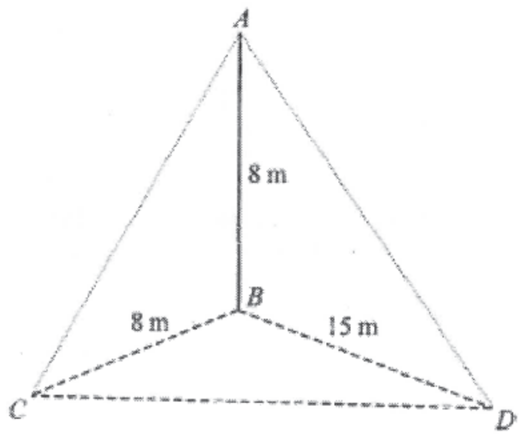
41. The figure shows a regular tetrahedron $ABCD$. Find the angle between the plane ABC and the plane BCD correct to the nearest degree.



A. 48°
B. 53°
C. 60°
D. 71°

[2012-DSE-MATHS 2-40]

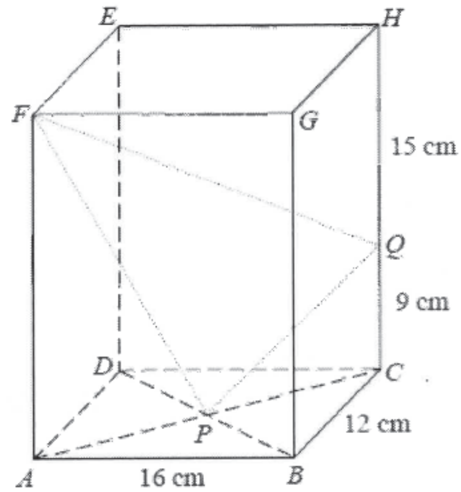
42. In the figure, AB is a vertical pole standing on the horizontal ground BCD, where $\angle CBD = 90°$. If the angle between the plane ACD and the horizontal ground is θ, then $\tan\theta =$



A. $\frac{8}{15}$.
B. $\frac{15}{8}$.
C. $\frac{15}{17}$.
D. $\frac{17}{15}$.

[2014-DSE-MATHS 2-40]

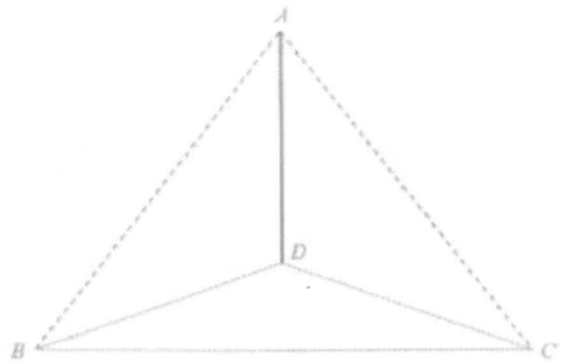
43. In the figure, $ABCDEFGH$ is a rectangular block. AC and BD intersect at P. Q is a point lying on CH such that $CQ = 9$ cm and $QH = 15$ cm. Find $\sin\angle PFQ$.



A. $\frac{33}{65}$
B. $\frac{56}{65}$
C. $\frac{13}{5\sqrt{181}}$
D. $\frac{58}{13\sqrt{181}}$

[2016-DSE-MATHS 2-39]

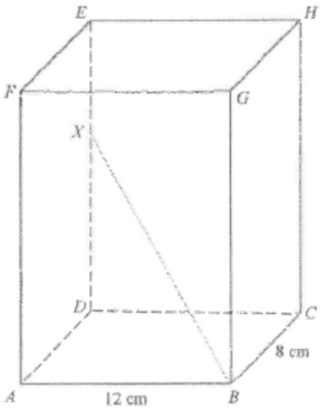
44. In the figure, AD is a vertical pole standing on the horizontal ground BCD. If $AB = 25$ m, $AD = 15$ m, $BC = 29$ m and $CD = 21$ m, find the angle between AB and the plane ACD correct to the nearest degree.



A. 53°
B. 54°
C. 69°
D. 70°

[2017-DSE-MATHS 2-39]

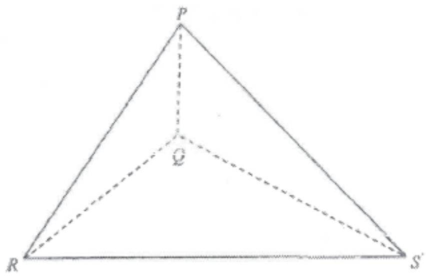
45. In the figure, $ABCDEFGH$ is a rectangular block. Let X be a point lying on DE such that DX = 9 cm and EX = 4 cm. Denote the angle between BX and the plane ABGF by θ. Find $\cos\theta$.



A. $\frac{3}{5}$
B. $\frac{4}{5}$
C. $\frac{8}{17}$
D. $\frac{15}{17}$

[2018-DSE-MATHS 2-41]

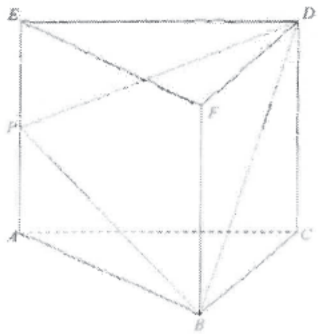
46. The figure shows a tetrahedron PQRS with the base QRS lying on the horizontal ground. It is given that Q is vertically below P. If $\angle PRQ = 47°$, $\angle PSQ = 53°$ and $\angle RQS = 120°$, find $\angle RPS$ correct to the nearest degree.



A. 52°
B. 60°
C. 68°
D. 76°

[2019-DSE-MATHS 2-40]

47. In the figure, ABCDEF is a right triangular prism. P is point lying on AE. If AB = AC = 12 cm, AP = 9cm, EP = 5 cm and BD = 2k cm, find the area of ΔBDP.



A. $\sqrt{(k^2-1)(196-k^2)}$ km
B. $\sqrt{(k^2-1)(196+k^2)}$ km
C. $\sqrt{(k^2+1)(196-k^2)}$ km
D. $\sqrt{(k^2+1)(196+k^2)}$ km\

[2020-DSE-MATHS 2-38]

HKDSE Problems

1. A drama club is formed by 12 boys and 8 girls. If a team of 5 students is selected from the club to participate in a competition and the team consists of at least one girl, how many different teams can be formed?

   A. 3 960
   B. 14 712
   C. 15 448
   D. 15 504

   [2012-DSE-MATHS 2-43]

2. If the first three digits and the last five digits of an eight-digit phone number are formed by a permutation of 5, 6, 9 and a permutation of 2, 3, 4, 7, 8 respectively, how many different eight-digit phone numbers can be formed?

   A. 15
   B. 126
   C. 720
   D. 40 320

   [2013-DSE-MATHS 2-44]

3. There are 13 boys and 17 girls in a class. If a team of 2 boys and 3 girls is selected from the class to participate in a voluntary service, how many different teams can be formed?

   A. 38 896
   B. 53 040
   C. 142 506
   D. 636 480

   [2014-DSE-MATHS 2-43]

4. A queue is formed by 6 boys and 2 girls. If no girls are next to each other, how many different queues can be formed?

   A. 1 440
   B. 10 080
   C. 30 240
   D. 35 280

   [2015-DSE-MATHS 2-43]

5. There are 20 boys and 15 girls in a class. If 6 students are selected from the class to form a committee consisting of at most 2 girls, how many different committees can be formed?

   A. 271 320
   B. 324 415
   C. 508 725
   D. 780 045

   [2016-DSE-MATHS 2-43]

6. There are 13 students and 6 teachers in a committee. If 5 students and 4 teachers are selected from the committee to form a team, how many different teams can be formed?

   A. 4 290
   B. 19 305
   C. 92 378
   D. 55 598 400

   [2017-DSE-MATHS 2-42]

7. In a class, there are 14 boys and 15 girls. If 3 students of the same gender are selected from the class to form a team, how many different teams can be formed?

   A. 819
   B. 3 654
   C. 4 914
   D. 165 620

   [2018-DSE-MATHS 2-42]

8. A queue is formed by 6 boys and 5 girls. If no boys are next to each other, how many different queues can be formed?

   A. 86 400
   B. 172 800
   C. 213 444
   D. 39 916 800

   [2020-DSE-MATHS 2-42]

Set Theory

1. If $X = \{a, b, c\}$, $Y = \{b, c, d\}$ and $Z = \{a, c, d\}$, what is $(X \cup Y) - (Z \cap X)$?

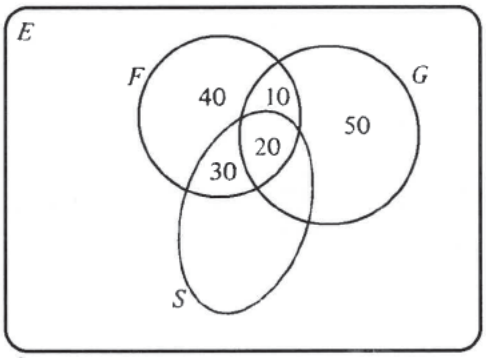
   A. $\{a, c\}$
   B. $\{b, c\}$
   C. $\{b, d\}$
   D. $\varnothing$
   E. None of the above

   [1972-CE-MATHS B1-8]

2. If  represents P and  represents Q so that  represents $P \cap Q$, then which of the following represents $Q' \cap P$?

   A. 
   B. 
   C. 
   D. 
   E. 

   [1972-CE-MATHS B1-9]

3. 

   In the Venn diagram above,

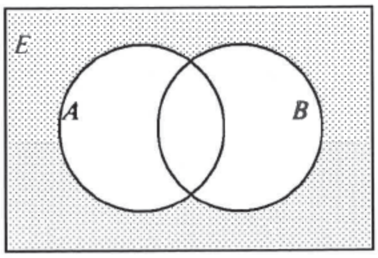
   E = {students in a school}
   S = {short-sighted students}
   F = {form 5 students}
   G = {girls}

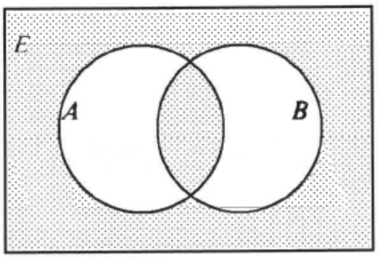
   How many form 5 girls are **not** short-sighted?

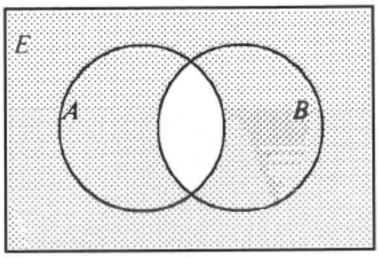
   A. 10
   B. 20
   C. 30
   D. 40
   E. 50

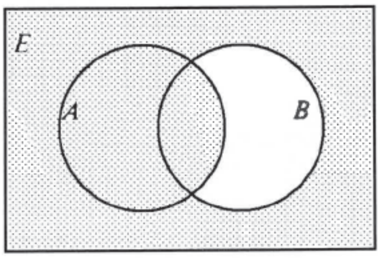
   [SP-CE-MATHS 2-37]

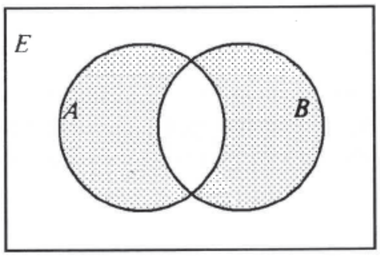
4. In the figures below, A and B are subsets of a set E. Which figure has its shaded part representing $(E - A) \cap (E - B)$?

   A. 

   B. 

   C. 

   D. 

   E. 

   [SP-CE-MATHS 2-38]

Probability

1. Mrs. Wong has 3 sons and 2 daughters. Mrs. Lee has 2 sons and 3 daughters. If a child is chosen at random from each family, what is the probability of choosing 1 boy and 1 girl?

   A. $\frac{5}{9}$
   B. $\frac{13}{25}$
   C. $\frac{36}{625}$
   D. $\frac{24}{25}$
   E. 1

[1972-CE-MATHS B1-11]

2. Two apples and one orange are to be distributed to John, Tom and Mary by drawing lots. What is the probability that John and Tom get the apples?

   A. $\frac{1}{6}$
   B. $\frac{2}{9}$
   C. $\frac{1}{3}$
   D. $\frac{1}{2}$
   E. $\frac{2}{3}$

[1977-CE-MATHS 2-34]

3. There are 21 boys and 9 girls in a class, $\frac{1}{3}$ of the boys and $\frac{1}{3}$ of girls wear glasses. If a student is chosen at random from the class, find the probability that a boy wearing glasses or a girl not wearing glasses is chosen.

   A. $\frac{1}{3}$
   B. $\frac{2}{3}$
   C. $\frac{13}{30}$
   D. $\frac{17}{30}$
   E. $\frac{7}{10}$

[1977-CE-MATHS 2-40]

4. In a throw of two dice, what is the probability of obtaining a total of 11 or 12?

   A. $\frac{1}{6}$
   B. $\frac{1}{9}$
   C. $\frac{1}{12}$
   D. $\frac{1}{18}$
   E. $\frac{1}{36}$

[SP-CE-MATHS 2-52]

5. A bag contains 2 black balls and 2 white balls. 2 balls are taken out at random. The first ball taken out is found to be black. What is the probability that the second is white?

   A. $\frac{1}{2}$
   B. $\frac{1}{3}$
   C. $\frac{2}{3}$
   D. $\frac{1}{4}$
   E. $\frac{3}{4}$

[SP-CE-MATHS 2-53]

6. A group consists of 4 boys and 4 girls. If two children are chosen at random, what is the probability that one boy and one girl are chosen?

