Solved Paper, 2021-22

MATHEMATICS (BASIC)

Term-I, Set-4

Series : JSK/2

Question Paper Code No. 430/2/4

Time allowed : 90 Minutes **Max. Marks : 40**

General Instructions:

Read the following instructions very carefully and strictly follow them:

(i) *This question paper contains **50** questions out of which **40** questions are to be attempted. **All** questions carry equal marks.*
(ii) *This question paper contains **three** Sections: A, B and C.*
(iii) ***Section A** has **20** questions. Attempt any **16** questions from Q. No **1** to **20**.*
(iv) ***Section B** has **20** questions. Attempt any **16** questions from Q. No. **21** to **40**.*
(v) ***Section C** consists of two Case Studies containing **5** questions is each case. Attempt any **4** questions from Q. No. **41** to **45** and another **4** from Q. No. **46** to **50**.*
(vi) *There is only one correct option for every multiple choice question (MCQ). Marks will not be awarded for answering more than one option.*
(vii) *There is no negative marking.*

SECTION - A

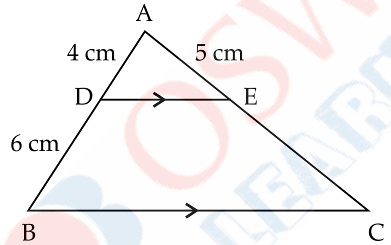
[1 Mark Each]

(In this Section, there are 20 questions. Any 16 are to be attempted.)

1. HCF of 92 and 152 is

(a) 4 (b) 19
(c) 23 (d) 57

2. In ΔABC, $DE \parallel BC$, AD = 4 cm, DB = 6 cm and AE = 5 cm. The length of EC is



(a) 7 cm (b) 6.5 cm
(c) 7.5 cm (d) 8 cm

3. The value of k, for which the pair of linear equations $x + y - 4 = 0$, $2x + ky - 3 = 0$ have no solution, is

(a) 0 (b) 2
(c) 6 (d) 8

4. The value of $(\tan^2 45° - \cos^2 60°)$ is

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{3}{2}$ (d) $\frac{3}{4}$

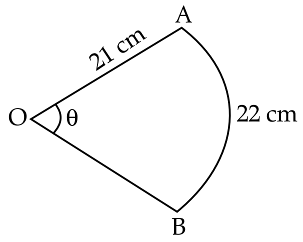
5. A point $(x, 1)$ is equidistant from (0, 0) and (2, 0). The value of x is

(a) 1 (b) 0
(c) 2 (d) $\frac{1}{2}$

6. Two coins are tossed together. The probability of getting exactly one head is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{3}{4}$ (d) 1

7. A circular arc of length 22 cm subtends an angle θ at the centre of the circle of radius 21 cm. The value of θ is



(a) 90° (b) 50°
(c) 60° (d) 30°

8. A quadratic polynomial having sum and product of its zeroes as 5 and 0 respectively, is

(a) $x^2 + 5x$ (b) $2x(x-5)$
(c) $5x^2 - 1$ (d) $x^2 - 5x + 5$

9. If $P(E)$ = 0.65, then the value of P(not E) is

(a) 1.65 (b) 0.25
(c) 0.65 (d) 0.35

10. It is given that $\Delta DEF \sim \Delta PQR$. $EF : QR = 3 : 2$, then value of ar(DEF) : ar(PQR) is

(a) 4 : 9 (b) 4 : 3
(c) 9 : 2 (d) 9 : 4

11. Zeroes of a quadratic polynomial $x^2 - 5x + 6$ are

(a) – 5, 1 (b) 5, 1

(c) 2, 3 (d) – 2, – 3

12. $\frac{57}{300}$ is a

(a) non-terminating and non-repeating decimal expansion.

(b) terminating decimal expansion after 2 places of decimals.

(c) terminating decimal expansion after 3 places of decimals.

(d) non-terminating but repeated decimal expansion.

13. Perimeter of a rectangle whose length (l) is 4 cm more than twice its breadth (b) is 14 cm. The pair of linear equations representing the above information is

(a) $l + 4 = 2b$, $2(l + b) = 14$ (b) $l - b = 4$, $2(l + b) = 14$

(c) $l = 2b + 4$, $l + b = 14$ (d) $l = 2b + 4$, $2(l + b) = 14$

14. $5.\overline{213}$ can also be written as

(a) 5.213213213... (b) 5.2131313...

