6

TERM-1 SAMPLE PAPER

SOLVED

MATHEMATICS (STANDARD)

Time Allowed: 90 Minutes *Maximum Marks: 40*

General Instructions: Same instructions as given in the Sample Paper 1.

SECTION - A **16 marks**

(Section A consists of 20 questions of 1 mark each. Any 16 questions are to be attempted.)

1. Find the value(s) of k, if one of the zeroes of the polynomial $f(x) = (k^2 + 8)x^2 + 13x + 6k$ is reciprocal of the other.

(a) 2, 4 (b) 3, 5

(c) 1, 3 (d) –1, 1

2. The distance between the points $\left(-\frac{8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right)$ is:

(a) 5 units (b) $\frac{7}{5}$ units

(c) 2 units (d) $\frac{14}{5}$ units

3. If the area of a circle is numerically equal to twice its circumference, then the radius of the circle is:

(a) 2 units (b) 4 units

(c) 6 units (d) 8 units

4. $\frac{2\sqrt{45}+3\sqrt{20}}{2\sqrt{5}}$ is a/an:

(a) rational number (b) irrational number

(c) prime number (d) co-prime number

5. If $\triangle ABC \sim \triangle DEF$ such that AB = 1.2 cm and DE = 1.4 cm, the ratio of the areas of $\triangle ABC$ and $\triangle DEF$ is:

(a) 49 : 36 (b) 6 : 7

(c) 7 : 6 (d) 36 : 49

6. Evaluate for what value of c the system of linear equations $cx + 3y = 3$; $12x + cy = 6$ has no solution.

(a) –6 (b) 0

(c) 6 (d) 12

7. What is the value of $\frac{\sin 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$?

(a) $(\sqrt{3}-1)$ (b) $\frac{\sqrt{3}(\sqrt{3}-1)}{4\sqrt{2}}$

(c) $4\sqrt{2}$ (d $\sqrt{3}(\sqrt{3}-1)$

8. What is the probability of getting exactly one head, when two coins are tossed simultaneously?

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

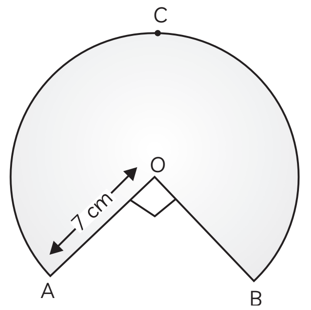
(c) $\frac{1}{4}$ (d) $\frac{1}{5}$

9. What is the probability of not getting a prime number in a single throw of a die?

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

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

10. The perimeter of the given figure is:



(a) 35 cm (b) 47 cm

(c) 33 cm (d) 11 cm

11. The ratio in which the point P(–3, x) divide the line segment joining the points A(–5, –4) and B(–2, 3) is:

(a) 3 : 2 (b) 4 : 7

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

12. Form a pair of linear equations to represent the given situation: Meena went to a bank to withdraw ₹ 2000. She asked the cashier to give her ₹ 50 and ₹ 100 note only. Meena got 25 notes in all. Consider ₹ 50 notes as x and ₹ 100 notes as y.

(a) $50x + 100y = 2000, x + y = 25$

(b) $x + 50y = 100, 100x + y = 2000$

(c) $x + y = 25, 100x + 50y = 2000$

(d) $50x + y = 100, x + 100y = 2000$

13. Find the value of $\alpha\beta^2 + \beta\alpha^2$, if α and β are the zeroes of polynomial $3x^2 + 4x + 2$.

(a) $\frac{3}{7}$ (b) $\frac{1}{9}$

(c) $-\frac{8}{9}$ (d) $\frac{7}{8}$

14. After how many places of decimal, will the decimal expansion of $\frac{141}{120}$ terminate?

(a) 1 (b) 2

(c) 3 (d) 4

15. What are the value(s) of y, if the points A(–1, y) and B(5, 7) lie on a circle with centre O(2, –3y)?

(a) 7, 3 (b) –1, 7

(c) 1, 7 (d) 7, 2

16. What are the coordinates of the centroid of the triangle having vertices as $(a, b - c)$, $(b, c - a)$ and $(c, a - b)$?

(a) (1, 1) (b) $\left(\frac{a+b+c}{3}, 0\right)$

(c) (0, 0) (d) $\left(0, \frac{b}{3}\right)$

17. Find the ratio of circumferences of two circles, whose areas are in the ratio of 16 : 25.

(a) 16 : 25 (b) 4 : 5

(c) 5 : 4 (d) 25 : 16

18. A quadratic polynomial with zeroes –2 and 3, is:

(a) $3x^2 - 2x + 6$ (b) $2x^2 + 3x - 6$

(c) $x^2 - 2x + 6$ (d) $x^2 - x - 6$

19. What are the coordinates of the point, which divides the join of the points (5, 0) and (0, 4) in the ratio 2 : 3 internally?

