

Delva Model Question Paper - 06

Part - I

1 marks:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	C	d	C	d	a	b	a	b	b	d	C	a	b

Part - II

8 marks:

15. $R: y^2$

$$x=1, y^2=1^2 \rightarrow 1$$

$$x=2, y^2=2^2 \rightarrow 4$$

$$x=3, y^2=3^2 \rightarrow 9$$

$$x=4, y^2=4^2 \rightarrow 16$$

$$x=5, y^2=5^2 \rightarrow 25$$

$$x=6, y^2=6^2 \rightarrow 36$$

$$x=7, y^2=7^2 \rightarrow 49 \notin A$$

$$\text{Domain} = \{1, 2, 3, 4, 5\}$$

$$\text{Range} = \{1, 4, 9, 16, 25, 36\}$$

16. $f \circ f = f(f(k))$

$$5 = f(2k-1)$$

$$5 = 2(2k-1)$$

$$5 = 4k - 2$$

$$5 = 4k$$

$$5 + 3 = 4k$$

$$8 = 4k$$

$$\frac{8}{4} = k$$

$$\boxed{2 = k}$$

17.

2 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

1, 1, 3, 2, 5, 3, 7, 4, 9, 5

2 1, 6, 3, 1, 5, 3, 7, 2, 9, 5

3 1, 1, 3, 1, 5, 3, 7, 1, 9, 5

3 1, 1, 1, 1, 5, 1, 7, 1, 3, 5

5 1, 1, 1, 1, 5, 1, 7, 1, 1, 5

7 1, 1, 1, 1, 1, 1, 7, 1, 1, 1

1, 1, 1, 1, 1, 1, 1, 1, 1, 1

$$\begin{aligned} \text{LCM} &= 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 \\ &= 8 \times 9 \times 35 \\ &= 72 \times 35 \end{aligned}$$

$$\boxed{\text{LCM} = 2520}$$

$$18. \quad a = 8 \quad S_{\infty} = \frac{32}{3}$$

$$S_{\infty} = \frac{a}{1-r}$$

$$\frac{32}{3} = \frac{8}{1-r}$$

$$32(1-r) = 3 \times 8$$

$$32 - 32r = 24$$

$$32 - 24 = 32r$$

$$8 = 32r$$

$$\frac{8}{32} = r$$

$$\boxed{\frac{1}{4} = r}$$

$$19. \quad \frac{x^2 - 16}{x^2 + 8x + 16} = \frac{x^2 - 4^2}{(x+4)(x+4)}$$

$$= \frac{(x+4)(x-4)}{(x+4)(x+4)}$$

$$= \frac{x-4}{x+4}$$

$$\begin{array}{r} 16 \\ \swarrow \downarrow \searrow \\ 4 \quad 4 \quad 4 \end{array}$$

$$20. \quad d = t^2 - 0.75t$$

$$t^2 - 0.75t = 11.25$$

$$t^2 - 0.75t - 11.25 = 0$$

$$(t+3)(t-3.75) = 0$$

$$t+3=0$$

$$t = -3$$

4 N

$$t-3.75=0$$

$$t = 3.75$$

$$\begin{array}{r} 11.25 \\ \swarrow \downarrow \searrow \\ 3 \quad -3.75 \end{array}$$

Answer : 3.75 seconds

$$21. \quad \sqrt{\frac{144 a^8 b^{12} c^{16}}{81 t^{12} g^4 h^{14}}} = \frac{12}{9} \left| \frac{a^4 b^6 c^8}{t^6 g^2 h^7} \right|$$

$$= \frac{4}{3} \left| \frac{a^4 b^6 c^8}{t^6 g^2 h^7} \right|$$

$$\begin{aligned}
 22. \quad 4A - 3B &= 4 \begin{bmatrix} 5 & 4 & -2 \\ \frac{1}{2} & \frac{3}{4} & \sqrt{2} \\ 1 & 9 & 4 \end{bmatrix} - 3 \begin{bmatrix} -7 & 4 & -3 \\ \frac{1}{4} & \frac{1}{2} & 3 \\ 5 & -6 & 9 \end{bmatrix} \\
 &= \begin{bmatrix} 20 & 16 & -8 \\ 2 & 3 & 4\sqrt{2} \\ 4 & 36 & 16 \end{bmatrix} + \begin{bmatrix} 21 & -12 & 9 \\ -\frac{3}{4} & -\frac{21}{2} & -9 \\ -15 & 18 & -27 \end{bmatrix} \\
 &= \begin{bmatrix} 41 & 4 & 1 \\ \frac{5}{4} & -\frac{15}{2} & 4\sqrt{2} - 9 \\ -11 & 54 & -11 \end{bmatrix}
 \end{aligned}$$

$$22. \quad \triangle ABC \sim \triangle PQR$$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} = \frac{36}{24}$$

$$\frac{AB}{PQ} = \frac{36}{24} \Rightarrow \frac{AB}{10} = \frac{36}{24}$$

$$AB = \frac{36 \times 10}{24}$$

$$AB = 15 \text{ cm}$$

$$24. \quad \theta = 30^\circ, c = -3$$

$$m = \tan \theta$$

$$m = \tan 30^\circ$$

$$m = \frac{1}{\sqrt{3}}$$

$$y = mx + c$$

$$y = \frac{1}{\sqrt{3}} x - \frac{3}{1}$$

$$y = \frac{x - 3\sqrt{3}}{\sqrt{3}} \text{ (cm)}$$

$$y\sqrt{3} = x - 3\sqrt{3}$$

$$x - y\sqrt{3} - 3\sqrt{3} = 0$$

25. L.H.S

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

$$\frac{\sin A - \sin A \cos A + \sin A + \sin A \cos A}{1 - \cos^2 A}$$

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

$$= 2 \times \frac{1}{\sin A}$$

$$= 2 \operatorname{cosec} A \rightarrow \text{R.H.S}$$

Hence Proved

26. $l = 5 \text{ cm}, R = 4 \text{ cm}, r = 1 \text{ cm}$

$$\text{C.S.A of frustum} = \pi (R + r) l \text{ sq. units}$$

$$= \frac{22}{7} (4 + 1) \times 5$$

$$= \frac{22}{7} \times 5 \times 5$$

$$= \frac{550}{7}$$

$$\text{C.S.A} = 78.57 \text{ cm}^2.$$

27. Range $R = L - S$

$$13.67 = 70.08 - S$$

$$S = 70.08 - 13.67$$

$$\boxed{S = 56.41}$$

28.

$$r_1 = 12$$

$$r_2 = 16$$

$$\frac{r_1}{r_2} = \frac{12}{16} \rightarrow \frac{3}{4}$$

$$\text{C.S.A of balloons} = \frac{4\pi r_1^2}{4\pi r_2^2}$$

$$= \left(\frac{r_1}{r_2}\right)^2 \Rightarrow \left(\frac{3}{4}\right)^2$$

$$\text{C.S.A} = \frac{9}{16}$$

Ratio of C.S.A of balloons is $\boxed{9:16}$

Part - III

29. $A = \{2, 3\}$ $B = \{0, 1\}$ $C = \{1, 2\}$

L.H.S $B \cap C = \{0, 1\} \cap \{1, 2\}$
 $= \{1\}$

$$A \times (B \cap C) = \{2, 3\} \times \{1\}$$

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

R.H.S

$$A \times B = \{2, 3\} \times \{0, 1\}$$

$$= \{(2, 0), (2, 1), (3, 0), (3, 1)\}$$

$$A \times C = \{2, 3\} \times \{1, 2\}$$

$$= \{(2, 1), (2, 2), (3, 1), (3, 2)\}$$

$$(A \times B) \cap (A \times C) = \{(2, 1), (3, 1)\} \text{ --- ②}$$

$$\text{①} = \text{②}$$

$$\therefore A \times (B \cap C) = (A \times B) \cap (A \times C)$$

30. (i) $f(0) = 2(0) - 3$
 $= 0 - 3$

$$f(0) = -3$$

$$f(1) = 2(1) - 3$$

$$= 2 - 3$$

$$f(1) = -1$$

$$\frac{f(0) + f(1)}{2} = \frac{-3 - 1}{2} \Rightarrow \frac{-4}{2} \Rightarrow \boxed{-2}$$

(ii) $f(x) = 0$

$$f(x) = 2x - 3$$

$$0 = 2x - 3$$

$$3 = 2x$$

$$\boxed{\frac{3}{2} = x}$$

$$\begin{aligned}
 \text{(iii)} \quad f(x) &= 2x - 3 \\
 x &= 2x - 3 \\
 x - 2x &= -3 \\
 -x &= -3 \\
 \boxed{x} &= 3
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad f(x) &= f(1-x) \\
 f(x) &= 2x - 3 \\
 f(1-x) &= 2(1-x) - 3 \\
 &= 2 - 2x - 3 \\
 f(1-x) &= -2x - 1 \\
 f(x) &= f(1-x) \\
 (2x - 3) &= -2x - 1 \\
 2x + 2x &= -1 + 3 \\
 4x &= 2 \\
 x &= \frac{2}{4} \\
 \boxed{x} &= \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 31. \quad & a - 3d, a - d, a + d, a + 3d \\
 & a - 3d + a - d + a + d + a + 3d = 28
 \end{aligned}$$

$$4a = 28$$

$$a = \frac{28}{4}$$

$$\boxed{a = 7}$$

$$(a - 3d)^2 + (a - d)^2 + (a + d)^2 + (a + 3d)^2 = 276$$

$$\begin{aligned}
 a^2 - 2(a)(3d) + (3d)^2 + a^2 - 2ad + d^2 + \\
 a^2 + 2ad + d^2 + a^2 + 2(a)(3d) + (3d)^2 \quad \} = 276
 \end{aligned}$$

$$a^2 + 9d^2 + a^2 + d^2 + a^2 + d^2 + a^2 + 9d^2 = 276$$

$$4a^2 + 20d^2 = 276$$

$$4(7)^2 + 20d^2 = 276$$

$$4(49) + 20d^2 = 276$$

$$196 + 20d^2 = 276$$

$$20d^2 = 276 - 196$$

$$20d^2 = 80$$

$$d^2 = \frac{80}{20}$$

$$d^2 = 4$$

$$d = \sqrt{4}$$

$$\underline{d = \pm 2}$$

$$a-3d, a-d, a+d, a+3d$$

$$\text{If } a=7, d=2$$

$$7-3(2), 7-2, 7+2, 7+3(2)$$

$$7-6, 5, 9, 7+6$$

$$\boxed{1, 5, 9, 13}$$

$$\text{If } a=7, d=-2$$

$$7-3(-2), 7-(-2), 7+(-2), 7+3(-2)$$

$$7+6, 7+2, 7-2, 7-6$$

$$\boxed{13, 9, 5, 1}$$

$$32. \quad x^2 y^{-2} \rightarrow x^2 \times \frac{1}{y^2} \Rightarrow \frac{x^2}{y^2} \Rightarrow x^2 \div y^2$$

$$x^2 \div y^2 = \left(\frac{a^2 + 3a - 4}{3a^2 - 3} \right)^2 \div \left(\frac{a^2 + 2a - 8}{2a^2 - 2a - 4} \right)^2$$

$$= \left(\frac{(a-1)(a+4)}{3(a^2-1)} \right)^2 \div \left(\frac{(a-2)(a+4)}{2(a^2-a-2)} \right)^2$$

$$= \left(\frac{(a-1)(a+4)}{3(a+1)(a-1)} \right)^2 \div \left(\frac{(a-2)(a+4)}{2(a+1)(a-2)} \right)^2$$

$$= \frac{(a-1)^2 (a+4)^2}{3^2 (a+1)^2 (a-1)^2} \div \frac{(a-2)^2 (a+4)^2}{2^2 (a+1)^2 (a-2)^2}$$

$$= \frac{(a-1)^2 (a+4)^2}{9 (a+1)^2 (a-1)^2} \times \frac{4 (a+1)^2 (a-2)^2}{(a-2)^2 (a+4)^2}$$

$$x^2 y^{-2} = \boxed{\frac{4}{9}}$$

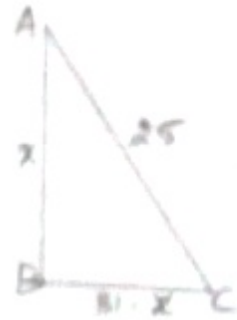
32.

$$AB + BC + CA = 56$$

$$x + BC + 25 = 56$$

$$BC = 56 - 25 - x$$

$$\underline{BC = 31 - x}$$



By Pythagoras theorem,

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

$$25^2 = x^2 + (31 - x)^2$$

$$625 = x^2 + (31)^2 - 2(31)x + x^2$$

$$625 = 2x^2 - 62x + 961$$

$$2x^2 - 62x + 961 - 625 = 0$$

$$2x^2 - 62x + 336 = 0$$

$$\div 2, \quad x^2 - 31x + 168 = 0$$

$$(x - 24)(x - 7) = 0$$

$$\begin{array}{l|l} x - 24 = 0 & x - 7 = 0 \\ \hline x = 24 & x = 7 \end{array} \quad 24 < 7$$

The smallest value is 7.

34. L.H.S

$$AB = \begin{bmatrix} 1 & 2 \\ 4 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 2 - 2 + 0 & -1 + 8 + 2 \\ 4 + 1 + 0 & -2 - 4 + 2 \end{bmatrix} = \begin{bmatrix} 0 & 9 \\ 5 & -4 \end{bmatrix}$$

$$(AB)^T = \begin{bmatrix} 0 & 5 \\ 9 & -4 \end{bmatrix} \text{ --- ①}$$

R.H.S

$$B^T = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{bmatrix}, \quad A^T = \begin{bmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{bmatrix}$$

$$B^T \times A^T = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 2-2+0 & 4+1+0 \\ -1+8+2 & -2-4+2 \end{bmatrix}$$

$$B^T A^T = \begin{bmatrix} 0 & 5 \\ 9 & -4 \end{bmatrix} \quad \text{--- (2)}$$

$$\textcircled{1} = \textcircled{2}$$

$$(AB)^T = B^T A^T$$

Hence Proved.

35. Alternate Segment Theorem Book Pg: 190, 191

36. $TR = y$ OT is perpendicular bisector of PQ .

$$PR = QR = 4 \text{ cm}$$

$$\text{In } \triangle ORP, OP^2 = OR^2 + PR^2$$

$$OR^2 = OP^2 - PR^2$$

$$OR^2 = 5^2 - 4^2 \Rightarrow 25 - 16 \Rightarrow 9$$

$$OR = \sqrt{9} = \underline{3 \text{ cm}}$$

$$OT = OR + RT = 3 + y \quad \text{--- (1)}$$

$$\text{In } \triangle PRT, TP^2 = TR^2 + PR^2 \quad \text{--- (2)}$$

and $\triangle OPT$ we have, $OT^2 = TP^2 + OP^2$

$$OT^2 = (TR^2 + PR^2) + OP^2 \quad (\text{substitute for } TP^2 \text{ from (2)})$$

$$(3+y)^2 = y^2 + 4^2 + 5^2 \quad (\text{substitute for } OT \text{ from (1)})$$

$$9 + 6y + y^2 = y^2 + 16 + 25$$

$$6y = 41 - 9, \text{ we get } y = \frac{16}{3}$$

$$\text{From (2), } TP^2 = TR^2 + PR^2$$

$$TP^2 = \left(\frac{16}{3}\right)^2 + 4^2 = \frac{256}{9} + 16 = \frac{400}{9}$$

$$TP = \frac{20}{3} \text{ cm.}$$

37. Area of quadrilateral = $\frac{1}{2} \{x_1 y_2 - x_2 y_1 + x_2 y_3 - x_3 y_2 + x_3 y_4 - x_4 y_3 + x_4 y_1 - x_1 y_4\}$

$$= \frac{1}{2} \{8 \cdot 5 - 5 \cdot -4 + 5 \cdot 12 - 12 \cdot 3 + 12 \cdot 6 - 6 \cdot 8\}$$

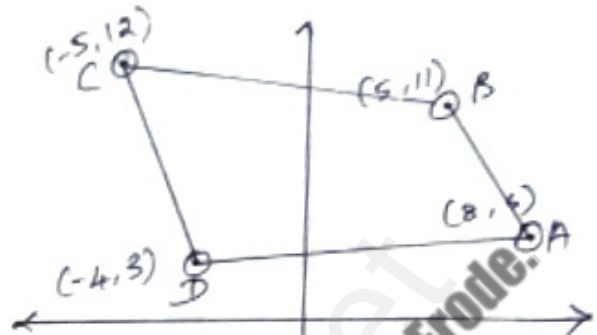
$$= \frac{1}{2} \{(88 + 60 - 15 - 24) - (30 - 55 - 48 + 24)\}$$

$$= \frac{1}{2} \{109 - (-49)\}$$

$$= \frac{1}{2} \{109 + 49\}$$

$$= \frac{1}{2} \{158\}$$

$$= 79 \text{ sq. units}$$



38. $\triangle BAC$, $\tan 30^\circ = \frac{AB}{AC}$

$$\frac{1}{\sqrt{3}} = \frac{200}{AC}$$

$$AC = 200\sqrt{3}$$

$\triangle BAD$, $\tan 45^\circ = \frac{AB}{AD}$

$$1 = \frac{200}{AD} \text{ (cm)}$$

$$AD = 200$$

$$CD = AC + AD$$

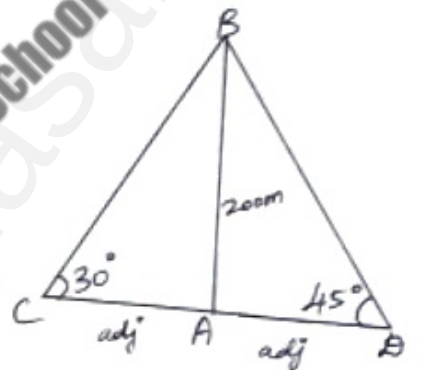
$$CD = 200\sqrt{3} + 200$$

$$CD = 200(\sqrt{3} + 1)$$

$$CD = 200(1.732 + 1)$$

$$CD = 200(2.732)$$

$$CD = 546.4 \text{ m}$$



AB = lighthouse

$$CD = AC + AD$$

$\therefore$ Distance between two ships is 546.4 m.

