Sample Question Paper - 4
Class- X Session- 2021-22 TERM 1
Subject- Mathematics (Basic)

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 40**

General Instructions:

1. The question paper contains three parts A, B and C.
2. Section A consists of 20 questions of 1 mark each. Attempt any 16 questions.
3. Section B consists of 20 questions of 1 mark each. Attempt any 16 questions.
4. Section C consists of 10 questions based on two Case Studies. Attempt any 8 questions.
5. There is no negative marking.

Section A

Attempt any 16 questions

1. If two numbers do not have common factor (other than 1), then they are called **[1]**

a) prime numbers b) co-prime numbers

c) composite numbers d) twin primes

2. The father's age is six times his son's age. Four years later, the age of the father will be four times his son's age. The present ages, in years, of the son and the father are, respectively **[1]**

a) 6 and 36 b) 4 and 24

c) 3 and 24 d) 5 and 30

3. A polynomial of degree ________ is called a quadratic polynomial. **[1]**

a) 1 b) 3

c) 2 d) 0

4. The sum of the digits of a two-digit number is 15. The number obtained by interchanging the digits exceeds the given number by 9. The number is **[1]**

a) 69 b) 87

c) 78 d) 96

5. If $\tan\theta = \frac{3}{4}$, then $\cos^2\theta - \sin^2\theta =$ **[1]**

a) $\frac{7}{25}$ b) $\frac{-7}{25}$

c) 1 d) $\frac{4}{25}$

6. ________ is neither prime nor composite. **[1]**

a) 4 b) 1

c) 2 d) 3

7. If‘ α and β are the zeroes of the polynomial $3x^2 + 11x - 4$, then the value of $\alpha^2 + \beta^2$ is **[1]**

a) $\frac{150}{9}$ b) $\frac{145}{9}$

c) $\frac{152}{9}$ d) $\frac{144}{9}$

8. The distance between the points (0, 5) and (–5, 0) is **[1]**

a) $5\sqrt{2}$ b) 10

c) 5 d) $2\sqrt{5}$

9. Which of the following is a true statement? **[1]**

a) $5x^3$ is a monomial b) $x^2 + 5x - 3$ is a linear polynomial

c) x + 1 is a monomial d) $x^2 + 4x - 1$ is a binomial

10. The polynomial $9x^2 + 6x + 4$ has **[1]**

a) two real zeroes b) one real zero

c) no real zeroes d) many real zeroes

11. An unbiased die is thrown once. The probability of getting a prime number is **[1]**

a) $\frac{1}{5}$ b) $\frac{1}{4}$

c) $\frac{1}{2}$ d) $\frac{1}{3}$

12. The HCF of 867 and 255 is **[1]**

a) 51 b) 35

c) 25 d) 55

13. The line 2x + y - 4 = 0 divides the line segment joining A(2, -2) and B(3, 7) in the ratio **[1]**

a) 2 : 9 b) 2 : 7

c) 2 : 3 d) 2 : 5

14. The ratio in which (4, 5) divides the join of (2, 3) and (7, 8) is **[1]**

a) 2 : 3 b) -3 : 2

c) -2 : 3 d) 3 : 2

15. The sum and product of the zeroes of the polynomial $f(x) = 4x^2 - 27x + 3k^2$ are equal, then the value of k is **[1]**

a) ± 3 b) 0

c) ± 1 d) ± 2

16. $(\sec^2\theta - 1)(1 - \text{cosec}^2\theta) =$ **[1]**

a) -1 b) 0

c) 1 d) 2

17. The value of a so that the point (3, a) lies on the line represented by 2x - 3y = 5 is **[1]**

a) $\frac{1}{3}$ b) – 1

c) 1 d) $\frac{-1}{3}$

18. An event is unlikely to happen. Its probability is closest to **[1]**

a) 0.00001 b) 0.0001

c) 0.1 d) 1

19. Which of the following numbers has terminating decimal expansion? **[1]**

a) $\frac{3}{11}$ b) $\frac{3}{7}$

c) $\frac{3}{5}$ d) $\frac{5}{3}$

20. If P is a point on x-axis such that its distance from the origin is 3 units, then the coordinates of a point Q on OY such that OP = OQ, are **[1]**

a) (0, 0) b) (0, -3)

c) (0, 3) d) (3, 0)