(c) 5.213 (d) $\frac{5213}{1000}$

15. The ratio is which the point (4, 0) divides the line segment joining the points (4, 6) and (4, – 8) is

(a) 1 : 2 (b) 3 : 4

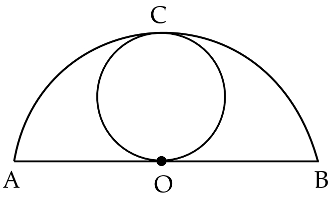
(c) 4 : 3 (d) 1 : 1

16. Which of the following is not defined ?

(a) sec 0° (b) cosec 90°

(c) tan 90° (d) cot 90°

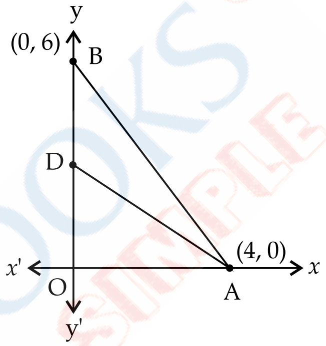
17. In the given figure, a circle is touching a semi-circle at C and its diameter AB at O. If $AB = 28$ cm, what is the radius of the inner circle ?



(a) 14 cm (b) 28 cm

(c) 7 cm (d) $\frac{7}{2}$ cm

18. The vertices of a triangle OAB are O(0, 0), A(4, 0) and B(0, 6). The median AD is drawn on OB. The length AD is



(a) $\sqrt{52}$ units (b) 5 units

(c) 25 units (d) 10 units

19. In a right angled triangle PQR, $\angle Q = 90°$. If $\angle P = 45°$, then value of tan P – $\cos^2$ R is

(a) 0 (b) 1

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

20. If tan θ = $\frac{2}{3}$, then the value of sec θ is

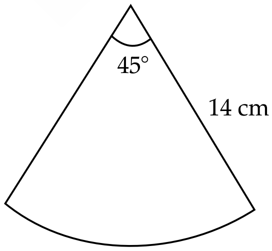
(a) $\frac{\sqrt{13}}{3}$ (b) $\frac{\sqrt{5}}{3}$

(c) $\sqrt{\frac{13}{3}}$ (d) $\frac{3}{\sqrt{13}}$

SECTION - B **[1 mark each]**

(There are 20 questions of 1 mark each. Any 16 are to be attempted.)

21. The perimeter of the sector of a circle of radius 14 cm and central angle 45° is



(a) 11 cm (b) 22 cm

(c) 28 cm (d) 39 cm

22. A bag contains 16 red balls, 8 green balls and 6 blue balls. One ball is drawn at random. The probability that it is blue ball is

(a) $\frac{1}{6}$ (b) $\frac{1}{5}$

(c) $\frac{1}{30}$ (d) $\frac{5}{6}$

23. If sin θ – cos θ = 0, then the value of θ is

(a) 30° (b) 45°

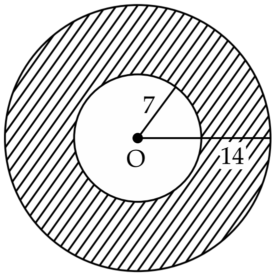
(c) 90° (d) 0°

24. The probability of happening of an event is 0.02. The probability of not happening of the event is

(a) 0.02 (b) 0.80

(c) 0.98 (d) $\frac{49}{100}$

25. Two concentric circles are centred at O. The area of shaded region, if outer and inner radii are 14 cm and 7 cm respectively, is



(a) 462 cm^2 (b) 154 cm^2
(c) 231 cm^2 (d) 308 cm^2

26. $\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}$ **can be simplified to get**

(a) $2\cos^2\theta$ (b) $\frac{1}{2}\sec^2\theta$
(c) $\frac{2}{\sin^2\theta}$ (d) $2\sec^2\theta$

27. The origin divides the line segment AB joining the points A(1, – 3) and B(– 3, 9) in the ratio:

(a) 3 : 1 (b) 1 : 3
(c) 2 : 3 (d) 1 : 1

28. The perpendicular bisector of line segment A(– 8, 0) and B(8, 0) passes through a point (0, k). The value of k is

(a) 0 only (b) 0 or 8 only
(c) any real number
(d) any non-zero real number

29. Which of the following is a correct statement ?

(a) Two congruent figure are always similar
(b) Two similar figures are always congruent
(c) All rectangles are similar
(d) The polygons having same number of sides are similar

30. The solution of the pair of linear equations x = – 5 and y = 6 is

(a) (– 5, 6) (b) (– 5, 0)
(c) (0, 6) (d) (0, 0)

31. A circle of radius 3 units is centered at (0, 0). Which of the following points lie outside the circle ?

(a) (– 1, – 1) (b) (0, 3)
(c) (1, 2) (d) (3, 1)

32. The value of k for which the pair of linear equations $3x + 5y = 8$ and $kx + 15y = 24$ has infinitely many solutions, is