(a) (8, –3) (b) (6, 5)

(c) $\left(3, \frac{8}{5}\right)$ (d) $\left(\frac{5}{2}, 2\right)$

20. Two given lines represent a pair of inconsistent linear equations, then both lines must be:

(a) intersecting at one point

(b) coincident

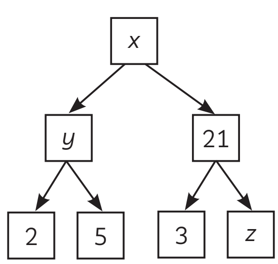
(c) parallel

(d) intersecting at two points

SECTION - B **16 marks**

(Section B consists of 20 questions of 1 mark each. Any 16 questions are to be attempted.)

21. From the given factor tree, the values of x, y, z respectively are:



(a) 210, 7, 10 (b) 210, 10, 7

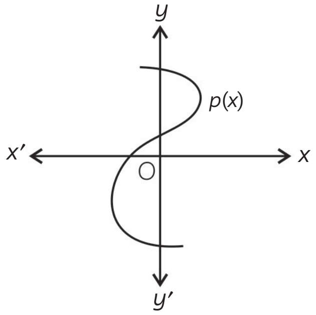
(c) 105, 5, 10 (d) 105, 10, 5

22. What are the values of a and b, respectively if $x = 2$ and $x = 0$ are the zeroes of the polynomial $f(x) = 2x^3 - 5x^2 + ax + b$?

(a) 2, 0 (b) 0, 2

(c) –1, 1 (d) 5, 3

23. Calculate the number of zeroes for the graph of a polynomial $p(x)$ as shown below:

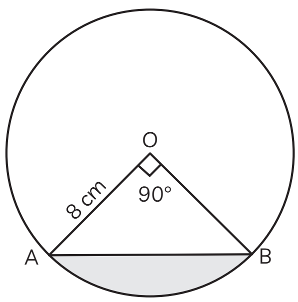


(a) 0 (b) 1
(c) 2 (d) 3

24. If a point (x, y) is equidistant from the points A(9, 8) and B(17, 8), then the relation between x and y is:

(a) $x + y = 13$ (b) $x - 13 = 0$
(c) $y - 13 = 0$ (d) $x - y = 13$

25. Shaurya is making a greeting card for the father's day. In the card, the shaded part is folded. What is the area of the region folded in the greeting card?

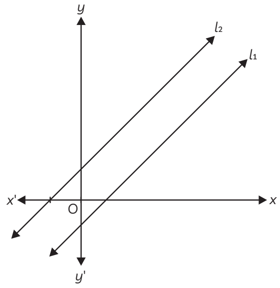


(a) $16(\pi - 2)\text{cm}^2$ (b) $8(\pi^2 - 2)\text{ cm}^2$
(c) $16\pi\text{ cm}^2$ (d) $\frac{7\pi}{2}\text{ cm}^2$

26. If (a, b) is the mid-point of the line segment joining the points A(10, –6) and B(k, 4) and $a - 2b = 18$, the value of k is:

(a) 30 (b) 22
(c) 4 (d) 40

27. In the given figure, AB is perpendicular to BC and DE is perpendicular to AC. Then, ΔABC is similar to which of the following triangle?



(a) ΔADE (b) ΔDAE
(c) ΔDEA (d) ΔAED

28. If $\tan(A + B) = 1$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, $0° < A + B < 90°$, then the value of $\sin(3A - 7B)$ is:

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

29. Tours of the regional capital and the white house begin at 8.30 am from tour agency. Tours for the regional capital leave every 15 min. Tours for the white house leave every 20 min. After many minutes do the tours leave at the same time?

(a) 60 min (b) 50 min
(c) 1 hr 5min (d) 15 min

30. Calculate the value of HCF (8, 9, 25) × LCM (8, 9, 25).

(a) 500 (b) 1800
(c) 200 (d) 2500

31. Two angles are supplementary to each other. The larger of two supplementary angles exceeds the smaller by 20°. Find the smaller angle.

(a) 60° (b) 80°
(c) 65° (d) 75°

32. On rolling two dice at once, what is the probability of getting a sum of doublets less than 5?

(a) $\frac{1}{6}$ (b) $\frac{2}{9}$
(c) $\frac{1}{18}$ (d) $\frac{3}{7}$

33. The points A(3, 0), B(6, 4) and C(–1, 3) form/are:

(a) collinear
(b) right triangle
(c) equilateral triangle
(d) isosceles right angled triangle

34. Calculate the point at which the pair of equations $4^{x+y} = 256$ and $256^{x-y} = 4$ will be intersected.

(a) $\left(\frac{1}{8}, \frac{17}{18}\right)$ (b) $\left(\frac{13}{8}, \frac{15}{8}\right)$
(c) $\left(\frac{17}{8}, \frac{15}{8}\right)$ (d) $\left(\frac{13}{8}, \frac{11}{8}\right)$

