

SECTION – I

15 x 1 = 15 marks

Q. No	Key	Answer	Q. No	Key	Answer
1.	(2)	$A \setminus B = A \cap B$	9.	(4)	60 m
2.	(4)	{3,4,5}			
3.	(1)	an A.P	10.	(4)	4.5 cm
4.	(4)	a^{k+5}	11.	(3)	$\tan^2\theta$
5.	(3)	$cx^2 + bx + a = 0$	12.	(2)	$\tan^2\theta$
6.	(1)	-1, 0, 0, -1	13.	(4)	27 : 125
7.	(4)	4	14.	(4)	27
8.	(2)	$3x-2y = 0$	15.	(2)	$\frac{2}{3}$

SECTION-II

10 x 2 = 20 marks

16. $B \cap C = \{2, 4, 6\}$ - 1 mark
 $A \cup (B \cap C) = \{2, 4, 6, 7, 8, 9\}$ - 1 mark

17. $f(5) = 9, a = 9$ - 1 mark
 $f(8) = 15, b = 15$ - 1 mark

18. $1^2 - 2^2 + 3^2 - 4^2 + \dots = (1 - 4) + (9 - 16) + \dots$
 $= (-3) + (-7) + \dots$
 $a = -3, d = -4, n = 10$
 $S_n = \frac{n}{2} [2a + (n-1)d]$ - 1 mark
 $= \frac{10}{2} [-6 + (9 \times -4)]$
 $= -210$ - 1 mark

19. $\frac{x^3 - 8}{x^2 - 4} \times \frac{x^2 + 6x + 8}{x^2 + 2x + 4} = \frac{(x-2)(x^2 + 2x + 4)}{(x+2)(x-2)} \times \frac{(x+4)(x+2)}{x^2 + 2x + 4}$ - 1 mark
 $= x + 4.$ - 1 mark

20. $\alpha + \beta = \frac{10}{3}$ - 1 mark
 $\alpha = \frac{1}{3}, \beta = 3$
 $\alpha\beta = \frac{k}{3}, k = 3$ - 1 mark

21. $2a - b = 10$
 $3a + b = 5$ - 1 mark
 $a = 3, b = -4$ - 1 mark

22. Let $a = 3k$, $b = 2k$

$$\frac{x}{3k} + \frac{y}{2k} = 1$$

- 1 mark

It passes (3, 4), $k = 3$

$$\frac{x}{9} + \frac{y}{6} = 1 \quad (\text{or}) \quad 2x + 3y - 18 = 0.$$

- 1 mark

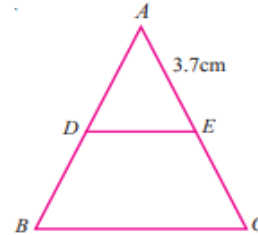
23. In ΔABC , $DE \parallel BC$

$$\frac{AD}{DB} = \frac{AE}{EC}$$

- 1 mark

$$EC = 5.55 \text{ cm}$$

- 1 mark



$$\begin{aligned} 24. \text{LHS} &= \sin^6 x + \cos^6 x \\ &= (\sin^2 \theta)^3 + (\cos^2 \theta)^3 \\ &= (\sin^2 \theta + \cos^2 \theta)^3 - 3 \sin^2 \theta \cos^2 \theta (\sin^2 \theta + \cos^2 \theta) \\ &= 1 - 3 \sin^2 \theta \cos^2 \theta = \text{RHS} \end{aligned}$$

- 1 mark

- 1 mark

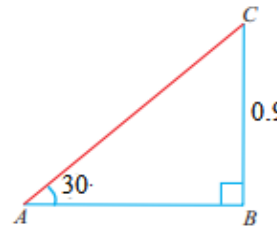
$$25. \sin 30^\circ = \frac{BC}{AC}$$

- 1 mark

$$AC = 1.8 \text{ m}$$

- 1 mark

The length of the ramp is 1.8 m.



