8

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. The values of m, n respectively, if $108 = 2^m \times 33 \times 5^n$, are :

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

2. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then which of the following is true?

(a) $\Delta BCA \sim \Delta PQR$
(b) $\Delta PQR \sim \Delta CAB$
(c) $\Delta PQR \sim \Delta ABC$
(d) $\Delta CBA \sim \Delta PQR$

3. Evaluate : cot 10°. cot 20°. cot 30°. cot 40° ...... cot 90°.

(a) 1 (b) –1
(c) $\frac{\sqrt{3}}{2}$ (d) 0

4. The ratio in which x-axis divides the join of A(2, –3) and B(5, 6) is:

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

5. If the area of a semi-circular region is 308 cm^2, then its perimeter is:

(a) 36 cm (b) 44 cm
(c) 88 cm (d) 72 cm

6. From a pack of 52 playing cards, the probability of picking a face card is:

(a) $\frac{1}{13}$ (b) $\frac{3}{13}$
(c) $\frac{1}{26}$ (d) $\frac{4}{13}$

7. In a ΔABC, right-angled at B, if $AB = \frac{x}{2}$, $BC = x + 2$ and $AC = x + 3$, then the quadratic equation, formed in x, is:

(a) $x^2 - 8x - 20 = 0$
(b) $x^2 - 2x + 5 = 0$
(c) $x^2 + 8x + 20 = 0$
(d) $x^2 + 2x + 5 = 0$

8. What is the distance between the points A(10 cos θ, 0) and B(0, 10 sin θ)?

(a) 15 units (b) 10 units
(c) 20 units (d) 1 unit

9. What is the value of k, if one of the zeroes of the quadratic polynomial $(k - 1)x^2 + kx + 1$ is –3?

(a) $\frac{4}{3}$ (b) $\frac{2}{3}$
(c) $\frac{1}{5}$ (d) $\frac{5}{7}$

10. Evaluate the value of $2\tan^2\theta + \cos^2\theta - 2$, where θ is an acute angle and $\sin\theta = \cos\theta$.

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

(c) $-\frac{3}{2}$ (d) 0

11. What is the perimeter of a square which is circumscribing a circle of radius x cm?

(a) $8x$ (b) $4x$

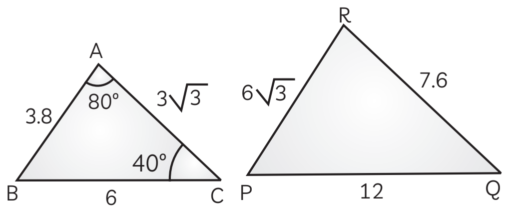
(c) $6x$ (d) $2x$

12. If the probability of raining tomorrow is 0.75, then the probability that it will not rain tomorrow, is:

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

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

13. What is measure of $\angle$P, in the given figure?



(a) 70° (b) 60°

(c) 80° (d) 40°

14. What is the ratio of the areas of $\triangle$ABC and $\triangle$BDE, if $\triangle$ABC and $\triangle$BDE are two equilateral triangles such that D is the mid-point of BC.

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

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

15. For what value of k, the system of equations $8x + 5y = 9$ and $kx + 10y = 18$ has infinitely many solutions?

(a) $k = 10$ (b) $k = 16$

(c) $k = 8$ (d) $k = 15$

16. If $\sin A = \frac{3}{5}$, then the value of sec A is:

(a) $\frac{4}{5}$ (b) $\frac{3}{4}$

(c) $\frac{4}{3}$ (d) $\frac{5}{4}$

17. If $p(x) = ax^2 + bx + c$, then $-\frac{b}{a}$ is equal to:

(a) 0 (b) 1

(c) product of zeroes (d) sum of zeroes

18. If –1 is a zero of the polynomial $p(x) = x^2 - 7x - 8$, then the other zero is:

(a) –8 (b) –7

(c) 1 (d) 8

19. 8 chairs and 5 tables cost ₹ 10500, while 5 chairs and 3 tables cost ₹ 6450. The cost of each chair will be:

(a) ₹ 750 (b) ₹ 600

(c) ₹ 850 (d) ₹ 900

20. What is the value of $(\tan\theta \operatorname{cosec}\theta)^2 - (\sin\theta \sec\theta)^2$?

(a) –1 (b) 0

(c) 1 (d) 2

SECTION - B **16 marks**

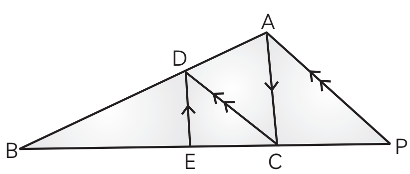
(Section B consists of 20 questions of 1 mark each. Any 16 questions are to be attempted.)