Section B

Attempt any 16 questions

21. The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinitely many solutions if **[1]**

a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

c) None of these d) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

22. On dividing a polynomial p(x) by a nonzero polynomial q(x), let g(x) be the quotient and r(x) be the remainder then p(x) $= q(x) \cdot g(x) + r(x)$, where **[1]**

a) either r(x) = 0 or deg r(x) < deg g(x) b) r(x) = g(x)

c) deg r(x) < deg g(x) always d) r(x) = 0 always

23. The HCF and the LCM of 12, 21, 15 respectively are: **[1]**

a) 3, 140 b) 420, 3

c) 12, 420 d) 3, 420

24. If sin $\theta = \frac{1}{2}$ then cotθ = ? **[1]**

a) $\frac{1}{\sqrt{3}}$ b) 1

c) $\frac{\sqrt{3}}{2}$ d) $\sqrt{3}$

25. In a cyclic quadrilateral ABCD, it is being given that $\angle$A = (x + y + 10)° $\angle$B = (y + 20)°, $\angle$C = (x + y - 30)° and $\angle$D = (x + y)°. Then, $\angle$B = ? **[1]**

a) 110° b) 70°

c) 100° d) 80°

26. The zeros of the polynomial $x^2 - 2x - 3$ are **[1]**

a) -3, 1 b) 3, -1

c) 3, 1 d) -3, -1

27. In an equilateral ΔABC, AD$\perp$BC and $AD^2 = P.BC^2$, then p is equal to **[1]**

a) $\frac{1}{3}$ b) $\frac{3}{4}$

c) $\frac{1}{2}$ d) $\frac{2}{3}$

28. If the point P(2, 1) lies on the line segment joining points A(4, 2) and B(8, 4), then **[1]**

a) $AP = \frac{1}{4}AB$ b) $AP = \frac{1}{2}AB$

c) $AP = \frac{1}{3}AB$ d) AP = PB

29. $\frac{\tan\theta}{\sec\theta - 1} + \frac{\tan\theta}{\sec\theta + 1}$ is equal to **[1]**

a) 2 cosecθ b) 2 tanθ secθ

c) 2 secθ d) 2 tanθ

30. The sum of two numbers is 8. If their sum is four times their difference, then the numbers are **[1]**

a) None of these b) 7 and 1

c) 6 and 2 d) 5 and 3

31. The decimal expansion of the rational number $\frac{33}{2^2 \cdot 5}$ will terminate after **[1]**

a) more than 3 decimal places b) two decimal places

c) three decimal places d) one decimal place

32. $\triangle$ ABC ~ $\triangle$ DEF and the perimeters of $\triangle$ABC and $\triangle$DEF are 30 cm and 18 cm respectively. If BC = 9 cm then EF = ? **[1]**

a) 4.5 cm b) 6.3 cm

c) 7.2 cm d) 5.4 cm

33. sin 2A = 2 sin A is true when A = **[1]**

a) 60° b) 30°

c) 0° d) 45°

34. The points A(9, 0), B(9, 6), C(-9, 6) and D(-9, 0) are the vertices of a **[1]**

a) rhombus b) trapezium

c) rectangle d) square

35. One card is drawn at random from a well-shuffled deck of 52 cards. What is the probability of getting a black face card? **[1]**

a) $\frac{3}{13}$ b) $\frac{3}{14}$

c) $\frac{3}{26}$ d) $\frac{1}{26}$

36. Graphically, the pair of equations 6x - 3y + 10 = 0, 2x - y + 9 = 0 represents two lines which are **[1]**

a) parallel b) Intersect at two points

c) coincident d) intersect at a point

37. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a = **[1]**

a) 1 b) 2

c) 4 d) 3

38. $\cos^2 30^\circ \cos^2 45^\circ + 4\sec^2 60^\circ + \frac{1}{2}\cos^2 90^\circ - 2\tan^2 60^\circ$ = ? **[1]**

