Solution class X

Section A

1. (i) (c) $x = \{1, 2, 3, 4\}$

(ii) (a) $x = 0$ or $x = 5$

(iii) (c) 1

(iv) (c) A is true but R is false (A and B are matrices)

(v) (d) $k = 2$

(vi) (c) $x = 1, y = 2.5$

(vii) (a) $7/8$

(viii) (b) ₹ 5,880

(ix) (d) ₹ 7,500

(x) (b) 125°

(xi) (a) $48\ cm^2$

(xii) (b) Both A and R are true and R is not the correct explanation of A.

(xiii) (a) $2:3$

(xiv) (c) 5.6

(xv) (b) 30°

2. (i) $(x-2)$ is a factor

$2(2)^3 + a(2)^2 + 2b - 14 = 0$

$16 + 4a + 2b - 14 = 0$

$4a + 2b + 2 = 0$

$2a + b = -1$ —— (1)

$(x-2)$ leaves a remainder 52

$2(3)^3 + a(3)^2 + 3b - 14 = 52$

$54 + 9a + 3b - 14 = 52$

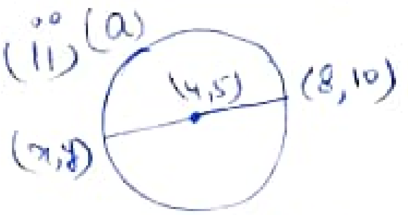
$9a + 3b = 12$

$3a + b = 4$ —— (2)

solving (1) & (2)

$a = 5, b = -11$

(ii) (a)



$\frac{x+8}{2} = 4$

$x = 0$

$\frac{y+10}{2} = 5$

$y = 0$

co-ordinates $(0,0)$

(b) $y = mx + c$

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

$3y = 2x + 12$

$2x - 3y + 12 = 0$

Co-ordinates $y = 0$, $2x + 12 = 0$

$x = -6$

$(-6, 0)$

(iii) (a) $\angle DCA = 30^\circ$

(b) $\angle DAC = 30^\circ$

(c) $\angle DCI = 62.5^\circ$

(d) $\angle AIC = 120^\circ$

3 (i) $ar^7 = \frac{5}{64}$

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

$r^5 = \frac{1}{32}$

$r = \frac{1}{2}$, $a = 10$

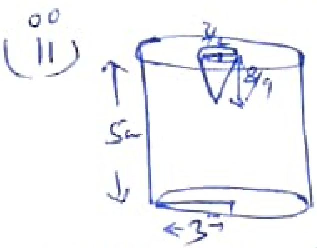
Sum of 10 terms

$$S_{10} = \frac{10\left[1-\left(\frac{1}{2}\right)^{10}\right]}{1-\frac{1}{2}}$$

$$= 20\left(1-\frac{1}{2^{10}}\right)$$

$$= \frac{20 \times 1023}{1024} = \frac{5115}{256}$$

(ii)



Volume of cylinder $= \pi r^2 h$

$= \pi \times 3 \times 3 \times 5$

$= 45\pi$

Volume of cone $= \frac{1}{3}\pi R^2 H$

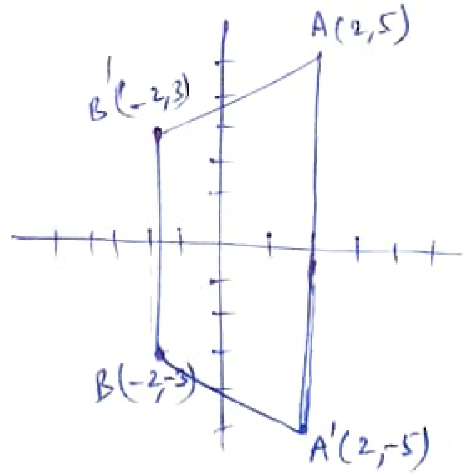
$= \frac{1}{3}\pi \times \frac{3}{2} \times \frac{3}{2} \times \frac{8}{9}$

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

Ratio of volume $= \dfrac{45\pi - \frac{2}{3}\pi}{\frac{2}{3}\pi}$

$= 133 : 2$

(iii)



$A'(2, -5)$

$B'(-2, 3)$

It is a trapezium $AA'BB'$

Area of trap. $= \frac{1}{2}(10+6) \times 4$

$= \frac{1}{2} \times 16 \times 4$

$= 32$ sq. units

Section B

Q4 (i) Let the number of shares be x

$$720 = \frac{12}{100} \times 25 \times x$$

$$\boxed{x = 240}$$

Amount invested $= 240 \times 36$
$= ₹8,640$

Percentage return $= \dfrac{720 \times 100}{8640}$
$= 8.33\%$

(ii) $-\frac{1}{5} \leq \frac{3x}{10} + 1 < \frac{2}{5}$, $x \in R$

$$-\frac{1}{5} - 1 \leq \frac{3x}{10} < \frac{2}{5} - 1$$

$$-\frac{6}{5} \times \frac{10}{3} \leq x < -\frac{3}{5} \times \frac{10}{3}$$

$$-4 \leq x < -2, \quad x \in R$$

(iii) $\dfrac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \dfrac{1 + \cos A}{\sin A}$