21. The mid-point of $(3p, 4)$ and $(-2, 2q)$ is $(2, 6)$. Find the value of pq.

(a) 5 (b) 6

(c) 7 (d) 8

22. In the figure below, DE || AC and DC || AP. Find BE : EC, if BC = 4 cm and BP = 6 cm.



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

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

23. What is the smallest number which when increased by 17 becomes exactly divisible by 520 and 468?

(a) 4680 (b) 4663

(c) 4581 (d) 4682

24. If the sum of zeroes of the polynomial $p(x) = 3x^2 - kx + 6$ is 3, then the value of k is:

(a) 6 (b) 9

(c) 12 (d) 3

25. Which type of lines are represented by the pair of linear equations $4x + 3y - 1 = 5$ and $12x + 9y = 15$?

(a) Coincident

(b) Intersecting at exactly one point

(c) Parallel

(d) Intersecting at two points

26. An uniform path runs around a circular park. The difference between the outer and inner circumference of the circular path is 132 m. Its width is:

(a) 7 m (b) 21 m
(c) 42 m (d) 32 m

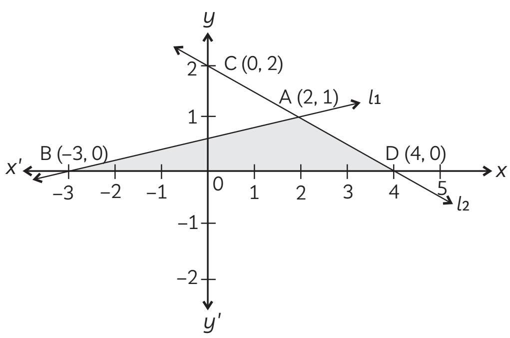
27. A box had tickets, numbered from 11, 12, 13 ......, 30. A ticket is taken out from it at random. Find the probability that the number on the drawn ticket is greater than 15 and a multiple of 5.

(a) $\frac{1}{21}$ (b) $\frac{1}{7}$
(c) $\frac{7}{20}$ (d) $\frac{3}{20}$

28. What is the value of $m^2 - n^2$, where $m = \tan\theta + \sin\theta$ and $n = \tan\theta - \sin\theta$?

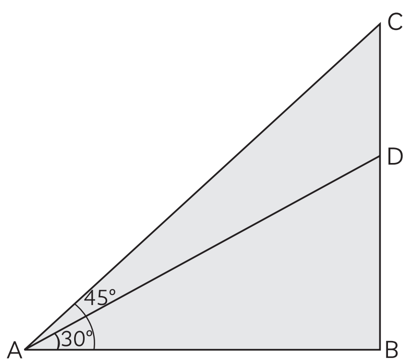
(a) $\sqrt{\frac{m}{n}}$ (b) $4\sqrt{mn}$
(c) $\sqrt{mn}$ (d) $4\sqrt{\frac{m}{n}}$

29. The area of triangle formed by the lines l_2 and l_2 and the x-axis is:



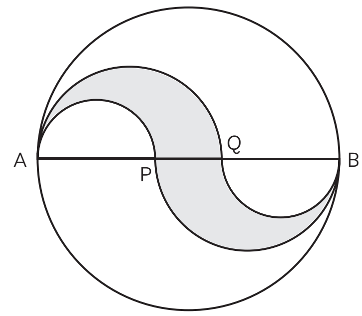
(a) 7 sq. units (b) $\frac{9}{2}$ sq. units
(c) $\frac{7}{2}$ sq. units (d) 4 sq. units

30. In the figure, the value of $\frac{AB}{BC} + \frac{BD}{AD}$ is:



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

31. What is the area of shaded region in the given figure where diameter AB is 12 cm long and AB is trisected at points P and Q.



(a) 14π cm^2 (b) 12π cm^2
(c) 22π cm^2 (d) 13π cm^2

32. In a ΔPQR, S in a point on side PQ and T is a point on side PR such that ST || QR, $\frac{PS}{SQ} = \frac{3}{5}$ and PR = 28 cm. What is the value of PT?

(a) 12.5 cm (b) 17.5 cm
(c) 10.5 cm (d) 13.5 cm

33. The zeroes of the polynomial $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ are:

(a) $2\sqrt{3}, \frac{2}{\sqrt{3}}$ (b) $2\sqrt{3}, \frac{\sqrt{3}}{2}$
(c) $6\sqrt{2}, 3$ (d) $3\sqrt{2}, 6$

34. A box contains 40 pens out of which x are non-defective. If one pen is drawn at random, the probability of drawing a non-defective pen is y. If we replace the pen drawn and then add 20 more non-defective pens in this bag, the probability of drawing a non-defective pen is $4y$. Then, evaluate the value of x.