   A. $\frac{4}{7}$
   B. $\frac{3}{7}$
   C. $\frac{2}{7}$
   D. $\frac{3}{14}$
   E. $\frac{1}{16}$

[1978-CE-MATHS 2-47]

7. When three fair dice are tossed, what is the probability that three consecutive numbers will turn up?

   A. $\frac{1}{6}$
   B. $\frac{1}{9}$
   C. $\frac{1}{27}$
   D. $\frac{1}{54}$
   E. $\frac{7}{36}$

[1978-CE-MATHS 2-48]

8.

Wong, Y.Y., 234 Nathan Road 3–688

Woo, Ada, 54 Waterloo Road 3–578225

A corner of a page of a telephone directory is torn off so that the last two digits of the telephone number of Mr. Y. Y. Wong are missing. (See figure.) If the last two digits are supplied at random, what is the probability of getting Mr. Wong's telephone number?

A. $\frac{1}{2}$

B. $\frac{1}{10}$

C. $\frac{1}{90}$

D. $\frac{1}{99}$

E. $\frac{1}{100}$

[1979-CE-MATHS 2-28]

9. There are 12 boys and 8 girls in a class. $\frac{1}{4}$ of the boys and $\frac{1}{4}$ of the girls wear glasses. What is the probability that a student chosen at random from the class is a boy not wearing glasses or a girl wearing glasses?

A. $\frac{5}{20}$

B. $\frac{9}{20}$

C. $\frac{11}{20}$

D. $\frac{15}{20}$

E. $\frac{9}{100}$

[1983-CE-MATHS 2-31]

10. The probability that John will win a game is $\frac{1}{3}$ and the probability that he will lose is $\frac{2}{3}$. What is the probability that, in three games, he will win any two games and lose one game?

A. $\frac{4}{27}$

B. $\frac{2}{27}$

C. $\frac{1}{27}$

D. $\frac{2}{9}$

E. $\frac{1}{9}$

[1984-CE-MATHS 2-30]

11. Two dice are thrown. What is the probability of getting a sum of 8?

A. $\frac{1}{12}$

B. $\frac{1}{11}$

C. $\frac{5}{36}$

D. $\frac{1}{6}$

E. $\frac{2}{9}$

[1984-CE-MATHS 2-31]

12. There are four balls, numbered 1, 2, 5 and 10 in a bag. If 2 balls are taken out at random, the probability that the sum of the numbers on the two balls drawn is greater than or equal to 7 is

A. $\frac{1}{2}$.

B. $\frac{5}{8}$.

C. $\frac{2}{3}$.

D. $\frac{3}{4}$.

E. $\frac{5}{6}$.

[1985-CE-MATHS 2-31]

13. Two dice are thrown. The probability of getting at least one '6' is

A. $\frac{1}{6}$.

B. $\frac{1}{3}$.

C. $\frac{11}{36}$.

D. $\frac{25}{36}$.

E. $\frac{35}{36}$.

[1985-CE-MATHS 2-32]

14. In a shooting game, the probabilities for John and Mary to hit a target are $\frac{4}{5}$ and $\frac{3}{5}$ respectively. When both shoot at the target, what is the probability that they both miss?

A. $\frac{2}{25}$

B. $\frac{3}{25}$

C. $\frac{8}{25}$

D. $\frac{12}{25}$

E. $\frac{13}{25}$

[1986-CE-MATHS 2-26]

15. One letter is taken from each of the words "MAN" and "ART" at random. Find the probability that the two letters are **not** the same.

A. $\frac{1}{9}$

B. $\frac{1}{3}$

C. $\frac{4}{9}$

D. $\frac{2}{3}$

E. $\frac{8}{9}$

[1987-CE-MATHS 2-31]

16. Four persons A, B, C, D sit randomly around a round table. The probability that A sits next to B is

A. $\frac{1}{4}$.

B. $\frac{1}{3}$.

C. $\frac{1}{2}$.

D. $\frac{2}{3}$.

E. $\frac{5}{6}$.

[1987-CE-MATHS 2-32]

17. A die is thrown twice. Find the probability that the number obtained at the first throw is greater than that at the second throw.

A. $\frac{1}{6}$

B. $\frac{5}{12}$

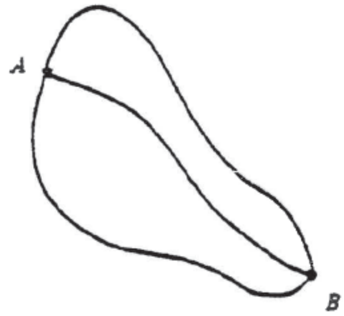
C. $\frac{1}{2}$

D. $\frac{7}{12}$

E. $\frac{5}{6}$

[1987-CE-MATHS 2-33]

18. The figure shows 3 paths joining A and B. A man walks from A to B and another man walks from B to A at the same time. If they choose their paths at random, what is the probability that they will meet?



A. $1-\frac{1}{9}$

B. $\frac{1}{3}$

C. $1-\frac{1}{3}$

D. $\frac{1}{2}\times\frac{1}{3}$

E. $\frac{1}{3}\times\frac{1}{3}$

[1988-CE-MATHS 2-31]

19. A **biased** die is thrown. Suppose the probabilities of getting 1, 2, 3, 4 and 5 are respectively $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ and $\frac{1}{32}$. What is the probability of getting 6?

A. $\frac{1}{64}$

B. $\frac{1}{36}$

C. $\frac{1}{32}$

D. $\frac{1}{12}$

E. $\frac{1}{6}$

[1989-CE-MATHS 2-26]

20. A bag contains 4 red, 3 green and 2 white balls. Three men A, B and C each draw one ball in turn from the bag at random without replacement. If A draw first, B second and C third, what is the probability that the balls drawn by B and C are both white?

A. $\frac{1}{36}$

B. $\frac{1}{28}$

C. $\frac{4}{81}$

D. $\frac{25}{72}$

E. $\frac{11}{28}$

[1989-CE-MATHS 2-27]

21. There are 7 bags, 3 of which are empty and the remaining 4 each contains a ball. An additional ball is now put into one of the bags at random. After that a bag is randomly selected. Find the probability of selecting an empty bag.

A. $\frac{2}{7}$

B. $\frac{3}{7}$

C. $\frac{6}{49}$

D. $\frac{12}{49}$

E. $\frac{18}{49}$

[1990-CE-MATHS 2-26]

22. A fair die is thrown 3 times. The probability that "6" occurs exactly once is

A. $\frac{1}{3}$.

B. $(\frac{1}{6})^3$.

C. $\frac{1}{3} \times \frac{1}{6}$.

D. $(\frac{1}{6})(\frac{5}{6})^2$.

E. $3(\frac{1}{6})(\frac{5}{6})^2$.

[1991-CE-MATHS 2-32]

23. Two cards are drawn randomly from five cards A, B, C, D and E. Find the probability that card A is drawn while C is not.

A. $\frac{3}{25}$

B. $\frac{3}{20}$

C. $\frac{4}{25}$

D. $\frac{6}{25}$

E. $\frac{3}{10}$

[1992-CE-MATHS 2-33]

24. Two fair dice are thrown. What is the probability of getting a total of 5 or 10?

A. $\frac{1}{9}$

B. $\frac{5}{36}$

C. $\frac{1}{6}$

D. $\frac{7}{36}$

E. $\frac{2}{9}$

[1993-CE-MATHS 2-31]

25. A box contains 5 eggs, 2 of which are rotten. If 2 eggs are chosen at random, find the probability that exactly one of them is rotten.

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{3}{10}$

D. $\frac{6}{25}$

E. $\frac{12}{25}$

[1994-CE-MATHS 2-31]

26. In a shooting game, the probability that A will hit a target is $\frac{3}{5}$ and the probability that B will hit it is $\frac{2}{3}$. If each fires once, what is the probability that they will both miss the target?

A. $\frac{1}{3}$

B. $\frac{1}{4}$

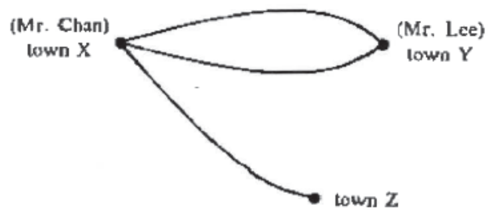
C. $\frac{2}{5}$

D. $\frac{2}{15}$

E. $\frac{11}{15}$

[1995-CE-MATHS 2-31]

27. The figure shows that Mr. Chan has 3 ways to leave town X and Mr. Lee has 2 ways to leave town Y. Mr. Chan and Mr. Lee leave town X and town Y respectively at the same time. If they select their ways randomly, find the probability that they will meet on their way.



A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. $\frac{1}{6}$

E. $\frac{5}{6}$

[1995-CE-MATHS 2-32]

28. There are 10 parcels. Two of them contain one pen each. If a man opens the parcels at random, what is the probability that he can find the two pens by opening two parcels only?

A. $\frac{1}{25}$
B. $\frac{1}{45}$
C. $\frac{1}{50}$
D. $\frac{1}{90}$
E. $\frac{1}{100}$

[1996-CE-MATHS 2-34]

29. In a certain game, the probability that John will win is 0.3. If he plays the game 3 times, find the probability that he will win at least once.

A. 0.147
B. 0.441
C. 0.657
D. 0.9
E. 0.973

[1996-CE-MATHS 2-35]

30. Two fair dice are thrown. Find the probability that the sum of the two numbers shown is 8.

A. $\frac{1}{4}$
B. $\frac{1}{6}$
C. $\frac{1}{11}$
D. $\frac{1}{12}$
E. $\frac{5}{36}$

[1997-CE-MATHS 2-25]

31. In a test, there are 3 questions. For each question, the probability that John correctly answers it is $\frac{2}{5}$. Find the probability that he gets exactly 2 questions correct.

A. $\frac{2}{3}$
B. $\frac{4}{25}$
C. $\frac{12}{25}$
D. $\frac{12}{125}$
E. $\frac{36}{125}$

[1997-CE-MATHS 2-26]

32. Two cards are drawn randomly from five cards numbered 2, 2, 3, 5 and 5 respectively. Find the probability that the sum of the numbers on the cards drawn is 5.

A. $\frac{1}{5}$
B. $\frac{2}{5}$
C. $\frac{1}{10}$
D. $\frac{2}{25}$
E. $\frac{4}{25}$

[1998-CE-MATHS 2-35]

33. In a shooting game, the probability that Mr. Tung will hit the target is $\frac{2}{3}$. If he shoots twice, find the probability that he will hit the target at least once.

A. $\frac{1}{9}$
B. $\frac{2}{9}$
C. $\frac{4}{9}$
D. $\frac{2}{3}$
E. $\frac{8}{9}$

[1998-CE-MATHS 2-36]

34. Two cards are drawn randomly from four cards numbered 1, 2, 3 and 4 respectively. Find the probability that the sum of the numbers drawn is odd.

A. $\frac{1}{6}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{1}{2}$
E. $\frac{2}{3}$

[1999-CE-MATHS 2-35]

35. Tom and Mary each throws a dart. The probability of Tom's dart hitting the target is $\frac{1}{3}$ while that of Mary's is $\frac{2}{5}$. Find the probability of only one dart hitting the target.

A. $\frac{2}{15}$

B. $\frac{3}{15}$

C. $\frac{7}{15}$

D. $\frac{11}{15}$

E. $\frac{13}{15}$

[1999-CE-MATHS 2-36]

36. Two fair dice are thrown. Find the probability that at least one "6" occurs.

A. $\frac{1}{3}$

B. $\frac{1}{6}$

C. $\frac{5}{18}$

D. $\frac{7}{36}$

E. $\frac{11}{36}$

[2000-CE-MATHS 2-21]

37. A bag contains six balls which are marked with the numbers −3, −2, −1, 1, 2 and 3 respectively. Two balls are drawn randomly from the bag. Find the probability that the sum of the numbers drawn is zero.

A. $\frac{1}{30}$

B. $\frac{1}{10}$

C. $\frac{1}{5}$

D. $\frac{1}{3}$

E. $\frac{1}{2}$

[2000-CE-MATHS 2-22]

38. Two cards are drawn randomly from five cards numbered 1, 2, 3, 4 and 4 respectively. Find the probability that the sum of the two numbers drawn is even.

A. $\frac{1}{2}$

B. $\frac{2}{5}$

C. $\frac{3}{10}$

D. $\frac{7}{10}$

E. $\frac{13}{25}$

[2001-CE-MATHS 2-35]

39. A bag contains 2 black balls and 3 white balls. A boy randomly draws balls from the bag one at a time (without replacement) until a white ball appears. Find the probability that he will make at least 2 draws.

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{1}{10}$

D. $\frac{3}{10}$

E. $\frac{7}{10}$

[2001-CE-MATHS 2-36]

40. Two numbers are drawn randomly from five cards numbered 3, 4, 5, 6 and 7 respectively. Find the probability that the product of the numbers drawn is even.

A. $\frac{3}{5}$

B. $\frac{1}{10}$

C. $\frac{7}{10}$

D. $\frac{16}{25}$

[2002-CE-MATHS 2-35]

41. In a test, there are two questions. The probability that Mary answers the first question correctly is 0.3 and the probability that Mary answers the second question correctly is 0.4. The probability that she answers at least one question correctly is

A. 0.42 .
B. 0.46 .
C. 0.58 .
D. 0.88 .

[2002-CE-MATHS 2-36]

42. A bag contains 2 black balls, 2 green balls and 2 yellow balls. Peter repeats drawing one ball at a time randomly from the bag without replacement until a green ball is drawn. Find the probability that he needs at most 4 draws.

A. $\frac{1}{15}$

B. $\frac{2}{15}$

C. $\frac{14}{15}$

D. $\frac{65}{81}$

[2003-CE-MATHS 2-34]

43. 1232★ is a 5-digit number, where ★ is an integer from 0 to 9 inclusive. The probability that the 5-digit number is divisible by 4 is

A. $\frac{1}{3}$.
B. $\frac{1}{4}$.
C. $\frac{1}{5}$.
D. $\frac{3}{10}$.

[2003-CE-MATHS 2-35]

44. A bag contains 3 red balls and 4 green balls. If two balls are drawn randomly from the bag one by one without replacement, then the probability that the two balls are of different colours is

A. $\frac{2}{7}$.
B. $\frac{4}{7}$.
C. $\frac{12}{49}$.
D. $\frac{24}{49}$.

[2004-CE-MATHS 2-33]

45. Peter and May each throws a dart. The probability of Peter's hitting the target is 0.2. The probability of May's hitting the target is 0.3. Find the probability of at least one dart hitting the target.