a) $\frac{75}{8}$

b) $\frac{73}{8}$

c) $\frac{83}{8}$

d) $\frac{81}{8}$

39. A number x is chosen at random from the numbers -4, -3, -2, -1, 0, 1, 2, 3, 4, 5. The probability that $|x| < 3$ is **[1]**

a) 1

b) 0

c) $\frac{1}{2}$

d) $\frac{7}{10}$

40. The point which lies on the perpendicular bisector of the line segment joining the points A (-2, -5) and B (2, 5) is **[1]**

a) (2, 0)

b) (–2, 0)

c) (0, 2)

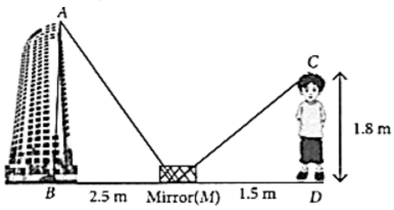
d) (0, 0)

Section C

Attempt any 8 questions

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:

Deepak's father is a mathematician. One day he gave Deepak an activity to measure the height of building. Deepak accepted the challenge and placed a mirror on ground level to determine the height of building. He is standing at a certain distance so that he can see the top of the building reflected from mirror. Deepak eye level is at 1.8 m above ground. The distance of Deepak from mirror and that of building from mirror are 1.5 m and 2.5 m respectively.



41. Two similar triangles formed in the above figure is **[1]**

a) $\triangle$ABM and $\triangle$CMD

b) None of these

c) $\triangle$ABM and $\triangle$CDM

d) $\triangle$AMB and $\triangle$CDM

42. Which criterion of similarity is applied here? **[1]**

a) SSS similarity criterion

b) AA similarity criterion

c) SAS similarity criterion

d) ASA similarity criterion

43. Height of the building is **[1]**

a) 3 m

b) 1 m

c) 2 m

d) 4 m

44. In ΔABM, if $\angle$BAM = 30°, then $\angle$MCD is equal to **[1]**

a) 40^o

b) 90^o

c) 65^o

d) 30^o

45. If ΔABM and ΔCDM are similar where CD = 6 cm, MD = 8 cm and BM = 24 cm, then AB is **[1]**

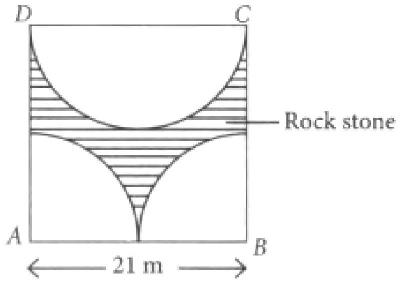
equal to

a) 14 cm | b) 16 cm

c) 12 cm | d) 18 cm

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

A builder of a residential project has a vacant square land of side 21 m. He wants to make a temple in the shape of the semi-circle and a park in the shape of two quadrants of a circle as shown in the figure.



46. Find the area of square. **[1]**

a) 436 m^2 | b) 444 m^2

c) 438 m^2 | d) 441 m^2

47. Area of two quadrants, shown in figure, is **[1]**

a) 178.25 m^2 | b) 170.25 m^2

c) 173.25 m^2 | d) 175 m^2

48. Find the area of semi-circular temple. **[1]**

a) 173.25 m^2 | b) 178.25 m^2

c) 168.25 m^2 | d) 163.25 m^2

49. Find the area of unshaded region. **[1]**

a) 346.5 m^2 | b) 355.65 m^2

c) 340.5 m^2 | d) 350.5 m^2

50. Find the area of shaded region. **[1]**

a) 92.5 m^2 | b) 90.5 m^2

c) 94.5 m^2 | d) 88.5 m^2

Solution

Section A

1. **(b)** co-prime numbers
Explanation: If two numbers do not have a common factor (other than 1), then they are called co-primer numbers. We know that two numbers are coprime if their common factor (greatest common divisor) is 1. e.g. co-prime of 12 are 11, 13.