(a) 4 (b) 7
(c) 6 (d) 2

35. How many solutions are there for the following pair of linear equations:

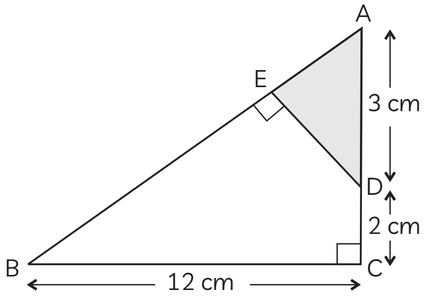
$x + 2y - 8 = 0, 2x + 4y = 16$

(a) Unique (b) Infinite
(c) No solution (d) Two solutions

36. If the vertices of ΔABC are A(–1, –3), B(2, 1) and C(8, –4), then the coordinates of its centroid are:

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

37. **In the given figure, if $\triangle ABC \sim \triangle ADE$, then the length of DE is:**



(a) $\dfrac{15}{13}$ cm (b) $\dfrac{13}{12}$ cm

(c) $\dfrac{36}{13}$ cm (d) $\dfrac{12}{13}$ cm

38. **In a $\triangle ABC$, right angled at B, find the value of $2 \sin A \cot A$ if $\tan A = \sqrt{3}$.**

(a) $\dfrac{1}{\sqrt{2}}$ (b) 1

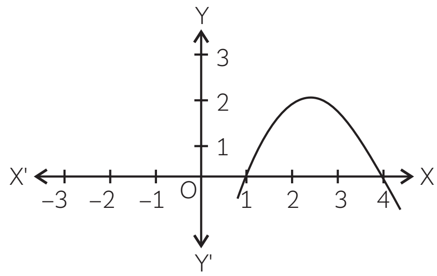
(c) –1 (d) $\dfrac{\sqrt{3}}{2}$

39. **What is the point of intersection of the lines $x - 3 = 0$ and $y - 5 = 0$?**

(a) (–3, 5) (b) (–3, –5)

(c) (3, 5) (d) (3, –5)

40. *Shraddha visited a temple in the Bikaner, Rajasthan. On the way she visited a Fort. The entrance gate of the fort has a shape of a quadratic polynomial (parabolic). The mathematical representation of the gate is shown in the figure.*



If one zero of the polynomial is 7 and product of zeroes is –35, then polynomial representation of the gate is:

(a) $x^2 + 12x - 35$ (b) $x^2 - 12x - 35$

(c) $-x^2 + 2x + 35$ (d) $x^2 + 2x + 35$

SECTION - C 8 marks

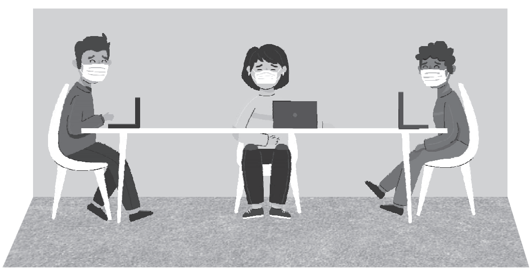
(Case Study Based Questions.)

(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:

Due to corona pandemic, we need to follow certain rules i.e. social distancing, washing of hands etc. Three friends namely, Pratima, Qasim and Rajni went to a park to discuss something. They decided to maintain the social distancing due to CORONAVIRUS pandemic and sat at the points P, Q and R respectively.



If the coordinates of P, Q and R are (4, – 3), (7, 3) and (8, 5) repsectively, then answer the following:

41. **How far are points P and Q?**

(a) $3\sqrt{5}$ units (b) $\sqrt{5}$ units

(c) $4\sqrt{5}$ units (d) $5\sqrt{2}$ units

42. **If a tree is at the point X, which is on the straight line joining Q and R such that it divides the distance between them in the ratio of 1 : 2, then, the coordinates of X are:**

(a) (9, 1) (b) (6, 1)

(c) $\left(\dfrac{23}{3}, \dfrac{13}{3}\right)$ (d) $\left(\dfrac{22}{3}, \dfrac{11}{3}\right)$

43. **What is the mid-point of the line segment QR?**

(a) $\left(\dfrac{11}{2}, 0\right)$ (b) $\left(\dfrac{15}{2}, 4\right)$

(c) (6, 1) (d) (8, 5)

44. **As point Q lies between the points P and R, so the ratio in which Q divides the line segment joining P and R is:**

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

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

45. **The points P, Q and R together makes:**

(a) an isosceles triangle

(b) an equilateral triangle

(c) a scalene triangle

(d) a straight line

Q. 46-50 are based on Case Study–2

Case Study–2:

A trailer is a large vehicle for hauling vehicles from one place to another or from the factory to the car showrooms. A leading manufacturer of cars in India has its factory located in Gurugram in Haryana. On a particular weekend, there was a surge in demand for cars. Two models of cars to be transported to various locations across the country. There were 792 cars of model A and 612 cars of model B.