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

$h=16,$

$R=20,$

$r=8.$

$= \frac{1}{3} \times \frac{22}{7} \times 16 [20^2 + (20 \times 8) + 8^2]$

$= \frac{22 \times 16}{7 \times 3} [400 + 160 + 64]$

$= \frac{22 \times 16}{21} [624]$

$= \frac{22 \times 16 \times 208}{7}$

$= \frac{10456.43}{1000} \rightarrow \text{litre}$

$= 10456 \times 40$

$= \underline{418.36}$

40. $\bar{x} = 45, \quad \frac{\sum x^2}{n} = \frac{16364}{8}$

$\frac{\sum x^2}{n} = 2045.5$

$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2} = \sqrt{2045.5 - 45^2}$

$= \sqrt{20.5}$

$= 4.5277$

$C.V. = \frac{\sigma}{\bar{x}} \times 100\%$

$= \frac{4.5277}{45} \times 100\%$

$= 0.1006 \times 100\%$

$C.V. = 10.06\%$

x	$d = x - \bar{x}$	d^2
38	$38 - 45 = -7$	49
40	$40 - 45 = -5$	25
47	$47 - 45 = 2$	4
44	$44 - 45 = -1$	1
46	$46 - 45 = 1$	1
43	$43 - 45 = -2$	4
49	$49 - 45 = 4$	16
53	$53 - 45 = 8$	64
		$\sum = 164$

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

$= \sqrt{\frac{164}{8}}$

$\sigma = 4.53$

$$A1. S = \{HHH, HTH, HHT, THH, TTH, THT, HTT, TTT\}$$

$$n(S) = 8$$

$$A = \{HHH, HTH, THH\}$$

$$n(A) = 3$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{3}{8}$$

$$B = \{HTH, HHT, THH, TTH, THT, HTT, TTT\}$$

$$n(B) = 7$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{7}{8}$$

$$C = \{HHT, THH, HHH\}$$

$$n(C) = 3 \quad P(C) = \frac{n(C)}{n(S)} = \frac{3}{8}$$

$$A \cap B = \{HHT, HTH, THH\}$$

$$n(A \cap B) = 3 \quad P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{3}{8}$$

$$B \cap C = \{HHT, THH\}$$

$$n(B \cap C) = 2 \quad P(B \cap C) = \frac{n(B \cap C)}{n(S)} = \frac{2}{8} \Rightarrow \frac{1}{4}$$

$$C \cap A = \{HHT, THH\}$$

$$n(C \cap A) = 2 \quad P(C \cap A) = \frac{n(C \cap A)}{n(S)} = \frac{2}{8} \Rightarrow \frac{1}{4}$$

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$

$$= \frac{3}{8} + \frac{7}{8} + \frac{3}{8} - \frac{3}{8} - \frac{2}{8} - \frac{2}{8} + \frac{2}{8}$$

$$= \frac{8}{8}$$

$$P(A \cup B \cup C) = \boxed{1}$$

42.

$$\frac{x}{a} + \frac{y}{b} = 1 \rightarrow (1)$$

$$a+b=5 \text{ (given)}$$

$$b=5-a.$$

$$\frac{x}{a} + \frac{y}{5-a} = 1. \Rightarrow \frac{x(5-a)+ay}{a(5-a)} = 1 \text{ (CM)}$$

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

(6, -2) lies on the point.
 $\begin{matrix} (6, -2) \\ x \quad y \end{matrix}$

$$6(5-a) + a(-2) = 5a - a^2$$

$$30 - 6a - 2a = 5a - a^2$$

$$a^2 - 13a + 30 = 0$$

$$(a-3)(a-10) = 0$$

$$a-3=0 \text{ or } a-10=0$$

$$a=3, \text{ or } a=10.$$

$$\begin{matrix} 30 \\ \wedge \\ -10 \quad -3 \end{matrix}$$

$$\text{At } a=3.$$

$$a+b=5$$

$$b=5-a$$

$$b=5-3$$

$$\Rightarrow b=2$$

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

$$\frac{2x+3y}{6} = \frac{1}{1} \text{ (CM)}$$

$$\boxed{2x+3y=6}$$

$$\text{At } a=10.$$

$$b=5-10$$

$$b=-5.$$

$$\frac{x}{10} + \frac{y}{-2} = 1$$

$$\frac{x}{10} - \frac{y}{2} = 1$$

$$\frac{x-2y}{10} = \frac{1}{1} \text{ (CM)}$$

$$\boxed{x-2y=10}$$

Deiva N Model Question Paper - 07

Part - I

1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	d	a	b	c	b	c	c	c	b	a	b	b	b

Part - II

15. A relation between two sets is a collection of ordered pairs containing one object from each set.

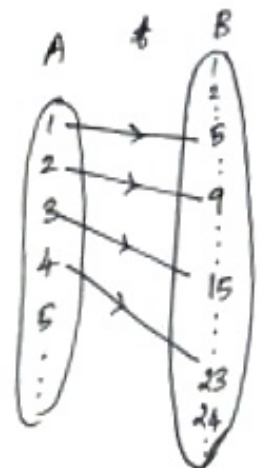
16. Natural numbers = $\{1, 2, 3, 4, \dots\}$

$$f(1) = 1^2 + 1 + 3 \Rightarrow 1 + 1 + 3 \Rightarrow 5 \quad (1, 5)$$

$$f(2) = 2^2 + 2 + 3 \Rightarrow 4 + 2 + 3 \Rightarrow 9 \quad (2, 9)$$

$$f(3) = 3^2 + 3 + 3 \Rightarrow 9 + 3 + 3 \Rightarrow 15 \quad (3, 15)$$

$$f(4) = 4^2 + 4 + 3 \Rightarrow 16 + 4 + 3 \Rightarrow 23 \quad (4, 23)$$



Distinct elements of A have distinct image in B. $\therefore$ It is one - one function

17.

$$x = 2k + 1$$

$$x^2 = (2k + 1)^2$$

$$x^2 = 4k^2 + 4k + 1$$

$$x^2 = 4(k^2 + k) + 1$$

$$x^2 = 4q + 1$$

$$\frac{k^2 + k = q}{\text{constant}}$$

18. $n = 4,$

$$a_4 = -(4^2 - 4)$$

$$= -(16 - 4)$$

$$= -16 + 4$$

$$= -12$$

$$\boxed{a_4 = -12}$$

$n = 11,$

$$a_{11} = -(11^2 - 4)$$

$$= -(121 - 4)$$

$$= -121 + 4$$

$$= -117$$

$$\boxed{a_{11} = -117}$$

19. $n=8$ $a=1$ $r = \frac{-3}{1} = \underline{-3}$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_8 = \frac{1((-3)^8 - 1)}{-3 - 1}$$

$$= \frac{6561 - 1}{-4} \Rightarrow \frac{6560}{-4}$$

$$\boxed{S_8 = 1640}$$

20. $\frac{9x^2 + 81x}{x^3 + 8x^2 - 9x} = \frac{9x(x+9)}{x(x^2 + 8x - 9)}$

$$= \frac{9x(x+9)}{x(x-1)(x+9)}$$

$$= \frac{9}{x-1}$$

21. $\alpha + \beta = \frac{-1}{2}$ $\alpha\beta = \frac{5}{2}$

$$x^2 - (\alpha + \beta)x + \alpha\beta \Rightarrow x^2 - \left(\frac{-1}{2}\right)x + \frac{5}{2}$$

$$= x^2 + \frac{1}{2}x + \frac{5}{2}$$

$$= 2x^2 + 7x + 5$$

$$\boxed{2x^2 + 7x + 5 = 0}$$

22. ① $\Rightarrow X + Y = \begin{bmatrix} 7 & 0 \\ 3 & 5 \end{bmatrix}$

② $\Rightarrow X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}$ (+)

$$2X = \begin{bmatrix} 10 & 0 \\ 3 & 9 \end{bmatrix}$$

$$X = \begin{bmatrix} \frac{10}{2} & \frac{0}{2} \\ \frac{3}{2} & \frac{9}{2} \end{bmatrix}$$

$$\boxed{X = \begin{bmatrix} 5 & 0 \\ \frac{3}{2} & \frac{9}{2} \end{bmatrix}}$$

① $\Rightarrow X + Y = \begin{bmatrix} 7 & 0 \\ 3 & 5 \end{bmatrix}$

$X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}$ (-) (+) (-)

$$2Y = \begin{bmatrix} 4 & 0 \\ 3 & 1 \end{bmatrix}$$

$$Y = \begin{bmatrix} \frac{4}{2} & \frac{0}{2} \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}$$

$$\boxed{Y = \begin{bmatrix} 2 & 0 \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}}$$

22. $\triangle PST \sim \triangle PQR$, LP is common

$$\frac{PS}{PQ} = \frac{PT}{PR}$$

$$\frac{2}{5} = \frac{2}{5}$$

$\therefore$ By SAS similarity, $\triangle PST \sim \triangle PQR$.

24. $OB \perp BT$ (radius to a tangent)

$$\angle OBT = 90^\circ$$

$$\angle OBA + \angle ABT = 90^\circ$$

$$\angle OBA + 65^\circ = 90^\circ$$

$$\angle OBA = 90^\circ - 65^\circ$$

$$\angle OBA = 25^\circ$$

$$OA = OB$$

$\therefore \angle OBA = \angle OAB$ (Isosceles triangle property)

$\triangle AOB$

$$\angle OBA + \angle OAB + \angle AOB = 180^\circ$$

$$25^\circ + 25^\circ + \angle AOB = 180^\circ$$

$$\angle AOB = 180^\circ - 50^\circ$$

$$\boxed{\angle AOB = 130^\circ}$$

25. Area of triangle

$$= \frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$$

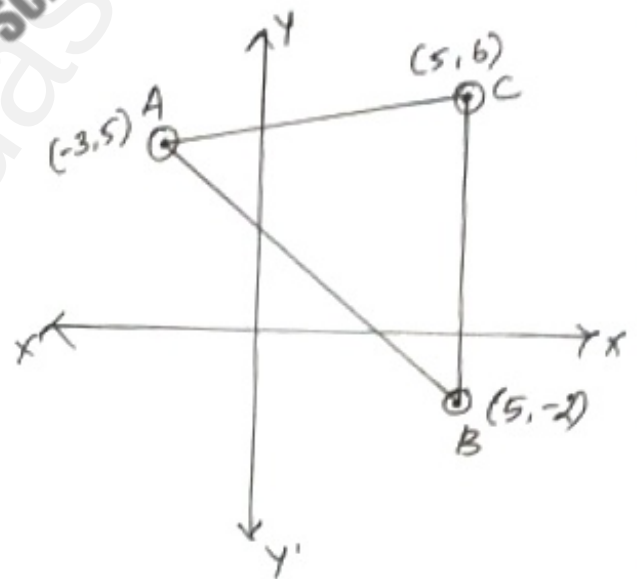
$$= \frac{1}{2} \begin{vmatrix} -3 & 5 & 5 & -3 \\ 5 & -2 & 6 & 5 \end{vmatrix}$$

$$= \frac{1}{2} \{ (6 + 30 + 25) - (25 - 10 - 18) \}$$

$$= \frac{1}{2} \{ 61 + 39 \}$$

$$= \frac{1}{2} \{ 100 \}$$

$$= 50 \text{ sq. units}$$



26. L.H.S $\tan^2 A - \tan^2 B = \frac{\sin^2 A}{\cos^2 A} - \frac{\sin^2 B}{\cos^2 B}$ (L.H.S)

$$= \frac{\sin^2 A \cos^2 B - \cos^2 A \sin^2 B}{\cos^2 A \cos^2 B}$$

$$= \frac{\sin^2 (1 - \sin^2 B) - (1 - \sin^2 A) \sin^2 B}{\cos^2 A \cos^2 B}$$

$$= \frac{(\sin^2 A - \sin^2 A \sin^2 B) - (\sin^2 B - \sin^2 A \sin^2 B)}{\cos^2 A \cos^2 B}$$

$$\cos^2 A \cos^2 B$$

$$= \frac{\sin^2 A - \sin^2 A \sin^2 B - \sin^2 B + \sin^2 A \sin^2 B}{\cos^2 A \cos^2 B}$$

$$\cos^2 A \cos^2 B$$

$$= \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B} \rightarrow \text{R.H.S}$$

Hence Proved.

27. C.S.A of cylinder = 88 sq.cm

$h = 14$

$$2\pi rh = 88$$

$$2 \times \frac{22}{7} \times r \times 14 = 88$$

$$2r = \frac{88 \times 7}{22 \times 14}$$

$$\boxed{r = 2 \text{ cm}}$$

28. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\frac{1}{3} = \frac{2}{3} + \frac{2}{5} - P(A \cap B)$$

$$P(A \cap B) = \frac{2}{3} + \frac{2}{5} - \frac{1}{3}$$

$$P(A \cap B) = \frac{10 + 6 - 5}{15}$$

$$P(A \cap B) = \frac{11}{15}$$

Part - III

29. (i) $f(-1) = (-1)^2 - 5(-1) + 6$
 $= 1 + 5 + 6$
 $= 12$

(ii) $f(2a) = (2a)^2 - 5(2a) + 6$
 $= 4a^2 - 10a + 6$

(iii) $f(2) = 2^2 - 5(2) + 6$
 $= 4 - 10 + 6$
 $= 4 - 4$
 $= 0$

(iv) $f(x-1) = (x-1)^2 - 5(x-1) + 6$
 $= x^2 - 2x + 1 - 5x + 5 + 6$
 $= x^2 - 7x + 12$

$$30. a = \frac{a-b}{a+b} \quad d = \frac{3a-2b}{a+b} - \frac{a-b}{a+b} \rightarrow \frac{3a-2b-a+b}{a+b} \rightarrow \underline{\underline{\frac{2a-b}{a+b}}}$$

$$S_n = n/2 [2a + (n-1)d]$$

$$S_{12} = 12/2 \left[2\left(\frac{a-b}{a+b}\right) + (12-1) \frac{2a-b}{a+b} \right]$$

$$S_{12} = 6 \left[\frac{2a-2b}{a+b} + 11\left(\frac{2a-b}{a+b}\right) \right]$$

$$S_{12} = \frac{6}{a+b} [2a-2b + 22a-11b]$$

$$S_{12} = \frac{6}{a+b} [24a - 13b]$$

$$31. \frac{n(n+1)(2n+1)}{6}$$

$$(1^2 + 2^2 + \dots + 28^2) - (1^2 + 2^2 + \dots + 14^2)$$

$$= \frac{28(28+1)(2(28)+1)}{6} - \frac{14(14+1)(2(14)+1)}{6}$$

$$= \frac{28 \times 29 \times 57}{6} - \frac{14 \times 15 \times 29}{6}$$

$$= 7714 - 1015$$

$$= \boxed{6699}$$

$$32. = \frac{(8x+3)(2x-1)}{(3x+1)(x-1)} \div \frac{(8x+3)(x+1)}{(3x+1)(x-4)}$$

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

$$= \frac{(2x-1)(x-4)}{(x-1)(x+1)}$$

$$= \frac{2x^2 - 8x - x + 4}{x^2 - 1}$$

$$= \frac{2x^2 - 9x + 4}{x^2 - 1}$$

Q3. Average speed of passenger train is 40 km/h
Average speed of express train is (x+20) km/h

$$T_1 = \frac{\text{distance}}{\text{speed}} = \frac{240}{x}, \quad T_2 = \frac{240}{x+20}, \quad T_1 = T_2 + 1 \text{ hr}$$

$$\frac{240}{x} - \frac{240}{x+20} = 1$$

$$240 \left[\frac{1}{x} - \frac{1}{x+20} \right] = 1$$

$$\frac{x+20-x}{x(x+20)} = \frac{1}{240}$$

$$\frac{20}{x^2+20x} = \frac{1}{240} \quad (1)$$

$$4800 = x^2 + 20x$$

$$x^2 + 20x - 4800 = 0$$

$$(x+80)(x-60) = 0$$

$$(x+80=0) \quad (x-60=0)$$

$$x+80=0$$

$$x-60=0$$

$$\boxed{x = -80}$$

$$x+20 \Rightarrow -60$$

$$\boxed{x = -80}$$

$\neq N$

$$\boxed{x = 60}$$

Ex. L.H.S

$$BC = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix} \times \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 8+0 & 0+0 \\ 2+5 & 0+10 \end{bmatrix} \Rightarrow \begin{bmatrix} 8 & 0 \\ 7 & 10 \end{bmatrix}$$

$$A(BC) = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} \times \begin{bmatrix} 8 & 0 \\ 7 & 10 \end{bmatrix}$$

$$A(BC) = \begin{bmatrix} 8+14 & 0+20 \\ 8+21 & 0+30 \end{bmatrix} \Rightarrow \begin{bmatrix} 22 & 20 \\ 29 & 30 \end{bmatrix} \rightarrow (1)$$

R.H.S

$$AB = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} \times \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$$

$$= \begin{bmatrix} 4+2 & 0+10 \\ 4+3 & 0+15 \end{bmatrix} \Rightarrow \begin{bmatrix} 6 & 10 \\ 7 & 15 \end{bmatrix}$$

$$(AB)C = \begin{bmatrix} 6 & 10 \\ 7 & 15 \end{bmatrix} \times \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$$

$$(AB)C = \begin{bmatrix} 12+10 & 0+20 \\ 14+15 & 0+30 \end{bmatrix} \Rightarrow \begin{bmatrix} 22 & 20 \\ 29 & 30 \end{bmatrix} \rightarrow (2)$$

From (1) and (2),

We have, $A(BC) = (AB)C$

Hence Proved.

In $\triangle ABD$,

$$AD^2 = AB^2 + BD^2$$

$$AD^2 = AB^2 + x^2 \quad \text{--- ①}$$

In $\triangle AEB$,

$$AE^2 = AB^2 + BE^2$$

$$AE^2 = AB^2 + (2x)^2$$

$$AE^2 = AB^2 + 4x^2 \quad \text{--- ②}$$

In $\triangle ABC$,

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

$$AC^2 = AB^2 + (3x)^2$$

$$AC^2 = AB^2 + 9x^2$$

R.H.S

$$3AC^2 + 5AD^2 = 3(AB^2 + 9x^2) + 5(AB^2 + x^2)$$

$$= 3AB^2 + 27x^2 + 5AB^2 + 5x^2$$

$$= 8AB^2 + 32x^2$$

$$= 8[AB^2 + 4x^2]$$

$$= 8AE^2$$

$$3AC^2 + 5AD^2 = 8AE^2$$

Hence proved.

$$36. \text{ Slope of } AB = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{-3 - (-4)}{2 - 1} \Rightarrow \frac{-3 + 4}{1} \Rightarrow \frac{1}{1} = 1$$

$$\text{Slope of } BC = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{-7 - (-3)}{4 - 2} \Rightarrow \frac{-7 + 3}{2} \Rightarrow \frac{-4}{2} = -2$$

$$\text{Slope of } AC = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{-7 - (-4)}{4 - 1} \Rightarrow \frac{-7 + 4}{3} \Rightarrow \frac{-3}{3} = -1$$

$$m_1 \times m_2 = -1$$

$$\text{Slope of } AB \times \text{Slope of } BC = 1 \times -2 = -2$$

$$\text{Slope of } BC \times \text{Slope of } AC = -2 \times -1 = 2$$

$$\text{Slope of } AB \times \text{Slope of } AC = 1 \times -1 = -1$$

$$= -1 \therefore AB \perp AC \quad \angle A = 90^\circ$$

The given points form a right angle triangle.

$$\begin{cases} x_1 = 1 \\ y_1 = -4 \\ x_2 = 2 \\ y_2 = -3 \end{cases}$$

$$\begin{cases} x_1 = 2 \\ y_1 = -3 \\ x_2 = 4 \\ y_2 = -7 \end{cases}$$

$$\begin{cases} x_1 = 1 \\ y_1 = -4 \\ x_2 = 4 \\ y_2 = -7 \end{cases}$$

$$\begin{aligned}
 37. \quad ① &\Rightarrow 5x - 6y = 2 \\
 ② \times 3 &\Rightarrow 9x + 6y = 30 \\
 \hline
 14x &= 32 \\
 x &= \frac{32}{14} \\
 x &= \frac{16}{7}
 \end{aligned}$$