A. 0.38
B. 0.44
C. 0.5
D. 0.56

[2004-CE-MATHS 2-34]

46. Bag X contains 1 white ball and 3 red balls while bag Y contains 3 yellow balls and 6 red balls. A ball is randomly drawn from bag X and put into bag Y. If a ball is now randomly drawn from bag Y, then the probability that the ball drawn is red is

A. $\frac{1}{2}$.
B. $\frac{2}{3}$.
C. $\frac{21}{40}$.
D. $\frac{27}{40}$.

[2005-CE-MATHS 2-35]

47. If a fair die is thrown three times, then the probability that the three numbers thrown are all different is

A. $\frac{5}{9}$.
B. $\frac{17}{18}$.
C. $\frac{125}{216}$.
D. $\frac{215}{216}$.

[2005-CE-MATHS 2-36]

48. Which of the following could be the probability of an event?

A. $\frac{\pi}{3}$
B. $\frac{2005}{2006}$
C. –0.2006
D. 1.2006

[2006-CE-MATHS 2-32]

49. Two fair dice are thrown. Find the probability that the sum of the two numbers thrown is a prime number.

A. $\frac{1}{2}$
B. $\frac{5}{11}$
C. $\frac{5}{12}$
D. $\frac{7}{18}$

[2006-CE-MATHS 2-33]

50. One letter is chosen randomly from each of the two words 'FORTY' and 'FIFTY'. Find the probability that the two letters chosen are the same.

A. 0.08
B. 0.16
C. 0.32
D. 0.48

[2006-CE-MATHS 2-52]

51. There are two questions in a test. The probability that David answers the first question correctly is $\frac{1}{4}$ and the probability that David answers the second question correctly is $\frac{1}{3}$. Given that David answers at least one question correctly in the test, find the probability that he answers the second question correctly.

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

[2006-CE-MATHS 2-53]

52. Two numbers are randomly drawn at the same time from five cards numbered 1, 2, 3, 4 and 5 respectively. Find the probability that the sum of the numbers drawn is a multiple of 3.

A. $\frac{2}{5}$

B. $\frac{3}{10}$

C. $\frac{9}{20}$

D. $\frac{9}{25}$

[2007-CE-MATHS 2-33]

53. A bag contains 8 black balls and 5 white balls. If two balls are drawn randomly from the bag one by one without replacement, then the probability that the two balls are of the same colour is

A. $\frac{14}{39}$.

B. $\frac{19}{39}$.

C. $\frac{89}{156}$.

D. $\frac{89}{169}$.

[2007-CE-MATHS 2-53]

54. One letter is chosen randomly from each of the two words 'CUBE' and 'CONE'. Find the probability that the two letters chosen are different.

A. $\frac{1}{4}$

B. $\frac{3}{4}$

C. $\frac{1}{8}$

D. $\frac{7}{8}$

[2007-CE-MATHS 2-54]

55. 4★ is a 2-digit number, where ★ is an integer from 0 to 9 inclusive. Find the probability that the 2-digit number is a prime number.

A. 0.2
B. 0.3
C. 0.4
D. 0.5

[2008-CE-MATHS 2-33]

56. Peter has one \$1 coin, one \$2 coin and one \$5 coin in his pocket. If Peter takes out two coins randomly from his pocket, then the probability that he will get enough money to buy a pen of price \$3.5 is

A. $\frac{1}{2}$.

B. $\frac{1}{3}$.

C. $\frac{2}{3}$.

D. $\frac{1}{6}$.

[2009-CE-MATHS 2-34]

57. A bag contains n white balls and 12 red balls. If a ball is randomly drawn from the bag, then the probability of drawing a red ball is $\frac{1}{4}$. Find the value of n.

A. 3
B. 4
C. 36
D. 48

[2010-CE-MATHS 2-33]

58. In a school, 55% of the students are boys. It is given that 60% of the boys and 30% of the girls live in Kowloon. Find the probability that a randomly selected student from the school is a girl who lives in Kowloon.

A. 0.135
B. 0.165
C. 0.27
D. 0.33

[2010-CE-MATHS 2-53]

59. Two fair dice are thrown. Find the probability that the sum of the two numbers thrown is not less than 10.

A. $\frac{1}{6}$

B. $\frac{5}{6}$

C. $\frac{1}{12}$

D. $\frac{11}{12}$

[2011-CE-MATHS 2-33]

60. A box contains 2 red cards, 3 blue cards and 4 yellow cards. Mary repeats drawing one card at a time randomly from the box with replacement until a red card is drawn. Find the probability that Mary needs at least three draws.

A. $\frac{5}{12}$

B. $\frac{7}{12}$

C. $\frac{49}{81}$

D. $\frac{343}{729}$

[2011-CE-MATHS 2-52]

HKDSE Problems

61. Bag A contains 2 red balls, 3 green balls and 4 white balls while bag B contains 2 red balls, 3 green balls and 4 yellow balls. If one ball is drawn randomly from each bag, then the probability that the two balls drawn are of different colours is

A. $\frac{13}{81}$.

B. $\frac{29}{81}$.

C. $\frac{52}{81}$.

D. $\frac{68}{81}$.

[SP-DSE-MATHS 2-43]

62. If 2 girls and 5 boys randomly form a queue, find the probability that the two girls are next to each other in the queue.

A. $\frac{1}{7}$

B. $\frac{2}{7}$

C. $\frac{6}{7}$

D. $\frac{1}{21}$

[SP-DSE-MATHS 2-44]

63. Two numbers are randomly drawn at the same time from four cards numbered 2, 3, 5 and 7 respectively. Find the probability that the sum of the numbers drawn is a multiple of 4.

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{6}$

D. $\frac{5}{16}$

[PP-DSE-MATHS 2-28]

64. Mary, Tom and 8 other students participate in a solo singing contest. If each participant performs once only and the order of performance is randomly arranged, find the probability that Mary performs just after Tom.

A. $\frac{1}{2}$

B. $\frac{1}{10}$

C. $\frac{1}{45}$

D. $\frac{1}{90}$

[PP-DSE-MATHS 2-43]

65. 9★◆ is a 3-digit number, where ★ and ◆ are integers from 0 to 9 inclusive. Find the probability that the 3-digit number is divisible by 5.

A. $\frac{1}{5}$

B. $\frac{7}{33}$

C. $\frac{20}{99}$

D. $\frac{19}{100}$

[2012-DSE-MATHS 2-27]

66. A box contains six balls numbered 7, 8, 8, 9, 9 and 9 respectively. John repeats drawing one ball at a time randomly from the box without replacement until the number drawn is 9. Find the probability that he needs exactly three draws.

A. $\frac{1}{2}$

B. $\frac{1}{6}$

C. $\frac{1}{8}$

D. $\frac{3}{20}$

[2012-DSE-MATHS 2-44]

67. Two numbers are randomly drawn at the same time from seven cards numbered 1, 2, 3, 4, 5, 6 and 7 respectively. Find the probability that the product of the numbers drawn is an odd number.

A. $\frac{2}{7}$

B. $\frac{4}{7}$

C. $\frac{12}{49}$

D. $\frac{16}{49}$

[2013-DSE-MATHS 2-26]

68. A box contains m yellow balls and 20 black balls. If a ball is randomly drawn from the box, then the probability of drawing a yellow ball is $\frac{1}{m}$. Find the value of m.

A. 4
B. 5
C. 15
D. 25

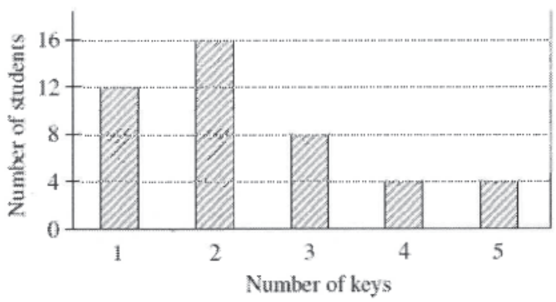
[2014-DSE-MATHS 2-27]

69. Two fair dice are thrown in a game. If the sum of the two numbers thrown is 7, \$36 will be gained; otherwise, \$6 will be gained. Find the expected gain of the game.

A. \$11
B. \$12
C. \$30
D. \$31

[2015-DSE-MATHS 2-27]

70. The bar chart below shows the distribution of the numbers of keys owned by the students in a class. Find the probability that a randomly selected student from the class owns 3 keys.



A. $\frac{1}{5}$

B. $\frac{2}{11}$

C. $\frac{4}{11}$

D. $\frac{9}{11}$

[2015-DSE-MATHS 2-28]

71. Bag P contains 2 red balls and 4 green balls while bag Q contains 1 red ball and 3 green balls. If a bag is randomly chosen and then a ball is randomly drawn from the bag, find the probability that a green ball is drawn.

A. $\frac{3}{10}$

B. $\frac{7}{10}$

C. $\frac{7}{24}$

D. $\frac{17}{24}$

[2015-DSE-MATHS 2-44]

72. Christine has one \$1 coin, one \$ 2 coin, one \$5 coin and one \$10 coin in her pocket. If Christine takes out three coins randomly from her pocket, find the probability that she gets at least \$13.

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{23}{24}$

[2016-DSE-MATHS 2-28]

73. A bag contains 1 red ball, 3 yellow balls and 6 white balls. In a lucky draw, a ball is randomly drawn from the bag and a certain number of tokens will be got according to the following table:

Colour of the ball drawn	Red	Yellow	White
Number of tokens got	90	20	10

Find the expected number of tokens got in the lucky draw.

A. 10
B. 21
C. 40
D. 61

[2016-DSE-MATHS 2-29]

74. There are 9 cans of coffee and 3 cans of tea in a box. If 4 cans are randomly chosen from the box, find the probability that at least 2 cans of tea are chosen.

A. $\frac{13}{55}$
B. $\frac{21}{55}$
C. $\frac{34}{55}$
D. $\frac{42}{55}$

[2016-DSE-MATHS 2-42]

75. The bar chart below shows the distribution of the numbers of tokens got by a group of children in a game. If a child is randomly selected from the group, find the probability that the selected child gets fewer than 5 tokens in the game.

A. $\frac{2}{3}$
B. $\frac{2}{5}$
C. $\frac{5}{12}$
D. $\frac{7}{25}$

[2017-DSE-MATHS 2-28]

76. When Teresa throws a dart, the probability that she hits the target is 0.7. If Teresa throws the dart 4 times, find the probability that she hits the target at most 3 times.

A. 0.0081
B. 0.2401
C. 0.7599
D. 0.9919

[2017-DSE-MATHS 2-43]

77. Two numbers are randomly drawn at the same time from seven cards numbered 1, 1, 1, 2, 2, 3 and 4 respectively. Find the probability that the sum of the numbers drawn is 5.

A. $\frac{5}{21}$
B. $\frac{5}{42}$
C. $\frac{5}{49}$
D. $\frac{10}{49}$

[2018-DSE-MATHS 2-28]

78. John and Mary take turns to throw a fair die until one of them gets a number '1' or '6'. John throws the die first. Find the probability that John gets a number '6'.

A. $\frac{1}{2}$
B. $\frac{1}{6}$
C. $\frac{3}{10}$
D. $\frac{7}{10}$

[2018-DSE-MATHS 2-43]

79. Two numbers are randomly drawn at the same time from nine balls numbered 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively. Find the probability that the two numbers drawn are consecutive integers.

A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. $\frac{2}{9}$
D. $\frac{7}{9}$

[2019-DSE-MATHS 2-28]

80. There are 2 green cups, 8 blue cups and 9 red cups in a bag. If 6 cups are randomly drawn from the bag at the same time, find the probability that at least 1 blue cup is drawn

A. $\frac{31}{57}$
B. $\frac{44}{323}$
C. $\frac{635}{646}$
D. $\frac{968}{969}$

[2019-DSE-MATHS 2-42]

81. There are three questions in a mathematics competition. The probabilities that Susan answers the first question correctly, the second question correctly and the third question correctly are $\frac{1}{3}$, $\frac{1}{5}$ and $\frac{1}{7}$ respectively. The probability that Susan answers at most 2 questions correctly in the competition is

A. $\frac{1}{105}$

B. $\frac{13}{105}$

C. $\frac{92}{105}$

D. $\frac{104}{105}$

[2019-DSE-MATHS 2-43]

82. Two numbers are randomly drawn at the same time from four cards numbered 3, 5, 7 and 9 respectively. Find the probability that the product of the numbers drawn is greater than 35.

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. $\frac{3}{8}$

[2020-DSE-MATHS 2-28]

83. There are 8 Chinese books and 7 English books in a box. If 5 books are randomly chosen from the box at the same time, find the probability that at most 3 Chinese books are chosen.

A. $\frac{2}{11}$

B. $\frac{9}{11}$

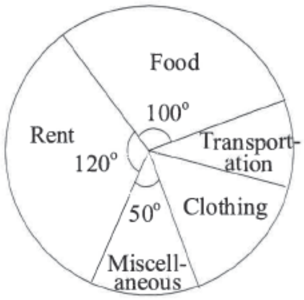
C. $\frac{61}{143}$

D. $\frac{82}{143}$

[2020-DSE-MATHS 2-43]

Pie Charts

1. The pie chart below shows how Mr. Chan spent \$1,800 in April.



If he spent $\$x$ on transportation and $\$2x$ on clothing, what is the value of x?