(a) 3 (b) 9
(c) 5 (d) 15

33. HCF of two consecutive event numbers is

(a) 0 (b) 1
(c) 2 (d) 4

34. The zeroes of quadratic polynomial $x^2 + 99x + 127$ are

(a) both negative (b) both positive
(c) one positive and one negative
(d) reciprocal of each other

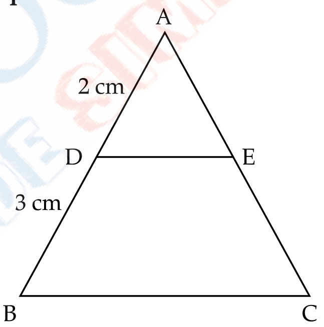
35. The mid-point of line segment joining the points (– 3, 9) and (– 6, – 4) is

(a) $\left(\frac{-3}{2}, \frac{-13}{2}\right)$ (b) $\left(\frac{9}{2}, \frac{-5}{2}\right)$
(c) $\left(\frac{-9}{2}, \frac{5}{2}\right)$ (d) $\left(\frac{9}{2}, \frac{5}{2}\right)$

36. The decimal expansion of $\frac{13}{2\times5^2\times7}$ is

(a) terminating after 1 decimal place
(b) non-terminating and non-repeating
(c) terminating after 2 decimal places
(d) non-terminating but repeating

37. In ΔABC, $DE \parallel BC$, AD = 2 cm, DB = 3 cm, DE : BC is equal to



(a) 2 : 3 (b) 2 : 5
(c) 1 : 2 (d) 3 : 5

38. The (HCF × LCM) for the numbers 50 and 20 is

(a) 1000 (b) 50
(c) 100 (d) 500

39. For which natural number n, 6^n ends with digit zero ?

(a) 6 (b) 5
(c) 0 (d) None

40. (1 + tan^2 A) (1 + sin A) (1 – sin A) is equal to

(a) $\frac{\cos^2 A}{\sec^2 A}$ (b) 1
(c) 0 (d) 2

SECTION - C

[1 mark each]

(Attempt any 4 questions from Q. No. 41 to 45 and another 4 from Q. No. 46 to 50.)

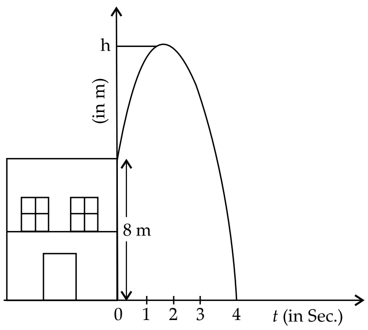
Case Study-I

Sukriti throws a ball upwards, from a rooftop which is 8 m high from ground level. The ball reaches to some maximum height and then returns and hit the ground.

If height of the ball at time t (in sec) is represented by $h(m)$, then equation of its path is given as

$h = -t^2 + 2t + 8$

Based on above information, answer the following:



41. The maximum height achieved by ball is:

(a) 7 m (b) 8 m

(c) 9 m (d) 10 m

42. The polynomial represented by above graph is:

(a) linear polynomial

(b) quadratic polynomial

(c) constant polynomial

(d) cubic polynomial

43. Time taken by ball to reach maximum height is:

(a) 2 second (b) 4 second

(c) 1 second (d) 2 minute

44. Number of zeroes of the polynomial whose graph is given, is

(a) 1 (b) 2

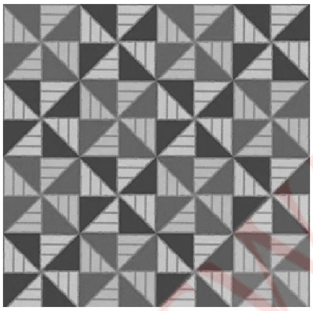
(c) 0 (d) 3

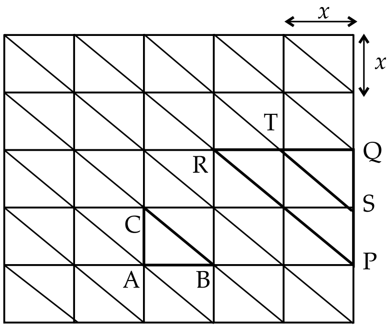
45. Zeroes of the polynomial are:

(a) 4 (b) – 2, 4

(c) 2, 4 (d) 0, 4

Case Study-II





Diagrammatic View

Quilts are available in various colours and design. Geometric design includes shapes like squares, triangles, rectangles, hexagons etc.

One such design is shown above. Two triangles are highlighted, ΔABC and ΔPQR.