Substitute $x = \frac{16}{7}$ in eq ②

$$3\left(\frac{16}{7}\right) + 2y = 10$$

$$\frac{48}{7} + 2y = 10$$

$$2y = 10 - \frac{48}{7}$$

$$2y = \frac{70 - 48}{7}$$

$$2y = \frac{22}{7}$$

$$y = \frac{22}{7} \times \frac{1}{2}$$

$$\underline{y = \frac{11}{7}}$$

$$\text{point} = \left(\frac{16}{7}, \frac{11}{7}\right)$$

$$4x - 7y + 13 = 0$$

$$7x + 4y + k = 0$$

$$\left(\frac{16}{7}, \frac{11}{7}\right)$$

$$(x, y)$$

$$7\left(\frac{16}{7}\right) + 4\left(\frac{11}{7}\right) + k = 0$$

$$16 + \frac{44}{7} + k = 0$$

$$\frac{112 + 44}{7} + k = 0$$

$$k = -\frac{156}{7}$$

$$7x + 4y - \frac{156}{7} = 0$$

$\times 7,$

$$\boxed{49x + 28y - 156 = 0}$$

$$38. \quad \angle CBD = 60^\circ$$

$$\tan 60^\circ = \frac{BC}{BD}$$

$$\sqrt{3} = \frac{30+h}{BD}$$

$$BD = \frac{30+h}{\sqrt{3}} \quad \text{--- ①}$$

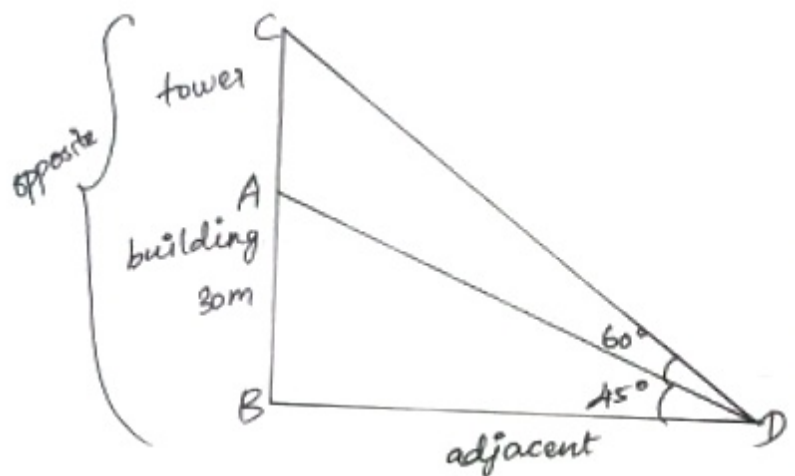
$$\tan 45^\circ = \frac{AB}{BD}$$

$$1 = \frac{30}{BD}$$

$$\underline{BD = 30}$$

Substitute $BD = 30$ in eq ①

$$BD = \frac{30+h}{\sqrt{3}}$$



$$AB = 30$$

$$BC = 30 + h$$

$$30 = \frac{30+h}{\sqrt{3}}$$

$$30\sqrt{3} = 30+h$$

$$30\sqrt{3} - 30 = h$$

$$30(\sqrt{3} - 1) = h$$

$$30(1.732 - 1) = h$$

$$30(0.732) = h$$

$$\boxed{21.96m = h}$$

39. Cylinder :- $h = 15 \text{ cm}$, $r = 6 \text{ cm}$

Volume of cylindrical container = $\pi r^2 h$ cu. units

Cone :- $h = 9$, $r = 3$

$$= \frac{22}{7} \times 6 \times 6 \times 15$$

Volume of 1 ice cream cone = Volume of cone + Volume of hemispherical cap

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

$$= \frac{1}{3} \times \frac{22}{7} \times 3 \times 3 \times 9 + \frac{2}{3} \times \frac{22}{7} \times 3 \times 3 \times 3$$

$$= \frac{22}{7} \times 9(3+2) \Rightarrow \frac{22}{7} \times 45$$

$$\text{No. of cones} = \frac{\text{Volume of cylinder}}{\text{Volume of one ice cream cone}}$$

$$\text{No. of ice cream cones needed} = \frac{\frac{22}{7} \times 6 \times 6 \times 15}{\frac{22}{7} \times 45}$$

$$= \underline{12}$$

12 Ice cream cones are required to empty the cylindrical container.

40. $A=11, C=1, d = \frac{x-A}{C} = \frac{x-11}{1}$

Time taken	Mid value $\bar{x}$	f	$d = \frac{x-A}{C}$	d^2	fd	fd^2
8.5 - 9.5	9	6	-2	4	-12	24
9.5 - 10.5	10	8	-1	1	-8	8
10.5 - 11.5	11	17	0	0	0	0
11.5 - 12.5	12	10	1	1	10	10
12.5 - 13.5	13	9	2	4	18	36
		$N=50$			$= 8$	$= 78$

$$\sigma = C \times \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$$

$$\sigma = 1 \times \sqrt{\frac{78}{50} - \left(\frac{8}{50}\right)^2}$$

$$= \sqrt{\frac{78}{50} - \frac{64}{2500}}$$

$$= \sqrt{1.56 - 0.026}$$

$$\sigma = \sqrt{1.534}$$

$$S.D(\sigma) \approx \underline{\underline{1.24}}$$

$$\begin{array}{r} 1.23... \\ 1 \overline{) 1.534} \\ \underline{1} \\ 53 \\ 44 \\ \underline{940} \\ 729 \\ \underline{211} \end{array}$$

A1. $n(S) = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

$n(A) \text{ Doublet} = \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$

$$P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} \Rightarrow \frac{1}{6}$$

$n(B)$ Sum as $A = \{(1,3), (2,2), (3,1)\}$

$$P(B) = \frac{n(B)}{n(S)} = \frac{3}{36} \Rightarrow \frac{1}{12}$$

$$n(A \cap B) = \{2,2\}$$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{1}{36}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{6}{36} + \frac{3}{36} - \frac{1}{36}$$

$$= \frac{8}{36}$$

$$P(A \cup B) = \frac{2}{9}$$

42. $a = (c^2 - ab)$, $b = -2(a^2 - bc)$, $c = b^2 - ac$

$$\Delta = b^2 - 4ac$$

$$= [-2(a^2 - bc)]^2 - 4[(c^2 - ab)(b^2 - ac)]$$

$$= 4(a^2 - bc)^2 - 4[c^2b^2 - c^3a - ab^3 + a^2bc]$$

$$= 4[(a^2)^2 - 2(a^2)(bc) + (bc)^2] - 4[c^2b^2 - c^3a - ab^3 + a^2bc]$$

$$= 4[a^4 - 2a^2bc + b^2c^2 - c^2b^2 + c^3a + ab^3 - a^2bc]$$

$$= 4[a^3 - 3abc + c^3 + b^3] = 0$$

$$4a = 0$$

$$a = \frac{0}{4}$$

$$a = 0$$

$$a^3 + b^3 + c^3 - 3abc = 0$$

$$a^3 + b^3 + c^3 = 3abc$$

Hence Proved.

Deiva NTadel Question Paper - 08

Part - I

1	2	3	4	5	6	7	8	9	10	11	12	13	14
d	b	c	a	d	a	b	d	c	a	b	c	a	b

Part - II

15. A = Set of all first co-ordinate elements
 $= \{2, 5\}$

B = Set of all second co-ordinate elements
 $= \{2, 4\}$

16. $f(2) = 2(2) + 5$
 $= 4 + 5 = 9$

$f(x+2) = 2(x+2) + 5$
 $= 2x + 4 + 5 = 2x + 9$

$\frac{f(x+2) - f(2)}{x} = \frac{2x + 9 - 9}{x}$
 $= \boxed{2}$

17. $a = 16$ $l = -54$ $d = 11 - 16 = -5$

$n = \left(\frac{l - a}{d}\right) + 1$

$n = \left(\frac{-54 - 16}{-5}\right) + 1$

$= \left(\frac{-70}{-5}\right) + 1$

$= 35 + 1$

$\boxed{n = 36}$

18. $n = 8$ $a = 9$ $r = \frac{3}{9} \Rightarrow \frac{1}{3}$

$t_n = ar^{n-1}$

$t_8 = 9\left(\frac{1}{3}\right)^{8-1}$

$$t_8 = 9 \left(\frac{1}{3}\right)^7$$

$$t_8 = 9 \left(\frac{1}{9 \times 243}\right)$$

$$t_8 = \frac{1}{243}$$

19.

$$= \frac{x+4}{3x+4y} \times \frac{(3x)^2 - (4y)^2}{(2x-5)(x+4)}$$

$$= \frac{x+4}{3x+4y} \times \frac{(3x+4y)(3x-4y)}{(2x-5)(x+4)}$$

$$= \frac{3x-4y}{2x-5}$$

20. Let, present age of Kumaran be x 2 years ago = $(x-2)$ years4 years after = $(x+4)$ years

$$(x-2)(x+4) = 1+2x$$

$$x^2 + 4x - 2x - 8 = 1 + 2x$$

$$x^2 + 2x - 8 - 1 - 2x = 0$$

$$x^2 - 9 = 0$$

$$x^2 - 3^2 = 0$$

$$(x-3)(x+3) = 0$$

$$x-3=0 \quad | \quad x+3=0$$

$$\underline{x=3} \quad | \quad \underline{x=-3} \notin N$$

Kumaran's present age is 3 years.

21. A square matrix, all of whose elements, except those in the leading diagonal are zero is called diagonal matrix.

Example:
$$\begin{bmatrix} -5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 12 \end{bmatrix}$$

22. $\triangle ABC \sim \triangle DEF$

$$\triangle ABC = 9 \text{ cm}^2$$

$$\triangle DEF = 16 \text{ cm}^2$$

$$BC = 2.1 \text{ cm}$$

$$\frac{\text{Area } (\triangle ABC)}{\text{Area } (\triangle DEF)} = \frac{BC^2}{EF^2}$$

$$\frac{9}{16} = \frac{2.1^2}{EF^2}$$

$$\sqrt{\frac{9}{16}} = \frac{2.1}{EF}$$

$$\frac{3}{4} = \frac{2.1}{EF}$$

$$3EF = 2.1 \times 4$$

$$EF = \frac{2.1 \times 4}{3}$$

$$EF = 0.7 \times 4$$

$$\boxed{EF = 2.8 \text{ cm}}$$

23. $(1, -5) (4, 2)$

$$x_1, y_1, x_2, y_2$$

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

$$= \left(\frac{1+4}{2}, \frac{-5+2}{2} \right)$$

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

$$(y - y_1) = m(x - x_1)$$

X axis

$$m = \tan \theta$$

$$m = \tan \theta$$

$$\boxed{m = 0}$$

$$y - \left(-\frac{3}{2} \right) = 0 \left(x - \frac{5}{2} \right)$$

$$y + \frac{3}{2} = 0 \left(x - \frac{5}{2} \right)$$

$$\frac{2y + 3}{2} = 0 \quad (\text{CA})$$

$$2y + 3 = 0 \times 2$$

$$\boxed{2y + 3 = 0}$$

Answer:

$$2y + 3 = 0$$

24. $\frac{1+\sin \theta}{1-\sin \theta} \times \frac{1+\sin \theta}{1+\sin \theta}$

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

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

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

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

$$= \sec \theta + \tan \theta \rightarrow \underline{\text{R.H.S}}$$

Hence Proved.

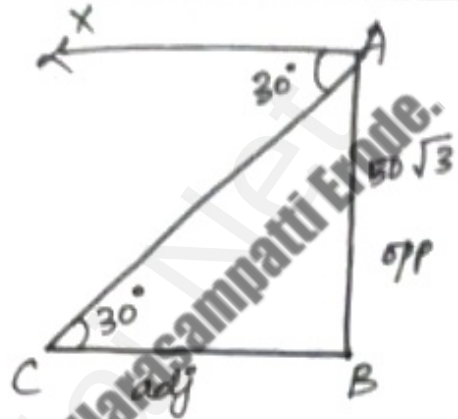
25. $\tan 30^\circ = \frac{AB}{BC}$

$$\frac{1}{\sqrt{3}} = \frac{50\sqrt{3}}{BC}$$

$$BC = 50\sqrt{3}\sqrt{3}$$

$$BC = 50 \times 3$$

$$\boxed{BC = 150 \text{ m}}$$



26. Circumference = 484 cm

$$2\pi r = 484$$

$$2 \times \frac{22}{7} \times r = 484$$

$$r = 484 \times \frac{7}{22} \times \frac{1}{2}$$

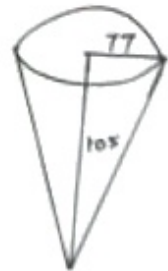
$$\boxed{r = 77}$$

$$r = 77, h = 105$$

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

$$V = \frac{1}{3} \times \frac{22}{7} \times 77 \times 77 \times 105$$

$$\boxed{\text{Volume} = 652190 \text{ cm}^3}$$



27. $P(\bar{A}) = 0.45$

$$P(A \cup B) = 0.65$$

$$P(A) = 1 - 0.45 \Rightarrow \underline{0.55}$$

$$P(A \cup B) = P(A) + P(B)$$

$$0.65 = 0.55 + P(B)$$

$$0.65 - 0.55 = P(B)$$

$$\boxed{0.1 = P(B)}$$

28. $(-2, 3) (8, 5)$
 x_1, y_1, x_2, y_2

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_1 = \frac{5-3}{(8)-(-2)} \Rightarrow \frac{5-3}{8+2}$$

$$m_1 = \frac{2}{10}$$

$$m_1 = \frac{1}{5}$$

$$y = ax + z$$

$$y = \underline{m}x + z$$

$$\underline{m_2 = a}$$

$$m_1 \times m_2 = -1$$

$$\frac{1}{5} \times a = -1$$

$$a = -1 \times 5$$

$$\boxed{a = -5}$$

Answer $\Rightarrow a = -5$

Part - III

29. $A \times B = \{3, 4, 7, 8\} \times \{1, 7, 10\}$
 $= \{(3, 1), (3, 7), (3, 10), (4, 1), (4, 7), (4, 10), (7, 1), (7, 7), (7, 10), (8, 1), (8, 7), (8, 10)\}$

(i) $R_1 \subseteq A \times B$

$\therefore$ It is a relation from A to B.

(ii) $R_2 \not\subseteq A \times B$

$(4, 12) \notin A \times B$

$\therefore$ It is not a relation from A to B.

(iii) $(7, 8)$ and $(8, 11) \notin A \times B$

$R_3 \not\subseteq A \times B$

$\therefore$ It is not a relation from A to B.

30. L.H.S

$$goh = g(h(x))$$

$$= g(3x)$$

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

$$= 1 - 6x$$

$$f(goh) = f(1 - 6x)$$

$$= 2(1 - 6x) + 3$$

$$\begin{aligned}
 &= 2 - 12x + 3 \\
 &= 1 - 12x \\
 \text{R.H.S } f \circ g &= f(1 - 2x) \\
 &= 2(1 - 2x) + 3 \\
 &= 2 - 4x + 3 \\
 &= 1 - 4x \\
 (f \circ g) \circ h &= 1 - 4(3x) \\
 &= 1 - 12x
 \end{aligned}$$

$$L.H.S = R.H.S$$

Hence Proved

$$31. \quad t_6 : t_8 = 7 : 9$$

$$\frac{t_6}{t_8} = \frac{7}{9}$$

$$\frac{a + (6-1)d}{a + (8-1)d} = \frac{7}{9}$$

$$\frac{a + 5d}{a + 7d} = \frac{7}{9} \text{ (CM)}$$

$$9(a + 5d) = 7(a + 7d)$$

$$9a + 45d = 7a + 49d$$

$$9a - 7a = 49d - 45d$$

$$2a = 4d$$

$$a = \frac{4}{2}d$$

$$\boxed{a = 2d}$$

$$\frac{t_9}{t_{13}} = \frac{a + (9-1)d}{a + (13-1)d}$$

$$= \frac{a + 8d}{a + 12d}$$

Substitute $a = 2d$ in $\frac{a+8d}{a+12d}$

$$= \frac{a + 8d}{a + 12d}$$

$$= \frac{2d + 8d}{2d + 12d}$$

$$= \frac{10d}{14d}$$

$$= \frac{5}{7}$$

$$\frac{t_9}{t_{13}} = \frac{5}{7}$$

$$\boxed{t_9 : t_{13} = 5 : 7}$$

$$\begin{aligned} \textcircled{1} \times 4 &\rightarrow 4x + 4y + 4z = 636 \\ \textcircled{2} &\rightarrow 3x + 4y + 6z = 780 \quad (-) \\ \hline &\quad \quad \quad x - 2z = -144 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \times 4 &\rightarrow 8x - 2z = 24 \\ \textcircled{4} &\rightarrow x - 2z = -144 \quad (-) \\ \hline &\quad \quad \quad 7x = 168 \\ &\quad \quad \quad x = \frac{168}{7} \\ &\quad \quad \quad \boxed{x = 24} \end{aligned}$$

Substitute $x=24$ in eq $\textcircled{3}$

$$4(24) - z = 12$$

$$96 - z = 12$$

$$96 - 12 = z$$

$$\boxed{84 = z}$$

Substitute $x=24, z=84$ in eq $\textcircled{1}$

$$24 + y + 84 = 159$$

$$y + 108 = 159$$

$$y = 159 - 108$$

$$\boxed{y = 51}$$

34.

$$\begin{array}{r} 3x^2 + 2x + 4 \\ 3x^2 \overline{) 9x^4 + 12x^3 + 28x^2 + ax + b} \\ \underline{9x^4} \\ 12x^3 + 28x^2 \\ 12x^3 + 4x^2 \\ \underline{12x^3 + 4x^2} \\ 24x^2 + ax + b \\ 24x^2 + 16x + 16 \\ \underline{24x^2 + 16x + 16} \\ 0 \end{array}$$

$$a - 16 = 0$$

$$\boxed{a = 16}$$

$$b - 16 = 0$$

$$\boxed{b = 16}$$

35. Pythagoras Theorem - Book Page No: 184.

$$32. (1^2 + 2^2 + \dots + 21^2) - (1^2 + 2^2 + \dots + 5^2)$$

$$\begin{aligned} & \frac{n(n+1)(2n+1)}{6} \\ &= \frac{21(21+1)(2(21)+1)}{6} - \frac{5(5+1)(5(2)+1)}{6} \\ &= \frac{21 \times 22 \times 43}{6} - \frac{5 \times 6 \times 11}{6} \\ &= 3311 - 55 \end{aligned}$$

$$\sum n^2 = \boxed{3256}$$

33. Let, x is Vani's age
 y is Vani's father's age
 z is Vani's grandfather's age

($\frac{\sum k}{n}$) Average $\rightarrow \frac{x+y+z}{3} = 53$
 $x+y+z = 159 \quad \text{--- (1)}$

$$\frac{1}{2}x + \frac{1}{3}y + \frac{1}{4}z = 65$$

$\times 12,$
 $\frac{x}{2} \times 12 + \frac{y}{3} \times 12 + \frac{z}{4} \times 12 = 65 \times 12$

$$6x + 4y + 3z = 780$$

$$3x + 2y + 1.5z = 390 \quad \text{--- (2)}$$

4 years ago,

$$\text{Vani's age} = x - 4$$

$$\text{Father's age} = y - 4$$

$$\text{Grandfather's age} = z - 4$$

$$4(x-4) = z-4$$

$$4x - 16 = z - 4$$

$$4x - 16 + 4 = z$$

$$4x - 12 = z$$

$$4x = z + 12$$

$$4x - z = 12 \quad \text{--- (3)}$$

28. $\triangle ACB$,

$$\tan 60^\circ = \frac{AB}{AC}$$

$$\sqrt{3} = \frac{60}{AC}$$

$$AC = \frac{60}{\sqrt{3}}$$

$$AC = \frac{60\sqrt{3}}{3}$$

$$\underline{AC = 20\sqrt{3}}$$

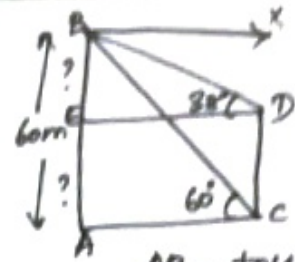
 $\triangle BDE$,

$$\tan 38^\circ = \frac{BE}{ED}$$

$$0.7813 = \frac{BE}{20\sqrt{3}}$$

$$0.7813 \times 20 \times \sqrt{3} = BE$$

$$\underline{27.06 = BE}$$



AB = tower
CD = lamp post
AC = ED

$$AB = AE + BE$$

$$60 = AE + 27.06$$

$$60 - 27.06 = AE$$

$$32.94 = AE$$

$$AE = CD$$

$$\therefore CD = 32.94$$

Ans: Height of lamp post = 32.94 m

29. One person = 4 sq.m

$$150 \text{ person} = 4 \times 150$$

$$= 600$$

$$\pi r^2 = 600 \text{ --- (1)}$$

Cylinder		cone
$h_1 = 8$		$h_2 = ?$

Volume = Volume of cylinder + Volume of cone

$$150 \times 40 = \pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2$$

$$6000 = \pi r^2 (h_1 + \frac{1}{3} h_2)$$

$$6000 = 600 (8 + \frac{1}{3} h_2)$$

$$\frac{6000}{600} = 8 + \frac{h_2}{3}$$

$$10 = 8 + \frac{h_2}{3}$$

$$10 - 8 = \frac{h_2}{3}$$

$$2 = \frac{h_2}{3}$$

$$2 \times 3 = h_2$$

Ans: 6 m = h_2

36. $a+b=7$

$$b=7-a$$

$$\frac{x}{a} + \frac{y}{7-a} = 1$$

$$\frac{x(7-a) + ay}{a(7-a)} = 1$$

$$x(7-a) + ay = -a^2 + 7a$$

$(-3, 8)$ lies on point
x y

$$-3(7-a) + 8a = 7a - a^2$$

$$-21 + 3a + 8a = 7a - a^2$$

$$-21 + 3a + 8a - 7a + a^2 = 0$$

$$a^2 + 4a - 21 = 0$$

$$(a+7)(a-3) = 0$$

$$\begin{array}{l|l} a+7=0 & a-3=0 \\ \hline a=-7 & a=3 \\ \hline \neq N & \end{array}$$