LHS.

$$\frac{\cot A + \operatorname{cosec} A - (\operatorname{cosec}^2 A - \cot^2 A)}{\cot A - \operatorname{cosec} A + 1}$$

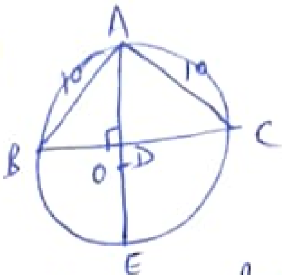
$$\frac{(\cot A + \operatorname{cosec} A) - (\operatorname{cosec} A - \cot A)(\operatorname{cosec} A + \cot A)}{(\cot A - \operatorname{cosec} A + 1)}$$

$$\frac{(\cot A + \operatorname{cosec} A)\cancel{[1 - \operatorname{cosec} A + \cot A]}}{\cancel{(1 - \operatorname{cosec} A + \cot A)}}$$

$$\frac{\cos A}{\sin A} + \frac{1}{\sin A}$$

$$\frac{1 + \cos A}{\sin A} = \text{RHS}.$$

Q5 (i)



ΔBAC is isosceles
$\Delta ABD \cong \Delta ACD$ (RHS)
D is the mid. pt of BC
$\Rightarrow$ AD is diameter. Let O be the centre

$AD^2 = 10^2 - 8^2 = 36$ sq cm
$\Rightarrow AD = 6$ cm

$AD \times DE = BD \times DC$
$6 \times DE = 8 \times 6$
$DE = \frac{32}{3}$ cm $= 10.6$ cm

Also $AE = AD + DE$
$= 6 + 10.6$ cm
$= 16.6$ cm

$\therefore$ Radius $= \frac{16.6}{2} = 8.3$ cm

(ii) $I = \dfrac{P\, n(n+1)\, r}{2 \times 12 \times 100}$

$$= \frac{P \times 24 \times 25 \times 10}{2 \times 12 \times 100}$$

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

$$MV = 24P + \frac{5}{2}P$$

$$7950 = \frac{48 + 5}{2}P$$

$$P = \frac{7950 \times 2}{53}$$

$= ₹ 300$

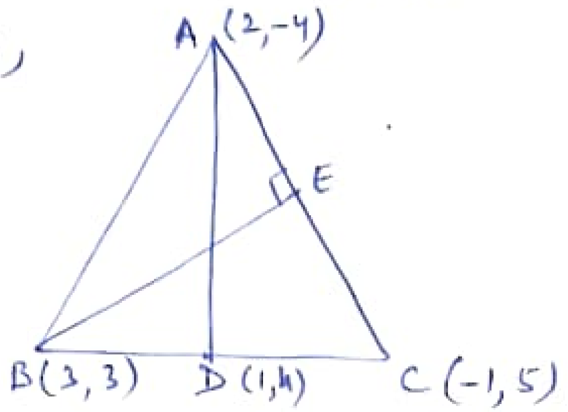
(vii)

Marks	f	x	fx
0-8	5	4	20
8-16	3	12	36
16-24	10	20	200
24-32	16	28	448
32-40	4	36	144
40-48	2	44	88
	40		936

Mean, $\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{936}{40}$

$= 23.4$

Q6 (i)



(a) D is mid-pt of BC

co-ordinates of D (1, 4)

Eq^n of median AD

$y+4 = \frac{8}{-2}(x-2)$

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

$y+4 = -4x+8$

$4x+y-4=0$

Length of AD $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{1^2+8^2} = \sqrt{65}$ units

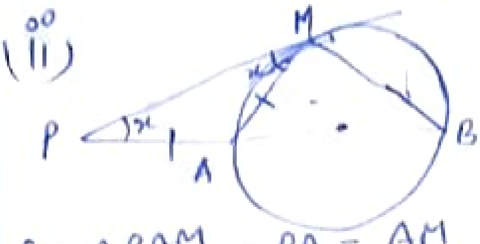
(b) slope of AC, $\frac{9}{-3} = -3$

slope of BE $= \frac{1}{3}$

Eq^n of BE, $y-3 = \frac{1}{3}(x-3)$

$x-3y+6=0$

(ii)



In ΔPAM, $PA = AM$

$\Rightarrow \angle APM = \angle AMP = x$ —— (1)

(angles opp. to equal sides)

Also $\angle ABM = \angle AMP = x$ —— (2)

(angles in alternate segment)

From (1) & (2)

$\angle APM = \angle ABM = x$

$\Rightarrow MB = MP$

$\therefore \Delta PMB$ is isosceles.