A. 450
B. 300
C. 150
D. 60
E. 30

[1977-CE-MATHS 2-38]

2. The following table shows how Joan spends her time in a day:

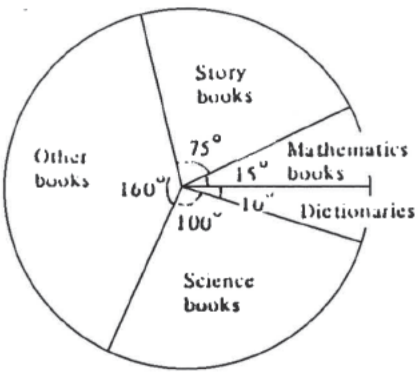
sleep	9 hours
study	6 hours
recreation	5 hours
household work	1 hour
other activities	3 hours

If these data are shown in a pie chart, what is the size of the angle of the sector for recreation?

A. $\frac{5}{24}^{\circ}$
B. 5°
C. 50°
D. 75°
E. 90°

[SP-CE-MATHS 2-54]

3.

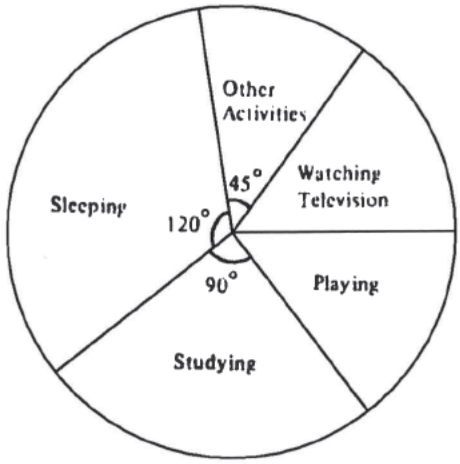


In a school library, there are 2880 books. The pie chart above shows their distribution by type. How many story books are there approximately in the library?

A. 75
B. 300
C. 600
D. 1200
E. 2160

[1979-CE-MATHS 2-3]

4.



The pie chart shows how a boy spends the 24 hours of a day. If the boy spends 4 hours playing, how much time does he spend watching television?

A. 1 hour
B. 2 hours
C. 3 hours
D. 4 hours
E. 5 hours

[1983-CE-MATHS 2-30]

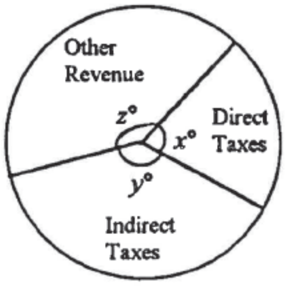
5. In the figure, the pie chart shows the monthly expenditure of a family. If the family spends \$4800 monthly on rent, what is the monthly expenditure on entertainment?

Monthly Expenditure of a Family

A. \$240
B. \$600
C. \$720
D. \$1 800
E. \$12 000

[1994-CE-MATHS 2-30]

6. In the pie chart, if $x : y : z = 75 : 106 : 119$, find x.



Total Government Revenue by Sources in a certain year

A. 25
B. 45
C. 75
D. 90
E. 120

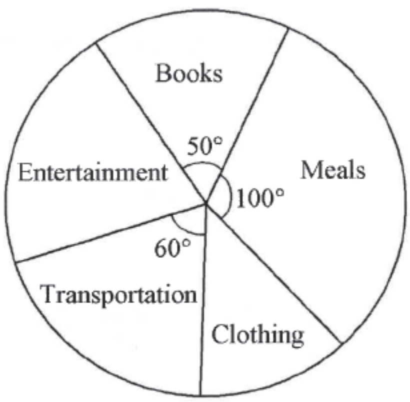
[1997-CE-MATHS 2-23]

7. The pie chart below shows the expenditure of a family in January 2002. The percentage of the expenditure on Rent was

A. 12.5% .
B. 22.5% .
C. 25% .
D. 45% .

[2002-CE-MATHS 2-33]

8. The pie chart below shows the expenditure of a student in March 2004. If the student spent \$520 on meals, then the student's total expenditure on entertainment and clothing was

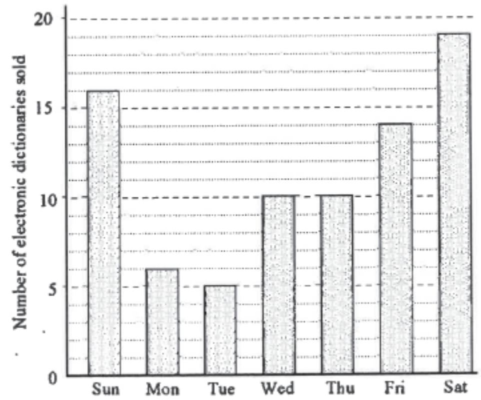


A. \$780 .
B. \$1 092 .
C. \$1 352 .
D. \$1 872 .

[2004-CE-MATHS 2-35]

Bar Charts

9. The bar chart below shows the number of electronic dictionaries sold in a shop last week:

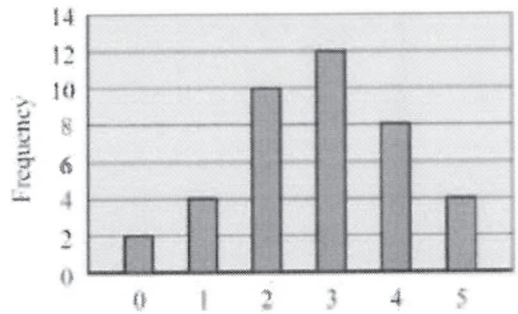


Of those electronic dictionaries sold last week, what percentage were sold on Sunday?

A. 16%
B. 18%
C. 20%
D. 22.5%
E. 25%

[1996-CE-MATHS 2-32]

10. The bar chart below shows the distribution of scores in a test. Find the percentage of scores which are less than 3.

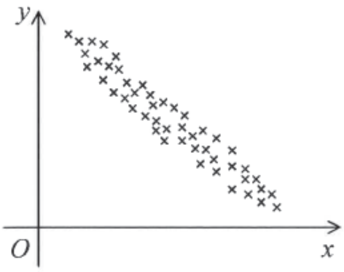


A. 35%
B. 40%
C. 50%
D. 65%
E. 70%

[2001-CE-MATHS 2-5]

Scatter Diagrams

11. The scatter diagram below shows the relation between x and y. Which of the following may represent the relation between x and y?

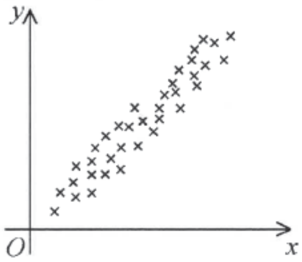


A. y varies directly as x^2.
B. y decreases when x increases.
C. x increases when y increases.
D. x remains unchanged when y increases.

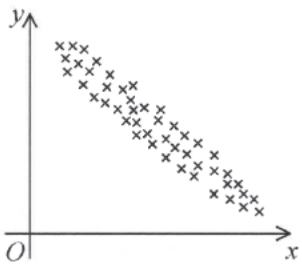
[2006-CE-MATHS 2-36]

12. If y increases when x increases, which of the following scatter diagrams may represent the relation between x and y?

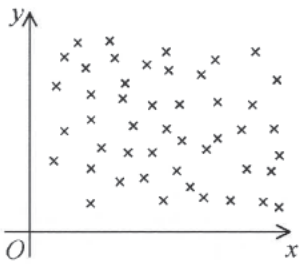
A.



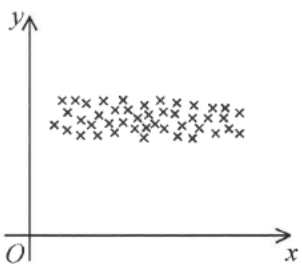
B.



C.



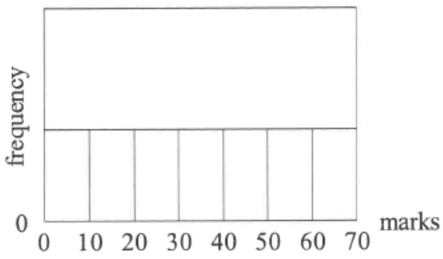
D.



[2008-CE-MATHS 2-36]

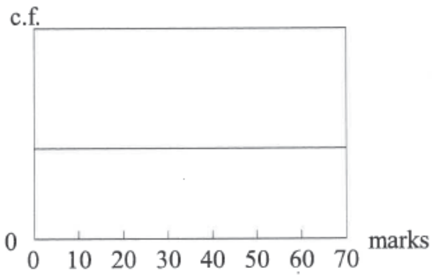
Frequency Curves

13.

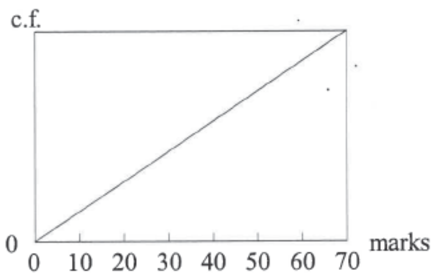


The figure above is the histogram of a distribution. Which of the following could be cumulative frequency curve of this distribution?

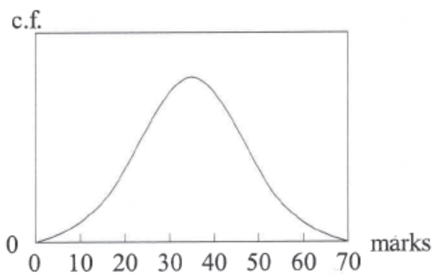
A.



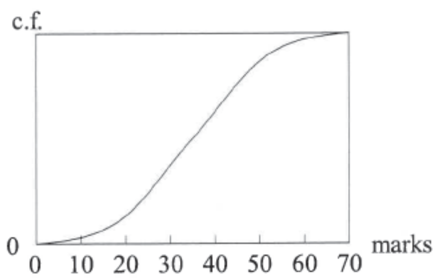
B.



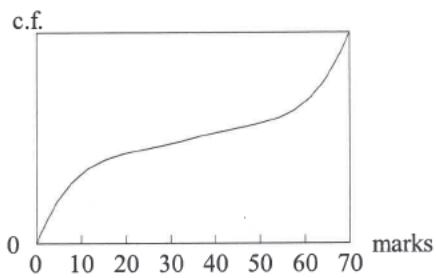
C.



D.

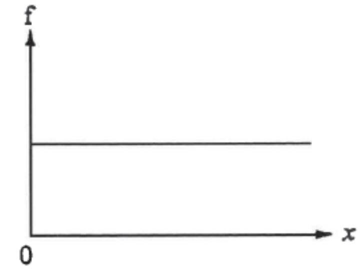


E.

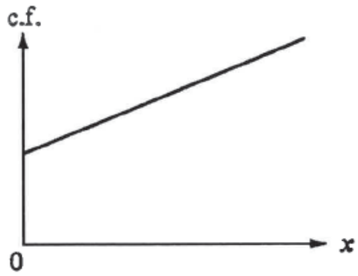


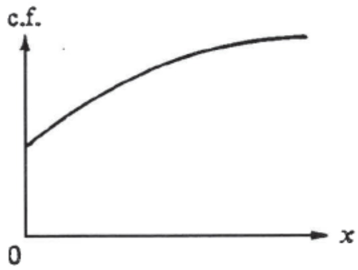
[1978-CE-MATHS 2-50]

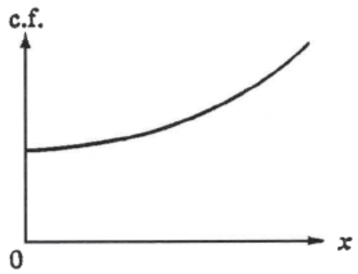
14. The figure shows the frequency curve of a certain distribution.

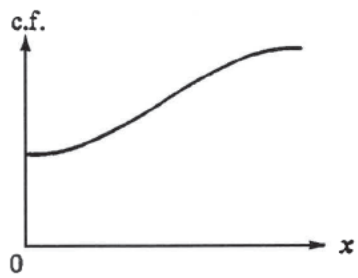


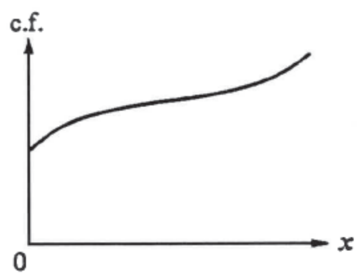
Which of the following can be the distribution's cumulative frequency curve?

A.


B.


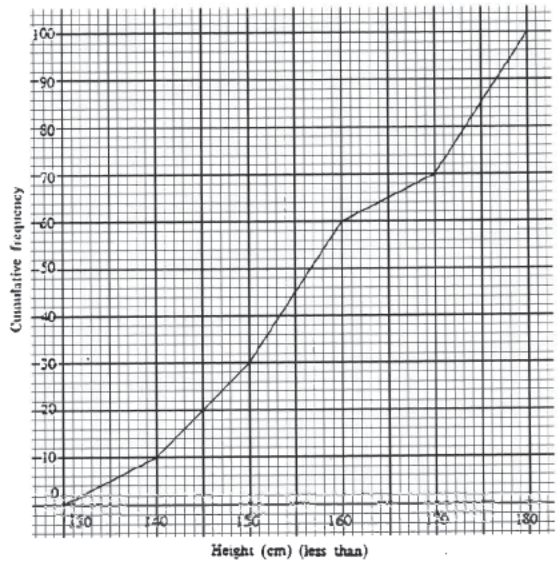
C.


D.


E.


[1986-CE-MATHS 2-28]

15. The figure shows the cumulative frequency polygon of the heights of 100 persons. If one persons is selected at random from the group, find the probability that his height is less than 170 cm but not less than 150 cm.