35. Calculate the HCF of p^3q^2 and p^2q, provided that p and q ae prime numbers:

(a) pq (b) pq^2
(c) p^2q (d) p^2q^2

36. **Find the decimal expansion of the rational number $\frac{14587}{1250}$.**

(a) 11.6696 (b) 12.6182

(c) 9.3120 (d) 10.717

37. **The line segment joining the points A(3, –4) and B(1, 2) is trisected at the points P(p, –2) and Q$\left(\frac{5}{3}, q\right)$. The values of p, q respectively are:**

(a) $0, \frac{7}{3}$ (b) $\frac{7}{3}, 0$

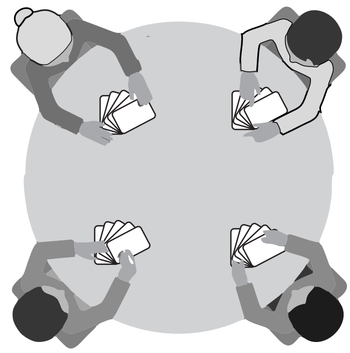
(c) $\frac{8}{3}, -1$ (d) $-1, \frac{8}{3}$

38. **Calculate the number of solutions for the pair of linear equations $y = 0$ and $y = 7$.**

(a) 2 (b) 3

(c) 0 (d) 1

39. *Rita, Sita, Gita and Shyama are playing a bridge game. It is a four persons play and a pair of two-two persons as a partner is made. A deck of 52 playing cards is distributed around the table clockwise.*



Find the probability that the card drawn is a queen of black colour.

(a) $\frac{5}{26}$ (b) $\frac{1}{26}$

(c) $\frac{3}{26}$ (d) $\frac{25}{26}$

40. **Which of the following is a zero of the polynomial $x^2 + 6x + 9$?**

(a) 2 (b) –1

(c) –3 (d) 0

SECTION - C **8 marks**

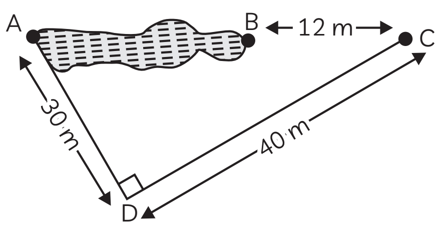
(Case Study Based Questions.)

(Section C consists of 10 questions of 1 mark each. Any 8 questions are to be attempted.)

Q. 41-45 are based on Case Study–1

Case Study–1:

Suresh wants to measure the distance of a pond during the visit to his native. He marks points A and B on the opposite edges of the pond as shown in the figure below. To find the distance between the points, he makes a right-angled triangle using rope connecting B with another point C are at a distance of 12 m, connecting C to point D at a distance of 40 m from point C and the connecting D to the point A which is at a distance of 30 m from D such that ∠ADC = 90°



41. **Which 4 property of geometry will be used to find the distance AC?**

(a) Similarity of triangles

(b) Thales theorem

(c) Pythagoras theorem

(d) Area of similar triangles

42. **What is the distance AC?**

(a) 50 m (b) 12 m

(c) 100 m (d) 70 m

43. **Which of following does not form a Pythagoras triplet?**

(a) (7, 24, 25) (b) (15, 8, 17)

(c) (5, 12, 13) (d) (21, 20, 28)

44. **Find the length AB.**

(a) 12 cm (b) 38 m

(c) 50 m (d) 100 m

45. **Find the length of rope used.**

(a) 120 m (b) 70 m

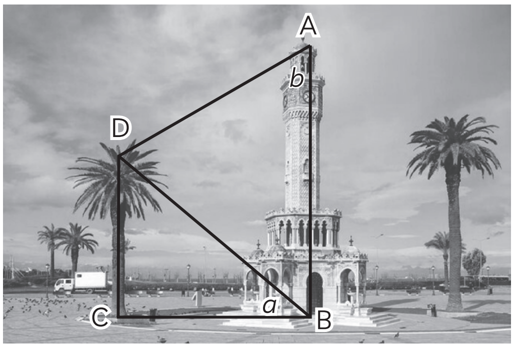
(c) 82 m (d) 22 m

Q. 46-50 are based on Case Study–2

Case Study–2:

Izmir Clock Tower is a historic clock tower in Konak Square in the center of Izmir, Turkey. The French architect Raymond Charles Pere designed the Izmir Clock Tower. It was built in 1901 to commemorate the 25th anniversary of Abdulhamid II's accession to the throne. Four fountains with three water taps each are set around the base of the tower in a circular pattern, and the columns are inspired by Moorish designs. The clock tower has become the symbol of Izmir, and it appeared on the back of Turkish 500 lira banknotes from 1983 to 1989.

Let us assume that the height of the tower AB = 14 m, height of tree CD = 5 m and BD – BC = 1 m. As the tower is vertical, ∠ABC = 90°. Further, let us denote ∠CBD by 'a' and ∠BAD by 'b'.