2. **(a)** 6 and 36
Explanation: Let ‘x’ year be the present age of father and ‘y’ year be the present age of son.
Four years later, given condition becomes,
(x + 4) = 4(y + 4)
x + 4 = 4y + 16
x - 4y - 12 = 0 ...(i)
and initially, x = 6y ...(ii)
On putting the value of from Eq. (ii) in Eq. (i), we get
6y - 4y - 12 = 0
2y = 12
Hence, y = 6
Putting y = 6, we get x = 36.
Hence, present age of father is 36 years and age of son is 6 years.

3. **(c)** 2
Explanation: A polynomial of degree two is called a quadratic polynomial. An equation involving a quadratic polynomial is called a quadratic equation. A quadratic equation is an equation that can be written in the form $ax^2 + bx + c = 0$, where $a \neq 0$.

4. **(c)** 78
Explanation: Let us assume the tens and the unit digits of the required number be x and y respectively
$\therefore$ Required number = (10x + y)
According to the given condition in the question,
we have
x + y = 15 .....(i)
By reversing the digits, we obtain the number = (10y + x)
$\therefore$ (10y + x) = (10x + y) + 9
10y + x - 10x - y = 9
9y - 9x = 9
y - x = 1 .....(ii)
Now, on adding (i) and (ii) we get:
2y = 16
$\therefore y = \frac{16}{8} = 8$
Putting the value of y in (i), we get:
x + 8 = 15
x = 15 - 8
x = 7
$\therefore$ Required number = (10x + y) = $10 \times 7 + 8 = 70 + 8 = 78$

5. **(a)** $\frac{7}{25}$
Explanation: $\tan \theta = \frac{3}{4} = \frac{\text{Perpendicular}}{\text{Base}}$
By Pythagoras Theorem,
$(\text{Hyp.})^2 = (\text{Base})^2 + (\text{Perp.})^2$
= $(4)^2 + (3)^2 = 16 + 9 = 25$

$\therefore Hyp. = \sqrt{25} = 5$

Now, $\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{3}{5}$

and $\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{4}{5}$

$\cos^2\theta - \sin^2\theta = \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$

= $\frac{16}{25} - \frac{9}{25} = \frac{16-9}{25} = \frac{7}{25}$

6. **(b)** 1

Explanation: 1 is neither prime nor composite.

A prime is a natural number greater than 1 that has no positive divisors other than 1 and itself e.g. 5 is prime because 1 and 5 are its only positive integers factors but 6 is composite because it has divisors 2 and 3 in addition to 1 and 6.

7. **(b)** $\frac{145}{9}$

Explanation: Here a = 3, b = 11, c = -4

Since $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$

= $\left(\frac{-b}{a}\right)^2 - 2 \times \frac{c}{a}$ = $\frac{b^2}{a^2} - \frac{2c}{a}$ = $\frac{b^2-2ac}{a^2}$

Putting the values of $a,\ b$ and c, we get = $\frac{(11)^2-2\times3\times(-4)}{(3)^2}$

= $\frac{121+24}{9}$

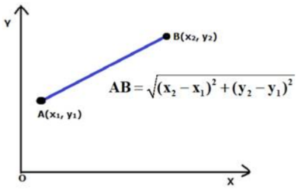
= $\frac{145}{9}$

8. **(a)** $5\sqrt{2}$

Explanation:

By using the formula:

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$



To calculate distance between the points (x_1 , y_1) and (x_2, y_2)

Here we have;

$x_1 = 0, x_2 = -5$

$y_2 = 5, y_2 = 0$

$d^2 = [(-5) - 0]^2 + [0 - 5]^2$

d = $\sqrt{(-5-0)^2 + (0-5)^2}$

d = $\sqrt{25+25}$

d = $\sqrt{50}$ = $5\sqrt{2}$

9. **(a)** $5x^3$ is a monomial

Explanation: $5x^3$ is a monomial as it contains only one term.

