3

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. What is the value of k in the quadratic polynomial $3x^2 + 2kx - 3$, if $x = -\frac{1}{2}$ is one of the zeroes of it?

(a) $\frac{1}{5}$ (b) $\frac{3}{2}$

(c) $-\frac{1}{4}$ (d) $-\frac{9}{4}$

2. A circle, has its centre at (–1, 3). If one end of a diameter of the circle has co-ordinates (2, 5), then find the co-ordinates of the other end of the diameter.

(a) (–4, 1) (b) (1, 8)

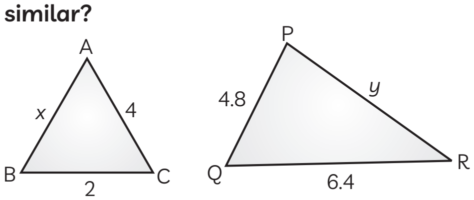
(c) (0.5, 4) (d) (–1, 4)

3. Evaluate $\frac{1+\tan^2 A}{1+\cot^2 A}$

(a) $\sec^2 A$ (b) –1

(c) $\cot^2 A$ (d) $\tan^2 A$

4. What is value of $x + y$, if ΔABC and ΔPQR are similar?



(a) 12.8 cm (b) 14.3 cm

(c) 12.5 cm (d) 14 cm

5. If we toss two unbiased coins simultaneously, then the probability of getting no head is $\frac{A}{B}$. Then $(A + B)^2$ will be equal to:

(a) 21 (b) 25 (c) 10 (d) 5

6. What is the smallest number by which $\frac{891}{3500}$ must be multiplied so it becomes a terminating decimal?

(a) 6 (b) 7 (c) 10 (d) 5

7. The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$ has no solution, is:

(a) –2 (b) $\neq 2$ (c) 2 (d) 3

8. If $(1 - p)$ is a zero of the polynomial $x^2 + px + 1 - p = 0$, then find both zeroes of the polynomial.

(a) 0, –1 (b) 1, –1 (c) 1, 0 (d) 0, 0

9. In an isosceles right angled triangle, what is the length of the equal sides of the triangle, if its hypotenuse is $6\sqrt{2}$ cm?

(a) $3\sqrt{2}$ cm (b) 6 cm

(c) 12 cm (d) 5 cm

10. Evaluate the area of the largest circle that can be inscribed inside a rectangle of sides 7 cm and 3.5 cm.

(a) $\frac{12}{7}\text{cm}^2$ (b) $\frac{17}{7}\text{cm}^2$

(c) $\frac{77}{8}\text{cm}^2$ (d) $\frac{22}{7}\text{cm}^2$

11. Find the value of p if the distance between the points (4, p) and (1, 0) is 5.

(a) ± 4 (b) ± 6 (c) ± 8 (d) ± 7

12. What is the value of k if the point (–3, k) divides the line segment joining the points (–5, –4) and (–2, 3) in a certain ratio?

(a) –1 (b) 3 (c) 2 (d) $\frac{2}{3}$

13. For any two numbers a and b, if 3 is the least prime factor of a and 7 is the least prime factor of b, then find the least prime factor of (a + b).

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

14. In $\triangle$ABC, AD is the bisector of $\angle$A. Evaluate AC, if BD = 4 cm, DC = 3 cm and AB = 6 cm.

(a) 4.5 cm (b) 6 cm

(c) 3 cm (d) 7 cm

15. What is the area of a quadrant of a circle whose circumference is 44 cm?

(a) $\frac{77}{2}\text{cm}^2$ (b) 77 cm^2

(c) $\frac{44}{7}\text{cm}^2$ (d) 44 cm^2

16. The HCF of 85 and 153 can be expressed in the form of 85m – 153. Calculate the value of m.

(a) 1 (b) 5 (c) –1 (d) 2

17. The total number of factors of a prime number is:

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

18. Evaluate the distance between the points (a sin α, –b cos α) and (–a cos α, b sin α).

(a) 1

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

(c) $2\sqrt{a^2+b^2}$

(d) $\sqrt{a^2+b^2}$ (sin α + cos α)

19. For the given polynomial $p(x) = x^2 - 5x - 1$, if α and β are its zeroes, then find the value of $\alpha^2\beta + \alpha\beta^2$.

(a) –5 (b) 4 (c) 0 (d) –7

20. The centroid of a $\triangle$ABC with vertices A(–4, 6), B(2, –2) and C(2, 5) is:

(a) (3, 0) (b) $\left(\frac{8}{3}, 3\right)$

(c) $\left(3, \frac{8}{3}\right)$ (d) (0, 3)

SECTION - B

16 marks

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

21. Find the value of $\frac{3-4\sin^2 A}{4\cos^2 A-3}$ if sec A = $\frac{17}{8}$.

(a) $\frac{33}{611}$ (b) $\frac{53}{78}$

(c) $\frac{2}{\sqrt{3}}$ (d) $\frac{17}{64}$

22. A, B and C start running in a circular track at the same time in the same direction. A completes a round in 252 s, B in 308 s and C in 198 s. After what time will they meet again at the starting point?