46. **The maximum number of cars that can be loaded in a trailer such that each trailer has the same number of cars of the same model is:**

(a) 12 (b) 18
(c) 36 (d) 72

47. **The number of trailers required for transporting the cars is:**

(a) 39 (b) 78
(c) 156 (d) 312

48. **The LCM of 792 and 612 is:**

(a) 1224 (b) 1584
(c) 6732 (d) 13464

49. **The power of 2 in the prime factorization of 792 is:**

(a) 1 (b) 2
(c) 3 (d) 4

50. **The LCM of the smallest multiple of 4 and smallest multiple of 6 is:**

(a) 6 (b) 12
(c) 24 (d) 48

SOLUTION
SAMPLE PAPER - 8

SECTION - A

1. *(a) 2, 0*

Explanation:

2	108
2	54
3	27
3	9
3	3
	1

We have, $108 = 2^2 \times 3^3$

$= 2^2 \times 3^3 \times 5^0$

Comparing with $2^m \times 3^3 \times 5^n$, we get

$m = 2, n = 0$

2. *(b) $\Delta PQR \sim \Delta CAB$*

Explanation:

$$\because \quad \frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$$

$\therefore$ By SSS similarity criterion,

$\Delta CAB \sim PQR$

3. *(d) 0*

Explanation: Since, $\cot 90° = 0$

$\therefore \cot 10°. \cot 20°. \cot 30° \ldots\ldots . \cot 90° = 0$

4. *(d) 1 : 2*

Explanation: On x-axis, y-coordinate is zero.

$\therefore$ Let the point on x-axis which divide the join of points A and B be P(x, 0).

Also, let the required ratio be k : 1.

Then using section formula,

$$P(x, 0) = \left(\frac{k \times 5 + 1 \times 2}{k+1}, \frac{k \times 6 + 1 \times (-3)}{k+1}\right)$$

$$= \left(\frac{5k+2}{k+1}, \frac{6k-3}{k+1}\right)$$

$$\Rightarrow \quad 0 = \frac{6k-3}{k+1} \Rightarrow 6k - 3 = 0 \Rightarrow k = \frac{1}{2}$$

$\therefore$ Required ratio $= k : 1 = \frac{1}{2} : 1 = 1 : 2$

5. *(d) 72 cm*

Explanation: Let r cm be the radius of the semicircular region.

Then, $\frac{1}{2}\pi r^2 = 308$

$\Rightarrow \frac{1}{2} \times \frac{22}{7} \times r^2 = 308$

$\Rightarrow r^2 = 14 \times 2 \times 7$

$\Rightarrow r = 14$

Now, Perimeter = 2 × radius + length of semi-circular arc

$= 2r + \pi r$

$= 2 \times 14 + \frac{22}{7} \times 14$

$= 28 + 44$

$= 72$

6. *(b)* $\frac{3}{13}$

Explanation:

Total number of cards = 52

Number of face cards = 12

$\therefore$ P (Face card) $= \frac{12}{52} = \frac{3}{13}$

7. *(a)* $x^2 - 8x - 20 = 0$

Explanation:

$\because$ ΔABC is right-angled at B

$\therefore$ Using Pythagoras theorem,

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

$\Rightarrow (x+3)^2 = \left(\frac{x}{2}\right) + (x+2)^2$

$\Rightarrow x^2 + 6x + 9 = \frac{x^2}{4} + x^2 + 4x + 4$

$\Rightarrow 2x + 5 = \frac{x^2}{4}$

$\Rightarrow 8x + 20 = x^2$

$\Rightarrow x^2 - 8x - 20 = 0$

8. *(b) 10 units*

Explanation: We have,

Required distance AB

$= \sqrt{(10\cos\theta - 0)^2 + (0 - 10\sin\theta)^2}$

$= \sqrt{100\cos^2\theta + 100\sin^2\theta}$

$= \sqrt{100(\cos^2\theta + \sin^2\theta)}$

$= \sqrt{100 \times 1} = 10$ units

9. *(a)* $\frac{4}{3}$

Explanation: Let $p(x) = (k-1)x^2 + kx + 1$

Since, –3 is a zero of the polynomial

$\therefore p(-3) = 0$

$\therefore (k-1)(-3)^2 + k(-3) + 1 = 0$

$\Rightarrow 9(k-1) - 3k + 1 = 0$

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

$\Rightarrow 6k - 8 = 0$

$\Rightarrow 6k = 8$

$\therefore k = \frac{8}{6}$

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

10. *(b)* $\frac{1}{2}$

Explanation: Given, $\sin\theta = \cos\theta$

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

$\Rightarrow \tan\theta = \tan 45°$

$\Rightarrow \theta = 45°$

$\therefore 2\tan^2\theta + \cos^2\theta - 2 = 2\tan^2 45° + \cos^2 45° - 2$

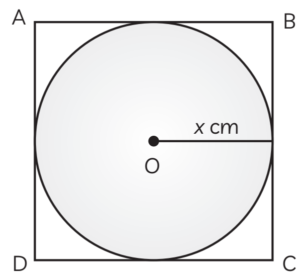
$= 2(1)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 - 2$

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

$= \frac{1}{2}$

11. *(a) 8x*

Explanation: A square is circumscribing a circle of radius x cm.