Based on above information, answer the following questions:

46. Which of the following criteria is not suitable for ΔABC to be similar to ΔQRP ?

(a) SAS (b) AAA

(c) SSS (d) RHS

47. If each square is of length x unit, then length BC is equal to

(a) $x\sqrt{2}$ unit (b) $2x$ unit

(c) $2\sqrt{x}$ unit (d) $x\sqrt{x}$ unit

48. Ratio BC : PR is equal to

(a) 2 : 1 (b) 1 : 4

(c) 1 : 2 (d) 4 : 1

49. ar(PQR) : ar(ABC) is equal to

(a) 2 : 1 (b) 1 : 4

(c) 4 : 1 (d) 1 : 8

50. Which of the following is not true ?

(a) ΔTQS ~ ΔPQR (b) ΔCBA ~ ΔSTQ

(c) ΔBAC ~ ΔPQR (d) ΔPQR ~ ΔABC

❑❑❑

SOLUTION

SECTION - A

1. (a) 4

Explanation: Prime factorisation of 92

$= 2 \times 2 \times 23$

Prime factorisation of 152 = $2 \times 2 \times 2 \times 19$

To find HCF, we multiply all the prime factors common to both numbers:

Therefore, HCF $= 2 \times 2 = 4$

2. (c) 7.5 cm

Explanation: Since DE || BC,

$$\frac{AD}{DB} = \frac{AE}{EC} \text{ (By Basic Proportionality Theorem)}$$

Since AD = 4 cm, DB = 6 cm and AE = 5 cm

So, $$\frac{4}{6} = \frac{5}{EC}$$

Therefore, $$EC = \frac{6 \times 5}{4} = \frac{30}{4}$$

$= 7.5$ cm

3. (b) 2

Explanation:

For no solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} \uparrow \frac{c_1}{c_2}$

Here, $a_1 = 1$, $a_2 = 2$, $b_1 = 1$, $b_2 = k$, $c_1 = -4$, $c_2 = -3$

So, $$\frac{1}{2} = \frac{1}{k}$$

Therefore, $$k = \frac{1 \times 2}{1} = 2$$

4. (d) 3/4

Explanation: We know that,

$$\tan 45° = 1 \text{ and } \cos 60° = \frac{1}{2}$$

So, $$(\tan^2 45° - \cos^2 60°) = \left\{(1)^2 - \left(\frac{1}{2}\right)^2\right\}$$

$$= \left(1 - \frac{1}{4}\right)$$

$$= \frac{3}{4}$$

5. (a) 1

Explanation: Let the point $(x, 1)$ be A, $(0, 0)$ be B and $(2, 0)$ be C.

According to question, AB = AC

[Using distance formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$]

$\Rightarrow \quad \sqrt{(0-x)^2 + (0-1)^2} = \sqrt{(2-x)^2 + (0-1)^2}$

Squaring both sides

$\Rightarrow \left(\sqrt{(0-x)^2 + (0-1)^2}\right)^2 = \left(\sqrt{(2-x)^2 + (0-1)^2}\right)^2$

$\Rightarrow \quad (0 - x)^2 + (0 - 1)^2 = (2 - x)^2 + (0 - 1)^2$

$\Rightarrow \quad (-x)^2 + (-1)^2 = (4 - 4x + x^2) + (-1)^2$

{Since, $(a - b)^2 = (a^2 - 2ab + b^2)$}

$\Rightarrow \quad x^2 + 1 = 4 - 4x + x^2 + 1$

$\Rightarrow \quad 0 = 4 - 4x$

$\Rightarrow \quad 4x = 4$

$\Rightarrow \quad x = 1$

6. (b) $\frac{1}{2}$

Explanation: When two coins are tossed together, the possible outcomes are: HH, HT, TH and TT

Exactly one head is occurring in only two cases (HT and TH) out of the four listed above.

So, $$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of total outcomes}}$$

$\therefore \quad P(E) = \frac{2}{4}$

$= \frac{1}{2}$

7. (c) 60°

Explanation:

$$\text{Length of arc} = \frac{\theta}{360°} \times 2\pi r$$

$\Rightarrow \quad 22 = \frac{\theta}{360°} \times 2 \times \frac{22}{7} \times 21$

$\Rightarrow \quad \theta = \frac{22 \times 360° \times 7}{2 \times 21 \times 22}$

$\therefore \quad \theta = 60°$

8. (b) $2x(x - 5)$

Explanation: Let the zeroes be α and β.

According to question, $\alpha + \beta = 5$ and

$\alpha\beta = 0$

Now, $\quad p(x) = k(x^2 - (\alpha + \beta)x + \alpha\beta)$,

where k is any real number

$\Rightarrow \quad p(x) = k(x^2 - 5x + 0)$,

where k is any real number

When $\quad k = 2$

$\Rightarrow \quad p(x) = 2(x^2 - 5x)$

$\therefore \quad p(x) = 2x(x - 5)$

9. (d) 0.35

Explanation: We know that,

$P(E) + P(\text{not } E) = 1$

$\Rightarrow \quad 0.65 + P(\text{not } E) = 1$

$\Rightarrow \quad P(\text{not } E) = 1 - 0.65$

$\therefore \quad P(\text{not } E) = 0.35$

10. (d) 9 : 4

Explanation: Since ΔDEF ~ ΔPQR

$\Rightarrow \quad \frac{ar(\Delta DEF)}{ar(\Delta PQR)} = \left(\frac{EF}{QR}\right)^2$

(If two triangles are similar, then the ratio of the area of both triangles is proportional to the square of the ratio of their corresponding sides.)