(a) 46 min 12 sec (b) 42 min 6 sec

(c) 52 min 12 sec (d) 56 min 10 sec

23. On choosing a number randomly from the numbers : – 2, – 1, 0, 1, 2, the probability that $x^2 < 2$ is:

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

(c) $\frac{3}{5}$ (d) $\frac{2}{5}$

24. The diagonals of a rhombus are of length 10 cm and 24 cm, then the length of its each side is:

(a) 9 cm (b) 13 cm

(c) 15 cm (d) 17 cm

25. In $\triangle$ABC, DE || BC. If AD = 2x – 1, AE = 2x + 5, BD = x – 3 and CE = x – 1, then the value of x is:

(a) 8 (b) 9 (c) 10 (d) 11

26. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side, respectively are equal?

(a) $\sqrt{2} : \pi$ (b) $\sqrt{3} : \pi$

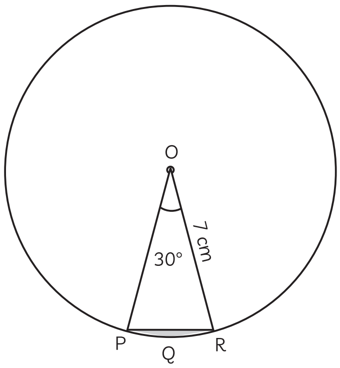
(c) $\pi : \sqrt{3}$ (d) $\pi : \sqrt{2}$

27. A line intersects y–axis and x–axis at the points P and Q respectively. Find the coordinates of P, if (2, –5) is the mid-point of PQ.

(a) (0, –10) (b) (4, 0)

(c) (10, 0) (d) (0, –4)

28. **What is the area of the segment PQR, in the given figure, if the radius of the circle is 7 cm? $\left(\text{use } \pi = \frac{22}{7}\right)$**



(a) $\frac{12}{7}\text{cm}^2$ (b) $\frac{11}{5}\text{cm}^2$

(c) $\frac{22}{7}\text{cm}^2$ (d) $\frac{7}{12}\text{cm}^2$

29. **A card is drawn from a box, which have cards marked with numbers 2 to 101, mixed thoroughly. One card is drawn from the box. What is the probability that the card taken out bears a number which is a perfect cube?**

(a) $\frac{1}{20}$ (b) $\frac{7}{100}$

(c) $\frac{9}{100}$ (d) $\frac{3}{100}$

30. **Consider two numbers, whose HCF and LCM are 33 and 264 respectively. The first number is completely divisible by 2 and gives quotient 33. What is the other number?**

(a) 66 (b) 132 (c) 58 (d) 73

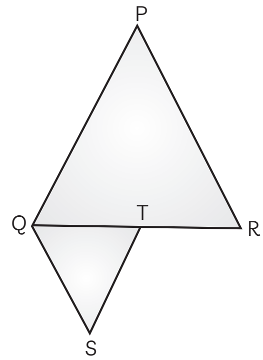
31. *Quadratic polynomial i.e., a parabolic curve is used to model the shape of many architectural structures around the world. The tallest memorial, Gate Arch of USA is one type of such structures. The graph of a quadratic polynomial is a U-shaped curve with a maximum or minimum point called vertex. It is either open upward or downward.*

What are the zeroes of the polynomial $6x^2 - 7x - 3$, if it represent the arch?

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

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

32. **ΔPQR and ΔQST are two equilateral triangles such that T is the mid-point of QR. Find the ratio of areas of ΔPQR and ΔQST.**



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

33. **Evaluate the coordinates of the point which divides the line segment joining the points (8, –9) and (2, 3) internally in the ratio 1 : 2.**

(a) (6, –5) (b) (5, 5) (c) (1, –4) (d) (2, 3)

34. **Evaluate λ, if three points (0, 0), $(3, \sqrt{3})$ and (3, λ) form an equilateral triangle.**

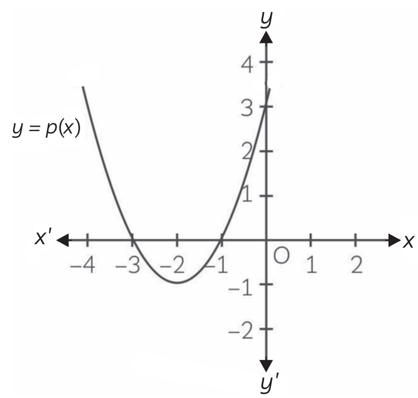
(a) –4 (b) 2 (c) –3 (d) $\pm\sqrt{3}$

35. **From a well-shuffled deck of 52 playing cards, three cards ace, jack and queen of hearts are removed. One card is selected from the remaining cards. What is the probability of getting a card of hearts?**

(a) $\frac{10}{49}$ (b) $\frac{5}{49}$

(c) $\frac{8}{49}$ (d) $\frac{13}{49}$

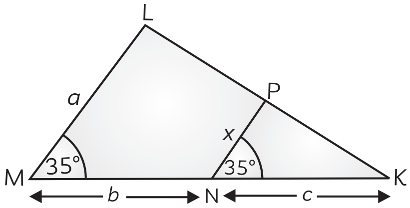
36. **The graph of a polynomial *p*(*x*) is given in the figure. What are the zeroes of the polynomial *p*(*x*)?**



(a) 3 and 0 (b) –3 and –1

(c) –3 and 0 (d) –1 and 0

37. Evaluate the value of x in terms of a, b and c. (See the given figure)



(a) $\dfrac{ac}{b+c}$ (b) $\dfrac{ab+ac}{b^2}$

(c) $\left(\dfrac{1}{a}+\dfrac{1}{b}\right)^c$ (d) $\dfrac{a+b}{c}$

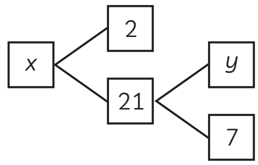
38. What is the value of a, if 2 is a zero of the polynomial $p(x) = 4x^2 + 2x - 5a$?