$\therefore$ Side of square = Diameter of circle

$\Rightarrow$ Side of square $= 2(x) = 2x$

$\therefore$ Perimeter of square $= 4(2x) = 8x$

12. *(a)* $\frac{1}{4}$

Explanation: We know that,

P(rain tomorrow) + P(not rain tomorrow) = 1

$\Rightarrow$ 0.75 + P(not rain tomorrow) = 1

$\Rightarrow$ P(not rain tomorrow)

$= 1 - 0.75 = 0.25 = \frac{1}{4}$

Hence, the probability that it will not rain tomorrow is $\frac{1}{4}$.

13. *(d) 40°*

Explanation : In ΔABC and ΔPQR

$$\frac{AB}{QR} = \frac{3.8}{7.6} = \frac{1}{2};$$

$$\frac{BC}{PQ} = \frac{6}{12} = \frac{1}{2}; \text{ and}$$

$$\frac{AC}{RP} = \frac{3\sqrt{3}}{6\sqrt{3}} = \frac{1}{2}$$

$\therefore$ By SSS similarity axiom,

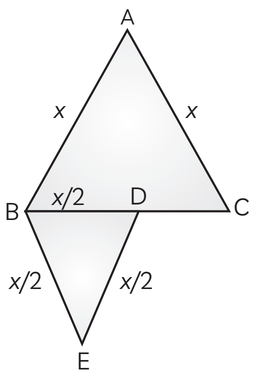
$\Delta ABC \sim \Delta RQP$

$\therefore \quad \angle C = \angle P$

$\Rightarrow \quad \angle P = 40°$

14. *(d) 4 : 1*

Explanation : Since, ΔABC and ΔBDE are two equilateral triangles.



$\therefore \quad \Delta ABC \sim \Delta EBD$

[By AA similarity criterion]

$$\Rightarrow \quad \frac{ar(\Delta ABC)}{ar(\Delta EBD)} = \frac{BC^2}{BD^2} = \frac{x^2}{\frac{x^2}{4}} = \frac{4}{1}$$

15. *(b) k = 16*

Explanation: We have

$$8x + 5y - 9 = 0$$

and, $\quad kx + 10y - 18 = 0$

For infinitely many solutions, we have

$$\frac{8}{k} = \frac{5}{10} = \frac{-9}{-18}$$

$$\Rightarrow \quad \frac{8}{k} = \frac{1}{2} \Rightarrow k = 16$$

16. *(d)* $\frac{5}{4}$

Explanation: We know, $\cos^2 A + \sin^2 A = 1$

$$\Rightarrow \cos A = \sqrt{1 - \sin^2 A} = \sqrt{1 - \left(\frac{3}{5}\right)^2} = \frac{4}{5}$$

and, $\sec A = \dfrac{1}{\cos A} = \dfrac{1}{4/5} = \dfrac{5}{4}$

17. *(d) Sum of zeroes*

Explanation: Here $p(x) = ax^2 + bx + c$

$$= -x^2 + \frac{b}{a}x + c$$

But the general equation of a quadratic equation with α and β as zeroes is:

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0 \quad \text{...(i)}$$

$\therefore$ Sum of zeroes or $(\alpha + \beta) = -\dfrac{b}{a}$

18. *(d)* 8

Explanation: Let the other zero be α.

We know,

$$\text{Sum of zeroes} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$$

$$\Rightarrow \quad -1 + \alpha = -\frac{(-7)}{1}$$

$$\Rightarrow \quad -1 + \alpha = 7 \Rightarrow \alpha = 8$$

19. *(a) ₹ 750*

Explanation: Let the cost of one chair be ₹x and the cost of one table be ₹y.