10. **(c)** no real zeroes

Explanation: The polynomial $9x^2 + 6x + 4$ has no real zeroes because it can not be factorized.

$D = b^2 - 4ac$, $D = 36 - 4 \times 9 \times 4 = -108$

D < 0, roots are imaginary and unequal

11. **(c)** $\frac{1}{2}$

Explanation: Number of possible outcomes = {2, 3, 5} = 3

Number of Total outcomes = 6

$\therefore$ Probability of getting a prime number = $\frac{3}{6} = \frac{1}{2}$

12. **(a)** 51

Explanation: 867 = 255 $\times$ 3 + 102

255 = 102 $\times$ 2 + 51

102 = 51 $\times$ 2 + 0

Hence, we got remainder as 0 , therefore HCF of (867 , 255) is 51

13. **(a)** 2 : 9

Explanation: Let the required ratio be K : 1

Then, the point of division is p $\left(\frac{3k+2}{k+1}, \frac{7k-2}{k+1}\right)$

this point lies on the line $2x + y - 4 = 0$

$= \frac{2(3k+2)}{k+1} + \frac{(7k-2)}{k+1} - 4 = 0 = 6k + 4 + 7k - 2 - 4k - 4 = 0$

$\Leftrightarrow 9k = 2 \Rightarrow k = \frac{2}{9}$

so, the required ratio is $\left(\frac{2}{9} : 1\right)$, i.e., $(2 : 9)$

14. **(a)** 2 : 3

Explanation: Let the point (4, 5) divides the line segment joining the points (2, 3) and (7, 8) in the ratio m: n

$\therefore 4 = \frac{mx_2+nx_1}{m+n} = \frac{m\times7+n\times2}{m+n}$

$\Rightarrow$ 4(m + n) = 7m + 2n $\Rightarrow$ 4m + 4n = 7m + 2n

4n - 2n = 7m - 4m

$\Rightarrow$ 2n = 3m $\Rightarrow \frac{m}{n} = \frac{2}{3}$

$\therefore$ m : n = 2 : 3

15. **(a)** ±3

Explanation: Let $\alpha,\ \beta$ are the zeroes of the given polynomial.

Given: $\alpha + \beta = \alpha\beta$

$\Rightarrow \frac{-b}{a} = \frac{c}{a}$

$\Rightarrow$ -b = -c

$\Rightarrow$ -(-27) = $3k^2$

$\Rightarrow$ k^2 = 9

$\Rightarrow$ k = ±3

16. **(a)** -1

Explanation: Given: $(\sec^2\theta - 1)(1 - \mathrm{cosec}^2\theta)$

= $\tan^2\theta\ (-\cot^2\theta)$

[$\because \sec^2\theta - 1 = \tan^2\theta$ and $\mathrm{cosec}^2\theta - 1 = \cot^2\theta$]

= $\tan^2\theta \times \frac{-1}{\tan^2\theta}$ = -1

17. **(a)** $\frac{1}{3}$

Explanation: 2x - 3y = 5

$\Rightarrow$ 2 $\times$ 3 - 3 $\times$ a = 5

$\Rightarrow$ 6 - 3a = 5

$\Rightarrow$ a = $\frac{1}{3}$

18. **(a)** 0.00001

Explanation: An event is unlikely to happen. Its probability is very very close to zero but not zero, So it is equal to 0.00001

19. **(c)** $\frac{3}{5}$

Explanation: $\frac{3}{5}$ has terminal decimal expansion because terminal decimal expansion should have the denominator 2 or 5 only.