$\Rightarrow \quad \frac{ar(\Delta DEF)}{ar(\Delta PQR)} = \left(\frac{3}{2}\right)^2$

$\Rightarrow \quad \frac{ar(\Delta DEF)}{ar(\Delta PQR)} = \frac{9}{4}$

11. (c) 2, 3

Explanation: $\quad p(x) = x^2 - 5x + 6 = 0$

$\Rightarrow \quad x^2 - 3x - 2x + 6 = 0$

(splitting the middle term)

$\Rightarrow \quad x(x - 3) - 2(x - 3) = 0$

$\Rightarrow \quad (x - 3)(x - 2) = 0$

$\Rightarrow \quad x = 3, 2$

12. (b) terminating decimal expansion after 2 places of decimals.

Explanation: Here $\frac{57}{300}$ can be written as

$\frac{57}{2^2 \times 3^1 \times 5^2}$

Further, it can be written as $\frac{19}{2^2 \times 5^2} = \frac{19}{100}$

$= 0.19$

Since, the denominator is of the form $2^m \times 5^n$, the decimal expansion will be terminating.

Therefore, it is terminating decimal expansion after 2 decimal places.

13. (d) $l = 2b + 4$

$2(l + b) = 14$

Explanation: To solve the above question, let us break the statement into parts.

It says that perimeter is 14 cm

$\therefore \quad 2(l + b) = 14$

Also, length is 4 cm more than twice its breadth.

$\Rightarrow \quad \text{Length} = 2 \times \text{Breadth} + 4$

$\therefore \quad l = 2b + 4$

14. (a) 5.213213213...

Explanation: Bar present on 213 in $5.\overline{213}$ means 213 is repeated multiple times.

15. (b) 3 : 4

Explanation: Let the ratio be k : 1.
Using section formula,

$$(x, y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$$

$$\Rightarrow \quad (4, 0) = \left(\frac{k \times 4 + 1 \times 4}{k+1}, \frac{k \times -8 + 1 \times 6}{k+1}\right)$$

$$\Rightarrow \quad (4, 0) = \left(\frac{4k+4}{k+1}, \frac{-8k+6}{k+1}\right)$$

$$\therefore \quad 4 = \frac{4k+4}{k+1}$$

$$\text{and} \quad 0 = \frac{-8k+6}{k+1}$$

$$\Rightarrow \quad 0 = -8k + 6$$

$$\Rightarrow \quad 8k = 6$$

$$\therefore \quad \frac{k}{1} = \frac{6}{8} = \frac{3}{4}$$

Therefore, the required ratio is 3 : 4.

16. (c) tan 90°

Explanation: $\tan 90° = \frac{\sin 90°}{\cos 90°} = \frac{1}{0}$

= not defined

17. (c) 7 cm

Explanation: Here AB is the diameter of the semicircle, so AB = 28 cm
OA is the radius; so, $OA = OC$ = 14 cm
But OC is the diameter of the circle and we know that diameter = 2 × radius

$\therefore \quad OC = 2 \times \text{radius}$

$\Rightarrow \quad 14 = 2 \times \text{radius}$

$\therefore \quad \text{radius} = \frac{14}{2} = 7 \text{ cm}$

18. (b) 5 units

Explanation: Co-ordinates of D can be found with help of mid-point formula *i.e.*

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\Rightarrow \quad D = \left(\frac{0+0}{2}, \frac{0+6}{2}\right)$$

$$\Rightarrow \quad D = \left(\frac{0}{2}, \frac{6}{2}\right)$$

$$\therefore \quad D = (0, 3)$$

Now, length of AD can be found using the distance formula, $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$\Rightarrow \quad AD = \sqrt{(4-0)^2 + (0-3)^2}$$