A.T.Q., $\quad 8x + 5y = 10500 \quad$ ....(i)

and $\quad 5x + 3y = 6450 \quad$ ....(ii)

Eq. (i) × 3 – Eq. (iii) × 5, we get

$$24x + 15y = 31500$$
$$25x + 15y = 32250$$
$$- \quad - \quad -$$

$$-x = -750$$
$$x = 750$$

$\therefore$ cost of one chair = ₹x = ₹ 750

20. *(c) 1*

Explanation: $(\tan\theta \operatorname{cosec}\theta)^2 - (\sin\theta \sec\theta)^2$

$$= \left(\frac{\sin\theta}{\cos\theta} \times \frac{1}{\sin\theta}\right) \left(\sin\theta \times \frac{1}{\cos\theta}\right)^2$$

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

$$= \sec^2\theta - \tan^2\theta = 1$$

SECTION - B

21. *(d) 8*

Explanation: Using mid-point formula,

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

$$\Rightarrow \quad 2 = \frac{3p - 2}{2}; 6 = \frac{4 + 2q}{2}$$

$$\Rightarrow \quad 3p = 4 + 2; 2q = 12 - 4$$

$$\Rightarrow \quad 3p = 6; 2q = 8$$

$\Rightarrow \quad p = 2; q = 4$

$\therefore \quad pq = 2 \times 4 = 8$

22. *(c) 2 : 1*

Explanation: In ΔBAC, DE || AC.

$$\therefore \quad \frac{BE}{EC} = \frac{BD}{DA} \quad \text{...(i)}$$

[By basic proportionality theorem]

Also, in ΔBAP, DC || AP.

$$\therefore \quad \frac{BC}{CP} = \frac{BD}{DA} \quad \text{....(ii)}$$

From eqs. (i) and (ii), we get

$$\frac{BE}{EC} = \frac{BC}{CP}$$

$$\Rightarrow \quad \frac{BE}{CE} = \frac{BC}{BP - BC}$$

$$\therefore \quad \frac{BE}{EC} = \frac{6}{6-4} = \frac{4}{2} \quad \text{[given]}$$

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

23. *(b) 4663*

Explanation: We have,

$$520 = 2 \times 2 \times 2 \times 5 \times 13$$

$$468 = 2 \times 2 \times 3 \times 3 \times 13$$

Number exactly divisible by 520 and 468

$$= \text{LCM } (520, 468)$$

$$= 2^3 \times 3^2 \times 5 \times 13 = 4680$$

$\therefore$ Required number

$$= \text{LCM } (520, 468) - 17$$

$$= 4680 - 17 = 4663.$$

24. *(b)* 9

Explanation: We known:

$$\text{Sum of zeroes} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$$

$$\Rightarrow \quad 3 = -\frac{(-k)}{3}$$

$$\Rightarrow \quad k = 9$$

25. *(c) Parallel*

Explanation:

Here, $\frac{4}{12} = \frac{3}{9} \neq \frac{6}{15}$ *i.e.,* $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ Given pair of equations represent parallel lines.

26. *(b) 21 m*

Explanation: Let the inner radius of the circular path be *r* and its outer radius be R.

Then, $\quad 2\pi R - 2\pi r = 132$ m $\quad$ (Given)

$$\Rightarrow \quad 2\pi(R - r) = 132$$

$$\Rightarrow \quad R - r = \frac{132}{2\pi} = 21$$

$\therefore$ Width of the path = 21 m

27. *(d)* $\frac{3}{20}$

Explanation: Total number of tickets in the bag = 20

Number of tickets greater than 15 and multiple of 5 are {20, 25, 30} *i.e.,* 3

$\therefore$ P(greater than 15 and multiple of 5) = $\frac{3}{20}$

28. *(b)* $4\sqrt{mn}$

Explanation: Given, $m = \tan\theta + \sin\theta$ and $n = \tan\theta - \sin\theta$

$$\therefore \quad m^2 - n^2 = (\tan\theta + \sin\theta)^2 - (\tan\theta - \sin\theta)^2$$

$$= 4 \tan\theta \sin\theta \quad \text{... (i)}$$

$$\text{Now, } 4\sqrt{mn} = 4\sqrt{(\tan\theta + \sin\theta)(\tan\theta - \sin\theta)}$$

$$= 4\sqrt{\tan^2\theta - \sin^2\theta}$$

$$= 4 \sin\theta\sqrt{\sec^2 - 1} = 4 \sin\theta \tan\theta$$

From (i),

$$m^2 - n^2 = 4\sqrt{mn}$$

29. *(c)* $\frac{7}{2}$ *sq. units*

Explanation:

Required area = ar (ΔABD)

$$= \frac{1}{2} \times \text{BD} \times \text{perpendicular distance of A from } x\text{-axis}$$

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

$$= \frac{1}{2} \times 7 \times 1$$

$$= \frac{7}{2} \text{ sq. units}$$

30. *(c)* $\frac{3}{2}$

Explanation: Here,

$$\frac{AB}{BC} = \cot 45° = 1$$

$$\text{and,} \quad \frac{BD}{AD} = \sin 30° = \frac{1}{2}$$

$$\text{So,} \quad \frac{AB}{BC} + \frac{BD}{AD} = 1 + \frac{1}{2} = \frac{3}{2}$$