46. **The value of sin *a* is:**

(a) $\frac{12}{13}$ (b) $\frac{13}{12}$

(c) $\frac{13}{5}$ (d) $\frac{5}{13}$

47. **The value of tan *b* is:**

(a) $\frac{12}{9}$ (b) $\frac{9}{12}$

(c) $\frac{15}{12}$ (d) $\frac{15}{9}$

48. **The value of $\sec^2 a + \mathrm{cosec}^2 b$ is:**

(a) $\frac{255}{144}$ (b) $\frac{197}{72}$

(c) 1 (d) $\frac{72}{197}$

49. **The value of $\sin^2 a + \cos^2 a$ is:**

(a) 0 (b) –1

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

50. **The value of $\cot^2 b$ is:**

(a) $\frac{81}{144}$ (b) $\frac{144}{225}$

(c) $\frac{81}{225}$ (d) $\frac{225}{44}$

SOLUTION

SAMPLE PAPER - 6

SECTION - A

1. *(a) 2, 4*

Explanation: Let α, β be two zeroes of the given polynomial. Then, $\alpha = \frac{1}{\beta}$ or $\beta = \frac{1}{\alpha}$

∴ Let $\alpha, \frac{1}{\alpha}$ be the two zeroes of the given polynomial.

By relationship between zeroes and coefficients of a polynomial, we have

$$\alpha \times \frac{1}{\alpha} = \frac{6k}{k^2+8}$$

$$\Rightarrow \quad k^2 + 8 = 6k$$

$$\Rightarrow \quad k^2 - 6k + 8 = 0$$

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

$$\Rightarrow \quad k = 4, 2$$

2. *(c) 2 units*

Explanation:

$$\text{Required distance} = \sqrt{\left[\frac{2}{5} - \left(-\frac{8}{5}\right)\right]^2 + (2-2)^2}$$

$$= \sqrt{\left(\frac{10}{5}\right)^2 + 0} = \sqrt{2^2} = 2$$

3. *(b) 4 units*

Explanation: Let r be the radius of the circle.

Then, $\pi r^2 = 2(2\pi r)$ [Given]

$\Rightarrow \quad r^2 = 4r$

$\Rightarrow \quad r = 4$ [$\because r \neq 0$]

4. *(a) rational number*

Explanation: We have,

$$\frac{2\sqrt{45}+3\sqrt{20}}{2\sqrt{5}} = \frac{2\sqrt{3\times3\times5}+3\sqrt{2\times2\times5}}{2\sqrt{5}}$$

$$= \frac{2\times3\sqrt{5}+3\times2\sqrt{5}}{2\sqrt{5}}$$

$$= \frac{6\sqrt{5}+6\sqrt{5}}{2\sqrt{5}}$$

$$= \frac{12\sqrt{5}}{2\sqrt{5}} = 6$$

which is a rational number.

5. *(d) 36 : 49*

Explanation: Here,

$$\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2} = \frac{(1.2)^2}{(1.4)^2} = \frac{1.44}{1.96} = \frac{36}{49}$$

6. *(a) −6*

Explanation: The given system of linear equations is

$$cx + 3y - 3 = 0;\ 12x + cy - 6 = 0$$

For no solution, $\frac{c}{12} = \frac{3}{c} \neq \frac{-3}{-6}$

Now, $\frac{c}{12} = \frac{3}{c} \Rightarrow c^2 = 36 \Rightarrow c = \pm 6$

Also, $\frac{3}{c} \neq \frac{-3}{-6} \Rightarrow \frac{3}{c} \neq \frac{1}{2} \Rightarrow c \neq 6$

$\therefore \quad c = -6$

7. *(b)* $\frac{\sqrt{3}(\sqrt{3}-1)}{4\sqrt{2}}$

Explanation:

$$\frac{\sin 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ} = \frac{\frac{1}{\sqrt{2}}}{\frac{2}{\sqrt{3}} + 2}$$

$$= \frac{\sqrt{3}}{\sqrt{2}\,(2 + 2\sqrt{3})}$$

$$= \frac{\sqrt{3}}{2\sqrt{2}\,(1+\sqrt{3})} \times \frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$$

$$= \frac{\sqrt{3}\,(\sqrt{3}-1)}{2\sqrt{2}\left((\sqrt{3})^2 - 1\right)}$$

$$= \frac{\sqrt{3}\,(\sqrt{3}-1)}{2\sqrt{2}(3-1)}$$

$$= \frac{\sqrt{3}\,(\sqrt{3}-1)}{2\sqrt{2} \times 2}$$

$$= \frac{\sqrt{3}\,(\sqrt{3}-1)}{4\sqrt{2}}$$

8. *(a)* $\frac{1}{2}$

Explanation: When two coins are tossed simultaneously, then

Total possible outcomes = {HT, TH, HH, TT}

$\therefore \quad n(S) = 4$

Favourable outcomes = {HT, TH}

$\therefore \quad n(E) = 2$

$\therefore$ P(getting exactly one head) $= \frac{n(E)}{n(S)}$

$$= \frac{2}{4} = \frac{1}{2}$$

9. *(a)* $\frac{1}{2}$

Explanation: On a die, there are six numbers namely, 1, 2, 3, 4, 5, 6.