$$\Rightarrow \quad AD = \sqrt{(4)^2 + (3)^2}$$

$$\Rightarrow \quad AD = \sqrt{16+9}$$

$$\Rightarrow \quad AD = \sqrt{25}$$

$$\Rightarrow \quad AD = 5$$

$\therefore$ Length of AD = 5 units

19. (c) $\frac{1}{2}$

Explanation: Since $\angle P$ = 45°

$\Rightarrow \quad \angle R = 45°$

$(\angle P + \angle Q + \angle R = 180°)$

Now, tan P = tan 45° = 1

Also, cos R = cos 45° = $\frac{1}{\sqrt{2}}$

$$\text{Now,} \quad \tan P - \cos^2 R = 1 - \left(\frac{1}{\sqrt{2}}\right)^2$$

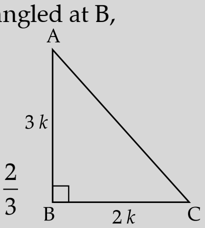
$$= 1 - \frac{1}{2}$$

$$= \frac{1}{2}$$

20. (a) $\frac{\sqrt{13}}{3}$

Explanation: In ΔABC, right-angled at B,

let $\quad \angle A = \theta$



Given, $\quad \tan \theta = \frac{2}{3}$

$$\Rightarrow \quad \tan \theta = \frac{BC}{AB} = \frac{2}{3}$$

Let $BC = 2k$ and $AB = 3k$

By Pythagoras Theorem

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow \quad AC^2 = (2k)^2 + (3k)^2$$

$$\Rightarrow \quad AC^2 = 4k^2 + 9k^2$$

$$\Rightarrow \quad AC^2 = 13k^2$$

$$\Rightarrow \quad AC = \sqrt{13}k$$

$$\text{Now,} \quad \sec \theta = \frac{AC}{AB} = \frac{\sqrt{13}k}{3k}$$

$$= \frac{\sqrt{13}}{3}$$

SECTION - B

21. **(d)** 39 cm

Explanation: Perimeter of sector of circle

= length of arc + 2 × radius

$= \frac{\theta}{360^\circ} \times 2\pi r + 2 \times 14$

$= \frac{45}{360ϒ} \times 2 \times \frac{22}{7} \times 14 + 28$

= 11 + 28

= 39 cm

22. **(b)** $\frac{1}{5}$

Explanation:

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of total outcomes}}$

Number of blue balls = 6

Total number of balls = 16 + 8 + 6 = 30

$\therefore$ P (getting a blue ball) $= \frac{6}{30} = \frac{1}{5}$

23. **(b)** 45°

Explanation: Since sin θ – cos θ = 0

$\Rightarrow \sin\theta = \cos\theta$

$\Rightarrow \frac{\sin\theta}{\cos\theta} = 1$

$\Rightarrow \tan\theta = 1$

$\Rightarrow \tan\theta = \tan 45^\circ$

$\therefore \theta = 45^\circ$

24. **(c)** 0.98

Explanation: We know that, $P(E) + P(\text{not } E) = 1$

Given, $P(E) = 0.02$

So, $0.02 + P(\text{not } E) = 1$

$\Rightarrow P(\text{not } E) = 1 - 0.02$

$\therefore P(\text{not } E) = 0.98$

25. **(a)** 462 cm^2

Explanation: Area of shaded region = Area of outer circle – Area of inner circle

(Let R = radius of outer circle and r = radius of inner circle)

$= \pi R^2 - \pi r^2$

$= \pi(R^2 - r^2)$

$= \frac{22}{7}\{(14)^2 - (7)^2\}$

$= \frac{22}{7}(196 - 49)$

$= \frac{22}{7} \times 147$

= 22 × 21 = 462

$\therefore$ Area of shaded region = 462 cm^2

26. **(d)** $2\sec^2\theta$

Explanation: $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta}$

$= \frac{1-\sin\theta+1+\sin\theta}{(1+\sin\theta)(1-\sin\theta)}$ (Taking L.C.M.)

$= \frac{2}{(1)^2 - \sin^2\theta}$

{Since, $(a - b)(a + b) = a^2 - b^2$}

$= \frac{2}{1-\sin^2\theta}$

$= \frac{2}{\cos^2\theta}$ (Since, $1 - \sin^2\theta = \cos^2\theta$)

$= 2\sec^2\theta$ $\left(\because \frac{1}{\cos^2\theta} = \sec^2\theta\right)$

27. **(b)** 1 : 3

Explanation: Let the ratio be $k : 1$

Using section formula,

$(x, y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$

$\Rightarrow (0, 0) = \left(\frac{k\times -3 + 1\times 1}{k+1}, \frac{k\times 9 + 1\times -3}{k+1}\right)$

$\Rightarrow (0, 0) = \left(\frac{-3k+1}{k+1}, \frac{9k-3}{k+1}\right)$

$\therefore 0 = \frac{-3k+1}{k+1}$ and $0 = \frac{9k-3}{k+1}$

$\Rightarrow 0 = -3k + 1$ and $0 = 9k - 3$

$\Rightarrow 3k = 1$ and $9k = 3$

$\therefore \frac{k}{1} = \frac{1}{3}$ and $\frac{k}{1} = \frac{3}{9} = \frac{1}{3}$

Therefore, the required ratio is 1 : 3.