31. *(b)* 12π cm^2

Explanation: Here, AP = PQ = QB = $\frac{AB}{3}$ = 4 cm

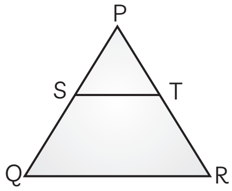
$$\therefore \text{Area of shaded region} = 2 \times \left[\frac{\pi}{2}(4)^2 - \frac{\pi}{2} \times (2)^2\right]$$

$$= 2 \times [8\pi - 2\pi]$$

$$= 12\pi \text{ cm}^2$$

32. *(c) 10.5 cm*

Explanation: ST || QR, $\frac{PS}{SQ} = \frac{3}{5}$ and PR = 28 cm.



By using basic proportionality theorem, we get

$$\frac{PS}{SQ} = \frac{PT}{TR} \Rightarrow \frac{PS}{SQ} = \frac{PT}{PR - PT}$$

$$\Rightarrow \quad \frac{3}{5} = \frac{PT}{28 - PT} \Rightarrow 3(28 - PT) = 5PT$$

$$\Rightarrow \quad 84 = 5PT + 3PT$$

$$\therefore \quad PT = \frac{84}{8} = 10.5$$

Hence, the length of PT is 10.5 cm.

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

Explanation:

Let $\quad p(x) = \sqrt{3}x^2 - 8x + 4\sqrt{3}$

$$= \sqrt{3}x^2 - 2x - 6x + 4\sqrt{3}$$

$$= x\left(\sqrt{3}x - 2\right) - 2\sqrt{3}\left(\sqrt{3}x - 2\right)$$

$$= \left(x - 2\sqrt{3}\right)\left(\sqrt{3}x - 2\right)$$

To find zeroes of $p(x)$,

Put $p(x) = 0$

$$\Rightarrow \left(x - 2\sqrt{3}\right)\left(\sqrt{3}x - 2\right) = 0$$

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

34. *(a) 4*

Explanation: Case 1:

P(getting a non-defective pen)

$$= \frac{x}{40} = y \qquad \text{...(i)}$$

Case II: Number of non-defective pens

$$= x + 20$$

$\therefore$ Total number of pens = 60

$\therefore$ P(getting a non-defective pen)

$$= \frac{x + 20}{60}$$

$$= 4y \qquad \text{...(ii)}$$

From (i) and (ii),

$$\frac{4x}{40} = \frac{x + 20}{60}$$

$$\Rightarrow \quad 6x = x + 20 \Rightarrow x = 4$$

35. *(b) Infinite*

Explanation: Here

$$\frac{a_1}{a_2} = \frac{1}{2},$$

$$\frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}; \text{ and}$$

$$\frac{c_1}{c_2} = \frac{-8}{-16} = \frac{1}{2}$$

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

$\therefore$ The given pair of linear equations has infinitely many solutions.

36. *(b) (3, –2)*

Explanation: We know,

Centroid of a triangle

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

$$= \frac{-1 + 2 + 8}{3}, \frac{-3 + 1 + (-4)}{3}$$

$$= \left(\frac{9}{3}, \frac{-6}{3}\right) = (3, -2)$$

37. *(c)* $\frac{36}{13}$ *cm*

Explanation:

$\because \quad \Delta ABC \sim \Delta ADE$

$$\therefore \quad \frac{AB}{AD} = \frac{BC}{DE} \qquad \text{...(i)}$$

In ΔABC, using Pythagoras theorem

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

$$= (3 + 2)^2 + (12)^2$$

$$= 25 + 144$$

$$= 169$$

$$\Rightarrow \quad AB = 13$$

Putting AB =13 in (i), we get

$$\frac{13}{3} = \frac{12}{DE}$$

$$\Rightarrow \quad DE = \frac{36}{13} \text{ cm}$$

38. *(b) 1*

Explanation: We have, tan A = $\sqrt{3}$

$\Rightarrow \quad \angle A = 60°$

Now, 2 sin A cot A = 2 sin 60° cot 60°

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

39. *(c) (3, 5)*

Explanation: The given lines are

$$x - 3 = 0 \Rightarrow x = 3,$$

which is parallel to y-axis.

and $y - 5 = 0 \Rightarrow y = 5$,

which is parallel to x-axis.

Hence, the lines intersect at (3, 5).

40. *(c)* $-x^2 + 2x + 35$

Explanation: Clearly, other zero $= -\frac{35}{7} = -5$

Thus, the zeroes are 7 and –5.

Hence, the required polynomial is given by $k(x - 7)(x + 5)$ *i.e.*, $k(x^2 + 5x - 7x - 35)$ *i.e.*, $k(x^2 - 2x - 35)$

Since, the shape of gate is always in the shape of downward parabola, therefore coefficient of x^2 should be negative.