(a) 4 (b) 6 (c) –1 (d) 0

39. What is the ratio in which the line $3x + y - 9 = 0$ divides the segment joining the points A(1, 3) and B(2, 7)?

(a) 4 : 3 (b) 3 : 4 (c) 4 : 7 (d) 7 : 4

40. Calculate $\dfrac{x}{y}$



(a) 14 (b) 3

(c) 15 (d) 18

SECTION - C **8 marks**

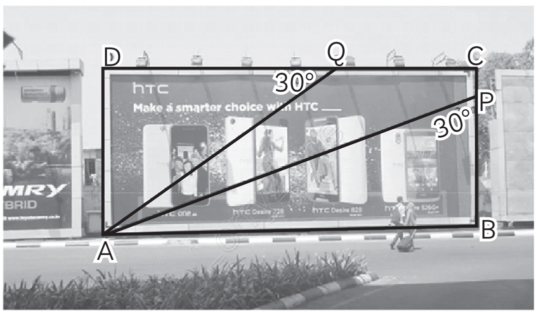
(Case Study Based Questions.)

(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:

Neeraj who belongs to a small town in Maharashtra was coming to a big city for the first time. As he was driving past the Mumbai airport road along with his family, he observed a big billboard of length 6 m and width 3 m. Further, ∠DQA = 30° and ∠APB = 30°.



41. The length AP is :

(a) 6 m (b) $6\sqrt{3}$ m

(c) 12 m (d) $12\sqrt{3}$ m

42. The length BP is:

(a) 6 m (b) 12 m

(c) $6\sqrt{3}$ m (d) $12\sqrt{3}$ m

43. Ratio of sin ∠APB : sin ∠AQD is:

(a) 1 : 2 (b) $1 : \sqrt{3}$

(c) $\sqrt{3} : 1$ (d) 1 : 1

44. The value of sin 60° cos 30° + sin 30° cos 60° is:

(a) 1 (b) 0 (c) –1 (d) $\dfrac{1}{4}$

45. The length of (AP + AQ) is:

(a) $6(\sqrt{3}+1)$ m (b) 18 m

(c) 36 m (d) $12(\sqrt{3}+1)$m

Q. 46-50 are based on Case Study–2

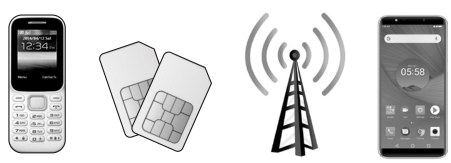
Case Study–2:

Rajesh want to choose a best plan for his mobile phone. He has 2 options available with him. The first plan of company A, cost ₹ 20 per month, with costing an additional 25 paise per minute.
The second plan of company B charges ₹ 40 per month, but calls cost 8 paise per minute. These two situations are shown below in the form of linear equations.

$$y = 0.25\,x + 20$$

and $$y = 0.08x + 40$$

Where, x is the minutes used any is the total cost per month.

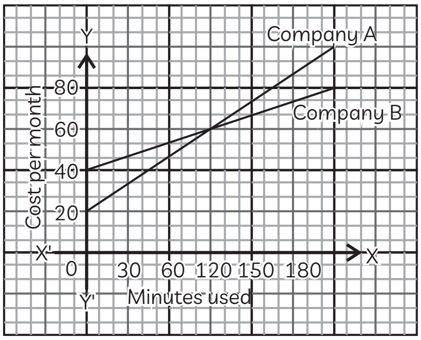


Cost : Plans prices range from under 10 to over 100

Types of Plan : Prepaid and post-paid or phone on a plane

Network : Coverage

Other benifits : Calls. SMS, Data and other extras



46. **If Rajesh decides to take first plan and calls for 90 minutes in a month, then how much amount will he has to pay?**
(a) ₹ 45 (b) ₹ 42.50 (c) ₹ 40 (d) ₹ 20

47. **Rajesh's friend takes second plan and also calls for 90 minutes in a month. Then how much amount will he has to pay?**
(a) ₹ 47 (b) ₹ 47.20 (c) ₹ 45 (d) ₹ 45.20

48. **What are the values of x and y in the system of linear equations $x + 2y = -1$ and $2x - 3y = 12$?**
(a) (–3, –2) (b) (3, 2) (c) (–3, 2) (d) (3, –2)

49. **If the system of pair of linear equations $kx + 2y = 5$, $3x + y = 1$ has a unique solution, then the value of k is:**
(a) $k = 6$ (b) $k \neq 6$ (c) $k \neq \frac{3}{2}$ (d) $k \neq \frac{2}{3}$