A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{3}{5}$

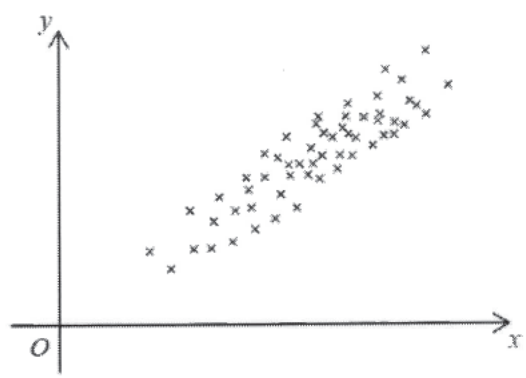
D. $\frac{1}{2}$

E. $\frac{7}{10}$

[1988-CE-MATHS 2-32]

HKDSE Problems

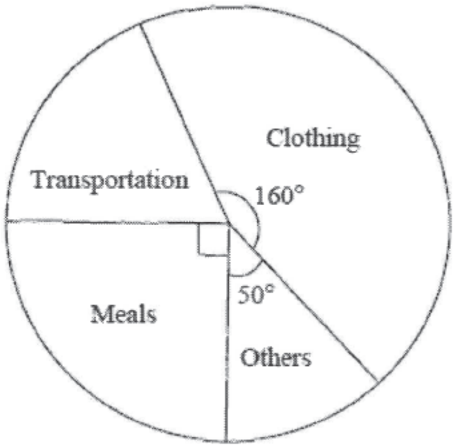
16. The scatter diagram below shows the relation between x and y. Which of the following may represent the relation between x and y?



A. y increases when x increases.
B. y decreases when x increases.
C. y varies inversely as x^2.
D. y varies directly as x^{-3}.

[2013-DSE-MATHS 2-28]

17. The pie chart below shows the expenditure of John in a certain week. John spends \$240 on clothing that week. Find his expenditure on transportation that week.



A. \$40
B. \$60
C. \$90
D. \$135

[2014-DSE-MATHS 2-29]

Measures of Central Tendency

1. A manufacturer produced 900 transistors in the first week, x in the second week, $3x$ in the third week and 600 in the fourth week. If the mean for the four weeks was 825 transistors, then x is

A. 206.
B. 375.
C. 450.
D. 750.
E. 825.

[1972-CE-MATHS B1-5]

2. The average of x, y is a; that of y, z is b; and that of z, x is c. The average of x, y, z is

A. $\frac{a+b+c}{6}$.
B. $\frac{a+b+c}{3}$.
C. $\frac{a+b+c}{2}$.
D. $\frac{2(a+b+c)}{3}$.
E. $\frac{3(a+b+c)}{2}$.

[1977-CE-MATHS 2-11]

3. If the average of x, y and z is 4, the average of $x-1$, $y-5$ and $z+3$ is

A. -1.
B. 1.
C. 3.
D. 5.
E. 9.

[SP-CE-MATHS 2-7]

4. The following are the weights in kg of 9 boys:

38	22	40
36	26	30
36	20	40

What is the median of the distribution?

A. 26
B. 30
C. 35
D. 36
E. 38

[SP-CE-MATHS 2-51]

5. A class consists of 9 children. The following are their scores in a test:

80 70 80 50 30 55 65 70 40

What is the median of the distribution of scores?

A. 50
B. 55
C. 60
D. 65
E. 70

[1978-CE-MATHS 2-46]

6. The average of x and y is a, the average of y and z is b, and the average of x and z is c. What is the average of x, y and z?

A. $\frac{1}{6}(a+b+c)$
B. $\frac{1}{3}(a+b+c)$
C. $\frac{1}{2}(a+b+c)$
D. $\frac{2}{3}(a+b+c)$
E. $\frac{3}{2}(a+b+c)$

[1982-CE-MATHS 2-38]

7.

Class mid-value	Frequency
$m-8$	3
$m-4$	1
m	2
$m+4$	6

The mean of the above distribution is

A. $m-\frac{1}{3}$.
B. $m-\frac{1}{2}$.
C. $m-2$.
D. $m-4$.
E. m.

[1985-CE-MATHS 2-30]

8. If the median of the 5 **different** integers 2, 7, 10, x, $2x-3$ is 7, then $x =$

A. 3.
B. 4.
C. 5.
D. 6.
E. 8.

[1987-CE-MATHS 2-29]

9. The maximum load a lift can carry is 600 kg. 11 men with a mean weight of 49 kg are already in the lift. If one more man is to enter the lift, his weight must not exceed

A. 49 kg.
B. 50 kg.
C. 51 kg.
D. 59 kg.
E. 61 kg.

[1988-CE-MATHS 2-29]

10. The mean length of 30 rods is 80 cm. If one of these rods of length 68 cm is taken out and replaced by another rod of length 89 cm, then the new mean length is

A. 79.3 cm.
B. 79.7 cm.
C. 80 cm.
D. 80.3 cm.
E. 80.7 cm.

[1988-CE-MATHS 2-30]

11. Ten years ago, the mean age of a band of 11 musicians was 30. One of them is now leaving the band at the age of 40. What is the present mean age of the remaining 10 musicians?

A. 40
B. 39
C. 37
D. 30
E. 29

[1990-CE-MATHS 2-25]

12. The table shows the mean marks of two classes of students in a mathematics test.

	Number of students	Mean mark
Class A	38	72
Class B	42	54

A student in Class A has scored 91 marks. It is found that his score was wrongly recorded as 19 in the calculation of the mean mark for Class A in the above table. Find the correct mean mark of the 80 students in the two classes.

A. 61.65
B. 62.55
C. 63
D. 63.45
E. 63.9

[1992-CE-MATHS 2-32]

13. Under which of the following condition **must** the mean of n consecutive positive integers also be an integer?

A. n is any positive integer
B. n is any positive odd integer
C. n is any positive even integer
D. n is any multiple of 3
E. n is the square of any positive integer

[1992-CE-MATHS 2-39]

14. A group of n numbers has mean m. If the numbers 1, 2 and 6 are removed from the group, the mean of the remaining $n-3$ numbers remains unchanged. Find m.

A. 1
B. 2
C. 3
D. 6
E. $n-3$

[1993-CE-MATHS 2-32]

15. The mean of a set of 9 numbers is 12. If the mean of the first 5 numbers is 8, the mean of the other four numbers is

A. 4.
B. 10.
C. 16.
D. 17.
E. 25.

[1995-CE-MATHS 2-33]

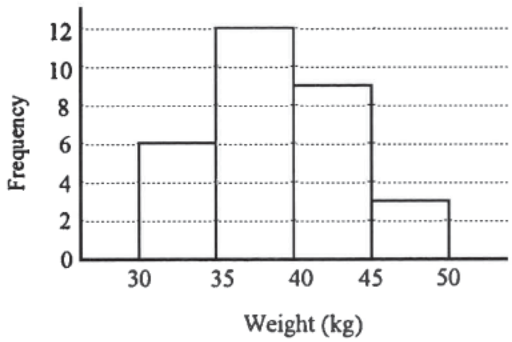
16. Which of the following **cannot** be read directly from a cumulative frequency curve?

(1) Mean
(2) Median
(3) Mode

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (2) and (3) only

[1996-CE-MATHS 2-33]

17. The histogram below shows the distribution of the weights of 30 students. Find the mean weight of these students.



A. 36.5 kg
B. 38.5 kg
C. 39 kg
D. 39.5 kg
E. 41.5 kg

[1997-CE-MATHS 2-24]

18. Find the median and mode of the ten numbers

6, 8, 3, 3, 5, 5, 5, 7, 7, 11.

A. median = 5, mode = 5
B. median = 5, mode = 5.5
C. median = 5.5, mode = 5
D. median = 5.5, mode = 6
E. median = 6, mode = 5

[1999-CE-MATHS 2-33]

19. If the mean of the ten numbers 8, 6, 6, 6, 7, 4, 10, 9, 9, x is 7, find the median of the ten numbers.

A. 5.5
B. 6
C. 6.5
D. 7
E. 7.5

[2001-CE-MATHS 2-21]

20. For the five numbers x, $x-1$, $x-2$, x, $x+8$, which of the following must be true?

(1) The median is $x-2$.
(2) The mean is $x+1$.
(3) The mode is 2.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2002-CE-MATHS 2-34]

21. The median of the five numbers 15, $x-1$, $x-3$, $x-4$, and $x+17$ is 8. Find the mean of the five numbers.

A. 8
B. 12
C. 13.6
D. 14.4

[2003-CE-MATHS 2-33]

22. The mean weight of 36 boys and 32 girls is 46 kg. If the mean weight of the boys is 52 kg, then the mean weight of the girls is

A. 39.25 kg.
B. 40 kg.
C. 40.67 kg.
D. 49 kg.

[2004-CE-MATHS 2-32]

23. If the mean of the five numbers 15, $x+4$, $x+1$, $2x-7$ and $x-3$ is 6, then the mode of the five numbers is

A. 1.
B. 4.
C. 5.
D. 15.

[2005-CE-MATHS 2-34]

24. If the mode of the seven numbers 8, 7, 1, 3, 7, a and b is 8, then the median of the seven numbers is

A. 3.
B. 6.
C. 7.
D. 8.

[2007-CE-MATHS 2-34]

25. The mean height of 54 boys and 36 girls is 162 cm. If the mean height of the girls is 153 cm, then the mean height of the boys is

A. 147 cm.
B. 157.5 cm.
C. 168 cm.
D. 175.5 cm.

[2009-CE-MATHS 2-35]

26. The weight of seven boys are 70 kg, 55 kg, 53 kg, 56 kg, 64 kg, 54 kg and x kg. If the mean weight of the boys is 58 kg, then the median of their weight is

A. 54 kg.
B. 55 kg.
C. 56 kg.
D. 57 kg.

[2011-CE-MATHS 2-34]

HKDSE Problems

27. Consider the following data:

19 10 12 12 13 13 14 15 16 m n

If both the mean and the median of the above data are 14, which of the following are true?

(1) $m \geq 14$
(2) $n \leq 16$
(3) $m + n = 30$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-30]

28. If the mean and the mode of the nine numbers 14, 6, 4, 5, 7, 5, x, y and z are 8 and 14 respectively, then the median of these nine numbers is

A. 5 .
B. 6 .
C. 7 .
D. 8 .

[2013-DSE-MATHS 2-27]

29. Consider the following integers:

2 2 3 3 3 3 3 5 5 6 8 8 9 10 m

Let p, q and r be the mean, the median and the mode of the above integers respectively. If $3 \leq m \leq 5$, which of the following must be true?

(1) $p > q$
(2) $p > r$
(3) $q > r$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2015-DSE-MATHS 2-30]

30. Consider the following data:

32 68 79 86 88 98 98 a b c

If the mean and the mode of the above data are 77 and 68 respectively, then the median of the above data is

A. 76 .
B. 82 .
C. 85 .
D. 93 .

[2016-DSE-MATHS 2-30]

31. The mean of the numbers of pages of 10 magazines is 132. If the mean of the number of pages of 6 of these 10 magazines is 108, then the mean of the numbers of pages of the remaining 4 magazines is

A. 148
B. 156
C. 168
D. 176

[2018-DSE-MATHS 2-29]

32. The table below shows the distribution of the numbers of merits obtained by some students in a year. Which of the following is true?

Number of merits obtained	6	7	8	9	10
Number of students	32	36	28	18	2

A. The mode of the distribution is 36.
B. The median of the distribution is 8.
C. The lower quartile of the distribution is 6.
D. The upper quartile of the distribution is 10.

[2020-DSE-MATHS 2-30]

33. Consider the following integers:

3, 3, 8, 8, 8, 10, 12, m, n

Let x, y and z be the median, the mean and the mode of the above integers respectively. If the range of the above integers is 9, which of the following must be true?

I. $x = 8$
II. $y = 8$
III. $z = 8$

A. I only
B. II only
C. I and III only
D. II and III only

[2020-DSE-MATHS 2-30]

Measures of Dispersion

1. The standard deviation of the five numbers $a-2d,\ a-d,\ a,\ a+d,\ a+2d,$ is

   A. 0 .
   B. d .
   C. $\sqrt{2}d$.
   D. $\sqrt{5}d$.
   E. $\sqrt{10}d$.

   [1984-CE-MATHS 2-32]

2. Referring to the data 1, 1, 1, 1, 1, 2, 2, 2, 3, which of the following is/are true?

   (1) median < mean
   (2) range = 3
   (3) mode = 3

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1989-CE-MATHS 2-25]

3. If the mean of the numbers 3, 3, 3, 3, 4, 4, 5, 5, 6, x is also x, which of the following is/are true?

   (1) Mean = Median
   (2) Mode = Range
   (3) Median = Mode

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. None of them
   E. All of them

   [1990-CE-MATHS 2-24]

4. The standard deviation of the four numbers $m-7,\ m-1,\ m+1$ and $m+7$ is

   A. 2.5 .
   B. 4 .
   C. 5 .
   D. 10 .

   [2002-CE-MATHS 2-54]

5. The standard deviation of the five numbers $10a+1,\ 10a+3,\ 10a+5,\ 10a+7$ and $10a+9$ is

   A. 8 .
   B. $\frac{12}{5}$.
   C. $\sqrt{10}$.
   D. $2\sqrt{2}$.

   [2006-CE-MATHS 2-54]

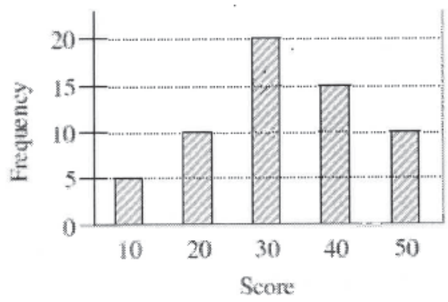
6. Let a, b, c and d be the mean, the median, the mode and the range of the group of numbers $\{x, x, x, x, x, x, x+1, x+1, x+2, x+3\}$ respectively. Which of the following must be true?

   (1) $a > b$
   (2) $b > c$
   (3) $c > d$

   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

   [2010-CE-MATHS 2-34]

7. The bar chart shows the distribution of scores obtained by a group of students in a test. Find the standard deviation of the scores correct to the nearest integer.