$\therefore$ Total number of possible outcomes = 6

Let E = Event of getting a prime number

$\therefore \quad$ E = 2, 3, 5 *i.e.* n(E) = 3

$\therefore \quad P(E) = \frac{3}{6} = \frac{1}{2}$

$\overline{E}$ = Event of not getting a prime number.

$\therefore \quad P(\overline{E}) = 1 - P(E) = 1 - \frac{1}{2} = \frac{1}{2}$

10. *(b) 47 cm*

Explanation: Here,

OA = OB = Radii

and, ACB = Arc of major sector

$\therefore$ Perimeter = OA + OB + Length of arc ACB

$$= 7 + 7 + \frac{360^\circ - 90^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 7$$

$$\left[\because \text{Length of arc} = \frac{\theta}{360} \times 2\pi r\right]$$

$$= 14 + \frac{270}{360} \times 44$$

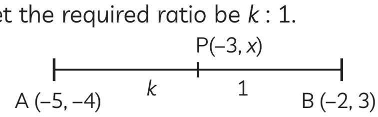
$$= 14 + \frac{3}{4} \times 44$$

$$= 14 + 33 = 47$$

11. *(c) 2 : 1*

Explanation:

Let the required ratio be k : 1.



Then, using section formula,

$$\Rightarrow \quad p(-3, x) = \left(\frac{k \times (-2) + 1 \times (-5)}{k+1}, \frac{k \times 3 + 1 \times (-4)}{k+1}\right)$$

$$\Rightarrow \quad p(-3, x) = \left(\frac{-2k-5}{k+1}, \frac{3k-4}{k+1}\right)$$

$$\Rightarrow \quad -3 = \frac{-2k \quad 5}{k+1}$$

$$\Rightarrow \quad -3k - 3 = -2k - 5$$

$$\Rightarrow \quad -k = -2 \Rightarrow k = 2$$

$\therefore$ Required ratio = k : 1 = 2 : 1

12. *(a) 50x + 100y = 2000, x + y = 25*

Explanation: Here, x and y are the number of ₹ 50 and ₹ 100 notes respectively.

$\therefore \quad x + y = 25$

(Since total notes is 25)

and Total amount = 2000

$\Rightarrow \quad 50x + 100y = 2000$

Thus required linear equations are $x + y = 25$ and $50x + 100y = 2000$.

13. *(c)* $\frac{-8}{9}$

Explanation: Let $p(x) = 3x^2 + 4x + 2$

So, sum of zeroes, $\alpha + \beta = -\frac{4}{3}$

and product of zeroes, $\alpha\beta = \frac{2}{3}$

Now, $\alpha\beta^2 + \beta\alpha^2 = \alpha\beta(\beta + \alpha) = \frac{2}{3} \times \left(-\frac{4}{3}\right) = \frac{-8}{9}$

14. *(c) 3*

Explanation: $\frac{141}{120} = \frac{3 \times 47}{2^3 \times 3 \times 5} = \frac{47}{2^3 \times 5}$

When, $x = p/q$ is a rational number such that prime factorisation of q is of the form $2^m \times 5^n$, where m, n are non-negative integers, then, x has a decimal expansion which terminates after k places of decimals where k is the larger of m and n.

Here, $k = 3$

Hence, $\frac{141}{120}$ will terminate after 3 places of decimal

15. *(b) −1, 7*

Explanation: As, O is the centre of circle and A, B are points on its circumference.

$\therefore \quad OA = OB = \text{Radii}$

or $\quad OA^2 = OB^2$

$\Rightarrow (2 + 1)^2 + (-3y - y)^2 = (2 - 5)^2 + (-3y - 7)^2$

[Using distance formula]

$\Rightarrow \quad 9 + 16y^2 = 9 + 9y^2 + 49 + 42y$

$\Rightarrow \quad 7y^2 - 42y - 49 = 0$

$\Rightarrow \quad y^2 - 6y - 7 = 0$

$\Rightarrow \quad y^2 - 7y + y - 7 = 0$

$\Rightarrow \quad (y - 7)(y + 1) = 0$

$\Rightarrow \quad y = -1, 7$

16. *(b)* $\left(\frac{a+b+c}{3}, 0\right)$

Explanation: Here, $x_1 = a$, $y_1 = b - c$, $x_2 = b$, $y_2 = c - a$, $x_3 = c$ and $y_3 = a - b$

We know

$$\text{Centroid, G} = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$

$$= \left(\frac{a+b+c}{3}, \frac{b-c+c-a+a-b}{3}\right)$$

$$= \left(\frac{a+b+c}{3}, 0\right)$$

17. *(b) 4 : 5*

Explanation: Let the radii of two circles be r_1 and r_2.