20. **(c)** (0, 3)

Explanation: P is a point on x-axis and its distance from 0 is 3

Co-ordinates of P will be (3, 0)

Q is a point on OY such that OP = OQ
Co-ordinates of Q will be (0, 3)

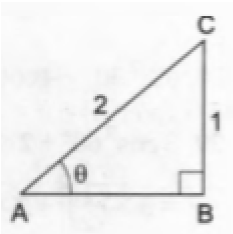
Section B

21. **(b)** $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
Explanation: The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinitely many solutions because both the equation satisfy the condition i.e $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

22. **(a)** either r(x) = 0 or deg r(x) < deg g(x)
Explanation: By Division Algorithm on polynomials, we have
either r(x) = 0 or deg r(x) < deg g(x)

23. **(d)** 3, 420
Explanation: We have,
$12 = 2 \times 2 \times 3$
$21 = 3 \times 7$
$15 = 5 \times 3$
HCF = 3
and L.C.M = $2 \times 2 \times 3 \times 5 \times 7$
= 420

24. **(d)** $\sqrt{3}$

Explanation: 

$\sin\theta = \frac{1}{2} = \frac{BC}{AC}$
$\therefore AB^2 = AC^2 - BC^2 = 4 - 1 = 3$
$\therefore \quad AB = \sqrt{3}$
$\cot\theta = \frac{AB}{BC} = \frac{\sqrt{3}}{1} = \sqrt{3}$

25. **(d)** 80°
Explanation:
$\angle A = (x + y + 10)$, $\angle B = (y + 20)^o$, $\angle C = (x + y - 30)$ and $\angle D = (x + y)^o$
And ABCD is a cylic quadrilateral
$\Rightarrow$ Sum of opposite angles = 180^o
$\angle A + \angle B = 180^o$
$\Rightarrow x + y + 10 + x + y - 30 = 180^o$
$\Rightarrow 2x + 2y - 20 = 180^o$
$\Rightarrow 2x + 2y = 200 \Rightarrow x + y = 100$ ... (1)
And
$\angle B + \angle D = 180^o$
$\Rightarrow y + 20 + x + y = 180^o$
$x + 2y = 160^o$ .... (2)
from eqn. (1) and (2)
x + y = 100
x + 2y = 160
-   -   -

+y = +60

$\Rightarrow y = 60^o, x = 40^o$

Now $\angle B = y + 20$

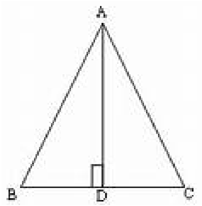
$= 60 + 20 = 80^o$

26. **(b)** 3, -1

Explanation: $x^2 - 2x - 3 = x^2 - 3x + x - 3$
$= x(x - 3) + (x - 3) = (x - 3)(x + 1)$
$\therefore (x - 3)(x + 1) = 0 \Rightarrow x = 3$ or $x = -1$

27. **(b)** $\frac{3}{4}$

Explanation:
In triangle ABC, if AD is perpendicular to BC, then



$AB^2 = BD^2 + AD^2$
$\Rightarrow AB^2 = \left(\frac{BC}{2}\right)^2 + AD^2$
$\Rightarrow BC^2 = \frac{BC^2}{4} + AD^2$ [AB = BC]
$\Rightarrow AD^2 = \frac{3}{4}BC^2$
Comparing with $AD^2 = pBC^2$
$p = \frac{3}{4}$

28. **(b)** $AP = \frac{1}{2}AB$

Explanation: AP = $\sqrt{(2-4)^2 + (1-2)^2}$
= $\sqrt{4+1}$ = $\sqrt{5}$ = units
AB = $\sqrt{(8-4)^2 + (4-2)^2}$
= $\sqrt{16+4}$ = $\sqrt{20}$ = $2\sqrt{5}$ units
Here AB = 2 $\times$AP
$\therefore$ AP = $\frac{1}{2}$AB

29. **(a)** 2 cosecθ

Explanation: We have, $\frac{\tan\theta}{\sec\theta-1} + \frac{\tan\theta}{\sec\theta+1}$
$= \tan\theta\left(\frac{1}{\sec\theta-1} + \frac{1}{\sec\theta+1}\right)$
$= \frac{\tan\theta(\sec\theta+1+\sec\theta-1)}{(\sec\theta-1)(\sec\theta+1)}$
$= \frac{\tan\theta\times 2\sec\theta}{\sec^2\theta-1} = \frac{2\tan\theta\sec\theta}{\tan^2\theta}$
$= \frac{2\sec\theta}{\tan\theta} = \frac{2\times\cos\theta}{\cos\theta\times\sin\theta} = \frac{2}{\sin\theta}$
$= 2cosec\theta$