   A. 12
   B. 14
   C. 23
   D. 33

   [2010-CE-MATHS 2-35]

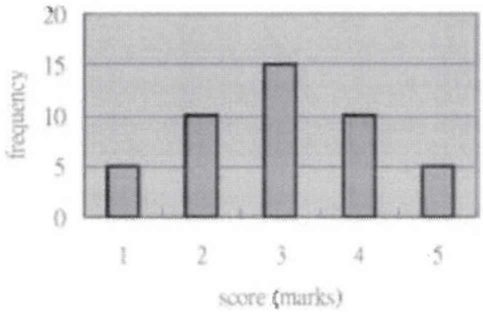
Mean Deviation (Out of Current Syllabus)

8. Find the mean deviation of the five numbers $x-2,\ x-1,\ x,\ x+1$ and $x+2$.

   A. x .
   B. 0 .
   C. $\frac{6}{5}$.
   D. $\sqrt{2}$.
   E. $\frac{\sqrt{30}}{5}$.

   [1998-CE-MATHS 2-51]

9. The bar chart below shows the distribution of scores of a test. Find the mean deviation of the scores of the test.



A. 0 mark

B. $\frac{8}{9}$ mark

C. $\frac{2\sqrt{2}}{3}$ mark

D. $\frac{2\sqrt{3}}{3}$ marks

E. $\frac{6}{5}$ marks

[2000-CE-MATHS 2-47]

10. Find the mean deviation of the five numbers 0 , 3 , 4 , 6 and 7.

A. 0

B. $\frac{3}{2}$

C. $\frac{\sqrt{10}}{2}$

D. 2

E. $\sqrt{6}$

[2001-CE-MATHS 2-41]

11. The mean deviation of the four numbers $x-8$, $x-2$, $x+3$ and $x+7$ is

A. x .

B. 0 .

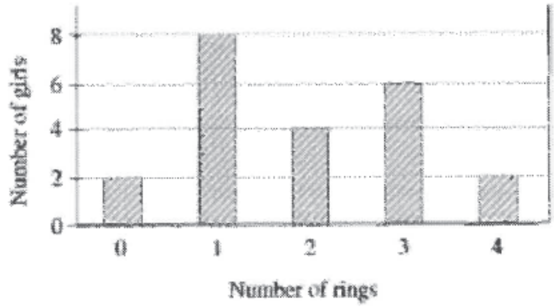
C. 5 .

D. 5.6 .

[2004-CE-MATHS 2-54]

HKDSE Problems

12. The bar chart below shows the distribution of the numbers of rings owned by the girls in a group. Find the standard deviation of the distribution correct to 2 decimal places.



A. 1.04
B. 1.16
C. 1.19
D. 2.09

[2012-DSE-MATHS 2-29]

13. Consider the following positive integers:

$$2 \quad 3 \quad 4 \quad 6 \quad 7 \quad 9 \quad 10 \quad m \quad n$$

Let a, b and c be the mode, the median and the range of the above positive integers respectively. If the mean of the above positive integers is 5, which of the following must be true?

(1) $a = 2$
(2) $b = 4$
(3) $c = 8$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

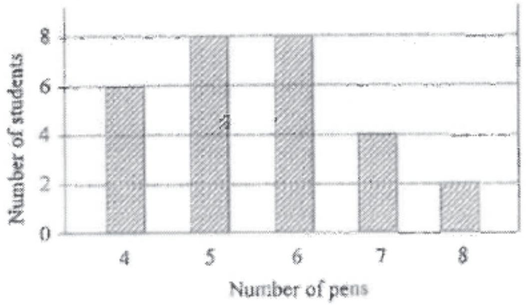
[2017-DSE-MATHS 2-30]

14. There are 49 terms in an arithmetic sequence. If the variance of the first 7 terms of the sequence is 9, then the variance of the last 7 terms of the sequence is

A. 9
B. 18
C. 49
D. 81

[2018-DSE-MATHS 2-45]

15. The bar chart below shows the distribution of the numbers of pens owned by some students. Find the inter-quartile range of the distribution.

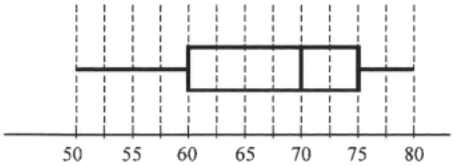


A. 1
B. 2
C. 4
D. 6

[2020-DSE-MATHS 2-29]

Box-and-Whisker Diagram

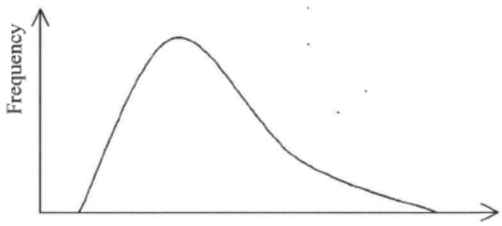
1. The box-and-whisker diagram below shows the distribution of the weights (in kg) of some students. Find the inter-quartile range of their weights.



A. 5 kg
B. 10 kg
C. 15 kg
D. 30 kg

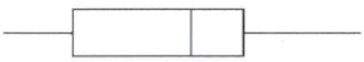
[2006-CE-MATHS 2-35]

2. The frequency curve below shows the distribution of the heights (in cm) of the students in a school.



Which of the following box-and-whisker diagrams may represent the distribution of their heights?

A. 

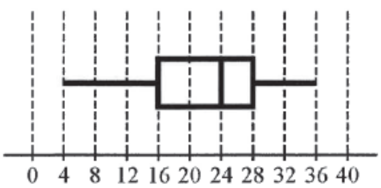
B. 

C. 

D. 

[2008-CE-MATHS 2-35]

3. The box-and-whisker diagram below shows the distribution of temperatures (in °C) of water in an experiment under various settings. Which of the following are true?

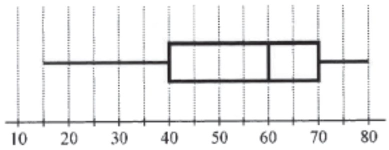


(1) The range is 40 °C.
(2) The median is 24 °C.
(3) The interquartile range is 12 °C.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2009-CE-MATHS 2-36]

4. The box-and-whisker diagram below shows the distribution of the numbers of books read by some students in a year. Find the inter-quartile range of the numbers of books read.



A. 30
B. 40
C. 55
D. 65

[2010-CE-MATHS 2-36]

5. Which of the following can be obtained from any box-and-whisker diagram?

(1) Mean
(2) Mode
(3) Range
(4) Upper quartile

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (4) only
D. (3) and (4) only

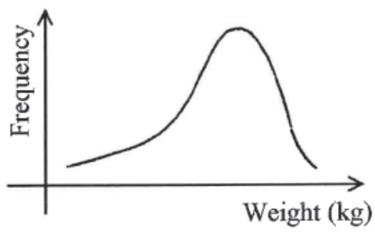
[2011-CE-MATHS 2-35]

Stem-and-Leaf Diagram

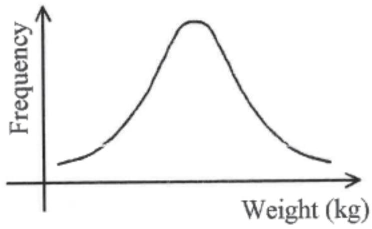
6. The stem-and-leaf diagram below shows the distribution of the weights (in kg) of some students.

Stem (tens)	Leaf (units)
3	6
4	2 4 5 7 8 9
5	2 3 4 5 5 6 7 8
6	1 2 3 6 7
7	0 5 8
8	4 7
9	3

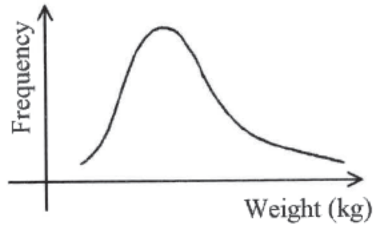
Which of the following frequency curves may represent the distribution of their weights?

A. 

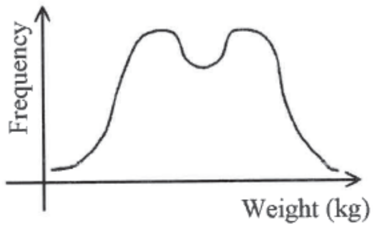
B.



C.



D.



[2007-CE-MATHS 2-36]

7. The stem-and-leaf diagram below shows the distribution of the ages of 24 members of a committee.

Stem (tens)	Leaf (units)
1	a
2	2 2 3 7 8 8
3	3 3 4 5 5 6 7 9
4	1 1 b 6
5	0 5 8
6	0 1

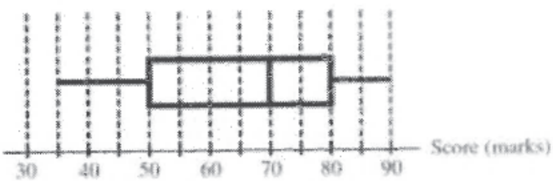
If the range and the inter-quartile range of the distribution are 42 and 18 respectively, then

A. $a = 8$ and $b = 5$.
B. $a = 8$ and $b = 6$.
C. $a = 9$ and $b = 5$.
D. $a = 9$ and $b = 6$.

[2011-CE-MATHS 2-36]

HKDSE Problems

8. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in a test.



If the passing score of the test is 50 marks, then the passing percentage of the class is

A. 25%.
B. 50%.
C. 70%.
D. 75%.

[SP-DSE-MATHS 2-27]

9. The stem-and-leaf diagram below shows the distribution of heights (in cm) of 23 staff members in an office.

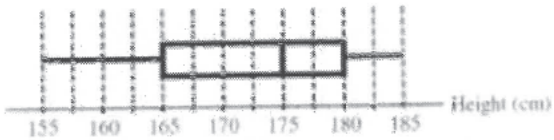
Stem (tens)	Leaf (units)
15	3 3 4 5 6 7 9
16	1 2 2 3 5 6 6 8
17	1 2 6 7 9
18	2 6 7

Find the median of the distribution.

A. 164 cm
B. 165 cm
C. 165.5 cm
D. 166 cm

[SP-DSE-MATHS 2-28]

10. The box-and-whisker diagram below shows the distribution of the heights (in cm) of some students. Which of the following is / are true?



(1) The height of the tallest student is 180 cm.
(2) The inter-quartile range of the distribution is 15 cm.
(3) Less than half of the students are taller than 170 cm.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[PP-DSE-MATHS 2-29]

11. The stem-and-leaf diagram below shows the distribution of the ages of a group of members in a recreational centre.

Stem (tens)	Leaf (units)
5	0 5 6 6 8
6	1 4 5 5 7 8 8 9
7	3 4 4 6 7 9
8	
9	1

A member is randomly selected from the group. Find the probability that the selected member is not under the age of 74.

A. 0.2
B. 0.3
C. 0.7

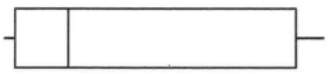
D. 0.8

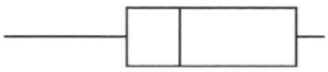
[2012-DSE-MATHS 2-28]

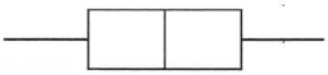
12. The stem-and-leaf diagram below shows the distribution of the hourly wages (in dollars) of some workers.

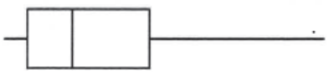
Stem (tens)	Leaf (units)
4	0 2 2 2 4 4 4 7
5	0 0 1 2 2 6 8 9
6	3 5 5 7
7	0
8	2 6
9	5

Which of the following box-and-whisker diagrams may represent the distribution of their hourly wages?

A. 

B. 

C. 

D. 

[2013-DSE-MATHS 2-29]

13. The stem-and-leaf diagram below shows the distribution of the ages of the passengers in a bus.

Stem (tens)	Leaf (units)
1	h 4 6
2	3 3 3 4 6 7 7
3	1 2 2 2 6 8
4	0 k

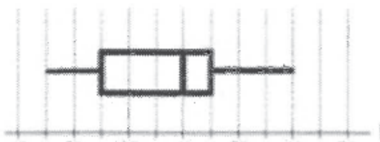
If the range of the above distribution is at least 33, which of the following must be true?

(1) $0 \leq h \leq 3$
(2) $3 \leq k \leq 9$
(3) $3 \leq k - h \leq 5$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2014-DSE-MATHS 2-30]

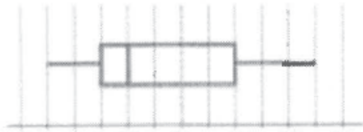
14. The box-and-whisker diagram below shows the distribution of the numbers of books read by some teachers in a term. Find the inter-quartile range of the distribution.



A. 20
B. 35
C. 40
D. 45

[2015-DSE-MATHS 2-29]

15. The box-and-whisker diagram below shows the distribution of the numbers of online hours spent by a class of students in a certain week. Find the lower quartile of the distribution.



A. 5
B. 15
C. 25
D. 40

[2017-DSE-MATHS 2-29]

16. The stem-and-leaf diagram below shows the distribution of the numbers of books read by 20 students in a year. If the inter-quartile range of the distribution is at most 25, which of the following must be true?

Stem (tens)	Leaf (units)
2	1 2 2 8
3	a a
4	0 2 4 5 5 7 8
5	3
6	b b 9 9
7	0 8

I. $5 \leq a \leq 9$
II. $0 \leq b \leq 4$
III. $1 \leq a - b \leq 6$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2018-DSE-MATHS 2-30]

17. Which of the following can be obtained from any box-and-whisker diagram?

I. Range
II. Standard Deviation
III. Inter-quartile range

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2019-DSE-MATHS 2-29]

Operations on Data

1. Given two groups of numbers

$$a + 1, \ a + 2, \ a + 3$$
$$b + 1, \ b + 2, \ b + 3$$

where $a > b$, m_1 and m_2 are respectively the means of the two groups, and s_1 and s_2 are respectively their standard deviations. Which of the following is true?

A. $m_1 > m_2$ and $s_1 > s_2$.
B. $m_1 > m_2$ and $s_1 = s_2$.
C. $m_1 = m_2$ and $s_1 > s_2$.
D. $m_1 = m_2$ and $s_1 = s_2$.
E. $m_1 > m_2$ and $s_1 < s_2$.

[1986-CE-MATHS 2-27]

2. The mean and standard deviation of a distribution of test scores are m and s respectively. If 4 marks are added to each score of the distribution, what are the mean and standard deviation of the new distribution?