$$b=7-a$$

$$b=7-3$$

$$b=4$$

$$\frac{x}{3} + \frac{y}{4} = 1$$

$$\frac{4x+3y}{12} = 1$$

$$4x+3y = 12$$

Ans: $4x+3y-12=0$

37. A $(-4, 2)$ B $(6, -4)$
x₁ y₁ x₂ y₂

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

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

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

$$(1, -1)$$

Slope of AB

$$\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$$

$$\frac{y-2}{-4-2} = \frac{x-(-4)}{6-(-4)}$$

$$\frac{y-2}{-6} = \frac{x+4}{10} \text{ (CM)}$$

$$10(y-2) = -6(x+4)$$

$$10y-20 = -6x-24$$

$$10y-20+6x+24=0$$

$$10y-20+6x=0$$

$$6x+10y+4=0$$

$$\div 2,$$

$$3x+5y+2=0$$

$$-5x+3y+k=0$$

$$\begin{array}{l} (1, -1) \\ x \quad y \end{array}$$

$$-5(1)+3(-1)+k=0$$

$$-5-3+k=0$$

$$k-8=0$$

$$k=8$$

$$-5x+3y+8=0$$

Ans: $5x-3y-8=0$

$$\text{A2. } \frac{(A+B)^2 + (A-B)^2}{\frac{A}{B}} = \frac{2(A^2+B^2)}{\frac{A}{B}}$$

$$= 2(A^2+B^2) \times \frac{B}{A}$$

$$A = \frac{x}{x+1}, \quad B = \frac{1}{x+1}$$

$$\frac{B}{A} = \frac{\frac{1}{x+1}}{\frac{x}{x+1}} \Rightarrow \frac{1}{x+1} \times \frac{x+1}{x}$$

$$\frac{B}{A} = \frac{1}{x}$$

$$A^2+B^2 = \left(\frac{x}{x+1}\right)^2 + \left(\frac{1}{x+1}\right)^2$$

$$= \frac{x^2}{(x+1)^2} + \frac{1}{(x+1)^2}$$

$$A^2+B^2 = \frac{x^2+1}{(x+1)^2}$$

$$= 2(A^2+B^2) \times \frac{B}{A}$$

$$= 2 \frac{x^2+1}{(x+1)^2} \times \frac{1}{x}$$

$$= \frac{2(x^2+1)}{x(x+1)^2}$$

$$\frac{(A+B)^2 \div (A-B)^2}{(A \div B)} = \frac{2(x^2+1)}{x(x+1)^2}$$

Hence Proved.

40.

 $A = 35$

x	$d = x - A$	d^2
32	-3	9
35	0	0
37	2	4
30	-5	25
33	-2	4
36	1	1
35	0	0
37	2	4
	$\Sigma d = -5$	$\Sigma d^2 = 47$

$$\sigma = \sqrt{\frac{\Sigma d^2}{n} - \left(\frac{\Sigma d}{n}\right)^2}$$

$$= \sqrt{\frac{47}{8} - \left(\frac{-5}{8}\right)^2}$$

$$= \sqrt{\frac{47}{8} - \frac{25}{64}}$$

$$= \sqrt{\frac{376 - 25}{64}}$$

$$= \sqrt{5.48}$$

$$\sigma = 2.34$$

41. $n(S) = 5 + 6 + 7 + 8$

$$n(S) = 26$$

(i) $n(A) = 6$

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

$$= \frac{6}{26}$$

$$P(A) = \boxed{\frac{3}{13}}$$

(ii) $n(B) = 8 + 5$

$$n(B) = 13$$

$$P(B) = \frac{n(B)}{n(S)}$$

$$= \frac{13}{26}$$

$$P(B) = \boxed{\frac{1}{2}}$$

(iii) $n(C) = 26 - 6$

$$n(C) = 20$$

$$P(C) = \frac{n(C)}{n(S)}$$

$$= \frac{20}{26}$$

$$P(C) = \boxed{\frac{10}{13}}$$

(iv) $n(D) = 5 + 7$

$$n(D) = 12$$

$$P(D) = \frac{n(D)}{n(S)}$$

$$= \frac{12}{26}$$

$$P(D) = \boxed{\frac{6}{13}}$$

$$a=1, d=5-1=\underline{4}, n=28$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{28} = \frac{28}{2} [2(1) + (28-1)4]$$

$$= 14 [2 + 27(4)]$$

$$= 14 [2 + 108]$$

$$= 14 [110]$$

$$S_{28} = \boxed{1540}$$

$$\begin{array}{r} 14 \times 110 \\ 14 \\ \hline 1540 \end{array}$$

$$19. p(x) \div q(x) = \frac{x-7}{x+2}$$

$$\frac{p(x)}{q(x)} = \frac{x-7}{x+2}$$

$$p(x) = \frac{x-7}{x+2} \times q(x)$$

$$p(x) \times \frac{x+2}{x-7} = q(x)$$

$$q(x) = \frac{x+2}{x-7} \times (x^2 - 5x - 14)$$

$$q(x) = \frac{(x+2)}{(x-7)} \times (x+2)(x-7)$$

$$q(x) = (x+2)(x+2)$$

$$q(x) = (x+2)^2$$

$$\boxed{q(x) = x^2 + 4x + 4}$$

$$20. 2m^2 + 19m + 30 = 0$$

$$(2x+15)(x+2) = 0$$

$$2x+15=0$$

$$2x = -15$$

$$\boxed{x = \frac{-15}{2}}$$

$$x+2=0$$

$$\boxed{x = -2}$$

$$\begin{array}{r} 60 \\ \swarrow \downarrow \searrow \\ 15 \quad 4 \quad 12 \\ \hline 2 \quad \quad 2 \end{array}$$

$$21. \underline{\underline{L.H.S}} \quad AB = \begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix} \times \begin{bmatrix} 1 & -3 \\ 2 & 5 \end{bmatrix}$$

$$= \begin{bmatrix} 2+10 & -6+25 \\ 4+6 & -12+15 \end{bmatrix} \Rightarrow \begin{bmatrix} 12 & 19 \\ 10 & 3 \end{bmatrix} \text{--- ①}$$

Deiva NTadel Question Paper - 09

Part - I

1	2	3	4	5	6	7	8	9	10	11	12	13	14
c	c	d	c	c	c	d	a	c	b	b	b	d	b

Part - II

15. (i) $R = \{(x, y) \mid y = x - 2, x \in P, y \in Q\}$

(ii) $\{(5, 3), (6, 4), (7, 5)\} = R$

(iii) Domain of $R \Rightarrow R = \{5, 6, 7\}$

Range of $R \Rightarrow R = \{3, 4, 5\}$

16. $f_2(x) = 2x^2 - 5x + 3$ and $f_1(x) = \sqrt{x}$

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

$$= \sqrt{f_2(x)}$$

$$= f_1(f_2(x))$$

$$= f_1 \circ f_2(x)$$

$$= \boxed{f_1 \circ f_2}$$

17. $67 + x \equiv 1 \pmod{4}$

$$67 + x - 1 = 4k$$

$$66 + x = 4k$$

Least positive value of x is 2.

$$\begin{array}{r} 16 \\ 4 \overline{) 66} \\ \underline{4} \\ 26 \\ \underline{24} \\ 2 \end{array}$$

18. $S_n = ?$ $S_n = 4n - 3$

$n=1, S_1 = 4(1) - 3 \Rightarrow 4 - 3 \Rightarrow \underline{1}$.

$n=2, S_2 = 4(2) - 3 \Rightarrow 8 - 3 \Rightarrow \underline{5}$

$n=3, S_3 = 4(3) - 3 \Rightarrow 12 - 3 \Rightarrow \underline{9}$

$1, 5, 9, \dots$

Substitute in equation - ①

$$3(6) - 7(4) + k = 0$$

$$18 - 28 + k = 0$$

$$-10 + k = 0$$

$$\boxed{k = 10}$$

Ans: $3x - 7y + 10 = 0$

26. $d = 2.8\text{m}$ $h = 8\text{m}$
 $r = 1.4\text{m}$

Area covered in 1 revolution = C.S.A of cylinder

$$= 2\pi rh \text{ sq. units}$$

$$= 2 \times \frac{22}{7} \times 1.4 \times 8$$

Area covered in 1 revolution = 26.4m^2

Area covered in 8 revolution = 8×26.4

$$\boxed{211.2\text{m}^2}$$

27. $L = 28$, $S = 18$

Range $R = L - S$

$$R = 28 - 18$$

$$R = 10 \text{ years}$$

28. $\sin 60^\circ = \frac{\text{opposite}}{\text{hypotenuse}}$

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

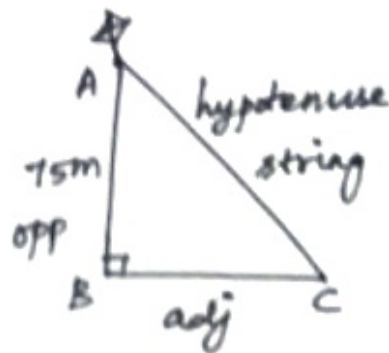
$$\frac{\sqrt{3}}{2} = \frac{75}{AC} \text{ (CM)}$$

$$AC \sqrt{3} = 75 \times 2$$

$$AC = \frac{150}{\sqrt{3}}$$

$$AC = \frac{150\sqrt{3}}{3}$$

$$\boxed{AC = 50\sqrt{3}}$$



Q11 $BA = \begin{bmatrix} 1 & -3 \\ 2 & 6 \end{bmatrix} + \begin{bmatrix} 1 & 9 \\ 4 & 1 \end{bmatrix}$

$$= \begin{bmatrix} 1+1 & -3+9 \\ 2+4 & 6+1 \end{bmatrix} = \begin{bmatrix} 2 & 6 \\ 6 & 7 \end{bmatrix} = B$$

$$J H S \neq R H S$$

$$AB \neq BA$$

22. $h = \frac{ab}{a+b}$ $a=6$ $b=8$

$$h = \frac{6(8)}{6+8} \Rightarrow \frac{48}{14} = \frac{24}{7}$$

$$h = 2m$$

23. A necessary and sufficient condition for points P, Q, R on the respective sides BC, CA, AB (or their extension) of a triangle ABC to be collinear is that $\frac{BP}{PC} \times \frac{CQ}{QA} \times \frac{AR}{RB} = -1$ where all segments in the formula are directed segments.



24. $4x - 9y + 36 = 0$

$$4x - 9y = -36$$

$$\div 36,$$

$$\frac{4x}{-36} - \frac{9y}{-36} = \frac{-36}{-36}$$

$$\frac{x}{-9} + \frac{y}{4} = 1$$

$$\left[\frac{x}{a} + \frac{y}{b} = 1 \right]$$

$$\underline{a = -9} \quad \underline{b = 4}$$

25. $3x - 7y = 12$

$$3x - 7y - 12 = 0$$

$$3x - 7y + k = 0 \quad \text{--- (1)}$$

$$(6, 4)$$

$$x_1, y_1$$

Part - III

29. $A = \{1, 2, 3, 4, 5, 6, 7\}$ $B = \{2, 3, 5, 7\}$, $C = \{2\}$

L.H.S

$$B - C = \{2, 3, 5, 7\} - \{2\}$$

$$= \{3, 5, 7\}$$

$$A(B - C) = \{1, 2, 3, 4, 5, 6, 7\} \times \{3, 5, 7\}$$

$$= \{(1, 3), (1, 5), (1, 7), (2, 3), (2, 5), (2, 7), (3, 3), (3, 5), (3, 7),$$

$$(4, 3), (4, 5), (4, 7), (5, 3), (5, 5), (5, 7), (6, 3),$$

$$(6, 5), (6, 7), (7, 3), (7, 5), (7, 7)\} \text{ --- ①}$$

R.H.S

$$A \times B = \{1, 2, 3, 4, 5, 6, 7\} \times \{2, 3, 5, 7\}$$

$$= \{(1, 2), (1, 3), (1, 5), (1, 7), (2, 2), (2, 3), (2, 5), (2, 7),$$

$$(3, 2), (3, 3), (3, 5), (3, 7), (4, 2), (4, 3), (4, 5), (4, 7),$$

$$(5, 2), (5, 3), (5, 5), (5, 7), (6, 2), (6, 3), (6, 5), (6, 7),$$

$$(7, 2), (7, 3), (7, 5), (7, 7)\}$$

$$A \times C = \{1, 2, 3, 4, 5, 6, 7\} \times \{2\}$$

$$= \{(1, 2), (2, 2), (3, 2), (4, 2), (5, 2), (6, 2), (7, 2)\}$$

$$(A \times B) - (A \times C) = \{(1, 3), (1, 5), (1, 7), (2, 3), (2, 5), (2, 7), (3, 3), (3, 5), (3, 7),$$

$$(4, 3), (4, 5), (4, 7), (5, 3), (5, 5), (5, 7), (6, 3), (6, 5),$$

$$(6, 7), (7, 3), (7, 5), (7, 7)\} \text{ --- ②}$$

L.H.S = R.H.S

$$A \times (B - C) = (A \times B) - (A \times C)$$

Hence proved.

30. (i) $x=2$, $f(2) = \frac{2}{2} - 1 \Rightarrow 1 - 1 \Rightarrow \underline{0}$ $(2, 0)$

$x=4$, $f(4) = \frac{4}{2} - 1 \Rightarrow 2 - 1 \Rightarrow \underline{1}$ $(4, 1)$

$x=6$, $f(6) = \frac{6}{2} - 1 \Rightarrow 3 - 1 \Rightarrow \underline{2}$ $(6, 2)$

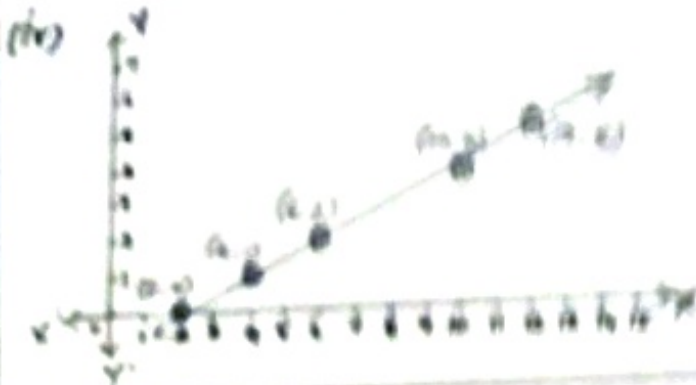
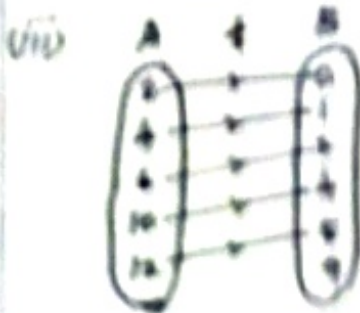
$x=10$, $f(10) = \frac{10}{2} - 1 \Rightarrow 5 - 1 \Rightarrow \underline{4}$ $(10, 4)$

$x=12$, $f(12) = \frac{12}{2} - 1 \Rightarrow 6 - 1 \Rightarrow \underline{5}$ $(12, 5)$

$$f = \{(2, 0), (4, 1), (6, 2), (10, 4), (12, 5)\}$$

(ii)

x	2	4	6	10	12
f(x)	0	1	2	4	5



31. $a_1 = 1, a_2 = 1$

n=3. $a_3 = \frac{a_2 - 1}{a_2 + 2}$

$$= \frac{a_2}{a_2 + 2}$$

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

$$a_3 = \frac{1}{3}$$

n=4. $a_4 = \frac{a_3 - 1}{a_3 + 2}$

$$= \frac{a_3}{a_3 + 2}$$

$$= \frac{\frac{1}{3}}{\frac{1}{3} + 2}$$

$$= \frac{\frac{1}{3}}{\frac{7}{3}}$$

$$= \frac{1}{7} \times \frac{3}{3}$$

$$a_4 = \frac{1}{7}$$

n=5. $a_5 = \frac{a_4 - 1}{a_4 + 2}$

$$= \frac{a_4}{a_4 + 2}$$

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

$$= \frac{\frac{1}{7}}{\frac{15}{7}}$$

$$= \frac{1}{15} \times \frac{7}{7}$$

$$a_5 = \frac{1}{15}$$

$\therefore$ Sequence :-

$$1, \frac{1}{3}, \frac{1}{7}, \frac{1}{15}, \dots$$

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$$Q2. S_n = (x+y)(x^2+xy+y^2) + (x^3+x^2y+xy^2+y^3) + \dots$$

$\times$ and $\div$ by $(x-y)$

$$S_n = \frac{1}{x-y} ((x-y)(x+y) + (x-y)(x^2+xy+y^2) + (x-y)(x^3+x^2y+xy^2+y^3) + \dots)$$

$$S_n = \frac{1}{x-y} ((x^2-y^2) + (x^3-y^3) + (x^4-y^4) + \dots)$$

$$S_n = \frac{1}{x-y} (x^2+x^3+x^4+\dots) - (y^2+y^3+y^4+\dots)$$

$$S_n = \frac{1}{x-y} (x^2(1+x+x^2+\dots n \text{ terms}) - y^2(1+y+y^2+\dots n \text{ terms}))$$

$$a=1, \quad \lambda = \frac{x}{1} = x \quad x \neq 0,$$

$$S_n = \frac{a(\lambda^n - 1)}{\lambda - 1}$$

$$S_n = \frac{1}{x-y} \left[\frac{x^2(1(x^n-1))}{x-1} - \frac{y^2(1(y^n-1))}{y-1} \right]$$

$$(x-y)S_n = \left[\frac{x^2(x^n-1)}{x-1} - \frac{y^2(y^n-1)}{y-1} \right]$$

Hence Proved

$$33. x + 2y - z = 5 \quad \text{--- (1)}$$

$$x - y + z = -2 \quad \text{--- (2)}$$

$$-5x - 4y + z = -11 \quad \text{--- (3)}$$

(1), (2),

$$(1) \Rightarrow x + 2y - z = 5$$

$$(2) \Rightarrow x - y + z = -2$$

$$\underline{2x + y = 3} \quad \text{--- (4)}$$

(1), (3),

$$(1) \Rightarrow x + 2y - z = 5$$

$$(3) \Rightarrow -5x - 4y + z = -11$$

$$\underline{-4x - 2y = -6} \quad \text{--- (5)}$$

(4), (5),

$$(4) \times 2 \Rightarrow 4x + 2y = 6$$

$$(5) \Rightarrow -4x - 2y = -6$$

$$\underline{0 = 0}$$

Ans:

This system has
infinite no. of solution.