So, $\quad \frac{\pi r_1^2}{\pi r_2^2} = \frac{16}{25}$ [Given]

$\Rightarrow \quad \frac{r_1^2}{r_2^2} = \frac{16}{25}$

$\Rightarrow \quad \frac{r_1}{r_2} = \frac{4}{5}$

Ratio of their circumferences $= \frac{2\pi r_1}{2\pi r_2} = \frac{r_1}{r_2} = \frac{4}{5}$

18. *(d)* $x^2 - x - 6$

Explanation : Let the zeroes of required polynomial be α and β.

Then, $\quad \alpha = -2$ and $\beta = 3$

$\therefore$ Equation of second degree polynomal is

$x^2 - (\alpha + \beta)x + \alpha\beta$

i.e., $x^2 - (-2 + 3)x + (-2)(3)$

i.e., $x^2 - x - 6$

⚠ Caution

➥ *Here the zeroes of polynomial is given, so first find the sum and product of the zeroes to find the required equation.*

19. *(c)* $\left(3, \frac{8}{5}\right)$

Explanation: Let P(x, y) be the point which divides the join of A(5, 0) and B(0, 4) in the ratio 2 : 3 internally.

$\therefore x = \frac{2(0) + 3(5)}{2+3} = 3$ and $y = \frac{2(4) + 3(0)}{2+3} = \frac{8}{5}$

Hence, the required point is $\left(3, \frac{8}{5}\right)$

20. *(c) parallel*

Explanation: As in case of parallel lines, the two lines never intersects.

SECTION - B

21. *(b) 210, 10, 7*

Explanation: We have,

$$21 = 3 \times z$$

$$z = \frac{21}{3} = 7$$

Also, $y = 2 \times 5 = 10$

and, $x = y \times 21$

$= 10 \times 21 = 210$

$\therefore$ $x = 210;\quad y = 10;\quad z = 7$

22. *(a) 2, 0*

Explanation : Given, $f(x) = 2x^3 - 5x^2 + ax + b$

Since, $x = 2$ and $x = 0$ are the zeroes of $f(x)$.

$\therefore$ $f(2) = 0$ and $f(0) = 0$

Now, $f(2) = 2(2)^3 - 5(2)^2 + a(2) + b$

$0 = 16 - 20 + 2a + b$

$\Rightarrow$ $2a + b = 4$ ...(i)

Also, $f(0) = 2(0)^3 - 5(0)^2 + a(0) + b$

$0 = b$

So, $2a + b = 4$

$\Rightarrow$ $a = 2$

$\therefore$ $a = 2, b = 0$

23. *(b) 1*

Explanation: The number of zeroes of the polynomial $p(x)$ is 1, as the graph intersects the x-axis at only one point.

24. *(b) x – 13 = 0*

Explanation:

Let the required point be P(x, y).

Then, according to the question,

PA = PB

or $(PA)^2 = (PB)^2$ [Squaring both sides]

$\Rightarrow$ $(9 - x)^2 + (8 - y)^2 = (17 - x)^2 + (8 - y)^2$

[Using distance formula]

$\Rightarrow$ $81 - 18x + x^2 = 289 - 34x + x^2$

$\Rightarrow$ $-18x + 34x = 289 - 81$

$\Rightarrow$ $16x = 208$

$\Rightarrow$ $x = 13$

or $x - 13 = 0$

25. *(a) 16(π – 2) cm²*

Explanation: We have, radius = 8 cm and $\theta = 90°$

$\therefore$ Area of minor segment

= Area of sector OAB – Area of ΔAOB

$$= \frac{\theta}{360°} \times \pi r^2 - \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{90°}{360°} \times \pi \times (8)^2 - \frac{1}{2} \times 8 \times 8$$

$$= 16\pi - 32 = 16(\pi - 2) \text{ cm}^2$$

26. *(b) 22*

Explanation: The mid point of AB

$$= \left(\frac{10+k}{2}, \frac{-6+4}{2}\right) \textit{ i.e., } \left(5+\frac{k}{2}, -1\right)$$

Given: mid-point of AB is (a, b).

$$b = -1,\ 5 + \frac{k}{2} = a$$

Putting the values of a and b in the equation $a - 2b = 18$, we get

$\Rightarrow$ $5 + \frac{k}{2} = 16$

$\Rightarrow$ $k = 22$

27. *(d) ΔAED*

Explanation: Since,

$\angle AED = \angle ABC = 90°$

and $\angle A = \angle A$ [common angle]

$\therefore$ By AA similarity criterion,

$\Delta AED \sim \Delta ABC$

28. *(a)* $\frac{\sqrt{3}}{2}$

Explanation: We have,

$\tan(A + B) = 1 = \tan 45°$

$A + B = 45°$ ...(i)