	Mean	Standard Deviation
A.	$m+4$	s
B.	$m+4$	$s+2$
C.	$m+4$	$s+4$
D.	m	$s+2$
E.	m	$s+4$

[1991-CE-MATHS 2-30]

3. The mean, standard deviation and interquartile range of n numbers are m, s and q respectively. If 3 is added to each of the n numbers, what will be their new mean, standard deviation and interquartile range?

	Mean	Standard Deviation	Interquartile Range
A.	m	s	q
B.	m	$s+3$	$q+3$
C.	$m+3$	s	q
D.	$m+3$	s	$q+3$
E.	$m+3$	$s+3$	$q+3$

[1994-CE-MATHS 2-32]

4. $\{x, x+2, x+4, x+6, x+8\}$ and $\{x+1, x+3, x+5, x+7, x+9\}$ are two groups of numbers. Which of the following is / are true?

(1) The two groups of numbers have the same range.
(2) The two groups of numbers have the same standard deviation.
(3) The two groups of numbers have the same mean.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (1) and (3) only

[2000-CE-MATHS 2-23]

5. x is the mean of the group of numbers $\{a, b, c, d, e\}$. Which of the following statements about the two groups of numbers $\{a, b, c, d, e\}$ and $\{a, b, c, d, e, x\}$ must be true?

(1) The two groups of numbers have the same mean.
(2) The two groups of numbers have the same range.
(3) The two groups of numbers have the same standard deviation.

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

[2003-CE-MATHS 2-36]

6. $\{x-6, x-3, x+4, x+5\}$ and $\{x-8, x-1, x+2, x+9\}$ are two groups of numbers. Which of the following is / are true?

(1) The two groups of numbers have the same mean.
(2) The two groups of numbers have the same median.
(3) The two groups of numbers have the same range.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2006-CE-MATHS 2-34]

7. Let A be a group of numbers $\{\alpha, \beta, \gamma, \delta\}$ and B be another group of numbers $\{\alpha, \beta, \gamma, \delta, \mu\}$, where $\alpha < \beta < \gamma < \delta < \mu$. Which of the following must be true?

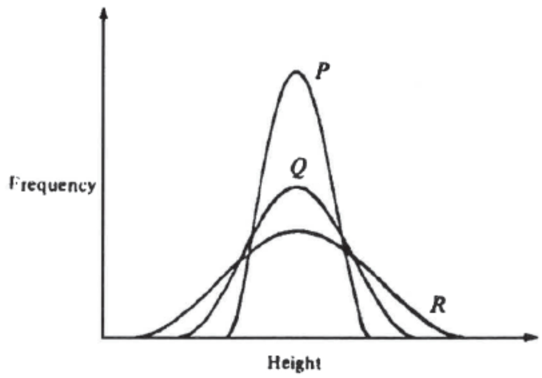
(1) The range of A is smaller than that of B.
(2) The mean of A is smaller than that of B.
(3) The median of A is smaller than that of B.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2008-CE-MATHS 2-34]

Comparison between Distributions

8.

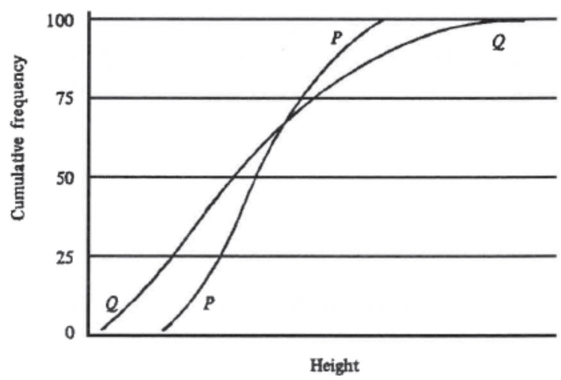


In the figure, P, Q and R are curves showing the frequency distributions of heights of students in three schools, each having the same number of students. Which distribution has the greatest standard deviation and which the smallest?

	Greatest	Smallest
A.	P	Q
B.	P	R
C.	Q	R
D.	R	P
E.	R	Q

[1983-CE-MATHS 2-32]

9.



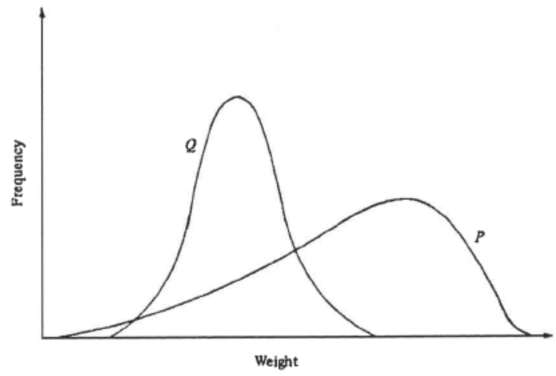
In the figure, P and Q are the cumulative frequency curves for the heights of two groups of students, each having 100 students. Which is the following must be true?

(1) range of P < range of Q
(2) median of P < median of Q
(3) the 3rd quartile of P < the 3rd quartile of Q

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1985-CE-MATHS 2-33]

10.



In the figure, P and Q are curves showing the distribution of weights of students in two schools, each having the same number of students. Which is the following must be true?

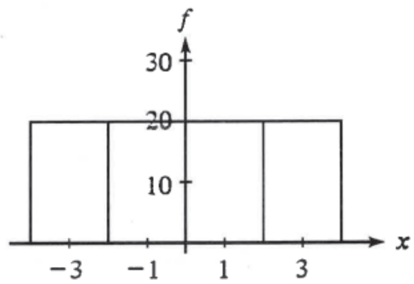
(1) standard deviation of P > standard deviation of Q
(2) mode of P > mode of Q
(3) median of P > median of Q

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

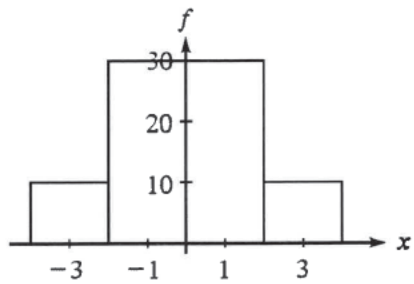
[1985-CE-MATHS 2-34]

11. The figures show the histograms of three frequency distributions. Arrange their standard deviations in ascending order of magnitude.

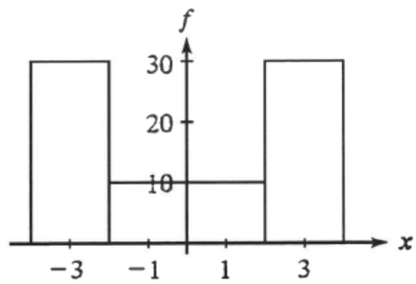
(1)



(2)



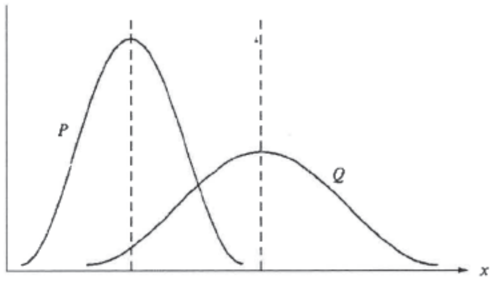
(3)



A. (1), (2), (3)
B. (1), (3), (2)
C. (2), (1), (3)
D. (2), (3), (1)
E. (3), (2), (1)

[1987-CE-MATHS 2-30]

12. The graph shows the frequency curves of two symmetric distributions P and Q.



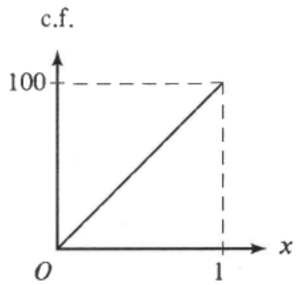
Which of the following is/are true?

(1) The mean of P < the mean of Q.
(2) The mode of P > the mode of Q.
(3) The inter-quartile range of P < the inter-quartile range of Q.

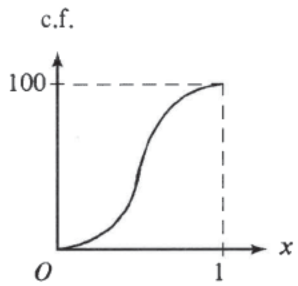
A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1991-CE-MATHS 2-31]

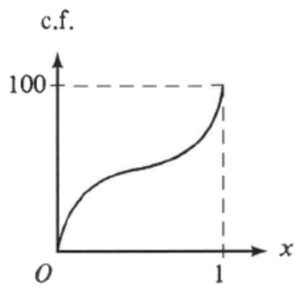
13. (1)



(2)



(3)

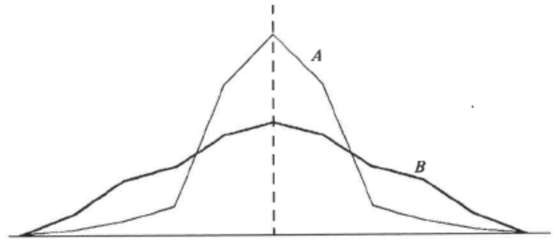


The figure shows the cumulative frequency curves of three distributions. Arrange the three distributions in the order of their standard deviations, from the smallest to the largest.

A. (1), (2), (3)
B. (1), (3), (2)
C. (2), (1), (3)
D. (2), (3), (1)
E. (3), (1), (2)

[1992-CE-MATHS 2-34]

14.



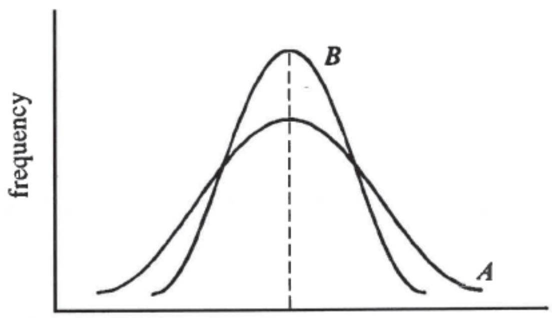
The figure shows the frequency polygons of two symmetric distributions A and B with the same mean. Which of the following is/are true?

(1) Interquartile range of A < Interquartile range of B
(2) Standard deviation of A > Standard deviation of B
(3) Mode of A > Mode of B

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1993-CE-MATHS 2-33]

15. The figure shows the frequency curves of two symmetric distributions A and B.



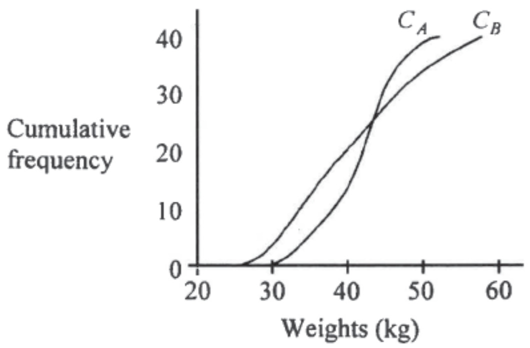
Which of the following is/are true?

(1) The mean of A = the mean of B.
(2) The inter-quartile range of A > the inter-quartile range of B.
(3) The standard deviation of A > the standard deviation of B.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1995-CE-MATHS 2-34]

16. In the figure, C_A and C_B are the cumulative frequency curves of two distributions of weights A and B respectively. Which of the following is/are true?

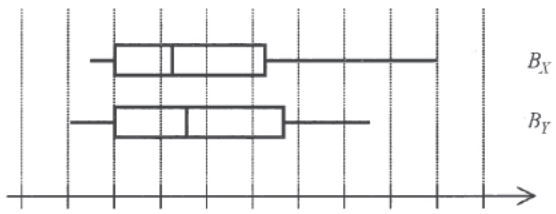


(1) median of A > median of B
(2) range of A > range of B
(3) inter-quartile range of A > inter-quartile range of B

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-34]

17.



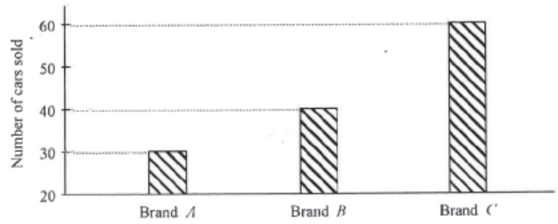
In the figure, B_X and B_Y are the box-and-whisker diagrams for the distributions X and Y respectively. Let μ_1, q_1 and r_1 be the mean, the interquartile range and the range of X respectively while μ_2, q_2 and r_2 be the mean, the interquartile range and the range of Y respectively. Which of the following must be true?

(1) $\mu_1 < \mu_2$
(2) $q_1 < q_2$
(3) $r_1 < r_2$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2007-CE-MATHS 2-35]

18. The bar chart below shows the numbers of cars sold for brand A, brand B and brand C in a certain month.



A sales representative makes the following claims:

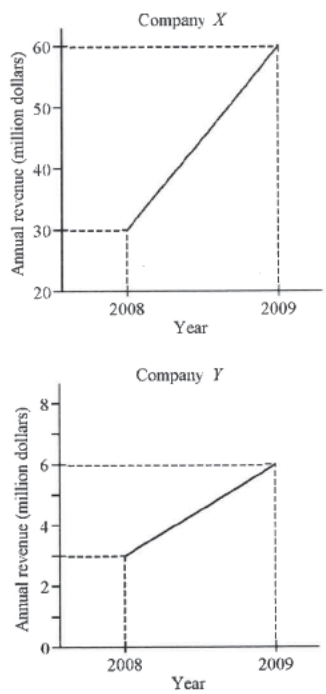
(1) In that month, the number of cars sold for brand C is two times that for brand B.
(2) In that month, the total number of cars sold for brand A and brand B is less than the number of cars sold for brand C.
(3) In that month, the number of cars sold for brand A is 50% less than that for brand C.

Which of the above claims are **false**?

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2008-CE-MATHS 2-54]

19. The broken line graphs below show the annual revenue (in million dollars) of Company X and Company Y in 2008 and 2009.

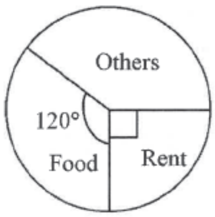


Which of the following statements about the percentage increases of the annual revenue of the two companies from 2008 to 2009 is true?