$$34. (2W+16)(2W+12)=285$$

$$4W^2+24W+32W+192=285$$

$$4W^2+56W+192-285=0$$

$$4W^2+56W-93=0$$

$$(2W+31)(2W-3)=0$$

$$2W+31=0$$

$$2W=-31$$

$$W=-\frac{31}{2}$$

$$\cancel{W} N$$

$$2W-3=0$$

$$2W=3$$

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

$$W=1.5$$

$$\text{Width} = \underline{1.5 \text{ m}}$$

$$\begin{array}{r} -372 \\ \swarrow \quad \searrow \\ 62 \quad -6 \\ \hline 4 \quad 4 \\ \hline 31\frac{1}{2} \quad -3\frac{1}{2} \end{array}$$

$$35. SR=x, QS=3x, QR=4x$$

$\triangle PSQ,$

$$PQ^2 = QS^2 + PS^2$$

$$PQ^2 = (3x)^2 + PS^2$$

$$PQ^2 = 9x^2 + PS^2 \quad \text{--- ①}$$

$\triangle PSR,$

$$PR^2 = PS^2 + SR^2$$

$$PR^2 = PS^2 + x^2 \quad \text{--- ②}$$

R.H.S

$$2PR^2 + QR^2 = 2(PS^2 + x^2) + (4x)^2$$

$$= 2PS^2 + 2x^2 + 16x^2$$

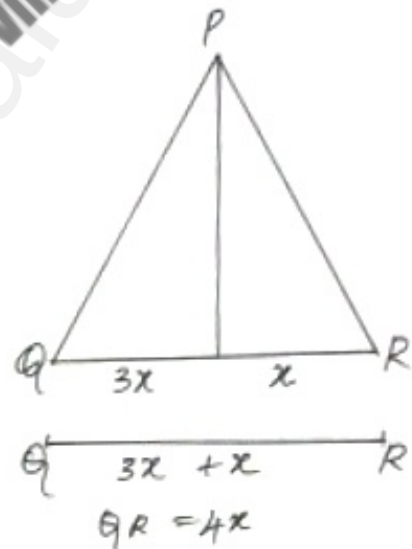
$$= 2PS^2 + 18x^2$$

$$= 2(PS^2 + 9x^2)$$

$$= 2PQ^2$$

$$2PR^2 + QR^2 = 2PQ^2$$

Hence Proved..



$$38. \tan 45^\circ = \frac{BC}{AB}$$

$$1 = \frac{BC}{AB}$$

$$AB = BC \text{ --- ①}$$

$$\tan 60^\circ = \frac{BD}{AB}$$

$$\sqrt{3} = \frac{BC+5}{AB}$$

$$AB = \frac{BC+5}{\sqrt{3}} \text{ --- ②}$$

① & ②,

$$BC = \frac{BC+5}{\sqrt{3}}$$

$$\sqrt{3} BC = BC + 5$$

$$\sqrt{3} BC - BC = 5$$

$$BC(\sqrt{3}-1) = 5$$

$$BC = \frac{5}{\sqrt{3}-1}$$

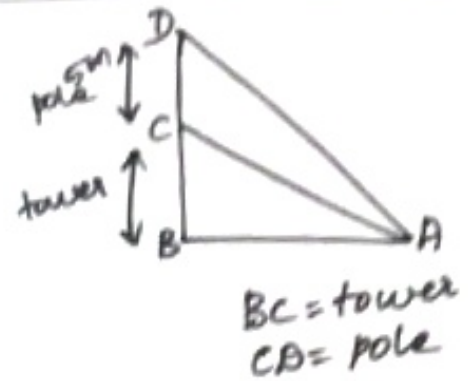
$$BC = \frac{5}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$BC = \frac{5(\sqrt{3}+1)}{3-1}$$

$$BC = \frac{5(1.732+1)}{2}$$

$$BC = \frac{5(2.732)}{2}$$

$$\text{Ans: } BC = 6.83 \text{ m}$$



$$39. r = 7 \text{ cm}, h = 24 \text{ cm}$$

$$L = \sqrt{r^2 + h^2}$$

$$L = \sqrt{7^2 + 24^2}$$

$$L = \sqrt{49 + 576}$$

$$L = \sqrt{625}$$

$$L = 25 \text{ m}$$

$$\text{C.S.A of conical tent} = \pi r l \text{ sq. units}$$

$$\text{Area of canvas} = \frac{22}{7} \times 7 \times 25$$

$$= 550 \text{ m}^2$$

$$\text{Length of canvas} = \frac{\text{Area of canvas}}{\text{width}} \rightarrow \frac{550}{4} \rightarrow 137.5 \text{ m}$$

$$\text{Answer: } 137.5 \text{ m}$$

36. Area of quadrilateral =

$$\frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$$

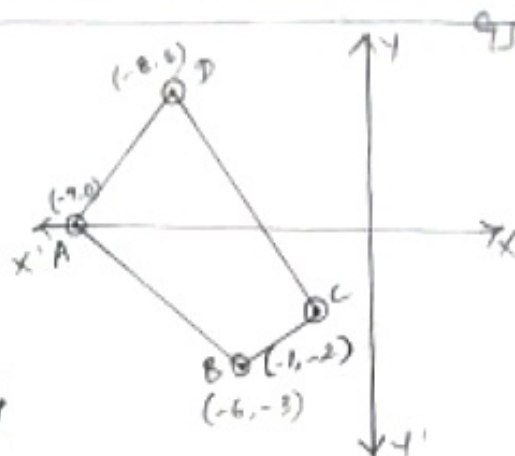
$$= \frac{1}{2} \begin{vmatrix} -9 & -6 & -1 & -8 & -9 \\ 0 & -3 & -2 & 6 & 0 \end{vmatrix}$$

$$= \frac{1}{2} \{ (27 + 12 - 6 - 0) - (0 + 3 + 16 - 54) \}$$

$$= \frac{1}{2} \{ 33 + 35 \}$$

$$= \frac{1}{2} \{ 68 \}$$

$$= \underline{\underline{34 \text{ sq. units}}}$$



37. (i) $y = 0.40$

$$0.40 = -0.25x + 1$$

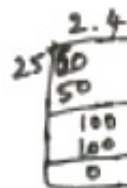
$$-1 + 0.40 = -0.25x$$

$$-0.60 = -0.25x$$

$$\frac{0.60}{0.25} = x$$

$$\frac{60}{25} = x$$

$$\boxed{x = 2 \text{ hours}}$$



(ii) $y = 0$

$$0 = -0.25x + 1$$

$$0.25x = 1$$

$$x = \frac{1}{0.25}$$

$$x = \frac{100}{25}$$

$$\boxed{x = 4 \text{ hours}}$$

$$= \frac{4}{52}$$

$$P(A \cup B) = \frac{1}{13}$$

$$\text{Ans. } \frac{1}{p-q} - \frac{2q}{p^2-q^2} = \frac{1}{p-q} - \frac{2q}{(p-q)(p+q)}$$

$$= \frac{p+q-2q}{(p-q)(p+q)}$$

$$= \frac{p-q}{(p-q)(p+q)}$$

$$= \frac{1}{p+q}$$

$$p+q = \frac{x}{x+y} + \frac{y}{x+y}$$

$$= \frac{x+y}{x+y}$$

$$p+q = 1$$

$$\frac{1}{p+q} = \frac{1}{1}$$

$$= 1$$

$$\frac{1}{p-q} - \frac{2q}{p^2-q^2} = 1$$

40. Cylinder

$$d = 14$$

$$R = 7$$

$$h = ?$$

$$V = \pi R^2 h$$

Hollow hemisphere

$$d = 6$$

$$\text{Internal radius } r = 3$$

$$\text{external radius } R = 5$$

$$V = \frac{2}{3} \pi (R^3 - r^3)$$

$$\pi R^2 h = \frac{2}{3} \pi (R^3 - r^3)$$

$$7 \times 7 \times h = \frac{2}{3} (5^3 - 3^3)$$

$$7 \times 7 \times h = \frac{2}{3} (125 - 27)$$

$$7 \times 7 \times h = \frac{2}{3} (98)$$

$$h = \frac{2}{3} \times 98 \times \frac{1}{7} \times \frac{1}{7}$$

$$h = \frac{2}{3} \times 2$$

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

$$h = 1.33 \text{ cm}$$

$$41. n(S) = 52,$$

$$n(A) = 2,$$

$$n(B) = 2$$

A and B are mutually exclusive events

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

$$= \frac{2}{52}$$

$$P(B) = \frac{n(B)}{n(S)}$$

$$= \frac{2}{52}$$

$$P(A \cup B) = P(A) + P(B)$$

$$= \frac{2}{52} + \frac{2}{52}$$

DEIVA MODEL QUESTION PAPER - 10.

99

PART - I.Choose the correct answer:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
d	c	a	b	c	b	c	b	b	d	a	a	c	d.

Note: Answer any 10 questions.

Question No. 28 is compulsory.

15] Solution:

$$y = 2x$$

$$x = 1$$

$$y = 2(1) \\ = 2$$

$$x = 2$$

$$y = 2(2) \\ = 4$$

$$x = 3$$

$$y = 2(3) \\ = 6$$

$$x = 4$$

$$y = 2(4) \\ = 8$$

$$x = 5$$

$$y = 2(5) \\ = 10$$



Domain : $\{1, 2, 3, 4, 5, \dots\}$

Codomain : $\{1, 2, 3, 4, 5, \dots\}$

Range : $\{2, 4, 6, 8, 10, \dots\}$

16] $f(x) = 4x^2 - 1$, $g(x) = 1 + x$

Solution:

$$f \circ g = f(g(x))$$

$$= f(1+x)$$

$$= 4(1+x)^2 - 1$$

$$= 4(1^2 + 2x + x^2) - 1$$

$$= 4 + 8x + 4x^2 - 1$$

$$f \circ g = 4x^2 + 8x + 3 \quad \text{--- (1)}$$

$$g \circ f = g(f(x))$$

$$= g(4x^2 - 1)$$

$$= 1 + (4x^2 - 1)$$

$$g \circ f = 4x^2 \quad \text{--- (2)}$$

$$f \circ g \neq g \circ f$$

17] Solution:

$$\begin{array}{r|l}
 2 & 408 \\
 2 & 204 \\
 2 & 102 \\
 3 & 51 \\
 & 17
 \end{array}$$

$$408 = 2 \times 2 \times 2 \times 3 \times 17$$

$$170 = 5 \times 2 \times 17$$

$$HCF = 2 \times 17 = 34$$

$$LCM = 2 \times 2 \times 2 \times 3 \times 5 \times 7$$

$$120 \times 17$$

$$LCM = 2040$$

19] $a^2 + 4a - 12, a^2 - 5a + 6$ whose GCD is $a - 2$

Solution:

$$f(x) = a^2 + 4a - 12 \quad g(x) = a^2 - 5a + 6$$

$$f(x) \times g(x) = LCM \times GCD$$

-12x

6

+4+

$$(a+6)(a-2)$$

$$(a-2)(a-2)$$

$$LCM = \frac{f(x) \times g(x)}{GCD}$$

$$LCM = \frac{(a+6)(a-2)(a-3)(a-2)}{(a-2)}$$

$$LCM = (a+6)(a-2)(a-3)$$

18] Solution:

$$t_8 = 768$$

$$t_n = ar^{n-1}$$

$$ar^{8-1} = 768$$

$$ar^7 = 768$$

$$r = 2$$

$$t_{10} = ar^{10-1}$$

$$= ar^9$$

$$= ar^7 \times r \times r$$

$$= 768 \times 2 \times 2$$

$$t_{10} = 3072$$

20) Simplify

$$\frac{0x}{x+1} - \frac{x+1}{x-1}$$

Solution

$$\frac{0x}{(x+1)(x-1)} - \frac{x+1}{x-1}$$

$$\frac{0x - (x+1)(x+1)}{(x+1)(x-1)}$$

$$= \frac{0x - (x^2 + x + x + 1)}{(x+1)(x-1)}$$

$$= \frac{0x - (x^2 + 2x + 1)}{(x+1)(x-1)}$$

$$= \frac{-x^2 + 2x - 1}{(x+1)(x-1)} \rightarrow = \frac{4x - 2x - 1}{(x+1)(x-1)}$$

$$= \frac{-(x^2 - 2x + 1)}{(x+1)(x-1)}$$

$$= \frac{-(x-1)^2}{(x+1)(x-1)}$$

$$= \frac{(x-1)}{x+1}$$

$$= \frac{x+1}{x+1}$$

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

21] In the Matrix

$$A = \begin{bmatrix} 8 & 9 & 4 & 3 \\ -1 & \sqrt{7} & \frac{\sqrt{3}}{2} & 5 \\ 1 & 4 & 3 & 0 \\ 6 & 8 & -11 & 1 \end{bmatrix}$$

Solution:

(i) The number of elements.

$$A = 16$$

(ii) The order of the matrix.

$$A = 4 \times 4$$

(iii) Write the elements

$$a_{22} = \sqrt{7}$$

$$a_{23} = \frac{\sqrt{3}}{2}$$

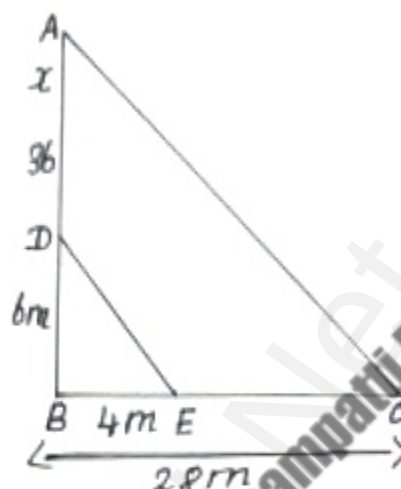
$$a_{24} = 5$$

$$a_{34} = 0$$

$$a_{43} = -11$$

$$a_{44} = 1$$

22] Solution:



$$400 \text{ cm} = 4 \text{ m}$$

$$\frac{BD}{AB} = \frac{BE}{BC}$$

$$\frac{6}{x+6} = \frac{4}{28}$$

$$\frac{6}{x+6} = \frac{1}{7}$$

$$42 = x + 6$$

$$42 - 6 = x$$

$$x = 36 \text{ m}$$

$$AB = x + 6$$

$$AB = 36 + 6$$

$$AB = 42 \text{ m}$$

23] Solution:

$$\perp (-2, 2) (5, 8)$$

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{8-2}{5-(-2)}$$

$$= \frac{6}{7}$$

$$5+2$$

$$= \frac{6}{7}$$

$$S(-8, 7) (-2, 0)$$

$$m_2 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_2 = \frac{0-7}{-2-(-8)}$$

$$= \frac{-7}{-2+8}$$

$$= \frac{-7}{6}$$

$$= \frac{-7}{6}$$

$$m_1 \times m_2 = -1$$

$$\left(\frac{6}{7}\right) \times \left(\frac{-7}{6}\right) = -1$$

$$\perp \neq 6$$

24] $y = \frac{4}{3}x - 7$ and passing through the point (7, -1).

Solution:

$$y = \frac{4}{3}x - 7$$

$$3y = 4x - 21$$

$$4x - 3y - 21 = 0$$

$$3x + 4y + k = 0$$

$$3(7) + 4(-1) + k = 0$$

$$21 - 4 + k = 0$$

$$17 + k = 0$$

$$k = -17$$

$$3x + 4y - 17 = 0$$

$$28. \frac{x^3 - 1}{x^2 + 2} + p(x) = \frac{3x^3 + 2x^2 + 4}{x^2 + 2}$$

$$\frac{3x^3 + 2x^2 + 4}{x^2 + 2} - \frac{x^3 - 1}{x^2 + 2} = p(x)$$

$$\frac{3x^3 + 2x^2 + 4 - x^3 + 1}{x^2 + 2} = p(x)$$

$$\boxed{\frac{2x^3 - 2x^2 + 5}{x^2 + 2} = p(x)}$$

25] prove that

$$\frac{\cot \theta - \cos \theta}{\cot \theta + \cos \theta} = \frac{\operatorname{cosec} \theta - 1}{\operatorname{cosec} \theta + 1}$$

Solution:

L.H.S.

$$\frac{\cot \theta - \cos \theta}{\sin \theta}$$

$$\frac{\cot \theta}{\sin \theta} + \cos \theta$$

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

$$\frac{\operatorname{cosec} \theta - 1}{\operatorname{cosec} \theta + 1} \Rightarrow \text{R.H.S}$$

$$\frac{\operatorname{cosec} \theta - 1}{\operatorname{cosec} \theta + 1} = \text{Hence proved.}$$

26] Solution:

Radius of cone = 6cm

height of cone = 24cm

Let, the radius of sphere be Rcm.

Volume of cone:

Volume of sphere.

$$\frac{1}{3} \pi r^2 h = \frac{4}{3} \pi R^3$$

$$\frac{1}{3} \pi (6)^2 (24) = \frac{4}{3} \pi R^3$$

$$6^3 = R^3$$

R = Radius of sphere = 6cm.

27] Solution:

$$\frac{P(A)}{P(\bar{A})} = \frac{17}{15}$$

$$\frac{1 - P(\bar{A})}{P(\bar{A})} = \frac{17}{15}$$

$$15(1 - P(\bar{A})) = 17P(\bar{A})$$

$$15 = 32P(\bar{A})$$

$$P(\bar{A}) = \frac{15}{32}$$

$$P(A) + P(\bar{A}) = 1$$

$$P(A) = \frac{15}{32} = 1$$

$$P(A) = 1 - \frac{15}{32} = \frac{17}{32}$$

$$\frac{n(A)}{n(S)} = \frac{17}{32}$$

$$\frac{n(A)}{640} = \frac{17}{32}$$

$$n(A) = \frac{17}{32} \times 640$$

$$= 340$$

PART - IIIANSWER ANY 10 QUESTIONS:QUESTION No. 42 is COMPULSORY:29] Given:

$$X = \{-5, 1, 3, 4\}$$

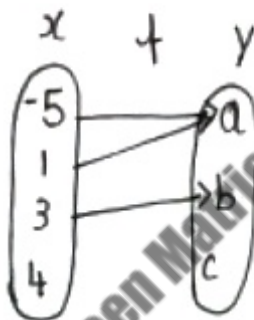
$$Y = \{a, b, c\}$$

$$(i) R_1 = \{(-5, a), (1, a), (3, b)\}$$

$$(ii) R_2 = \{(-5, b), (1, b), (3, a), (4, c)\}$$

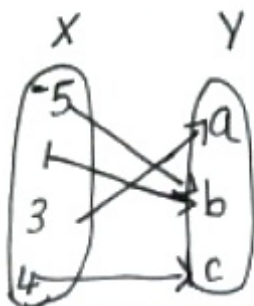
Solution:

$$(i) R_1 = \{(-5, a), (1, a), (3, b)\}$$



4 is not associated with any image in Y .
 $\therefore R_1$ is not a function.

$$(ii) R_2 = \{(-5, b), (1, b), (3, a), (4, c)\}$$



element of x has unique
 $\rightarrow$ image in Y .
 R_2 is a function.

30] $f(x) = 3x + 2$, $g(x) = 6x - k$

Solution:

$$f(x) = 3x + 2$$

$$g(x) = 6x + k$$

$$f \circ g = f(g(x))$$

$$= f(6x - k)$$

$$= 3(6x - k) + 2$$

$$= 18x - 3k + 2$$

$$g \circ f = g(f(x))$$

$$= g(3x + 2)$$

$$= 6(3x + 2) - k$$

$$= 18x + 12 - k$$

$$f \circ g = g \circ f$$

$$18x - 3k + 2 = 18x + 12 - k$$

$$-3k + k = 12 - 2$$

$$2k = 10$$

$$k = \frac{10}{2}$$

$$k = -5$$

The yearly savings are

₹ 2000, ₹ 2600, ₹ 3200,

form an A.P.

With $a = ₹ 2000$, $d = ₹ 600$, $tn = 20000$

$$tn = 20000$$

$$a + (n-1)d = 20000$$

$$2000 + (n-1)600 = 20000$$

$$2000 + 600n - 600 = 20000$$

$$600n + 1400 = 20000$$

$$600n = 20000 - 1400$$

$$600n = 18600$$

$$n = \frac{18600}{600}$$

$$\boxed{n = 31}$$

After 31 years her savings will be ₹ 20,000.