50. **Which type of lines is represented by the system of linear equations $x + 2y - 4 = 0$, $2x + 4y - 12 = 0$?**
(a) Coincident lines
(b) Parallel lines
(c) Intersecting lines
(d) Can't say

SOLUTION

SAMPLE PAPER - 3

SECTION - A

1. *(d)* $-\frac{9}{4}$

Explanation:

As $x = -\frac{1}{2}$ is a zero of $3x^2 + 2kx - 3$

$$\therefore \quad 3\left(-\frac{1}{2}\right)^2 + 2k\left(-\frac{1}{2}\right) - 3 = 0$$

$$\Rightarrow \quad \frac{3}{4} - k - 3 = 0$$

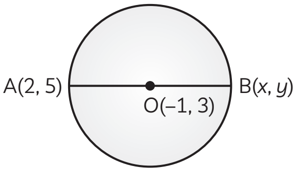
$$\Rightarrow \quad k = \frac{3}{4} - 3 = \frac{-9}{4}$$

2. *(a) (–4, 1)*

Explanation: Since O(–1, 3) is the centre of diameter AB.

$\therefore$ O be the mid-point of AB.

Let the coordinates of B be (x, y).



$$\therefore \quad -1 = \frac{2 + x}{2} \text{ and } 3 = \frac{y + 5}{2}$$

$$\Rightarrow \quad -2 = 2 + x \text{ and } 6 = y + 5$$

$$\Rightarrow \quad x = -4 \text{ and } y = 1$$

$\therefore$ Co-ordinates of other end are (–4, 1).

3. *(d)* $\tan^2 A$

Explanation:

$$\frac{1 + \tan^2 A}{1 + \cot^2 A} = \frac{1 + \frac{\sin^2 A}{\cos^2 A}}{1 + \frac{\cos^2 A}{\sin^2 A}} = \frac{\frac{\cos^2 A + \sin^2 A}{\cos^2 A}}{\frac{\sin^2 A + \cos^2 A}{\sin^2 A}}$$

$$= \frac{\frac{1}{\cos^2 A}}{\frac{1}{\sin^2 A}} \qquad [\because \sin^2\theta + \cos^2\theta = 1]$$

$$= \frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

4. *(b) 14.3 cm*

Explanation: As, ΔABC and ΔPQR are similar

$$\therefore \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

$\Rightarrow \quad \dfrac{AB}{PQ} = \dfrac{BC}{QR}$

$\Rightarrow \quad \dfrac{x}{4.8} = \dfrac{2}{6.4}$

$\Rightarrow \quad x = 1.5$

Also, $\quad \dfrac{AC}{PR} = \dfrac{BC}{QR}$

$\Rightarrow \quad \dfrac{4}{y} = \dfrac{2}{6.4}$

$\Rightarrow \quad y = 12.8$

$\therefore \quad x + y = 1.5 + 12.8$

$= 14.3$ cm

5. *(b) 25*

Explanation: If we toss two unbaised coins simultaneously, the possible outcomes that will be obtained are : HH, HT, TH, TT.

$\therefore$ Total number of outcomes = 4

No head will be obtained if the event TT occurs.

$\therefore$ Number of favourable outcomes = 1

$\therefore$ Required probability = $\dfrac{1}{4}$

But, given probability = $\dfrac{A}{B}$

So, A = 1 and B = 4

Therefore, $(A + B)^2 = (1 + 4)^2 = (5)^2 = 25$

6. *(b) 7*

Explanation: $\dfrac{891}{3500}$ can be written as

$$\frac{3^4 \times 11}{2^2 \times 5^3 \times 7}$$

If denominator is of the form of $2^m \times 5^n$ (m, n are whole number) then given fraction will become a terminating decimal.

So, given fraction must be multiplied by minimum number 7 to make it a terminating decimal.

7. *(c) 2*

Explanation: Given equations can be written as

$x + y - 4 = 0$

and $\quad 2x + ky - 3 = 0$

For no solution,

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

$\Rightarrow \quad \dfrac{1}{2} = \dfrac{1}{k} \neq \dfrac{-4}{-3}$

$\Rightarrow \quad k = 2;\ k \neq \dfrac{3}{4}$

8. *(a) 0, – 1*

Explanation: Let α and β be the zeroes of the polynomial $x^2 + px + 1 - p$.

Here $\quad \alpha = 1 - p \quad$ (given)

We know, $\quad \alpha + \beta = \dfrac{-p}{1}$

$\Rightarrow \quad 1 - p + \beta = -p$

$\Rightarrow \quad \beta = -1$

Put $x = -1$ in $x^2 + px + 1 - p$, we get

$\Rightarrow \quad 1 - p + 1 - p = 0$

$\Rightarrow \quad -2p = -2$

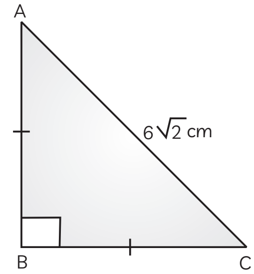
$\Rightarrow \quad p = 1$

$\therefore \quad \alpha = 1 - 1 = 0$

Zeroes of the polynomial are 0 and – 1.

9. *(b) 6 cm*

Explanation: Let ABC be a right triangle, right angled at B having AB = BC.