28. **(c)** any real number

Explanation: The points A (-8, 0) and B (8, 0) lie on X-axis.

The mid-point of the line joining these two points can be found with the help of mid-point formula $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$\Rightarrow O = \left(\frac{-8+8}{2}, \frac{0+0}{2}\right)$

$\Rightarrow O = (0, 0)$

Therefore, the line that bisects AB is the y-axis and it is given that it passes through a point $(0, k)$; so, k is any real number.

29. **(a)** Two congruent figure are always similar

Explanation: Since two figures are congruent, their corresponding sides are equal and thus the ratio of corresponding sides will always be equal to 1 and equal to each other. Therefore, two congruent figures are always similar.

30. **(a)** (– 5, 6)

Explanation: Given that $x = -5$ and $y = 6$
The lines drawn for the given equations meet at (–5, 6) and thus (–5, 6) is the solution of the given equations.

31. **(d)** (3, 1)

Explanation: Since the centre of circle lies at (0, 0) and its radius is 3 units.
From the given options, let us calculate the distance of each from the centre using distance formula, $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

For (–1, –1),

$$OA = \sqrt{(-1-0)^2 + (-1-0)^2} = \sqrt{(-1)^2 + (-1)^2} = \sqrt{1+1} = \sqrt{2}$$

Since $\sqrt{2} < 3$, it lies inside the circle.

For (0, 3),

$$OB = \sqrt{(0-0)^2 + (3-0)^2} = \sqrt{(0)^2 + (3)^2} = \sqrt{0+9} = \sqrt{9} = 3$$

Since 3 = 3, it lies on the circle.

For (1, 2),

$$OC = \sqrt{(1-0)^2 + (2-0)^2} = \sqrt{(1)^2 + (2)^2} = \sqrt{1+4} = \sqrt{5}$$

Since $\sqrt{5} < 3$, it lies inside the circle.

For (3, 1),

$$OD = \sqrt{(3-0)^2 + (1-0)^2} = \sqrt{(3)^2 + (1)^2} = \sqrt{9+1} = \sqrt{10}$$

Since $\sqrt{10} > 3$, so point (3,1) it lies outside the circle.

32. **(b)** 9

Explanation: For infinitely many solutions,

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

Here, $a_1 = 3, a_2 = k, b_1 = 5, b_2 = 15, c_1 = -8, c_2 = -24$

So, $\frac{3}{k} = \frac{5}{15} = \frac{-8}{-24}$

$\Rightarrow \quad \frac{3}{k} = \frac{1}{3}$

$\Rightarrow \quad k = 9$

33. **(c)** 2

Explanation: Let the two consecutive even numbers be $2n$ and $(2n + 2)$.
Prime factorisation of $2n = 2 \times n$
Prime factorisation of $(2n + 2) = 2 \times (n + 1)$
To find HCF, we multiply all the prime factors common to both numbers.
Therefore, HCF = 2

34. **(a)** both negative

Explanation: $p(x) = x^2 + 99x + 127$

Here, sum of zeroes $= \frac{-b}{a} = -99$ and

product of zeroes $= \frac{c}{a} = 127$

Since, product of zeroes is positive and sum is negative, it is possible only when both the zeroes are negative.
Therefore, both the zeroes are negative.

35. **(c)** $\left(\frac{-9}{2}, \frac{5}{2}\right)$

Explanation: The mid-point of the line joining these two points can be found with the help of mid-point formula $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$\Rightarrow \quad$ mid-point, $O = \left(\frac{-3+(-6)}{2}, \frac{9+(-4)}{2}\right)$

$\Rightarrow \quad$ mid-point, $O = \left(\frac{-9}{2}, \frac{5}{2}\right)$

36. **(d)** non-terminating but repeating

Explanation:
The denominator of $\frac{13}{2 \times 5^2 \times 7}$ is not of the form $2^m \times 5^n$, so, its decimal expansion is non-terminating but repeating.

37. **(b)** 2 : 5

Explanation: Since $DE \parallel BC$

$\Rightarrow \quad \angle ADE = \angle ABC$

and $\quad \angle AED = \angle ACB$

$\therefore$ By AA similarity criterion $\Delta ADE \sim \Delta ABC$

By C.P.C.T. $\quad \frac{AD}{AB} = \frac{DE}{BC}$

$\Rightarrow \quad \frac{2}{5} = \frac{DE}{BC}$ $\quad (AB = AD + DB = 2 + 3 = 5 \text{ cm})$

$\therefore \quad DE : BC = 2 : 5$

38. **(a)** 1000

Explanation:
We know that $HCF \times LCM$ = Product of two numbers

$\Rightarrow \quad HCF \times LCM = 20 \times 50$

$\therefore \quad HCF \times LCM = 1000$

39. **(d)** None

Explanation: Since 6^n is expressed as $(2 \times 3)^n$, it can never end with digit 0 as it does not have 5 in its prime factorisation.