$$26. r = \frac{14}{2} = 7 \text{ cm}$$

$$h = 14 \text{ cm}$$

$$v = \frac{1}{3} \pi r^2 h$$

- 1 mark

$$v = \frac{2156}{3} \quad (\text{or}) \quad 718.67 \text{ cm}^3$$

- 1 mark

$$27. 2\pi r^2 = 2772 \text{ cm}^2$$

$$\pi r^2 = 1386$$

$$\text{TSA} = 3\pi r^2$$

- 1 mark

$$= 4158 \text{ cm}^2$$

- 1 mark

$$28. C_v = 57, \sigma = 6.84$$

$$C_v = \frac{\sigma}{x} \times 100$$

- 1 mark

$$x = \frac{684}{57} = 12$$

- 1 mark

$$29. n(S) = 4, n(A) = 3$$

- 1 mark

$$P(A) = \frac{n(A)}{n(S)} = \frac{3}{4}$$

- 1 mark

30. (a) $A^{-1} = \begin{pmatrix} 1 & 3 \\ 9 & -6 \end{pmatrix} = A$

- 1 mark

$IA = \begin{pmatrix} 1 & 3 \\ 9 & -6 \end{pmatrix} = A$

- 1 mark

$AI = IA = A.$

(b) Area of $\Delta ABC = 0, \frac{1}{2} \begin{vmatrix} k & 2 & 4 \\ k & 3 & -1 \\ k & k & k \end{vmatrix} = 0$

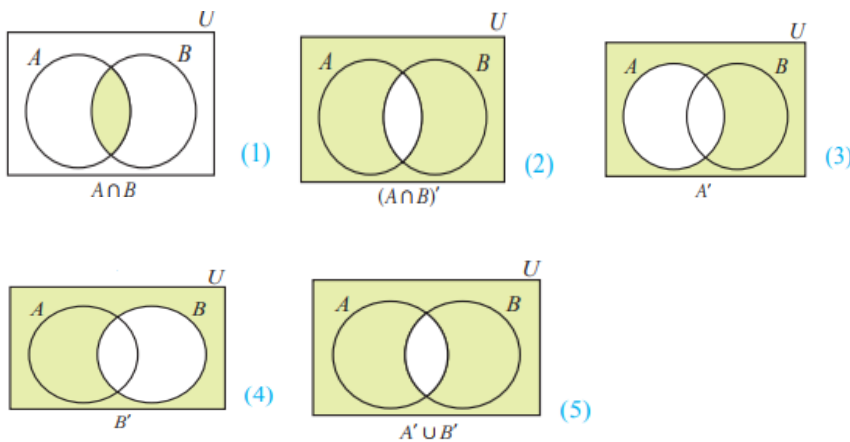
- 1 mark

$k = \frac{7}{3}$

- 1 mark

SECTION-III

31.



(Each diagram carries 1 mark)

- 5 marks

32. $f(-3) = 35, f(-2) = 15, f(-1) = 3, f(1) = 3$

- 1 mark

(i) $f(5) + f(6) = 16$

- 1 mark

(ii) $f(1) - f(-3) = -32$

- 1 mark

(iii) $f(-2) - f(4) = 5$

- 1 mark

(iv) $\frac{f(3) + f(-1)}{2f(6) - f(1)} = \frac{10}{15} = \frac{2}{3}$

-1 mark

33. $S_1 = \frac{a(1-r^n)}{1-r}, S_2 = \frac{a(1-r^{2n})}{1-r}, S_3 = \frac{a(1-r^{3n})}{1-r}$

$S_1 = (S_3 - S_2) = \frac{a^2 r^{2n} (1-r^n)^2}{(1-r)^2}$

-2 marks

$S_2 - S_1 = \frac{ar^n}{1-r} (1-r^n)$

-2 marks

$(S_2 - S_1)^2 = \frac{a^2 r^{2n}}{(1-r)^2} (1-r^n)^2 = S_1 (S_3 - S_2)$

- 1 mark

34.