In right angled ΔABC

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

[by Pythagoras theorem]

$\Rightarrow \quad (6\sqrt{2})^2 = (AB)^2 + (AB)^2 \quad [\because BC = AB]$

$\Rightarrow \quad 36 \times 2 = 2(AB)^2$

$\Rightarrow \quad AB^2 = 36$

On taking square root both sides, we get

AB = 6

Hence, the length of equal sides of a triangle is 6 cm.

Caution

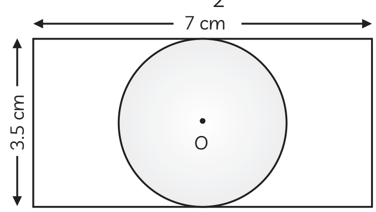
Drawing of a correct figure, according to the conditions mentioned in the question, make it easy for solution.

10. *(c) $\dfrac{77}{8} cm^2$*

Explanation: Sides of rectangle are 7 cm and 3.5 cm

$\therefore$ Diameter of the largest circle that can be inscribed in the rectangle is 3.5 cm.

$\therefore \quad r = \dfrac{3.5}{2}$



Hence,

$$\text{Area of circle } = \pi r^2 = \frac{22}{7} \times \left(\frac{3.5}{2}\right)^2$$

$$= \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} = \frac{77}{8} \text{cm}^2$$

11. *(a)* ± 4

Explanation: According to the given condition,

$\sqrt{(1-4)^2 + (0-p)^2} = 5$ [Using distance formula]

$\Rightarrow \quad \sqrt{9 + p^2} = 5$

On squaring both sides, we get

$$9 + p^2 = 25$$

$\Rightarrow \quad p^2 = 16$

$\Rightarrow \quad p = \pm 4$

12. *(d)* $\frac{2}{3}$

Explanation: Let point Q(–3, *k*) divides AB in the ratio of *p* : 1.

$\therefore \quad -3 = \dfrac{-2p - 5}{p + 1}$

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

$\therefore$ Ratio is 2 : 1.

Then, $\quad k = \dfrac{2 \times 3 - 4}{2 + 1} = \dfrac{2}{3}$

13. *(c) 2*

Explanation: Since, 3 is the least prime factor of *a*,

$\therefore$ *a* is an odd number.

Again, 7 is the least prime factor of *b*.

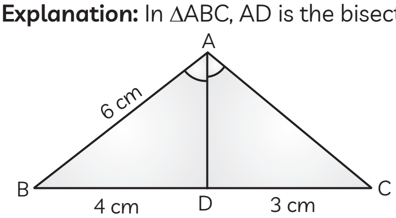
$\therefore$ *b* is also an odd number.

$\therefore$ (*a* + *b*) is an even number, because sum of two odds is even.

Hence, least factor of (*a* + *b*) is 2.

14. *(a) 4.5 cm*

Explanation: In ΔABC, AD is the bisector of $\angle$A.



$\therefore \quad \dfrac{BD}{DC} = \dfrac{AB}{AC}$

$\Rightarrow \quad \dfrac{4}{3} = \dfrac{6}{AC}$

$\Rightarrow \quad 4\,AC = 18$

$\therefore \quad AC = \dfrac{9}{2} \text{ cm} = 4.5 \text{ cm}$

15. *(a)* $\frac{77}{2} cm^2$

Explanation: Circumference of circle

$$= 44 \text{ cm}$$

$\therefore \quad 2\pi r = 44 \text{ cm}$

$$r = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm}$$

$\therefore$ Area of quadrant of a circle

$$= \frac{1}{4}\pi r^2$$

$$= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{77}{2} \text{cm}^2$$

16. *(d) 2*

Explanation: We have,

$$153 = 3 \times 3 \times 17 = 3^2 \times 17$$

and $\quad 85 = 5 \times 17$

$\therefore$ HCF of 85 and 153 is 17.

According to the question,

$$17 = 85m - 153$$

$\Rightarrow \quad 85m = 170$

$\therefore \quad m = \dfrac{170}{85} = 2$

Caution

➥ *Here, HCF will be calculated first to find the value of m.*

17. *(c) 2*

Explanation: Prime numbers are the numbers which have only two factors, namely, 1 and the number itself.

18. *(d)* $\sqrt{a^2 + b^2}(\sin\alpha + \cos\alpha)$

Explanation: Let the given points be A(*a* sin α, –*b* cos α) and B(–*a* cos α, *b* sin α).

$\therefore$ Required distance, AB

$$= \sqrt{(-a\cos\alpha - a\sin\alpha)^2 + (b\sin\alpha + b\cos\alpha)^2}$$

$$= \sqrt{(-a)^2(\cos\alpha + \sin\alpha)^2 + b^2(\sin\alpha + \cos\alpha)^2}$$

$$= \sqrt{(a^2 + b^2)(\sin\alpha + \cos\alpha)^2}$$

$$= \sqrt{a^2 + b^2}(\sin\alpha + \cos\alpha)$$

19. *(a) –5*

Explanation : Given, polynomial is

$$p(x) = x^2 - 5x - 1$$

Here, $\quad a = 1, b = -5$ and $c = -1$

So, sum of zeroes, $\alpha + \beta = -\dfrac{b}{a} = \dfrac{-(-5)}{1} = 5$

And product of zeroes, $\alpha\beta = \dfrac{c}{a} = \dfrac{-1}{1} = -1$

Now, $\alpha^2\beta + \alpha\beta^2 = \alpha\beta(\alpha + \beta)$

$$= -1 \times 5 = -5$$

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

Explanation: We know, centroid of a triangle

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

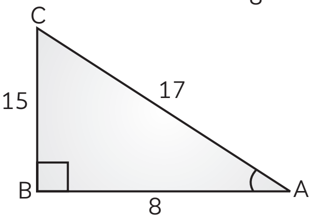
$$= \left(\frac{-4+2+2}{3}, \frac{6-2+5}{3}\right)$$