31] Solution: 1st 2nd

Salary : ₹ 15,000 ₹ 16,500

Expenses : ₹ 13,000 ₹ 13,900

Saving : ₹ 2,000 ₹ 2,600

34. $x^2 - 4x = 5$ — ①
 $y^2 - 2y = 8$ — ②

From eqn ①,

$$x^2 - 4x = 5$$

$$x^2 - 4x - 5 = 0$$

$$(x+1)(x-5) = 0$$

$$x+1=0 \quad | \quad x-5=0$$

$$\boxed{x = -1} \quad | \quad \boxed{x = 5}$$

From eqn ②,

$$y^2 - 2y = 8$$

$$y^2 - 2y - 8 = 0$$

$$(y+2)(y-4) = 0$$

$$y+2=0 \quad | \quad y-4=0$$

$$\boxed{y = -2} \quad | \quad \boxed{y = 4}$$

32] Solution:

$$\begin{array}{r}
 6x^2 - 5x + 3 \\
 \overline{36x^4 - 60x^3 + 61x^2 - mx + n} \\
 \underline{36x^4} \\
 -60x^3 + 61x^2 - mx + n \\
 \underline{+ 60x^3 - 25x^2} \\
 +36x^2 - mx + n \\
 \underline{+ 36x^2 - 30x + 9} \\
 0
 \end{array}$$

$(12x^2 - 5x + 3) \times 3$
 $(12x^2 - 5x + 3) \times 3$
 $(12x^2 - 5x + 3) \times 3$

$$\begin{array}{r}
 -m + 30 = 0 \\
 +m = +30 \\
 \boxed{m = 30} \\
 +n - 9 = 0 \\
 \boxed{n = 9}
 \end{array}$$

33] $3x^2 + 7x - 2 = 0$.

Solution:

$$(i) \frac{d}{\beta} + \frac{\beta}{\alpha}$$

$$a = 3$$

$$b = 7$$

$$c = -2$$

$$\text{POR } d + \beta = -\frac{b}{a}$$

$$= -7/3$$

$$\text{POR } d\beta = c/a = -2/3$$

$$\frac{d}{\beta} + \frac{\beta}{\alpha}$$

$$= \frac{d^2 + \beta^2}{d\beta}$$

$$= \frac{(d + \beta)^2 - 2d\beta}{d\beta}$$

$$= \frac{\left(-\frac{7}{3}\right)^2 - 2\left(-\frac{2}{3}\right)}{-2/3}$$

$$= \frac{\frac{49}{9} + \frac{4}{3}}{-2/3}$$

$$= \frac{\frac{49 + 12}{9}}{-2/3}$$

$$= \frac{61}{9} \times \frac{-3}{2}$$

$$\boxed{-\frac{61}{6}}$$

$$\begin{array}{r}
 3 \overline{) 9.3} \\
 3 \overline{) 3.1} \\
 \hline
 61
 \end{array}$$

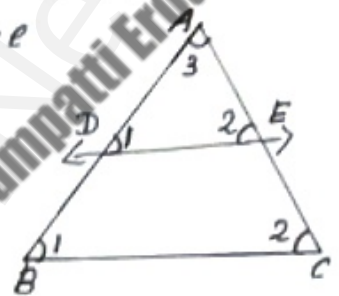
35] Basic proportionality Theorem (BPT) or Thales Theorem.

Statement:

A straight line drawn parallel to a side of triangle intersecting the other two sides, divides the sides in the same ratio.

Proof:

Given: In $\triangle ABC$, D is a point on AB and E is a point on AC.



To prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Draw a line $DE \parallel BC$

No.	Statement	Reason.
1.	$\angle ABC = \angle ADE = \angle 1$	Corresponding angles are equal because $DE \parallel BC$.
2.	$\angle ACB = \angle AED = \angle 2$	Corresponding angles are equal because $DE \parallel BC$.
3.	$\angle DAE = \angle BAC = \angle 3$	Both triangles have a common angle.
	$\triangle ABC \sim \triangle ADE$	By AAA Similarity
	$\frac{AB}{AD} = \frac{AC}{AE}$	Corresponding sides are proportional.
	$\frac{AD+DB}{AD} = \frac{AE+EC}{AE}$	Split AB and AC using the points D and E

$$4. \quad 1 + \frac{DB}{AD} = 1 + \frac{EC}{AE}$$

on simplification.

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

cancelling 1 on both sides.

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

Taking reciprocals.

36] Solution:

$$\text{Mid point} = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

Mid point of AC = Mid point of BD

$$\frac{2.5 + 2.5}{2}, \frac{3.5 - 2.5}{2} = \frac{10.5}{2}, \frac{-4 + 5}{2}$$

$$\frac{5}{2}, \frac{1}{2} = \frac{5}{2}, \frac{1}{2}$$

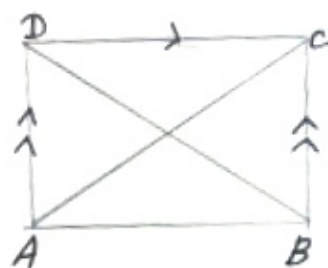
∴ As the midpoints of the diagonal are equal they form a ||gm.

Slope A(2.5, 3.5) B(10, -4) C(2.5, 2.5) D(-5, 5)

Slope of AB = Slope of CD.

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{-4 - 3.5}{10 - 2.5} = \frac{5 - 2.5}{-5 - 2.5}$$



$$\frac{-2.5}{2.5} = \frac{2.5}{-2.5}$$

$$-1 = -1 \quad \text{--- ①}$$

Slope of BC = Slope of AD.

$$\frac{-2.5+4}{2.5-10}, \frac{5-3.5}{-5-2.5}$$

$$\frac{1.5}{-7.5} = \frac{+1.5}{-7.5} \quad \text{--- ②}$$

from ① & ②

Slope of the opposite sides are equal. It is parallel.

∴ The given forms a parallelogram.

37] Solution:

In ΔBEC ,

$$\tan \beta = \frac{BC}{BE}$$

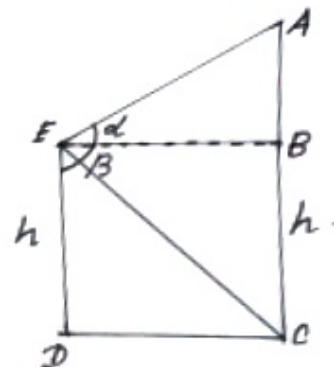
$$BE = \frac{BC}{\tan \beta}$$

$$BE = \frac{h}{\tan \beta} = h \times \frac{1}{\tan \beta}$$

$$BE = h \cot \beta$$

Now, In ΔABE

$$\tan \alpha = \frac{AB}{BE} \Rightarrow \frac{AB}{h \cot \beta}$$



$$AB = h \cot \beta \cdot \tan \alpha$$

$$\text{Height } AC = AB + BC$$

$$= h \cot \beta \cdot \tan \alpha + h$$

$$= h (1 + \tan \alpha \cdot \cot \beta) \text{ metres}$$

Hence proved.

38] Solution:

Frustrum

$$D = 10 \text{ m}$$

$$R = \frac{D}{2} = \frac{10}{2} = 5 \text{ m}$$

$$d = 4 \text{ m}$$

$$r = \frac{d}{2} = \frac{4}{2} = 2 \text{ m}$$

$$h = 4 \text{ m}$$

$$l = \sqrt{h^2 + (R - r)^2}$$

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

$$= \sqrt{16 + 3^2}$$

$$= \sqrt{16 + 9}$$

$$= \sqrt{25}$$

$$\boxed{l = 5 \text{ m}}$$

CSA =

$$CSA = \pi (R + r) l \text{ Sq. units}$$

$$= \pi (5 + 2) \times 5$$

$$= \frac{22}{7} \times 7 \times 5$$

$$\boxed{= 110 \text{ Sq. m}}$$

$$= (5R + \pi R^2 + \pi r^2)$$

$$= \pi (R + r) l + \pi R^2 + \pi r^2$$

$$\boxed{= \pi [(R + r) l + R^2 + r^2] \text{ Sq. unit}}$$

$$= \pi [(5 + 2) \times 5 + 5^2 + 2^2]$$

$$= \pi [7 \times 5 + 25 + 4]$$

$$= \pi [35 + 25 + 4]$$

$$= \frac{22}{7} [64]$$

$$= \frac{1408}{7}$$

$$= 201.142$$

$$\boxed{201.14 \text{ Sq. m}}$$

39] Solution:

Sphere

$$r = 6 \text{ cm}$$

$$V = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \pi \times 6 \times 6 \times 6$$

$$= 4 \pi \times 6 \times 6 \times 2$$

Hollow cylinder

$$R = 5 \text{ cm}$$

$$h = 32 \text{ cm}$$

$$r = ?$$

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

$$= \pi (5^2 - r^2) \times 32$$

$$= \pi (25 - r^2) \times 32$$

Volume of Hollow cylinder } = Volume of sphere.

$$\pi (25 - r^2) \times 32 = 4 \pi \times 6 \times 6 \times 2$$

$$25 - r^2 = \frac{4 \times 6 \times 6 \times 2}{32}$$

$$25 - r^2 = 9$$

$$-r^2 = 9 - 25$$

$$-r^2 = -16$$

$$\boxed{r = 4}$$

Thickness $R - r$

$$= 5 - 4$$

$$= 1 \text{ cm}$$

40] Solution:

Mean = $\frac{\text{Sum of all the observation}}{\text{no of observation}}$

$$1 + 2 + 3 + \dots + n$$

$$\text{Mean} = \frac{\sum x}{n} = \frac{1 + 2 + 3 + \dots + n}{n}$$

$$= \frac{n(n+1)}{2 \times n}$$

$$\boxed{\text{Mean} = \frac{n+1}{2}}$$

$$\text{Variance} = \sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n} \right)^2$$

$$\frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n} - \left(\frac{n+1}{2} \right)^2$$

$$\frac{n(n+1)(2n+1)}{6n} - \left(\frac{n^2 + 2n + 1}{4} \right)$$

$$\frac{2n^2 + n + 2n + 1}{6} - \left(\frac{n^2 + 2n + 1}{4} \right)$$

$$\frac{2(2n^2 + 3n + 1) - 3n^2 - 6n - 3}{6 \times 2}$$

$$\frac{4n^2 + 6n + 2 - 3n^2 - 6n - 3}{12} = \frac{n^2 - 1}{12} //$$

4) Solution:

$$n(S) = 50$$

A = Event of ^{Student} choosing rvc

$$n(A) = 28$$

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

$$= \frac{28}{50}$$

B = Event of Student choosing rvc

$$n(B) = 30$$

$$P(B) = \frac{n(B)}{n(S)}$$

$$= \frac{30}{50}$$

$$n(A \cap B) = 18$$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)}$$

$$= \frac{18}{50}$$

Student opted for rvc but not rvc.

$$P(A \cap \bar{B}) = P(A) - P(A \cap B)$$

$$= \frac{28}{50} - \frac{18}{50} = \frac{28-18}{50} = \frac{10}{50} = \frac{1}{5}$$

(ii) Student opted for NSS but not NCC.

$$P(\bar{A} \cap B) = P(B) - P(A \cap B)$$

$$= \frac{30}{50} - \frac{18}{50} = \frac{12}{50} = \frac{6}{25}$$

(iii) Student opted for exactly one of them.

$$P(A \cap \bar{B}) + P(\bar{A} \cap B)$$

$$\frac{10}{50} + \frac{12}{50} = \frac{22}{50} = \frac{11}{25}$$

42] x intercept a, y intercept b.

The Co-ordinate of A is (a, 0).

The Co-ordinate of B is (0, b).

Mid Point of AB = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$$\begin{matrix} (a, 0) & (0, b) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$(3, 2) = \left(\frac{a+0}{2}, \frac{0+b}{2} \right)$$

$$(3, 2) = (a/2, b/2)$$

$$\begin{array}{l|l} 3 = a/2 & 2 = b/2 \\ \hline a = 6 & b = 4 \end{array}$$

intercept form
of a line

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{4} = 1$$

$$\frac{2x+3y}{12} = 1$$

$$2x+3y=12$$

$$2x+3y-12=0$$

DEVA MODEL QUESTION PAPER - II

114

PART - I

CHOOSE THE CORRECT ANSWER.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
a	c	d	a	b	b	b	a	a	d	d	c	d	d	c

PART - II

GIVE ANSWER ONLY 10 QUESTIONS

QUESTION NO. 28 IS COMPULSORY

Q) $f(x) = x^2 - 2$ $x \in \{-2, -1, 0, 1\}$ $x \in \mathbb{R}$

Solution:

$$f(x) = x^2 - 2$$

$$x = -2$$

$$f(-2) = (-2)^2 - 2$$

$$= 4 - 2$$

$$= 2$$

$$= 2 \quad (-2, 2)$$

$$x = -1$$

$$f(-1) = (-1)^2 - 2$$

$$= 1 - 2$$

$$= -1 \quad (-1, -1)$$

$$x = 0$$

$$f(0) = 0^2 - 2$$

$$= 0 - 2$$

$$= -2$$

$$f(x) = x^2 - 2$$

$$= 9 - 2$$

$$= 7 \quad (3, 7)$$

$$(1) f = \{(-2, 2), (-1, -1), (0, -2), (3, 7)\}$$

(ii) f is a function as x have unique image in $f(x)$.

$$16] f(x) = 3 - 4x^2$$

Solution:

$$f(x) = 3 - 4x^2$$

$$f(-2) = 3 - 4(-2)^2$$

$$= 3 - 4(-4)$$

$$= 3 - 16$$

$$= -13$$

$$f(-1) = 3 - 4(-1)^2$$

$$= 3 - 4$$

$$= -1$$

$$f(1) = 3 - 4(1)^2$$

$$= 3 - 4$$

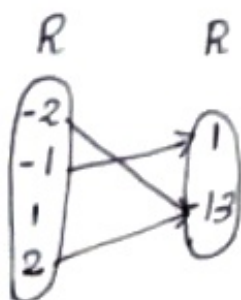
$$= -1$$

$$f(2) = 3 - 4(2)^2$$

$$= 3 - 16$$

$$= -13$$

$f(x)$ is not a bijective function.



$$17] 2^n + 6 \times 9^n$$

Solution:

$$9 \equiv 2 \pmod{7}$$

Raising to power 'n' on Both sides

$$9^n \equiv 2^n \pmod{7}$$

Mod by 6 on Both sides.

$$6 \times 9^n \equiv 6 \times 2^n \pmod{7}$$

Add 2^n on B.S.

$$2^n + 6 \times 9^n \equiv 2^n + 6 \times 2^n \pmod{7}$$

$$\equiv 2^n(1+6) \pmod{7}$$

$$\equiv 2^n(7) \pmod{7}$$

$$\equiv 2^n \times 0 \pmod{7}$$

$$\therefore \boxed{2^n + 6 \times 9^n \equiv 0 \pmod{7}}$$

$2^n + 6 \times 9^n$ is always div by 7

18] Solution:

$$tn = S_5 - S_4$$

$$Sn = \frac{5n^2}{2} + \frac{3n}{2}$$

$$S_{17} = \frac{5(17)^2}{2} + \frac{3(17)}{2}$$

$$= \frac{5(289)}{2} + \frac{51}{2}$$

$$= \frac{1445 + 51}{2}$$

$$Sn = \frac{1496}{2}$$

$$= \boxed{748}$$

$$S_{16} = \frac{5(16)^2}{2} + \frac{3(16)}{2}$$

$$= \frac{5(256)}{2} + \frac{48}{2}$$

$$= \frac{1280}{2} + \frac{48}{2}$$

$$= \frac{1280 + 48}{2}$$

$$= \frac{1328}{2}$$

$$\boxed{S_{16} = 664}$$

We know that

$$t_{17} = S_{17} - S_{16}$$

$$= 748 - 664$$

$$t_{17} = \boxed{84}$$

19] Solution:

pari needs to complete the work } = $\frac{x}{4}$

yuvan needs to complete the work } = $\frac{x}{6}$

$$\text{Together} = \frac{x}{4} + \frac{x}{6} = 1$$

$$= \frac{6x + 4x}{24} = 1$$

$$= \frac{10x}{24} = 1$$

$$= 10x = 24$$

$$= x = \frac{24}{10} = 2.4$$

2 hours (0.4 x 10)

2 hours 24 min.

20] Solution:

Let x be one number
reciprocal $\frac{1}{x}$ be
another number.

$$x - \frac{1}{x} = \frac{24}{5}$$

$$\frac{x^2 - 1}{x} = \frac{24}{5} \text{ (cm)}$$

$$5(x^2 - 1) = 24x$$

$$5x^2 - 5 = 24x$$

$$5x^2 - 24x - 5 = 0$$

$$(x-5)(5x+1) = 0$$

$$x-5=0 \quad | \quad 5x+1=0$$

$$\boxed{x=5}$$

$$\boxed{x = -1/5}$$

22] Solution:



By pythagoras theorem

$$OP^2 = OT^2 + PT^2$$

$$5^2 = 3^2 + PT^2$$

$$25 = 9 + PT^2$$

$$25 - 9 = PT^2$$

$$16 = PT^2$$

$$PT^2 = 16$$

$$PT = \sqrt{16}$$

$$PT = 4$$

$$\therefore \text{Length of tangent} = \boxed{4 \text{ cm}}$$

24] Solution:

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

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

$$2 \sin \theta \cos \theta = 2 \cos^2 \theta - (\cos^2 \theta + \sin^2 \theta)$$

$$2 \sin \theta \cos \theta = \cos^2 \theta - \sin^2 \theta = (\cos \theta + \sin \theta)(\cos \theta - \sin \theta)$$

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

$$\frac{\sqrt{2} \sqrt{2} \sin \theta}{\sqrt{2}} = \cos \theta + \sin \theta$$

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

hence proved

23] Solution:

Slope of AB: A(-3, -4) B(7, 2)

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - (-4)}{7 - (-3)}$$

$$= \frac{2 - (-4)}{7 - (-3)} = \frac{6}{10} = \frac{3}{5} = \frac{4}{5}$$

$$M_1 = \frac{3}{5}$$

Slope of BC: B(7, 2) C(12, 5)

$$m_2 = \frac{5 - 2}{12 - 7} = \frac{3}{5}$$

$$M_2 = \frac{3}{5}$$

Slope of AC: A(-3, -4) C(12, 5)

$$m_3 = \frac{5 - (-4)}{12 - (-3)} = \frac{9}{15} = \frac{3}{5}$$

$$M_3 = \frac{3}{5}$$

$\therefore$ Slope of AB = Slope of BC = Slope of AC

$\therefore$ The given points are collinear.

24] Solution:

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

$$= \frac{22}{7} (28^2 - 21^2) \times 9$$

$$= \frac{22}{7} (28 + 21) (28 - 21) \times 9$$

$$= \frac{22}{7} \times 49 \times 7 \times 9$$

$$V = 9702 \text{ cm}^3$$

25] Solution:

$$C.V = 25.6$$

$$C.V = 18.75$$

$$\sigma = ?$$

$$C.V = \frac{\sigma}{x} \times 100$$

$$18.75 = \frac{\sigma}{25.6} \times 100$$

$$\frac{18.75 \times 25.6}{100} = \sigma$$

$$\frac{480}{100} = \sigma$$

$$4.80 = \sigma$$

$$\sigma = 4.8$$

26] Solution:

$$S = \{HHH, THH, HTH, TTH, HHT, THT, HTT, TTT\}$$

$$n(S) = 8$$

Let A be the event of getting two consecutive tails.

$$A = \{TTH, HTT, TTT\}$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{3}{8}$$

$$P(A) = \frac{3}{8}$$

28] Solution:

$$SOR = (7 + \sqrt{3}) + (7 - \sqrt{3})$$

$$= 14$$

$$POR = (7 + \sqrt{3})(7 - \sqrt{3})$$

$$= 49 - 3$$

$$= 46$$

$$\therefore x^2 - SORx + POR = 0$$

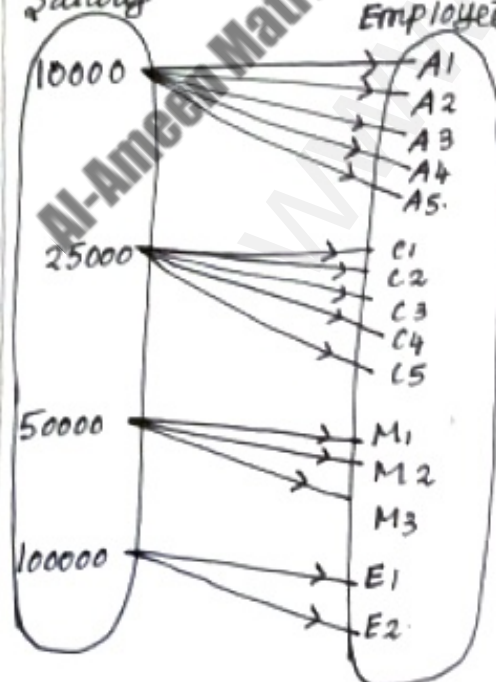
$$x^2 - 14x + 46 = 0$$

$$\#$$

PART - III

Question no. 42 is
compulsory.