30. **(d)** 5 and 3

Explanation: x + y = 8
x = 8 - y ... (i)
x + y = 4(x - y) ... (ii)
Substitute (i) in (ii)
8 = 4x - 4y
2 = x - y
2 = 8 - y - y
2y = 8 - 2
y = 3
therefore, x = 8 - 3 = 5
Hence, Numbers are 5 and 3

31. **(b)** two decimal places

Explanation: Number = $\frac{33}{2^2 \times 5} = \frac{66}{2^2 \times 5^2} = \frac{66}{100}$

Clearly, it terminates after two decimal places.

32. **(d)** 5.4 cm

Explanation: $\triangle \mathrm{ABC} \sim \triangle \mathrm{DEF}$

$\therefore \frac{\mathrm{AB}}{\mathrm{DE}} = \frac{\mathrm{BC}}{\mathrm{EF}} = \frac{\mathrm{AC}}{\mathrm{DF}}$

$= \frac{AB+BC+AC}{DE+EF+DF} = \frac{30}{18}$

$BC = 9cm$

$\therefore \frac{9}{\mathrm{EF}} = \frac{30}{18} \Rightarrow \mathrm{EF} = \frac{9 \times 18}{30} = \frac{27}{5}$

$\therefore \mathrm{EF} = 5.4\mathrm{cm}$

33. **(c)** 0°

Explanation: sin 2A = 2 sin A is true when A =0°

$\because \sin 2\mathrm{A} = 2\sin \mathrm{A}$

$\Rightarrow \sin(2 \times 0^\circ) = \sin 0^\circ$

$\Rightarrow \sin 0^\circ = \sin 0^\circ$

34. **(c)** rectangle

Explanation: A (9, 0), B(9, 6), C(- 9, 6) and D(- 9, 0) are the given vertices.

Then,

$AB^2 = (9 - 9)^2 + (6 - 0)^2$

$= (0)^2 + (6)^2 = 0 + 36 = 36$ units

$BC^2 = (- 9 - 9)^2 + (6 - 6)^2$

$= (-18)^2 + (0)^2 = 324 + 0 = 324$ units

$CD^2 = (- 9 + 9)^2 + (0 - 6)^2 = (0)^2 + (-6)^2 = 0 + 3 = 36$ units

$DA^2 = (- 9 - 9)^2 + (0 - 0)^2 = (- 18)^2 + (0)^2 = 324 + 0 = 324$ units

Therefore, we have:

$AB^2 = CD^2$ and $BC^2 = DA^2$

Now, the diagonals are:

$AC^2 = (- 9 - 9)^2 + (6 - 0)^2 = (- 18)^2 + (6)^2 = 324 + 36 = 360$ units

$BD^2 = (- 9 - 9)^2 + (0 - 6)^2 = (- 18)^2 + (- 6)^2 = 324 + 36 = 360$ units

Therefore,

$AC^2 = BD^2$

Hence, *ABCD* is a rectangle.

35. **(c)** $\frac{3}{26}$

Explanation: Total number of cards = 52.

Number of black face cards = 6

(2 kings + 2 queens + 2 jacks).

$\therefore$ P (getting a face card) = $\frac{6}{52} = \frac{3}{26}$

36. **(a)** parallel

Explanation: Given: $a_1 = 6$, $a_2 = 2$, $b_1 = -3$, $b_2 = -1$, $c_1 = 10$ and $c_2 = 9$

$a_1 = 6, a_2 = 2, b_1 = -3, b_2 = -1, c_1 = 10$ and $c_2 = 9$

Here $\frac{a_1}{a_2} = \frac{6}{2} = \frac{3}{1}, \frac{b_1}{b_2} = \frac{-3}{-1} = \frac{3}{1}, \frac{c_1}{c_2} = \frac{10}{9}$

but $\frac{c_1}{c_2} = \frac{10}{9}$

$\because \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Therefore, the lines are parallel.