So, putting $k = -1$, we get the required polynomial as $-x^2 + 2x + 35$.

SECTION - C

41. *(a)* $3\sqrt{5}$ *units*

Explanation: The distance between P and Q

$$= \sqrt{(7-4)^2 + (3+3)^2}$$
$$= \sqrt{3^2 + 6^2} = \sqrt{9 + 36}$$
$$= \sqrt{45} = 3\sqrt{5} \text{ units}$$

42. *(d)* $\left(\frac{22}{3}, \frac{11}{3}\right)$

Explanation: Let the coordinates of X be (x, y).

Then, by section formula,

$$x = \frac{1 \times 8 + 2 \times 7}{1 + 2} = \frac{8 + 14}{3} = \frac{22}{3}$$

and $$y = \frac{1 \times 5 + 2 \times 3}{1 + 2} = \frac{5 + 6}{3} = \frac{11}{3}$$

Thus, the coordinates of X are $\left(\frac{22}{3}, \frac{11}{3}\right)$.

43. *(b)* $\left(\frac{15}{2}, 4\right)$

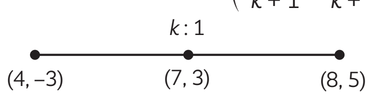
Explanation: The mid-point of Q and R is given by $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Here, $(x_1, y_1) = (7, 3)$ and $(x_2, y_2) = (8, 5)$

$\therefore$ mid-point $= \left(\frac{7+8}{3}, \frac{3+5}{2}\right) = \left(\frac{15}{2}, 4\right)$

44. (c) *3 : 1*

Explanation: Let Q divides the line segment joining P and R in the ratio $k : 1$. Then, the coordinates of Q will be $\left(\frac{8k+4}{k+1}, \frac{5k-3}{k+1}\right)$



Thus, we have $\left(\frac{8k+4}{k+1}, \frac{5k-3}{k+1}\right) = (7, 3)$

$\Rightarrow \quad \frac{8k+4}{k+1} = 7$

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

Consider, $\quad \frac{8k+4}{k+1} = 7$

$\Rightarrow \quad 8k + 4 = 7k + 7$

$\Rightarrow \quad k = 3$

Hence, the required ratio is 3 : 1.

45. *(d) A straight line*

Explanation: Clearly, distance between P and Q

$= 3\sqrt{5}$ units

Also, distance between Q and R

$$= \sqrt{(8-7)^2 + (5-3)^2}$$
$$= \sqrt{(1)^2 + (2)^2}$$
$$= \sqrt{5}$$

And, distance between P and R

$$= \sqrt{(8-4)^2 + (5+3)^2}$$
$$= \sqrt{4^2 + 8^2} = \sqrt{16 + 64}$$
$$= \sqrt{80} = 4\sqrt{5} \text{ units}$$

Since, PQ + QR = PR

$\therefore$ The given points are collinear and hence lie on a straight line.

46. *(c) 36*

Explanation: To find the maximum number of cars, we will find the HCF (792, 612) by prime factorization.

$$792 = 2 \times 2 \times 2 \times 3 \times 3 \times 11$$
$$612 = 2 \times 2 \times 3 \times 3 \times 17$$

HCF = Product of the smallest power of each common prime factor in the numbers.

Therefore, HCF $= 2^2 \times 3^2 = 36$

47. *(a) 39*

Explanation: As the maximum number of cars that can be transported in one trailer = 36, so we will require $\frac{792}{36} = 22$ trailers for model A and $\frac{612}{36} = 17$ trailers for model B. Therefore, a total of 22 + 17 = 39 trailers will be required for transporting all the cars.

48. *(d) 13464*

Explanation: To find the LCM (792, 612), we will first find the prime factors and then the product of greatest power of each prime factor involved in the numbers.

$$792 = 2 \times 2 \times 2 \times 3 \times 3 \times 11$$
$$612 = 2 \times 2 \times 3 \times 3 \times 17$$

Therefore, LCM (792, 612)

$$= 2^3 \times 3^2 \times 11 \times 17$$
$$= 13464$$

49. *(c) 3*

Explanation:

$$792 = 2 \times 2 \times 2 \times 3 \times 3 \times 11$$
$$= 2^3 \times 3^2 \times 11$$

Therefore, the power of 2 in the prime factorization of 792 is 3.

50. *(b) 12*

Explanation: The smallest multiple of 4 is 4 and the smallest multiple of 6 is 6.

To find LCM (4, 6), we will first find their prime factors.

$$4 = 2^2 ; 6 = 2^1 \times 3^1$$

Therefore, LCM $= 2^2 \times 3 = 12$