29] $R = \{(10000, A_1), (10000, A_2), (10000, A_3),$
 $\{(10000, A_4), (10000, A_5)\}$
 $(25000, C_1), (25000, C_2),$
 $(25000, C_3), (25000, C_4)$
 $(50000, M_1), (50000, M_2), (50000, M_3),$
 $\{(100000, E_1), (100000, E_2)\}$
 Salary



21] Solution:

$$A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$$

$$AB = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} (2 \ 1) \begin{pmatrix} 2 \\ 1 \end{pmatrix} & (2 \ 1) \begin{pmatrix} 0 \\ 3 \end{pmatrix} \\ (1 \ 3) \begin{pmatrix} 2 \\ 1 \end{pmatrix} & (1 \ 3) \begin{pmatrix} 0 \\ 3 \end{pmatrix} \end{bmatrix}$$

$$= \begin{bmatrix} 4+1 & 0+3 \\ 2+3 & 0+9 \end{bmatrix}$$

$$AB = \begin{bmatrix} 5 & 3 \\ 5 & 9 \end{bmatrix} \rightarrow \textcircled{1}$$

$$BA = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} (2 \ 0) \begin{pmatrix} 2 \\ 1 \end{pmatrix} & (2 \ 0) \begin{pmatrix} 1 \\ 3 \end{pmatrix} \\ (1 \ 3) \begin{pmatrix} 2 \\ 1 \end{pmatrix} & (1 \ 3) \begin{pmatrix} 1 \\ 3 \end{pmatrix} \end{bmatrix}$$

$$= \begin{bmatrix} 4+0 & 2+0 \\ 2+3 & 1+9 \end{bmatrix}$$

$$BA = \begin{bmatrix} 4 & 2 \\ 5 & 10 \end{bmatrix}$$

from $\textcircled{1}$ & $\textcircled{2}$; $AB \neq BA$.

30] Solution:

$$\{1, 3, 4, \dots\}$$

$$\{0, 1\}$$

$$\{2, -1, 3\}$$

$$(i) f(3)$$

$$f(3) = 3 + 2$$

$$= 5$$

$$(ii) f(0)$$

$$f(0) = 2$$

$$\therefore f(2) + f(-2) = \frac{4 - 3}{= 1}$$

$$(iii) f(-1.5)$$

$$f(-1.5) = 1.5 - 1$$

$$= -0.5$$

$$(iv) f(2) + f(-2)$$

$$f(2) = 2 + 2$$

$$= 4$$

$$f(-2) = -2 - 1$$

$$= -3$$

31] Solution:

$$400, 700, 1000, \dots$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$a = 400, d = 700 - 400 = 300$$

$$65,000 = \frac{n}{2} [2400 + (n-1)300]$$

$$65,000 \times 2 = n [2400 + 300n - 300]$$

$$1,30,000 = n [300n + 2100]$$

$$1,30,000 = 300n^2 + 2100n$$

$$300n^2 + 2100n = 1,30,000$$

$$\div 100 \quad 3n^2 + 21n = 1300$$

$$3n^2 + 21n - 1300 = 0$$

$$(3n + 65)(n - 20) = 0$$

$$3n + 65 = 0$$

$$3n = -65$$

$$n - 20 = 0$$

$$\boxed{n = 20}$$

32] Solution:

G.P.

$$t_7 = \frac{64}{243}$$

$$\wedge$$

$$ar^6 = \frac{64}{243} \quad \text{--- (1)}$$

$$t_4 = 8/9$$

$$\wedge$$

$$ar^3 = 8/9 \quad \text{--- (2)}$$

$$\textcircled{1} \div \textcircled{2}$$

$$\frac{ar^6}{ar^3} = \frac{64}{243} \div \frac{8}{9}$$

$$\frac{ar^3}{ar^3} = \frac{8}{9}$$

$$r^{4-3} = \frac{64}{243} \times \frac{9}{8}$$

$$r^1 = \frac{8}{27} \Rightarrow r^3 = \frac{2^3}{3^3} = \left(\frac{2}{3}\right)^3$$

$$\therefore r = \frac{2}{3}$$

Sub $r = \frac{2}{3}$ in (2)

$$ar^3 = 8/9$$

$$a\left(\frac{2}{3}\right)^3 = 8/9$$

$$a \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = 8/9$$

$$a = \frac{8}{9} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2}$$

$$\boxed{a = 3}$$

G.P.

$$a, ar, ar^2, \dots$$

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

$$= 3, 2, \frac{4}{3}, \dots$$

$$= \boxed{3, 2, \frac{4}{3}, \dots}$$

32) $x^4 - 12x^3 + 42x^2 - 36x + 9$

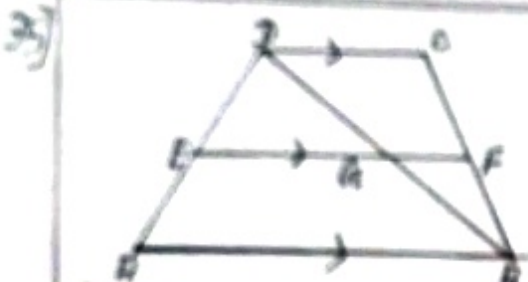
$$\begin{array}{r}
 x^4 - 12x^3 + 42x^2 - 36x + 9 \\
 \underline{-(x^4 - 6x^3 + 9x^2)} \\
 6x^3 - 33x^2 + 36x - 9 \\
 \underline{-(6x^3 - 18x^2 + 18x - 9)} \\
 15x^2 - 15x + 18 \\
 \underline{-(15x^2 - 9x + 9)} \\
 6x - 9 \\
 \underline{-(6x - 9)} \\
 0
 \end{array}$$

Ans: $(x^3 - 6x^2 + 9x - 3)$

In $\triangle DAB$, $FG \parallel AB$

By BPT, $\frac{DE}{EA} = \frac{DG}{GB}$

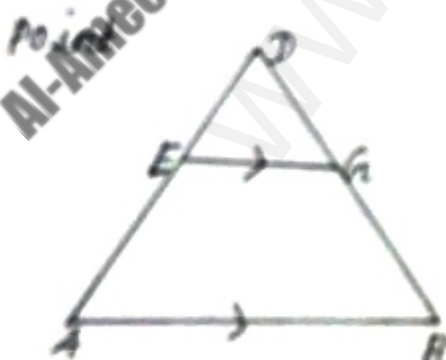
$$\frac{DE}{EA} = \frac{DG}{GB} \quad \text{--- (1)}$$



Given:

To prove: $\frac{AE}{ED} = \frac{BF}{FC}$

Const: Join BD intersecting EF at G



In $\triangle BCD$

$GF \parallel DC$

$\therefore$ By BPT

$$\frac{BE}{EC} = \frac{BG}{GD} \quad \text{--- (2)}$$

From (1) and (2)

$$\frac{AC}{ED} = \frac{BF}{FC}$$

34] Solution:

$$3x^2 + Kx + 81 = 0$$

$$a = 3$$

$$b = Kx$$

$$c = 81$$

Let one point = d Another point = d^2

$$SOR = -\frac{b}{a}$$

$$d + d^2 = -\frac{K}{3}$$

①

$$POR = \frac{c}{a}$$

$$d \times d^2 = \frac{81}{3}$$

$$d^3 = 27$$

$$d^3 = 3^3$$

$$\boxed{d = 3}$$

$$\text{Sub } d = 3 \text{ ①}$$

$$d + d^2 = -\frac{K}{3}$$

$$3 + 3^2 = -\frac{K}{3}$$

$$3 + 9 = -\frac{K}{3}$$

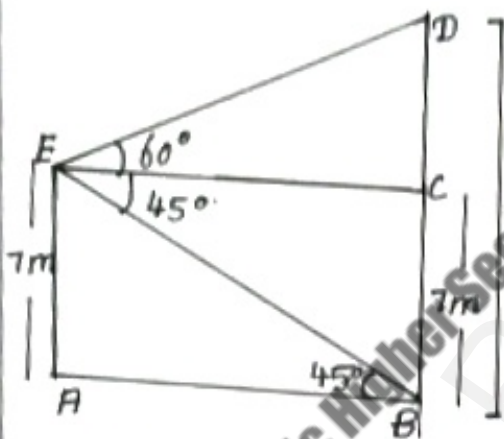
$$12 = -\frac{K}{3}$$

$$K = -36$$

$$\boxed{K = -36}$$

36] Pythagoras Theorem Book Pg. 180, 184 to 185.

38]



$$EC \parallel AB$$

$$EA = BC = 7m$$

$$AB = EC$$

Let the height of the tower be h In $\triangle EAB$.

$$\frac{AE}{AB} = \tan \theta$$

$$\frac{7}{AB} = \tan 45^\circ$$

$$\frac{7}{AB} = 1$$

$$AB = 7$$

$$\boxed{AB = EC = 7}$$

In $\triangle ECD$

$$\frac{CD}{EC} = \tan \theta$$

$$\frac{CD}{7} = \tan 60^\circ$$

$$\frac{CD}{7} = \sqrt{3}$$

$$CD = 7\sqrt{3}$$

height of the tower

$$BD = BC + CD$$

$$h = 7 + 7\sqrt{3}$$

$$\boxed{h = 7(1 + \sqrt{3})m}$$

39] cylinder

$$r = 7 \text{ cm}$$

$$h = 6 \text{ cm}$$

$$V_1 = \pi r^2 h$$

$$= \frac{22}{7} \times 7 \times 7 \times 6$$

$$V_1 = 22 \times 7 \times 6$$

$$= 924 \text{ cm}^3$$

Hemisphere

$$r = 7$$

$$V_2 = \frac{2}{3} \pi r^3$$

$$= \frac{2 \times 22}{3} \times 7 \times 7 \times 7$$

$$V_2 = \frac{2 \times 22 \times 7 \times 7}{3}$$

$$= \frac{2156}{3}$$

$$= 718.666 \text{ cm}^3$$

Volume of vessel } = V_1 + V_2

$$= 924 + 718.666$$

$$= 1642.666$$

$$= 1642.67 \text{ cm}^3$$

40] Solution:

Cone:

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

$$r = 7 \text{ cm}$$

$$h = 8 \text{ cm}$$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$V_1 = \frac{1}{3} \pi \times 7 \times 7 \times 8$$

Hollow sphere

$$D = 10 \text{ cm}$$

$$R = 5 \text{ cm}$$

r = ?

$$\text{Volume of Hollow sphere} = \frac{4}{3} \pi (R^3 - r^3)$$

$$= \frac{4}{3} \pi [5^3 - r^3]$$

Volume of Hollow sphere } = Vol of cone

$$\frac{4}{3} \pi [125 - r^3] = \frac{1}{3} \pi \times 7 \times 7 \times 8$$

$$125 - r^3 = \frac{7 \times 7 \times 8}{4}$$

$$125 - r^3 = 98$$

$$-r^3 = 98 - 125$$

$$+r^3 = +27$$

$$r^3 = 3^3$$

$$\therefore \boxed{r = 3}$$

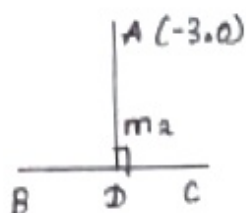
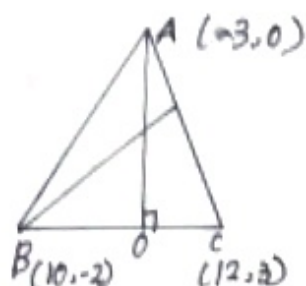
int diameter

$$d = 2r$$

$$d = 2 \times 3$$

$$d = 6 \text{ cm}$$

37]



Slope of BC

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{3+2}{12-10}$$

$$m_1 = \frac{5}{2}$$

$$m_2 = -\frac{2}{5}$$

$$m_2 = -\frac{2}{5}$$

Equ of line AD

$$m = -\frac{2}{5} \quad A(-3,0)$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = -\frac{2}{5}(x + 3)$$

$$5y = -2x - 6$$

$$2x + 5y + 6 = 0$$

Equ of AD

Slope of AC

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{0-3}{-3-12} = \frac{-3}{-15} = \frac{1}{5}$$

$$m_1 = \frac{1}{5}$$

$$\perp \therefore m_2 = -5$$

Equ of line BE

$$m = -5(B(10,-2))$$

$$y - y_1 = m(x - x_1)$$

$$y + 2 = -5(x - 10)$$

$$y + 2 = -5x + 50$$

$$5x + y - 50 + 2 = 0$$

$$5x + y - 48 = 0$$

Equ of BE

41]

$$P(A \cap \bar{B}) = P(\text{only } A) = P(A)$$

$$- P(A \cap B)$$

(ii)

$$P(\bar{A} \cap B) = P(\text{only } B) - P(B)$$

$$- P(A \cap B)$$

Refer

Theorem 1.

page No

12)

x intercept a, y intercept b

$$\frac{x}{a} + \frac{y}{b} = 1 \rightarrow (1)$$

$$a = b + 5$$

$$\frac{x}{b+5} + \frac{y}{b} = 1 \Rightarrow \frac{bx + y(b+5)}{b(b+5)} = 1$$

$$bx + y(b+5) = b(b+5) \quad \text{Line will pass through point } (22, -6)$$

$$22b + (-6)(b+5) = b^2 + 5b$$

$$22b - 6b - 30 - b^2 - 5b = 0$$

$$-b^2 + 11b - 30 = 0$$

$$b^2 - 11b + 30 = 0$$

$$(b-5)(b-6) = 0$$

$$b-5=0 \quad b-6=0$$

$$\boxed{b=5} \quad \text{or} \quad \boxed{b=6}$$

$$\begin{aligned} \text{At } b=5 \quad a &= b+5 \\ a &= 5+5 \\ a &= 10 \end{aligned}$$

$$\begin{aligned} \frac{x}{10} + \frac{y}{5} &= 1 \\ 5x + 10y &= 10 \\ 5x + 10y - 10 &= 0 \end{aligned}$$

$$\begin{aligned} \text{At } b=6 \quad a &= b+5 \\ a &= 6+5 \\ a &= 11 \end{aligned}$$

$$\begin{aligned} 5x + 10y &= 50 \\ (\div 5) \quad x + 2y &= 10 \\ x + 2y - 10 &= 0 \end{aligned}$$

$$\frac{x}{11} + \frac{y}{6} = 1$$

$$\frac{6x + 11y}{66} = \frac{1}{1} \Rightarrow$$

$$\begin{aligned} 6x + 11y &= 66 \\ 6x + 11y - 66 &= 0 \end{aligned}$$

DEIVA MODEL QUESTION PAPER - 12

130

PART-IANSWER all the questions:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
b	b	c	b	d	d	a	b	a	b	c	d	d	b

PART-IIANSWER ANY 10 QUESTIONS:

Question no. 28 is compulsory.

15] Solution:

$$f(x) = x^2 + 1$$

$$f(3) = 3^2 + 1 \Rightarrow 9 + 1 = 10$$

$$f(4) = 4^2 + 1 = 16 + 1 = 17$$

$$f(6) = 6^2 + 1 = 36 + 1 = 37$$

$$f(8) = 8^2 + 1 = 64 + 1 = 65$$

$$x \rightarrow f(x)$$



$$\Rightarrow R = \{(3, 10), (4, 17), (6, 37), (8, 65)\}$$

It is a function from X to N .

16] Solution:

$$f \circ g = f(g(x))$$

$$= f(x+1)$$

$$= x$$

$$g \circ f = g(f(x))$$

$$= g(2x-1)$$

$$= x$$

17] HCF 867 and 255.

$$867 \times 255.$$

$$a = b \times r + r$$

$$867 = 255 \times 3 + 102$$

$$255 = 102 \times 2 + 51$$

$$102 = 51 \times 2 + 0$$

$$\text{HCF} = 51.$$

$$\begin{array}{r} 3 \\ 255 \overline{) 867} \\ \underline{765} \\ 102 \end{array}$$

$$\begin{array}{r} 2 \\ 102 \overline{) 255} \\ \underline{204} \\ 51 \end{array}$$

18] $8, 7\frac{1}{4}, 6\frac{1}{2}, 5\frac{3}{4}, \dots$

AP

$$t_1 = a = 8$$

$$t_2 = 7\frac{1}{4}$$

$$d = t_2 - t_1$$

$$= 7\frac{1}{4} - 8$$

$$= \frac{29}{4} - 8$$

$$d = \frac{29 - 32}{4}$$

$$n = 15.$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{15} = \frac{15}{2} [2(8) + (15-1)(-\frac{3}{4})]$$

$$= \frac{15}{2} [16 + 14(-\frac{3}{4})]$$

$$= \frac{15}{2} [16 - \frac{21}{2}]$$

$$= \frac{15}{2} [\frac{32 - 21}{2}]$$

$$S_{15} = \frac{15}{2} [\frac{11}{2}]$$

$$S_{15} = \frac{165}{4}$$

19] Solution:

$$\frac{x^2 + 6x + 8}{x^3 + 8} - \frac{3}{x^2 - 2x + 4}$$

$$= \frac{x^2 + 6x + 8}{x^3 + 2^3} - \frac{3}{x^2 - 2x + 4}$$

$$= \frac{x^2 + 6x + 8}{(x+2)(x^2 - x(2) + 2^2)} - \frac{3}{x^2 - 2x + 4}$$

$$= \frac{x^2 + 6x + 8}{(x+2)(x^2 - 2x + 4)} - \frac{3}{(x^2 - 2x + 4)}$$

$$= \frac{x^2 + 6x + 8 - 3(x+2)}{(x+2)(x^2 - 2x + 4)}$$

$$= \frac{x^2 + 6x + 8 - 3x - 6}{(x+2)(x^2 - 2x + 4)}$$

$$= \frac{x^2 + 3x + 2}{(x+2)(x^2 - 2x + 4)}$$

$$= \frac{(x+2)(x+1)}{(x+2)(x^2 - 2x + 4)} = \boxed{\frac{x+1}{x^2 - 2x + 4}}$$

$$= \frac{4(\sqrt{17}x + \sqrt{2})}{(4x-1)}$$

20] $\frac{7x^2 + 2\sqrt{14}x + 2}{x^2 - \frac{1}{2}x + \frac{1}{16}}$

$$= \frac{16[7x^2 + 2\sqrt{14}x + 2]}{16[x^2 - \frac{1}{2}x + \frac{1}{16}]}$$

$$= \frac{16[7x^2 + 2\sqrt{14}x + 2]}{[16x^2 - 8x + 1]}$$

$$= \sqrt{\frac{16[7x^2 + 2\sqrt{14}x + 2]}{[16x^2 - 8x + 1]}}$$

$$= \frac{16[(\sqrt{14}x)^2 + 2(\sqrt{14}x)(\sqrt{2}) + (\sqrt{2})^2]}{(4x)^2 - 2(4x)(1) + (1)^2}$$

$$= \sqrt{\frac{16(\sqrt{17}x + \sqrt{2})^2}{(4x-1)^2}}$$

22] Solution:

In $\triangle AOQ$ and $\triangle BOP$

$$\angle OAQ = \angle OBP = 90$$

$$\angle AOQ = \angle BOP$$

$$\therefore \triangle AOQ \sim \triangle BOP$$

$$\frac{AO}{BO} = \frac{AQ}{BP} = \frac{OQ}{OP}$$

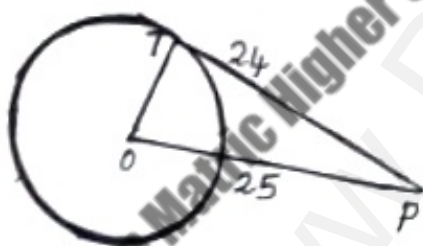
$$\frac{10}{6} = \frac{AQ}{9} = \frac{OQ}{OP}$$

$$\therefore \frac{AQ}{9} = \frac{10}{6}$$

$$AQ = \frac{9 \times 10}{6}$$

$$AQ = 15 \text{ cm}$$

23]



$$OT^2 + 24^2 = 25^2$$

$$OT^2 = 25^2 - 24^2$$

$$OT^2 = 576 - 625$$

$$OT^2 = 49$$

$$OT^2 = \sqrt{49}$$

$$OT = 7$$

24] Solution

$$8x - 7y + 6 = 0$$

$$y = mx + c$$

$$-7y = -8x - 6$$

$$7y = 8x + 6$$

$$y = \frac{8x}{7} + \frac{6}{7}$$

$$m = \frac{8}{7}$$

$$c = \frac{6}{7}$$

28] Solution:

$$3x - y + 7 = 0$$

$$3(1) - (-2) + k = 0$$

$$3 + 2 + k = 0$$

$$5 + k = 0$$

$$k = -5$$

$$3x - y - 5 = 0$$

25] Solution

$$\sin \theta + \cos \theta = \sqrt{3}$$

$$(\sin \theta + \cos \theta)^2 = (\sqrt{3})^2$$

$$\sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta = 3$$

$$1 + 2 \sin \theta \cos \theta = 3$$

$$2 \sin \theta \cos \theta = 3 - 1 = 2$$

$$\sin \theta \cos \theta = 1 \quad \text{--- (1)}$$

$$\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} = \frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \sin \theta}$$

$$= \frac{1}{1} = 1 \Rightarrow \therefore \tan \theta + \cot \theta = 1$$

26] Solution:

Sphere

$$SA = 154 \text{ M}^2$$

$$4 \pi r^2 = 154$$

$$4 \times \frac{22}{7} \times r^2 = 154$$

$$r^2 = \frac{154 \times 7}{4 \times 22}$$

$$r^2 = \frac{49}{4}$$

$$r = \sqrt{\frac{49}{4}}$$

$$r = \frac{7}{2}$$

$$d = 2 \times r$$

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

$$= 7 \text{ m}$$

21] Solution:

$$CV = \frac{\sigma}{\bar{x}} \times 100$$

$$\frac{CV \times \bar{x}}{100} = \sigma$$

$$\text{Mean } \bar{x} = 15$$

$$CV = 48$$

$$\text{Standard deviation } \sigma = \frac{CV \times \bar{x}}{100}$$

$$= \frac{48 \times 15}{100}$$

$$= \frac{720}{100}$$

$$= \boxed{7.2}$$

21] Solution:

$$2x + y = 4 \quad \text{--- (1)}$$

$$x + 2y = 5 \quad \text{--- (2)}$$

$$\text{①} \Rightarrow 2x + y = 4$$

$$\text{②} \Rightarrow 2x + 4y = 10$$

$$-3y = -6$$

$$y = \frac{-6}{-3}$$

$$\boxed{y = 2}$$

Substitute $y = 2$
in equation ①

$$2x + 2 = 4$$

$$2x = 4 - 2$$

$$2x = 2$$

$$x = \frac{2}{2}$$

$$\boxed{x = 1}$$

PART-III

NOTE: ANSWER ANY 10 QUESTIONS.

QUESTION NO. 42 is compulsory.

29] Solution:

$$f(a_1) = f(a_2)$$

$$\frac{1}{2} g t_1^2 + a t_1 + b = \frac{1}{2} g t_2^2 + a t_2 + b$$

$$\frac{1}{2} g t_1^2 + a t_1 = \frac{1}{2} g t_2^2 + a t_2$$

$$t_1 \left(\frac{1}{2} g t_1 + a \right) = t_2 \left(\frac{1}{2} g t_2 + a \right)$$

$$\boxed{t_1 = t_2}$$

21) Solution:

AP

$$t_3 = 3$$

$$S_3 = 234$$

$$d = ?$$

$$S_{21} = P$$

$$t_n = a + (n-1)d$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$t_3 = 3$$

$$a + 2d = 3 \quad \text{--- (1)}$$

$$S_3 = 234$$

$$\frac{1}{2} [2a + (n-1)d]$$

$$2a + 12d = 234$$

$$2a + 12d = 18 \times 9$$

$$(-9)$$

$$\frac{2a}{2} + \frac{12d}{2} = \frac{18 \times 9}{2}$$

$$a + 6d = 81 \quad \text{--- (2)}$$

$$a + 2d = 3 \quad \text{--- (1)}$$

$$a + 6d = 81 \quad \text{--- (2)}$$

$$6d = -78$$

$$d = \frac{-78}{6}$$

$$\therefore d = -13$$

$$S_{11} = 518 \quad \text{--- (3)}$$

$$a + 10d = 518$$

$$a + 10(-13) = 518$$

$$a = 518 + 130$$

$$a = 648$$

$$1. [a + 10d]$$

$$S_{11} = \frac{11}{2} [2a + 10d]$$

$$\frac{11}{2} [2(648) + 10(-13)]$$

$$= \frac{11}{2} [1296 - 130] = 168$$

22) Solution:

$$(i) \frac{2a^2 + 5a + 3}{2a^2 + 7a + 6} \cdot \frac{a^2 + 6a + 5}{-5a^2 - 25a - 50}$$

$$\frac{2a^2 + 5a + 3}{2a^2 + 7a + 6} \cdot \frac{x - 5a^2 - 25a - 50}{a^2 + 6a + 5}$$

$$= \frac{2a^2 + 5a + 3}{2a^2 + 7a + 6} \cdot \frac{x - 5(a^2 + 7a + 10)}{a^2 + 6a + 5}$$

$$= \frac{(2a+3)(a+1)}{(2a+3)(a+5)} \cdot \frac{x - 5(a+5)(a+2)}{(a+5)(a+2)}$$

$$= -5$$

23) Solution:

$$2x^2 - 7x + 5 = 0$$

$$a = 2, b = -7, c = 5$$

$$\text{SOR: } d + \beta = \frac{-b}{a}$$

$$d + \beta = \frac{7}{2}$$

$$\text{POR: } \alpha\beta = \frac{c}{a}$$

$$\alpha\beta = \frac{5}{2}$$

$$(i) \frac{1}{\alpha} + \frac{1}{\beta}$$

$$= \frac{\alpha + \beta}{\alpha\beta}$$

$$= \frac{(\frac{7}{2})}{(\frac{5}{2})}$$

$$= \frac{7}{5}$$

$$= \frac{7}{2} \times \frac{2}{5} = \frac{7}{5}$$

$$(ii) \frac{1}{\alpha} + \frac{1}{\beta}$$

$$= \frac{\alpha^2 + \beta^2}{\alpha\beta}$$

$$= \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta}$$

$$= \frac{(\frac{7}{2})^2 - 2(\frac{5}{2})}{\frac{5}{2}}$$

$$= \frac{\frac{49}{4} - 5}{\frac{5}{2}}$$

$$= \frac{\frac{49}{4} - \frac{20}{4}}{\frac{5}{2}}$$

$$= \frac{\frac{29}{4}}{\frac{5}{2}}$$

$$= \frac{29}{10}$$

$$= \frac{29}{10}$$

$$= \frac{29}{10}$$

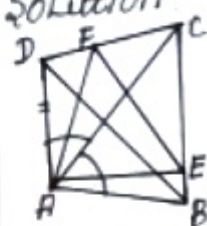
$$= \frac{29}{10}$$

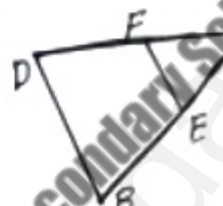
$$= \frac{29}{10}$$

34] Solution:
 In $\triangle ABD$ and $\triangle EFD$
 $\angle ABD = \angle EFD = 90^\circ$
 $\angle ADB = \angle EDF$
 $\therefore \triangle ABD \sim \triangle EFD$ [AA]
 $\frac{AB}{EF} = \frac{BD}{FD}$
 $\frac{a}{EF} = \frac{p}{FD}$
 $\boxed{\frac{EF}{a} = \frac{FD}{p}} \quad \text{--- (1)}$

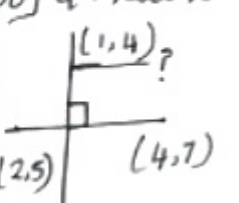
In $\triangle CDB$ and $\triangle EFB$
 $\angle CDB = \angle EFB$
 $\angle CBD = \angle EBF$
 $\triangle CDB \sim \triangle EFB$
 $\frac{CD}{EF} = \frac{DB}{FB}$
 $\frac{q}{EF} = \frac{p}{FB}$
 $\boxed{\frac{EF}{q} = \frac{FB}{p}} \quad \text{--- (2)}$

①+②
 $\frac{EF}{a} + \frac{EF}{q} = \frac{FD}{p} + \frac{FB}{p}$
 $\frac{EF}{a} + \frac{EF}{q} = \frac{FD+FB}{p}$
 $\frac{EF}{a} + \frac{EF}{q} = \frac{BD}{p}$
 $EF \left[\frac{1}{a} + \frac{1}{q} \right] = \frac{BD}{p}$
 $EF \left[\frac{a+q}{aq} \right] = 1$
 $EF \left[\frac{a+b}{ab} \right] = 1$
 $\boxed{EF = \frac{ab}{a+b}}$

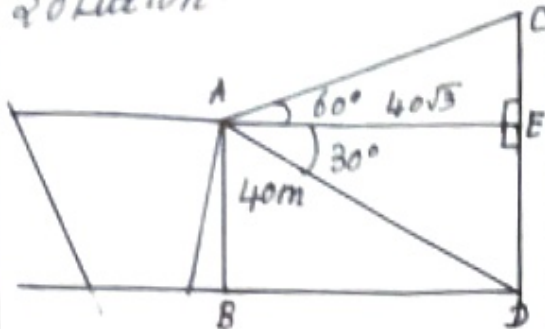
35] Solution:

 Proof
 In $\triangle ACD$
 AF is the bisector of $\angle DAC$
 $\frac{AD}{AC} = \frac{DF}{FC}$ (ABT) --- (1)
 In $\triangle ACB$, AE is the bisector of $\angle CAB$
 $\frac{AB}{AC} = \frac{BE}{EC}$ (ABT)
 $\frac{AD}{FC} = \frac{BE}{EC}$ [AB=AD] --- (2)
 From (1) and (2)
 $\frac{DF}{FC} = \frac{BE}{EC}$


 In $\triangle DCB$
 Taken Reciprocal
 $\frac{FC}{DF} = \frac{EC}{BE}$
 By con BPT
 $EF \parallel DB$

$= \frac{2}{2}$
 $\boxed{M_1 = 1}$
 Given line ①
 $M_1 \times M_2 = -1$
 $1 \times M_2 = -1$
 $M_2 = \frac{-1}{1}$
 $\boxed{M_2 = -1}$
 equation of Required straight line.
 $M = -1 \quad (1, 4)$
 $y - y_1 = m(x - x_1)$
 $y - 4 = -1(x - 1)$
 $y - 4 = -x + 1$
 $x + y - 4 - 1 = 0$
 $\boxed{x + y - 5 = 0}$

36] Solution:

 $(1, 4), (2, 5), (4, 7)$
 $m_1 = \frac{y_2 - y_1}{x_2 - x_1}$
 $= \frac{7 - 5}{4 - 2}$

37] Solution



Let A is the top of dock CD - Hill

In $\triangle AED$
 $\tan \theta = \frac{\text{opp}}{\text{adj}}$

$$\tan 30^\circ = \frac{40\text{m}}{AE}$$

$$\frac{1}{\sqrt{3}} = \frac{40}{AE}$$

$$\boxed{AE = 40\sqrt{3}\text{m}}$$

In $\triangle AEC$

$$\tan 60^\circ = \frac{CE}{AE}$$

$$\tan 60^\circ = \frac{CE}{AE}$$

$$\sqrt{3} = \frac{CE}{40\sqrt{3}}$$

$$40\sqrt{3} \times \sqrt{3} = CE$$

$$40 \times 3 = CE$$

$$\boxed{CE = 120\text{m}}$$

Ht of hill

$$CD = CE + ED$$

$$= 120 + 40$$

$$\boxed{= 160\text{m}}$$

Distance between ship and hill =

$$AE = 40\sqrt{3}$$

$$= 40 \times 1.732$$

$$= 69.280\text{m}$$

39] Solution:

Hemisphere

$$r = 6\text{cm}$$

$$V = \frac{2}{3} \pi r^3$$

$$= \frac{2}{3} \pi \times 6 \times 6 \times 6$$

$$= 144\pi\text{cm}^3$$

cone :

$$h = 12\text{cm}$$

$$r = 6\text{cm}$$

$$V_2 = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \pi \times 6 \times 6 \times 12$$

$$= 144\pi\text{cm}^3$$

Volume of water displaced

$$= V_1 + V_2$$

$$= 144\pi + 144\pi$$

$$= 288\pi$$

$$= 288 \times \frac{22}{7}$$

$$= \frac{6336}{7}$$

$$= 905.142\text{cm}^3$$

$$\boxed{= 905.14\text{cm}^3}$$

38] Solution

Frustum

$$h = 8\text{cm} \quad R = 12\text{cm}$$

$$r = 6\text{cm}$$

$$L = \sqrt{(R-r)^2 + h^2}$$

$$= \sqrt{(12-6)^2 + 8^2}$$

$$= \sqrt{6^2 + 8^2}$$

$$= \sqrt{36 + 64}$$

$$= \sqrt{100} = 10\text{cm}$$

CSA of Frustum:

$$\pi (R+r) L$$

$$= \pi (12+6) 10$$

$$= \pi (18) 10$$

$$= \boxed{180\pi\text{sq cm}}$$

Cylinder

$$h = 12\text{cm}$$

$$r = 6\text{cm}$$

$$\left. \begin{array}{l} \text{CSA of} \\ \text{Cylinder} \end{array} \right\} = 2\pi r h$$

$$= 2 \times \pi \times 6 \times 12$$

$$= 2 \times 72\pi$$

$$= \boxed{144\pi\text{sq cm}}$$

SA of Funnd

SA of frustum

CSA of Cylinder

$$= 180\pi + 144\pi$$

$$= 324\pi$$

$$= 324 \times \frac{22}{7}$$

$$= \frac{7128}{7}$$

$$= 1018.285\ldots$$

$$\boxed{= 1018.29\text{sq cm}}$$

40] Solution:

310, 290, 320, 280, 300, 290, 320, 310, 280

x	$d = x - \bar{x}$	d^2
310	$310 - 300 = 10$	100
290	$290 - 300 = -10$	100
320	$320 - 300 = 20$	400
280	$280 - 300 = -20$	400
300	$300 - 300 = 0$	0
290	$290 - 300 = -10$	100
320	$320 - 300 = 20$	400
310	$310 - 300 = 10$	100
280	$280 - 300 = -20$	400
$\Sigma x = 2700$	$\Sigma d = 0$	$\Sigma d^2 = 2000$

Mean

$$\bar{x} = \frac{\Sigma x}{n}$$

$$= \frac{2700}{9}$$

$$= 300$$

Variance

$$\sigma^2 = \frac{\Sigma d^2}{n}$$

$$= \frac{2000}{9}$$

$$\sigma^2 = 222.2222$$

Standard deviation $\sigma = \sqrt{\frac{\Sigma d^2}{n}}$

$$= \sqrt{222.2222}$$

1 4 90

	2, 22, 22, 22, 22
$\times 2$	4, 44, 44, 44, 44
$\times 24$	48, 528, 528, 528, 528
$\times 96$	192, 2112, 2112, 2112, 2112
$\times 88$	176, 1936, 1936, 1936, 1936
$\times 289$	576, 6352, 6352, 6352, 6352
$\times 2601$	17424, 19008, 19008, 19008, 19008
$\times 2981$	89544, 98832, 98832, 98832, 98832
	21 22

Standard deviation $\sigma = \sqrt{\frac{\Sigma d^2}{n}}$

$$= \sqrt{222.2222}$$

42] Solution:

$$A = (1+m^2)$$

$$B = 2mc$$

$$C = c^2 - a^2$$

Equal roots $\Delta = 0$
~~Disc~~ $\Delta = 0$

$$B^2 - 4AC = 0$$

$$(2mc)^2 - 4(1+m^2)(c^2 - a^2) = 0$$

$$4m^2c^2 - 4[c^2 - a^2 + m^2c^2 - m^2a^2] = 0$$

$$4m^2c^2 - 4c^2 + 4a^2 - 4m^2c^2 + 4m^2a^2 = 0$$

$$-4c^2 = -4a^2 - 4m^2a^2$$

$$4c^2 = 4a^2(1+m^2)$$

$$c^2 = a^2(1+m^2)$$

$$43] P(A \cap B) = \frac{1}{6}, P(B \cap C) = \frac{1}{4}, P(A \cap C) = \frac{1}{8}$$

$$P(A \cup B \cup C) = \frac{9}{10}, P(A \cap B \cap C) = \frac{1}{15}$$

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$$

$$\frac{9}{10} = P(A) + P(B) + P(C) - \frac{1}{6} - \frac{1}{4} - \frac{1}{8} + \frac{1}{15}$$

$$\frac{9}{10} = P(A) + P(B) + P(C) - \left(\frac{1}{6} + \frac{1}{4} + \frac{1}{8} \right) + \frac{1}{15}$$

$$\frac{9}{10} = P(A) + P(B) + P(C) - \left(\frac{4+6+3}{24} \right) + \frac{1}{15}$$

$$\frac{9}{10} = P(A) + P(B) + P(C) - \frac{13}{24} + \frac{1}{15}$$

$$\frac{9}{10} + \frac{13}{24} - \frac{1}{15} = P(A) + P(B) + P(C)$$

$$\frac{108 + 65 - 8}{120} = P(A) + P(B) + P(C)$$

$$\frac{165}{120} = P(A) + P(B) + P(C)$$

$$\frac{11}{8} = P(A) + P(B) + P(C) \text{ --- (1)}$$

Given that

$$P(B) = 2P(A)$$

$$P(C) = 3P(A)$$

Substitute equation ①

$$P(A) + 2P(A) + 3P(A) = \frac{11}{8}$$

$$6P(A) = \frac{11}{8}$$

$$P(A) = \frac{11}{8} \times \frac{1}{6}$$

$$P(A) = \frac{11}{48}$$

$$P(B) = 2P(A)$$

$$= 2 \times \frac{11}{48}$$

$$P(B) = \frac{11}{24}$$

$$P(C) = 3P(A)$$

$$= 3 \times \frac{11}{48}$$

$$P(C) = \frac{11}{16}$$

Answer:

$$P(A) = \frac{11}{48}, P(B) = \frac{11}{24}, P(C) = \frac{11}{16}$$

(4) $(1+m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has
equal roots.

$$ax^2 + bx + c = 0$$

here $a = 1+m^2$ $b = 2mc$ $c = c^2 - a^2$

For equal roots $\Delta = b^2 - 4ac = 0$
 $b^2 - 4ac = 0$

$$(2mc)^2 - 4(1+m^2)(c^2 - a^2) = 0$$

$$4m^2c^2 - 4[c^2 - a^2 + m^2c^2 - m^2a^2] = 0$$

$$4m^2c^2 - 4c^2 + 4a^2 - 4m^2c^2 + 4m^2a^2 = 0$$

$$-4c^2 + 4a^2 + 4m^2a^2 = 0$$

$\div 4$
 $-c^2 + a^2 + m^2a^2 = 0$

$$c^2 = a^2 + a^2m^2$$

$$c^2 = a^2(1+m^2)$$

hence proved

_____ x _____ x _____