$4x^2$	$16x^4 - 24x^3 + 25x^2 - 12x + 4$	-2marks
$8x^2 - 3x$	$16x^4$	-1 mark
$8x^2 - 6x + 2$	$-24x^3 + 25x^2$	-1 mark
	$-24x^3 + 9x^2$	
	$16x^2 - 12x + 4$	
	$16x^2 - 12x + 4$	
	0	
$\sqrt{16x^4 - 24x^3 + 25x^2 - 12x + 4} = 4x^2 - 3x + 2 $		-1 mark

35. The speed of the boat in the downstream and in the upstream are $(15 + x)$ km/hr

and $(15 - x)$ km/hr respectively.

$$T_1 = \frac{30}{15+x} \text{ and } T_2 = \frac{30}{15-x}$$

$$\frac{30}{15-x} + \frac{30}{15+x} = \frac{9}{2}$$

$$225 - x^2 = 200$$

$$x = \pm 5$$

The speed of the stream is 5 km/ hr.

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$$36. AB = \begin{pmatrix} 4 \\ -6 \\ -2 \end{pmatrix} \quad (2 \ 9 \ -3) = \begin{pmatrix} 8 & 36 & -12 \\ -12 & -54 & 18 \\ -4 & -18 & 6 \end{pmatrix}$$

$$(AB)^T = \begin{pmatrix} 8 & -12 & -4 \\ 36 & -54 & -18 \\ -12 & 18 & 6 \end{pmatrix}$$

$$B^T A^T = \begin{pmatrix} 2 \\ 9 \\ -3 \end{pmatrix} (4 \ -6 \ -2) = \begin{pmatrix} 8 & -12 & -4 \\ 36 & -54 & -18 \\ -12 & 18 & 6 \end{pmatrix}$$

37. Equation of PQ is $2x - 3y + 9 = 0$

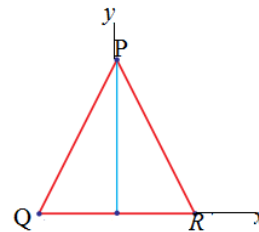
At P, $x = 0, y = 3$

P (0, 3)

At Q, $y = 0, x = \frac{-9}{2}$

Q $\left(\frac{-9}{2}, 0\right)$

The equation of the line along PR is $2x + 3y - 9 = 0$



-1 mark

-1 mark

-1 mark

-1 mark

-1 mark

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38. $a + b = 5, b = 5 - a$

$$\frac{x}{a} + \frac{y}{5-a} = 1$$

$$(5 - a)x + ay = a(5 - a)$$

It passes $(6, -2), a = 3$ (or) $a = 10$

When $a = 3, 2x + 3y = 6$

When $a = 10, x - 2y - 10 = 0.$

-1 mark

-1 mark

-1 mark

-1 mark

39. Diagram

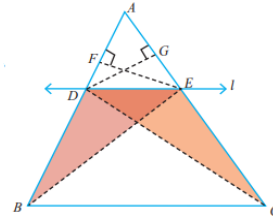
Statement

Given

To prove

Construction

Note: No diagram no mark.



-1 mark

-1 mark

-1 mark

-2 marks

40. LHS = $(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta)$

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

-1 mark

$$= \frac{(\sin \theta + \cos \theta - 1)(\cos \theta + \sin \theta + 1)}{\sin \theta \cos \theta}$$

-1 mark

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

-1 mark

$$= \frac{1 + 2 \sin \theta \cos \theta - 1}{\sin \theta \cos \theta}$$

-1 mark

$$= 2$$

-1 mark

= RHS.

41. Let R, r be the radii and h be the height of the frustum respectively.

$$2\pi R = 44 \text{ cm}, 2\pi r = 8.4 \pi \text{ cm}, h = 14 \text{ cm.}$$

-1 mark

$$R = 7 \text{ cm}, r = 4.2 \text{ cm.}$$

-1 mark

$$\text{Volume of the frustum} = \frac{1}{3} \pi h (R^2 + r^2 + Rr)$$

-1 mark

$$= 1408.57 \text{ cm}^2.$$

-2 marks

42. Let r_1 and h be the radius and height of a right circular cone.

Let r_2 be the radius of the spherical shaped clay.