37. **(c)** 4

Explanation: LCM (a, 18) = 36

HCF (a, 18) = 2

We know that the product of numbers is equal to the product of their HCF and LCM.
Therefore,
18a = 2(36)
$a = \frac{2(36)}{18}$
a = 4

38. **(c)** $\frac{83}{8}$
Explanation: $\cos^2 30^\circ \cos^2 45^\circ + 4\sec^2 60^\circ + \frac{1}{2}\cos^2 90^\circ - 2\tan^2 60^\circ$
$= \left(\frac{\sqrt{3}}{2}\right)^2 \cdot \left(\frac{1}{\sqrt{2}}\right)^2 + (4 \times 2^2) + \left(\frac{1}{2} \times 0^2\right) - 2 \times (\sqrt{3})^2$
$= \left(\frac{3}{4} \times \frac{1}{2}\right) + 16 + 0 - 6 = \frac{3}{8} + 10 = \frac{83}{8}$

39. **(c)** $\frac{1}{2}$
Explanation: Number of total outcomes = 10
Number of possible outcomes = {-2, -1, 0, 1, 2} = 5
∴ Required Probability = $\frac{5}{10} = \frac{1}{2}$

40. **(d)** (0, 0)
Explanation: As we know that, the perpendicular bisector of the any line segment divides the line segment into two equal parts i.e., the perpendicular bisector of the line segment always passes through the mid - point of the line segment.
As mid - point of any line segment which passes through the points
(x_1, y_1) and (x_2, y_2) is;
= $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
So mid - point of the line segment joining the points A (- 2, - 5) and B (2, 5) will be;
= $\left(\frac{-2+2}{2}, \frac{-5+5}{2}\right)$ = (0, 0)
Hence, (0, 0) is the required point lies on the perpendicular bisector of the lines segment.

Section C

41. **(c)** △ABM and △CDM
Explanation: Since, $\angle B = \angle D$ = 90°, $\angle AMB = \angle CMD$ (∵ Angle of incident = Angle of reflection)
∴ By similarity criterion, $\triangle ABM \sim \triangle CDM$

42. **(b)** AA similarity criterion
Explanation: SSS similarity criterion

43. **(a)** 3 m
Explanation: ∵ $\triangle ABM \sim \triangle CDM$
$\therefore \frac{AB}{CD} = \frac{BM}{DM} \Rightarrow \frac{AB}{1.8} = \frac{2.5}{1.5}$
⇒ AB = $\frac{2.5 \times 1.8}{1.5}$ = 3 m

44. **(d)** 30°
Explanation: Since, $\triangle ABM \sim \triangle CDM$
$\therefore \angle A = \angle C$ = 30° [∵ Corresponding angles of similar triangles are also equal]

45. **(d)** 18 cm
Explanation: Since, $\triangle ABM \sim \triangle CDM$
$\therefore \frac{AB}{CD} = \frac{BM}{MD} \Rightarrow \frac{AB}{6} = \frac{24}{8}$ ⇒ AB = 18 cm

46. **(d)** 441 m^2
Explanation: Area of square ABCD = 21 × 21 = 441 m^2

47. **(c)** 173.25 m^2
Explanation: Area of two quadrants = $2\left(\pi r^2 \times \frac{90^\circ}{360^\circ}\right)$
= $\frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{1}{2}$ = 173.25 m^2

48. **(a)** 173.25 m^2

Explanation: Area of semi-circular temple = $\frac{1}{2}(\pi r^2)$

= $\frac{1}{2} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$ = 173.25 m^2

49. **(a)** 346.5 m^2

Explanation: Area of unshaded region = Area of semi-circle + Area of two quadrants

= 173.25 + 173.25 = 346.5 m^2

50. **(c)** 94.5 m^2

Explanation: Area of shaded region = Area of square - (Area of two quadrants + Area of semi-circle)

= 441 - 346.5 = 94.5 m^2