And, $\tan(A - B) = \frac{1}{\sqrt{3}} = \tan 30°$

$A - B = 30°$ ...(ii)

Solving equations (i) and (ii), we get

$A = 37.5°,\quad B = 7.5°$

Now, $\sin(3A - 7B) = \sin(3 \times 37.5 - 7 \times 7.5)$

$= \sin(112.5° - 52.5°)$

$= \sin(60°)$

$= \frac{\sqrt{3}}{2}$

29. *(a) 60 min*

Explanation: Required time = LCM (15, 20)

By using prime factorisation method,

$15 = 3 \times 5$

and $20 = 2 \times 2 \times 5 = 2^2 \times 5$

$\therefore$ LCM (15, 20) $= 2^2 \times 3 \times 5 = 60$ min

$\therefore$ In every 60 min, tour leaves at the same time.

30. *(b) 1800*

Explanation: We have,

$$8 = 2^3,\ 9 = 3^2,\ 25 = 5^2$$

$\therefore$ HCF (8, 9, 25) = 1

and LCM (8, 9, 25) $= 2^3 \times 3^2 \times 5^2 = 1800$

$\therefore$ HCF (8, 9, 25) × LCM (8, 9, 25)

$$= 1 \times 1800 = 1800$$

31. *(b) 80°*

Explanation: Let the supplementary angles be x and y ($x > y$).

Now, $x + y = 180°$ ...(i)

and $x - y = 20°$ ...(ii)

From (ii), $y = x - 20°$ ...(iii)

Substituting the value of y from (iii) in (i), we get

$$x + x - 20° = 180°$$

$\Rightarrow$ $2x = 200°$

$\Rightarrow$ $x = 100°$

Substituting $x = 100°$ in (iii), we get

$$y = 100° - 20° = 80°$$

Hence, the smaller angle is 80°.

32. *(c)* $\frac{1}{18}$

Explanation: When two dice are rolled,

Total number of possible outcomes = 36

Doublets with sum less than 5 are (1, 1), (2, 2).

$\therefore$ Number of favourable cases = 2

$\therefore$ Required probability $= \frac{2}{36} = \frac{1}{18}$

33. *(d) isosceles right angled triangle*

Explanation: We have,

$$AB = \sqrt{(6-3)^2 + (4-0)^2}$$

$$= \sqrt{(3)^2 + (4)^2} = 5$$

$$BC = \sqrt{(-1-6)^2 + (3-4)^2}$$

$$= \sqrt{(-7)^2 + (-1)^2}$$

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

$$AC = \sqrt{(-1-3)^2 + (3-0)^2}$$

$$= \sqrt{(-4)^2 + (3)^2} = 5$$

$\Rightarrow$ AB = AC

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

$\therefore$ Points A, B and C form an isosceles right angled triangle.

34. *(c)* $\left(\frac{17}{8}, \frac{15}{8}\right)$

Explanation: Given,

$$4^{x+y} = 256 \Rightarrow 4^{x+y} = (4)^4$$

On comparing the powers, we get

$$x + y = 4 \quad ...(i)$$

Also, $(256)^{x-y} = 4 \Rightarrow (4^4)^{(x-y)} = (4)^1$

On comparing the powers, we get

$$4(x - y) = 1 \Rightarrow x - y = \frac{1}{4} \quad ...(ii)$$

On adding eqs. (i) and (ii), we get

$$2x = 4 + \frac{1}{4} = \frac{17}{4}$$

$\therefore$ $x = \frac{17}{8}$

On putting $x = \frac{17}{8}$ in eq. (i), we get

$$\frac{17}{8} + y = 4$$

$\therefore$ $y = 4 - \frac{17}{8} = \frac{15}{8}$

Caution

➥ *Here direct equation in terms of x and y is not given. So first form them by using given condition and then solve them to get the answer.*

35. *(c)* p^2q

Explanation: We have,

$$p^3q^2 = p \times p \times p \times q \times q$$

and $p^2q = p \times p \times q$

$\therefore$ HCF $= p \times p \times q = p^2q$

36. *(a) 11.6696*

Explanation: We have,

$$\frac{14587}{1250} = \frac{14587}{2 \times 5^4}$$

$$= \frac{14587}{10 \times 5^3} \times \frac{(2)^3}{(2)^3}$$

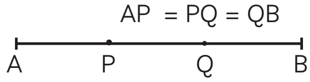
$$\frac{14587 \times 8}{10 \times 1000} = \frac{116696}{10000}$$

$$= 11.6696$$

37. *(b)* $\frac{7}{3}$, *0*

Explanation: We have,

$$AP = PQ = QB$$



$\therefore$ AP : PB = 1 : 2

$\therefore$ Using section formula,

$$P(p, -2) = \left(\frac{1\times1+2\times3}{1+2}, \frac{1\times2+2\times(-4)}{1+2}\right)$$

$$= \left(\frac{7}{3}, \frac{2-8}{3}\right) = \left(\frac{7}{3}, -2\right)$$

$$\Rightarrow \quad p = \frac{7}{3}$$

Also, Q is the mid-point of PB.

$$\therefore \quad Q \ \frac{5}{3}, q \quad = \left(\frac{\frac{7}{3}+1}{2}, \frac{-2+2}{2}\right)$$

$$\Rightarrow \quad q = \frac{-2+2}{2} = 0$$

$$\therefore \quad p = \frac{7}{3}, q = 0$$

38. *(c) 0*

Explanation: The pair of linear equations $y = 0$ and $y = 7$ are parallel lines and thus have no solution.