$$= \left(0, \frac{9}{3}\right) = (0, 3)$$

SECTION - B

21. *(a)* $\frac{33}{611}$

Explanation: Given, $\sec A = \frac{17}{8}$



$\Rightarrow \qquad \cos A = \frac{8}{17}$

$\therefore \qquad \sin A = \frac{15}{17}$

Now, $$\frac{3-4\sin^2 A}{4\cos^2 A-3} = \frac{3-4\times\left(\frac{15}{17}\right)^2}{4\times\left(\frac{8}{17}\right)^2-3}$$

$$= \frac{3\times 289-4\times 225}{4\times 64-3\times 289}$$

$$= \frac{867-900}{256-867}$$

$$= \frac{-33}{-611} = \frac{33}{611}$$

22. *(a) 46 min 12 sec*

Explanation:

$\because \qquad 252 = 2^2 \times 3^2 \times 7$

$308 = 2^2 \times 7 \times 11$

$198 = 2 \times 3^2 \times 11$

$\therefore$ Required time = LCM (252, 308, 198)

$= 2^2 \times 3^2 \times 7 \times 11$

$= 2772$ s

Now, 1 min = 60 s

$\Rightarrow \qquad 1 \text{ s} = \frac{1}{60}$ min

$\therefore \qquad 2772 \text{ s} = \frac{2772}{60}$ min = 46 min 12 sec

Caution

➥ *While solving such type of questions, be peculiar about what is to be calculated i.e., HCF or LCM.*

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

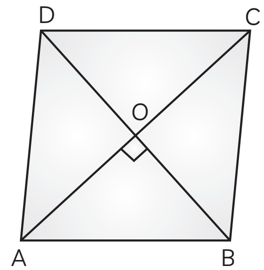
Explanation: Clearly, number x can take any one of the five given values.

So, total number of possible outcomes = 5

We observe that $x^2 < 2$ when x takes any one of the following three values: – 1, 0 and 1.

Hence, $P(x^2 < 2) = \frac{3}{5}$

24. *(b) 13 cm*



Explanation: Let ABCD be a rhombus whose diagonals AC = 10 cm and BD = 24 cm.

Since, diagonals of rhombus bisect each other at right angles.

$\therefore \qquad AO = 5$ cm, $BO = 12$ cm, $\angle AOB = 90°$

In right ΔAOB, we have

$AB^2 = AO^2 + OB^2$

$\Rightarrow \qquad AB^2 = (5)^2 + (12)^2$

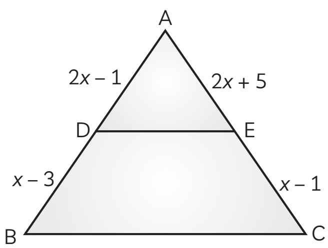
$= 25 + 144 = 169$

$\therefore \qquad AB = \sqrt{169} = 13$ cm

$\therefore$ Length of each side is 13 cm.

25. *(a) 8*

Explanation:



In ΔABC, DE || BC

$\therefore \qquad \frac{AD}{DB} = \frac{AE}{EC}$ [By Thales theorem]

$\Rightarrow \qquad \frac{2x-1}{x-3} = \frac{2x+5}{x-1}$

$\Rightarrow \quad (2x-1)(x-1) = (2x+5)(x-3)$

$\Rightarrow \quad 2x^2 - 2x - x + 1 = 2x^2 + 5x - 6x - 15$

$\Rightarrow \qquad 2x = 16$

$\Rightarrow \qquad x = 8$

Caution

➥ *Here DE || BC, so use the Thales theorem to find the value of x.*

26. *(c)* $\pi : \sqrt{3}$

Explanation: Let the radius of the circle be r units and the side of an equilateral triangle be a units.

So, $\quad 2r = a \quad$ [Given]

Now Area of circle, $A_1 = \pi r^2$

Area of triangle, $A_2 = \frac{\sqrt{3}}{4} \times a^2 = \frac{\sqrt{3}}{4} \times (2r)^2$

$\therefore \quad A_1 : A_2 = \pi r^2 : \frac{\sqrt{3}}{4} \times 4r^2 = \pi : \sqrt{3}$

27. *(a) (0, –10)*

Explanation: Let the coordinates of P and Q be $(0, y)$ and $(x, 0)$ respectively.

$\because$ (2, –5) is the mid-point of PQ.

$\therefore \quad 2 = \frac{x+0}{2}; -5 = \frac{0+y}{2}$

$\Rightarrow x = 4, y = -10$

$\therefore$ Points are P(0, –10) and Q(4, 0).