40. **(b)** 1

Explanation: $(1 + \tan^2 A)(1 + \sin A)(1 - \sin A)$

$$= (1 + \tan^2 A)\{(1)^2 - \sin^2 A\}$$

$$\{\because (a + b)(a - b) = (a^2 - b^2)\}$$

$$= \left(1 + \frac{\sin^2 A}{\cos^2 A}\right)(1 - \sin^2 A)$$

$$= \left(\frac{\cos^2 A + \sin^2 A}{\cos^2 A}\right)(\cos^2 A)$$

$$\{\because 1 - \sin^2 A = \cos^2 A\}$$

$$= \cos^2 A + \sin^2 A$$

$$= 1$$

SECTION - C

Case Study-I

41. **(c)** 9 m

Explanation: Here, $h = -t^2 + 2t + 8$

It is of the form $ax^2 + bx + c$

So, $t = x$

For a parabola, x-coordinate for maximum height is $x = \frac{-b}{2a}$.

$$\Rightarrow \quad x = \frac{-2}{2(-1)}$$

$$= \frac{-2}{-2} = 1$$

$$\Rightarrow \quad t = 1 \text{ sec}$$

Now, the height covered by ball in 1 second

$$= -(1)^2 + 2(1) + 8$$

$$= -1 + 2 + 8$$

$$= 9 \text{ m}$$

$\therefore$ The maximum height reached by the ball is 9 m.

42. **(b)** quadratic polynomial

Explanation: The graph of quadratic polynomial is a parabola.

43. **(c)** 1 second

Explanation: For a parabola, x-coordinate for maximum height is $x = \frac{-b}{2a}$

$$\Rightarrow \quad x = \frac{-2}{2(-1)}$$

$$= \frac{-2}{-2} = 1$$

$$\therefore \quad t = 1 \text{ sec}$$

44. **(b)** 2

Explanation: Number of zeroes of a quadratic polynomial = 2.

45. **(b)** – 2, 4

Explanation: Here $h = -t^2 + 2t + 8 = 0$

$$\Rightarrow \quad -t^2 + 2t + 8 = 0$$

$$\Rightarrow \quad -t^2 + 4t - 2t + 8 = 0$$

$$\Rightarrow \quad -t(t-4) - 2(t-4) = 0$$

$$\Rightarrow \quad (t-4)(-t-2) = 0$$

$$\therefore \quad t = 4, -2$$

Case Study-II

46. **(d)** RHS

Explanation: RHS is not a similarity criterion.

47. **(a)** $x\sqrt{2}$ unit

Explanation: Since $AB = AC = x$ units

$$\Rightarrow \quad AB^2 + AC^2 = BC^2$$

(by Pythagoras theorem)

$$\Rightarrow \quad x^2 + x^2 = BC^2$$

$$\Rightarrow \quad BC^2 = 2x^2$$

$$\therefore \quad BC = x\sqrt{2} \text{ units}$$

48. **(c)** 1 : 2

Explanation: Here $QR = 2x$ and $QP = 2x$

$$\Rightarrow \quad PR^2 = QR^2 + QP^2$$

$$\Rightarrow \quad PR^2 = (2x)^2 + (2x)^2$$

$$\Rightarrow \quad PR^2 = 4x^2 + 4x^2$$

$$\Rightarrow \quad PR^2 = 8x^2$$

$$\Rightarrow \quad PR = 2\sqrt{2}x$$

Now, $BC : PR = \sqrt{2}x : 2\sqrt{2}x = 1 : 2$

49. **(c)** 4 : 1

Explanation: Since $\frac{AB}{QP} = \frac{BC}{PR} = \frac{CA}{RQ}$

$$\Delta ABC \sim \Delta QPR$$

(by SSS similarity criterion)

$$\Rightarrow \quad \frac{ar(\Delta QPR)}{ar(\Delta ABC)} = \left(\frac{PR}{BC}\right)^2$$

(If two triangles are similar, then the ratio of the area of both triangles is proportional to the square of the ratio of their corresponding sides.)

$$\Rightarrow \quad \frac{ar(\Delta QPR)}{ar(\Delta ABC)} = \left(\frac{2}{1}\right)^2$$

$$\therefore \quad \frac{ar(\Delta QPR)}{ar(\Delta ABC)} = \frac{4}{1}$$

50. **(d)** $\Delta PQR \sim \Delta ABC$

Explanation: Since $\Delta ABC \sim \Delta QPR$, ΔPQR is not similar to ΔABC. The points A and B are not corresponding to P and Q respectively.

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