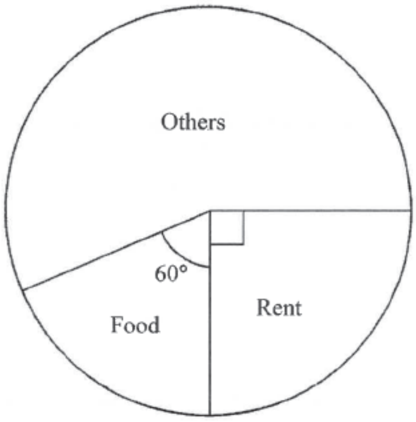
A. The percentage increases of the annual revenue of company X and company Y are the same.
B. The percentage increase of the annual revenue of company X is twice that of company Y.
C. The percentage increase of the annual revenue of company X is five times that of company Y.
D. The percentage increase of the annual revenue of company X is ten times that of company Y.

[2009-CE-MATHS 2-54]

20. The pie charts below show the expenditures of Albert and Betty in a certain month.



The expenditure of Albert



The expenditure of Betty

Which of the following must be true?

A. In that month, the expenditure of Albert is less than that of Betty.
B. In that month, the percentage of rent in the expenditure of Albert is the same as that of Betty.
C. In that month, the expenditure on rent of Albert is the same as that of Betty.
D. In that month, the expenditure on food of Albert is twice that of Betty.

[2010-CE-MATHS 2-54]

21. There are three groups of students in a tutorial class. The following table shows the mean mark of each of the three groups of students in a Mathematics test.

Group	Mean mark
Group A	60 marks
Group B	70 marks
Group C	80 marks

Which of the following must be true?

(1) In the test, the mean mark of all students in the tutorial class is 70 marks.
(2) In the test, the mean mark of all students of Group A and Group B is lower than the mean mark of all students of Group B and Group C.
(3) In the test, the student who gets the highest mark is in Group C.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2011-CE-MATHS 2-54]

HKDSE Problems

22. $\{a-7, a-1, a, a+2, a+4, a+8\}$ and $\{a-9, a-2, a-1, a+3, a+4, a+6\}$ are two groups of numbers. Which of the following is / are true?

(1) The two groups of numbers have the same mean.
(2) The two groups of numbers have the same median.
(3) The two groups of numbers have the same range.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[SP-DSE-MATHS 2-29]

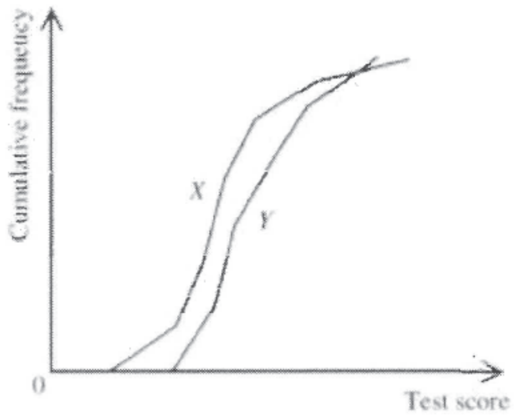
23. A set of numbers has a mode of 32, an inter-quartile range of 27 and a variance of 25. If 3 is added to each number of the set and each resulting number is then doubled to form a new set of numbers, find the mode, the inter-quartile range and the variance of the new set of numbers.

	Mode	Inter-quartile range	Variance
A.	64	60	50
B.	70	60	100
C.	70	54	50
D.	70	54	100

[SP-DSE-MATHS 2-45]

24. The figure below shows the cumulative frequency polygons of the test score distributions X and Y. Let m_1, r_1 and s_1 be

the median, the range and the standard deviation of X respectively while m_2, r_2 and s_2 be the median, the range and the standard deviation of Y respectively. Which of the following are true?



(1) $m_1 > m_2$
(2) $r_1 > r_2$
(3) $s_1 > s_2$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[PP-DSE-MATHS 2-30]

25. The mean, the variance and the inter-quartile range of a set of numbers are 40, 9 and 18 respectively. If 5 is added to each number of the set and each resulting number is then tripled to form a new set of numbers, find the mean, the variance and the inter-quartile range of the new set of numbers.

	Mean	Variance	Inter-quartile range
A.	120	27	69
B.	120	81	69
C.	135	27	54
D.	135	81	54

[PP-DSE-MATHS 2-44]

26. Let A be a group of numbers $\{\alpha, \beta, \gamma, \delta\}$ and B be another group of numbers $\{\alpha + 2, \beta + 2, \mu + 2, \gamma + 2, \delta + 2\}$, where $\alpha < \beta < \mu < \gamma < \delta$. Which of the following must be true?

(1) The median of A is smaller than that of B.
(2) The range of A and the range of B are the same.
(3) The standard deviation of A is greater than that of B.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[PP-DSE-MATHS 2-45]

27. Let m_1, r_1 and v_1 be the mean, the range and the variance of a group of numbers $\{x_1, x_2, x_3, \dots, x_{100}\}$ respectively. If m_2, r_2 and v_2 are the mean, the range and the variance of the group of numbers $\{x_1, x_2, x_3, \dots, x_{100}, m_1\}$ respectively, which of the following must be true?

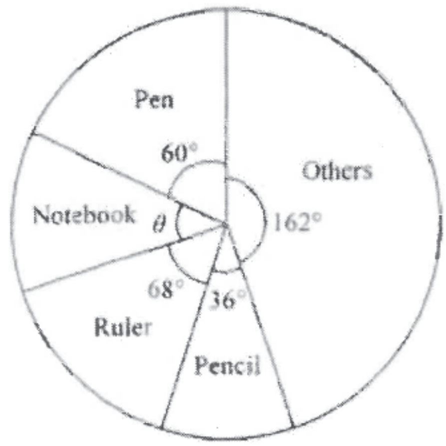
(1) $m_1 = m_2$
(2) $r_1 = r_2$
(3) $v_1 = v_2$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

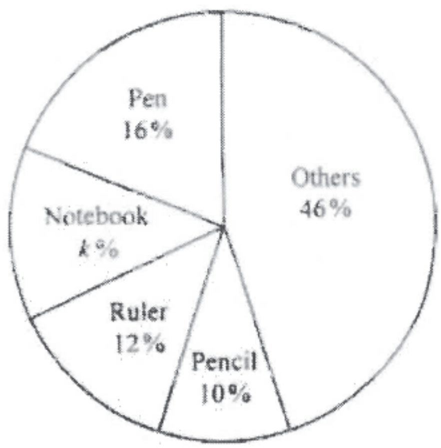
[2012-DSE-MATHS 2-45]

28. The pie charts below show the distributions of the profits of stationery shop X and stationery shop Y from the sales of stationery in a certain month. Which of the following must be true?

Distribution of the profits of stationery shop X



Distribution of the profits of stationery shop Y



A. In that month, the profit from the sales of pencils of stationery shop X is the same as that of stationery shop Y.

B. In that month, the total profit from the sales of pens and notebooks of stationery shop X is less than the total profit from the sales of rulers and pencils of the shop.
C. $k = 14$
D. $\theta = 36°$

[2013-DSE-MATHS 2-30]

29. If the variance of the five numbers x_1, x_2, x_3, x_4 and x_5 is 13, then the variance of the five numbers $3x_1 + 4$, $3x_2 + 4$, $3x_3 + 4$, $3x_4 + 4$ and $3x_5 + 4$ is

A. 39 .
B. 43 .
C. 117 .
D. 121 .

[2013-DSE-MATHS 2-45]

30. The mean height of 25 teachers and 140 students is 150 cm. If the mean height of the students is 145 cm, then the mean height of the teachers is

A. 151 cm .
B. 155 cm .
C. 176 cm .
D. 178 cm .

[2014-DSE-MATHS 2-28]

31. If the variance of the four numbers a, b, c and d is 9, then the variance of the four numbers $14 - a$, $14 - b$, $14 - c$ and $14 - d$ is

A. 5 .
B. 9 .
C. 23 .
D. 121 .

[2014-DSE-MATHS 2-45]

32. Let x_1, y_1 and z_1 be the mean, the median and the variance of a group of numbers $\{a_1, a_2, a_3, \dots, a_{50}\}$ respectively while x_2, y_2 and z_2 be the mean, the median and the variance of the group of numbers $\{a_1, a_2, a_3, \dots, a_{49}\}$ respectively. If $x_1 = a_{50}$, which of the following must be true?

(1) $x_1 = x_2$
(2) $y_1 \geq y_2$
(3) $z_1 \leq z_2$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2015-DSE-MATHS 2-45]

33. The variance of a set of numbers is 49. Each number of the set is multiplied by 4 and then 9 is added to each resulting number to form a new set of numbers. Find the variance of the new set of numbers.

A. 196
B. 205
C. 784
D. 793

[2016-DSE-MATHS 2-45]

34. Let m_1, r_1 and v_1 be the mode, the inter-quartile range and the variance of a group of numbers $\{x_1, x_2, x_3, x_4, x_5, x_6, x_7\}$ respectively while m_2, r_2 and v_2 be the mode, the inter-quartile range and the variance of the group of numbers $\{8x_1, 8x_2, 8x_3, 8x_4, 8x_5, 8x_6, 8x_7\}$ respectively. Which of the following must be true?

(1) $m_2 = 8m_1$
(2) $r_2 = 8r_1$
(3) $v_2 = 8v_1$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2017-DSE-MATHS 2-45]

35. The mean, the range and the variance of a set of numbers are m, r and v respectively. Each number of the set is multiplied by 6 and then 5 is added to each resulting number to form a new set of numbers. Which of the following is/are true?

I. The mean of the new set of numbers is $6m+5$
II. The range of the new set of numbers is $6r+5$
III. The variance of the new set of numbers is $6v + 5$

A. I only
B. II only
C. I and III only
D. II and III only

[2019-DSE-MATHS 2-45]

36. The variance of the six numbers $20a + 3$, $20a + 5$, $20a + 9$, $20a + 11$, $20a + 15$ and $20a + 17$ is

A. 5
B. 10
C. 25
D. $20a + 25$

[2020-DSE-MATHS 2-45]

Standard Score

1. A student scored 50 marks in a test and the corresponding standard score is –0.5. If the mean of the test scores is 60 marks, find the standard deviation of the scores.

   A. $\sqrt{20}$ marks
   B. 5 marks
   C. 9.5 marks
   D. 10 marks
   E. 20 marks

   [1999-CE-MATHS 2-34]

2. The mean mark of a mathematics test was 63 marks. Peter got 75 marks in the test and his standard score was 0.75. If Mary got 83 marks in the same test, then her standard score would be

   A. 0.83.
   B. 1.25.
   C. 2.22.
   D. 5.

   [2003-CE-MATHS 2-32]

3. David got 70 marks in a test and his standard score was –0.625. If the standard deviation of the test marks was 8 marks, then the mean mark of the test was

   A. 62 marks.
   B. 65 marks.
   C. 75 marks.
   D. 78 marks.

   [2004-CE-MATHS 2-36]

HKDSE Problems

4. In an examination, Peter gets 55 marks and his standard score is –3 while Mary gets 95 marks and her standard score is 2. Find the mean of the examination scores.

   A. 8 marks
   B. 64 marks
   C. 75 marks
   D. 79 marks

   [2014-DSE-MATHS 2-44]

5. The stem-and-leaf diagram below shows the distribution of the scores (in marks) of a group of students in a test. Ada gets the highest score in the test.

Stem (tens)	Leaf (units)
4	5 6 7 8
5	5 5 6 8
6	3 5 5 6 9 9
7	0 0 1
8	0 2 5

   Which of the following is/are true?

   (1) The upper quartile of the distribution is 55 marks.
   (2) The standard score of Ada in the test is lower than 2.
   (3) The standard deviation of the distribution is greater than 12 marks.

   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

   [2016-DSE-MATHS 2-44]

6. The standard score of Tom in a Mathematics examination is –2. If the score of Tom in the Mathematics examination is 33 marks and the mean of the scores of the Mathematics examination is 45 marks, then the standard deviation of the scores of the Mathematics examination is

   A. 3 marks.
   B. 6 marks.
   C. 12 marks.
   D. 36 marks.

   [2017-DSE-MATHS 2-44]

7. In a test, the mean of the test scores is 68 marks. Peter gets 46 marks in the test and his standard score is –2.2. If Susan gets 52 marks in the test, then her standard score is

   A. –2.5
   B. –1.6
   C. –0.6
   D. 1.6

   [2018-DSE-MATHS 2-44]

8. In an examination, the standard deviation of the examination score is 8 marks. The examination score of Mary is 69 marks and her standard score is 0.5. If the standard score of John in the examination is -1.5, then his examination score is

A. 45 marks
B. 53 marks
C. 65 marks
D. 77 marks

[2019-DSE-MATHS 2-44]

9. In a test, the difference of the test scores and the difference of the standard scores of two students are 30 marks and 6 respectively. In the test, the standard deviation of the test scores is

A. 5 marks
B. 24 marks
C. 25 marks
D. 36 marks

[2020-DSE-MATHS 2-23]

Sampling Techniques

1. The manager of a popular restaurant designs a questionnaire to collect the opinions from customers about the food provided by the restaurant. The manager has four relatives who are customers of the restaurant and only these four relatives are selected as a sample to fill in the questionnaire. Which of the following are disadvantages of this sampling method?

   (1) The sample size is too small.
   (2) The customers are not randomly selected.
   (3) Not all the customers are selected.

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2011-CE-MATHS 2-53]

HKDSE Problems

2. The students' union of a school of 950 students wants to investigate the opinions of students in the school on the services provided by the tuck shop. A questionnaire is designed by the students' union and only the chairperson and vice-chairperson of the students' union are selected as a sample to fill in the questionnaire. Which of the following are the disadvantages of this sampling method?

   (1) The sample size is very small.
   (2) Not all students in the school are selected.
   (3) Not all students in the school have an equal chance of being selected.

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [SP-DSE-MATHS 2-30]