28. *(d)* $\frac{7}{12} cm^2$

Explanation: Area of the segment PQR

= Area of sector OPQRO – Area of ΔOPR

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

$= \frac{30°}{360°} \times \frac{22}{7} \times (7)^2 - \frac{1}{2} \times (7)^2 \times \sin 30°$

$= \frac{1}{12} \times 22 \times 7 - \frac{49}{4}$

$= \frac{77}{6} - \frac{49}{4}$

$= \frac{154 - 147}{12} = \frac{7}{12} cm^2$

29. *(d)* $\frac{3}{100}$

Explanation: Total cards from 2 to 101 are 100.

Perfect cubes from 2 to 101 are 8, 27, 64.

$\therefore$ Number of perfect cubes = 3

$\therefore$ P (perfect cube) $= \frac{3}{100}$

30. *(b) 132*

Explanation: HCF = 33, LCM = 264.

First number is completely divisible by 2 and gives quotient 33.

$\therefore \quad$ First number $= 2 \times 33 = 66$

Let the second number be x.

Then, $\quad x = \frac{\text{HCF} \times \text{LCM}}{\text{1st number}}$

$= \frac{33 \times 264}{66} = 132$

Caution

➥ *Here for finding first number, use the division algorithm*
i.e., Divisor = Dividend × Quotent + Remainder

31. *(c)* $-\frac{1}{3}, \frac{3}{2}$

Explanation: Let $p(x) = 6x^2 - 7x - 3$

$= 6x^2 - 9x + 2x - 3$

$= 3x(2x - 3) + 1(2x - 3)$

$= (2x - 3)(3x + 1)$

To find the zeroes of $p(x)$

Put $\quad p(x) = 0$

$\Rightarrow \quad (2x - 3)(3x + 1) = 0$

$\Rightarrow \quad x = \frac{3}{2}, -\frac{1}{3}$

Thus, the zeroes are $\frac{3}{2}$ and $-\frac{1}{3}$

32. *(d) 4 : 1*

Explanation: Since, ΔPQR and ΔQST are two equilateral triangles.

$\therefore \quad \Delta PQR \sim \Delta QST$

[By AA similarity criterion]

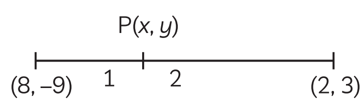
$\Rightarrow \quad \frac{ar(\Delta PQR)}{ar(\Delta QST)} = \frac{QR^2}{QT^2}$

$= \frac{(2QT)^2}{(QT)^2} = \frac{4}{1}$

[$\because$ T is mid-point of QR]

33. *(a) (6, –5)*

Explanation: Let $P(x, y)$ be the point which divides the line segment joining the points (8, –9) and (2, 3) in the ratio 1 : 2.



$\therefore$ Using section formula

$\therefore \quad x = \frac{1 \times 2 + 2 \times 8}{1+2} = \frac{2+16}{3} = \frac{18}{3} = 6$

and $y = \frac{1 \times 3 + 2(-9)}{1+2} = \frac{3-18}{3} = \frac{-15}{3} = -5$

So, the required point is P(6, –5).

Caution

➥ *Be careful while putting the values in the formula, otherwise an error could occur.*

34. *(d)* $\pm\sqrt{3}$

Explanation: Let the given points be A(0, 0), B $B(3, \sqrt{3})$ and C(3, λ).

Since, ΔABC is an equilateral triangle,

$\therefore \quad AB = AC$

$\Rightarrow \sqrt{(3-0)^2+(\sqrt{3}-0)^2} = \sqrt{(3-0)^2+(\lambda-0)^2}$

$\Rightarrow \quad 9 + 3 = 9 + \lambda^2$

$\Rightarrow \quad \lambda^2 = 3$

$\Rightarrow \quad \lambda = \pm\sqrt{3}$

35. *(a)* $\frac{10}{49}$

Explanation: Number of cards left = 52 – 3 = 49

Number of heart cards left = 13 – 3 = 10

$\therefore$ Required probability = $\frac{10}{49}$

36. *(b) –3 and –1*

Explanation : Since the graph intersects the x-axis at two points *i.e.*, at $x = -3$ and $x = -1$.

So, –3 and –1 are the zeroes of the polynomial $p(x)$.

37. *(a)* $\frac{ac}{b+c}$

Explanation: In ΔKNP and ΔKML, we have

$\angle KNP = \angle KML = 35°$ (Given)

$\angle K = \angle K$ (Common)

$\therefore \quad \Delta KNP \sim \Delta KML$

(By AA similarity criterion)

$\Rightarrow \quad \frac{PN}{LM} = \frac{KN}{KM}$

($\because$ Corresponding sides of similar triangles are proportional)

$\Rightarrow \quad \frac{x}{a} = \frac{c}{KN+NM} = \frac{c}{c+b}$

$\Rightarrow \quad x = \frac{ac}{b+c}$

38. *(a) 4*

Explanation: Given, polynomial is

$p(x) = 4x^2 + 2x - 5a$

Since, 2 is a zero of the polynomial $p(x)$

$\therefore \quad p(2) = 0$

$\Rightarrow 4(2)^2 + 2(2) - 5a = 0$ [putting $x = 2$]

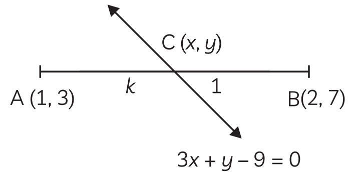
$\Rightarrow \quad 16 + 4 - 5a = 0$

$\Rightarrow \quad 5a - 20 = 0$

$\Rightarrow \quad a = \frac{20}{5} = 4$

39. *(b) 3 : 4*

Explanation: Suppose the line $3x + y - 9 = 0$ divides the line segement joining A(1, 3) and B(2, 7) in the ratio $k : 1$ at point C.