39. *(b)* $\frac{1}{26}$

Explanation: Total number of cards = 52

Number of black queens = 2.

$$\therefore \text{P(black queen)} = \frac{2}{52} = \frac{1}{26}$$

40. *(c) –3*

Explanation: Let,

$$p(x) = x^2 + 6x + 9$$
$$= (x + 3)^2$$

To find zeroes, put $p(x) = 0$

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

SECTION - C

41. *(c) Pythagoras theorem*

42. *(a) 50 m*

Explanation: In ΔADC,

$$AC^2 = AD^2 + CD^2$$

(by Pythagoras theorem)

$$AC^2 = 40^2 + 30^2 = 1600 + 900$$
$$AC^2 = 2500 \Rightarrow AC = 50 \text{ m}$$

43. *(d) (21, 20, 28)*

Explanation: As $21^2 + 20^2 \neq 28^2$

44. *(b) 38 m*

Explanation:

$$AB = AC - BC$$
$$= 50 - 12$$
$$= 38 \text{ m}$$

45. *(c) 82 m*

Explanation: Length of rope used

$$= AD + CD + BC$$
$$= 30 + 40 + 12$$
$$= 82 \text{ m}$$

46. *(d)* $\frac{5}{13}$

Explanation: To find sin a, we will first find BD. It is given that BD – BC = 1 m and CD = 5 m. Therefore, applying Pythagoras theorem in triangle BCD, we get :

$$BD^2 = BC^2 + CD^2 \Rightarrow BD^2 = (BD - 1)^2 + 5^2$$

$$\Rightarrow BD^2 = BD^2 - 2BD + 1 + 25$$

Solving further, 2BD = 26, or BD = 13 m

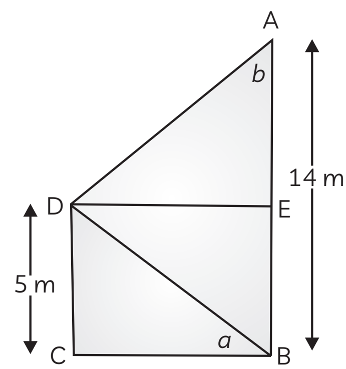
Therefore, BC = 12 m.

In ΔBCD, $\quad \sin a = \frac{\text{Perpendicular}}{\text{Base}}$

$$= \frac{CD}{BD} = \frac{5}{13}$$

47. *(a)* $\frac{12}{9}$

Explanation: To find tan b, we will find AE and DE (drawn parallel to BC)



On constructing DE || BC, we get a rectangle.

$\therefore$ AB = BE + AE or 14 = 5 + AE

Therefore, AE = 9 m.

and, DE = BC = 12 m

Therefore, $\quad \tan b = \frac{\text{Perpendicular}}{\text{Base}}$

$$\frac{DE}{AE} = \frac{12}{9}$$

48. *(b)* $\frac{197}{72}$

Explanation:

$$\sec a = \frac{\text{Hypotenuse}}{\text{Base}}$$

$$= \frac{BD}{BC} = \frac{13}{12}$$

and $\quad \text{cosec } b = \frac{\text{Hypotenuse}}{\text{Perpendicular}}$

$$= \frac{AD}{DE} = \frac{15}{12}$$

where we have used Pythagoras theorem in ΔAED to evaluate AD.

$$AD^2 = AE^2 + DE^2 = 9^2 + 12^2$$
$$= 81 + 144 = 225 \Rightarrow AD$$
$$= 15 \text{ m}$$

Therefore, $\sec^2 a + \text{cosec}^2 b$

$$= \left(\frac{13}{12}\right)^2 + \left(\frac{15}{12}\right)^2$$

$$= \frac{169 + 225}{144}$$

$$= \frac{394}{144} = \frac{197}{72}$$

49. *(c) 1*

Explanation: We know,

$$\sin^2\theta + \cos^2\theta = 1$$

$$\therefore \quad \sin^2 a + \cos^2 a = 1$$

50. *(a)* $\frac{81}{144}$

Explanation: $\cot b = \frac{\text{Base}}{\text{Perpendicular}}$

$$= \frac{AE}{DE} = \frac{9}{12}$$

Therefore, $\quad \cot^2 b = \left(\frac{9}{12}\right)^2 = \frac{81}{144}$