Given that $r_1 = 12 \text{ cm}, h = 48 \text{ cm}$

$$\frac{4}{3} \pi r_2^3 = \frac{1}{3} \pi r_1^2 h$$

-1 mark

$$r_2^3 = 12^3$$

-3 marks

The radius of the spherical clay = 12 cm

-1 mark

43. $\bar{x} = \frac{\sum x}{n} = \frac{231}{7} = 33$

x	$d = x - \bar{x}$	d^2
26	-7	49
28	-5	25
31	-2	4
34	1	1
34	1	1
38	5	25
40	7	49
		$\Sigma d^2 = 154$

-2 marks

$$\sigma = \sqrt{\frac{\sum d^2}{n}}$$

-1 mark

$$\sigma = \sqrt{22}$$

$$\sigma = 4.69$$

-2 marks

44. $n(s) = 20$

$$P(W) = \frac{10}{20}$$

-1 mark

$$P(B) = \frac{5}{20}$$

-1 mark

$$P(G) = \frac{3}{20}$$

-1 mark

$$P(W \cup B \cup G) = P(W) + P(B) + P(G)$$

-1 mark

$$= \frac{10}{20} + \frac{5}{20} + \frac{3}{20}$$

$$= \frac{9}{10}$$

-1 mark

45. (a) 108, 117, 126, ..., 999

This is an A.P, $a = 108$, $d = 9$, $l = 999$

-1 mark

$$n = \frac{l - a}{d} + 1$$

-1 mark

$$n = 100$$

-1 mark

$$S_n = \frac{n}{2}(a + l)$$

-1 mark

$$S_{100} = 55350.$$

-1 mark

45. (b) Let α and $\beta = \alpha^2$ be the roots of the equation $3x^2 + kx - 81 = 0$

$$a = 3, b = k, c = -81$$

-1 mark

$$\alpha + \beta \Rightarrow \alpha + \alpha^2 = \frac{-k}{3}$$

-1 mark

$$\alpha \beta \Rightarrow \alpha(\alpha^2) = -27$$

-1 mark

$$\alpha = -3$$

-1 mark

$$k = -18.$$

-1 mark

SECTION – IV

46. (a) Rough diagram **-1 mark**
First Circle **- 3 marks**
Line Segment OP **-1 mark**
Perpendicular bisector **-1 mark**
Second circle **-2 marks**
Two tangents lines **-1 mark**
Measuring the length **-1 mark**
-

46. (b) Rough diagram **-1 mark**
Draw a line segment PQ **-1mark**
Draw arcs with radii 7 cm and 5.5 cm. Join PR and QR **-1mark**
Draw perpendicular bisectors of PQ and QR **-3 marks**
Draw a circumcircle **-3 marks**
Join PS and RS **-1mark**
-

47. (a) $y = x^2 + x - 12$

x	-4	-3	-2	-1	0	1	2	3
x^2	16	9	4	1	0	1	4	9
x	-4	-3	-2	-1	0	1	2	3
-12	-12	-12	-12	-12	-12	-12	-12	-12
y	0	-6	-10	-12	-12	-10	-6	0

- Plot the points $(-4, 0), (-3, -6), (-2, -10), (-1, -12), (0, -12), (1, -10), (2, -6), (3, 0)$ **-3 marks**
Join the points by a smooth curve **-4 marks**
Scale and drawing x and y axis **-2 marks**
It has no real roots. **-1 mark**
-

(b) $y \propto x \Rightarrow y = kx \Rightarrow \frac{y}{x} = k$

$y = 2x$

- Formation of equation **-1 mark**
Plotting the points and drawing the curve **-5 marks**
Drawing x and y axes, scale **-2 marks**
Solution Set **-2 marks**
 $x = 4, y = 8$
 $y = 12, x = 6$

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