$\therefore$ Using section formula,

Co-ordinates of C = $\left(\frac{2k+1}{k+1}, \frac{7k+3}{k+1}\right)$

But point C lies on the line $3x + y - 9 = 0$.

$\therefore$ It must satisfy the equation

$\Rightarrow 3\left(\frac{2k+1}{k+1}\right) + \frac{7k+3}{k+1} - 9 = 0$

$\Rightarrow (6k + 3) + (7k + 3) - 9k - 9 = 0$

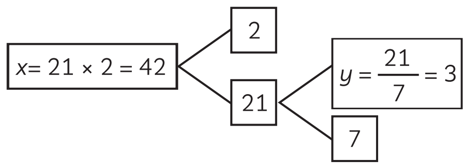
$\Rightarrow 4k - 3 = 0$

$\therefore \quad k = \frac{3}{4}$

So, the required ratio is $\frac{3}{4} : 1$ *i.e.* 3 : 4.

40. *(a) 14*

Explanation:



$\therefore \quad \frac{x}{y} = \frac{42}{3} = 14$

SECTION - C

41. *(c) 12 m*

Explanation: To find the length AP, we will use the value of sin 30° in right triangle ABP.

$\sin \angle APB = \frac{AB}{AP}$

$\Rightarrow \quad \sin 30° = \frac{6}{AP}$

$\Rightarrow \quad \frac{1}{2} = \frac{6}{AP}$

$\Rightarrow \quad AP = 12$ m

42. *(c)* $6\sqrt{3}$ *m*

Explanation: To find the length BP, we will use the value of tan 30° in right triangle ABP.

$\tan \angle APB = \frac{AB}{BP}$

$\Rightarrow \quad \tan 30° = \frac{6}{BP}$

$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{6}{BP}$

$\Rightarrow \quad BP = 6\sqrt{3}$ m

43. *(d) 1 : 1*

Explanation: sin ∠APB = sin 30° = $\frac{1}{2}$

and sin ∠AQD = sin 30° = $\frac{1}{2}$

∴ Therefore, ratio of sin ∠APB : sin ∠AQD

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

44. *(a) 1*

Explanation:

$$\sin 60° = \frac{\sqrt{3}}{2};$$

$$\cos 30° = \frac{\sqrt{3}}{2};$$

$$\sin 30° = \frac{1}{2};$$

$$\cos 60° = \frac{1}{2}.$$

∴ sin 60° cos 30° + sin 30° cos 60°

$$= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} = 1$$

45. *(b) 18 m*

Explanation: AP = 12 m (calculated in Q. 41 above)

To calculate AQ, we use sin ∠AQD = $\frac{AD}{AQ}$

$\Rightarrow \frac{1}{2} = \frac{3}{AQ} \Rightarrow$ AQ = 6 m

Therefore, AP + AQ = 12 + 6 = 18 m

46. *(b) ₹ 42.50*

Explanation: We have,

$$y = 0.25x + 20$$

When x = 90 minutes,

$$\therefore \quad y = 0.25 \times 90 + 20 = 42.50$$

∴ Total cost for a month is ₹ 42.50.

47. *(b) ₹ 47.20*

Explanation: We have, total cost,

$$y = 0.08x + 40$$

When x = 90 minutes,

$$y = 0.08 \times 90 + 40 = 47.20$$

∴ Total cost for a month = ₹ 47.20

48. *(d) (3, –2)*

Explanation: We have,

$$(x + 2y = -1) \times 2 \quad \text{...(i)}$$

$$2x - 3y = 12 \quad \text{...(ii)}$$

$$\underline{-\quad +\qquad -} \quad \text{(On subtracting)}$$

$$7y = -14$$

$$\Rightarrow \quad y = -2$$

Putting $y = -2$ in equation (i), we get

$$x + 2 \times (-2) = -1$$

$$\Rightarrow \quad x = -1 + 4 = 3$$

$$\Rightarrow \quad x = 3$$

∴ Solution is (3, –2).

49. *(b) $k \neq 6$*

Explanation: Given system of linear equations are

$$kx + 2y = 5$$

and

$$3x + y = 1$$

For unique solution, we have

$$\Rightarrow \quad \frac{k}{3} \neq \frac{2}{1} \Rightarrow k \neq 6$$

50. *(b) Parallel lines*

Explanation: Given linear equations are:

$$x + 2y - 4 = 0$$

$$2x + 4y - 12 = 0$$

We have, $\frac{1}{2} = \frac{2}{4} \neq \frac{-4}{-12}$

$$\Rightarrow \quad \frac{1}{2} = \frac{1}{2} \neq \frac{1}{3}$$

i.e., $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

∴ It represent parallel lines.