$\because$ chord AB is produced and tangent at point M intersect each other externally at P.

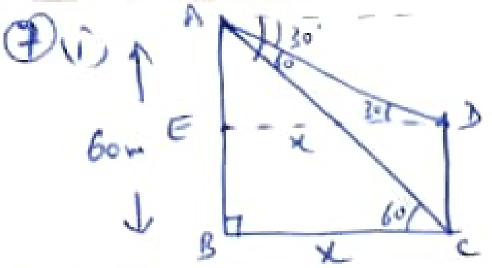
$\therefore PA \times PB = MP^2$

or $PA \times PB = MB^2$

(iii)

Item	Rate	Quantity	Rate of MP & Discount	Taxable Amount	GST	Total amount
Fan	₹1540	5	$\frac{7700\times10}{100} = 770$	$5\times154\left(1-\frac{10}{100}\right) = ₹6930$	18%	$6930\left(1+\frac{18}{100}\right) = 8177.40$
Tubes	₹50 each	1 dz	$\frac{600\times10}{100} = ₹60$	$50\times12\left(1-\frac{10}{100}\right) = ₹540$	12%	$540\left(1+\frac{12}{100}\right) = ₹604.80$
LED bulbs	₹180/dz	2 dz	NIL	$180\times2 = ₹360$	5%	$360\left(1+\frac{5}{100}\right) = ₹378$

(7) (i)



In Δ ABC

$\tan 60° = \frac{60}{x}$

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

$x = \frac{60\sqrt{3}}{3} = 20\sqrt{3}$ m (Horizontal dist between AB & CD)

In Δ AED

$\tan 30° = \frac{AE}{x} = \frac{AE}{20\sqrt{3}}$

$\frac{1}{\cancel{\sqrt{3}}} = \frac{AE}{20\cancel{\sqrt{3}}}$

AE = 20m

CD = 60m − 20m = 40m (Height of the lamp post)

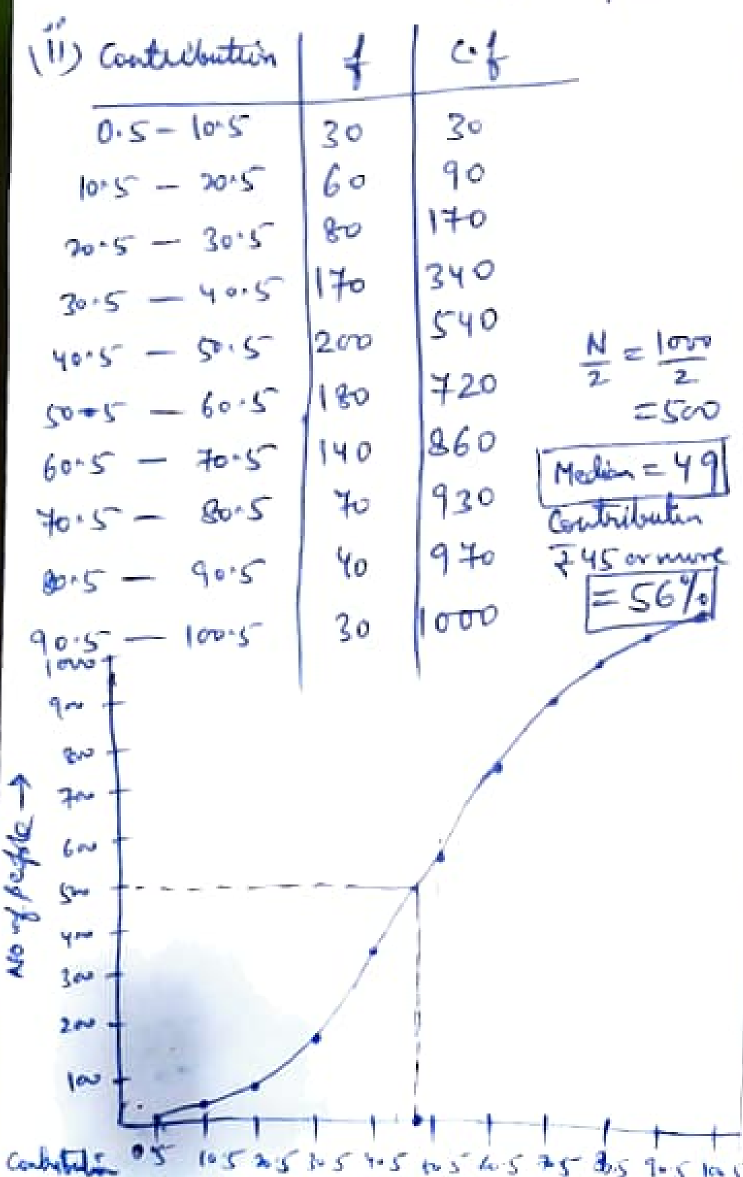
(ii)

Contribution	f	c.f
0.5 − 10.5	30	30
10.5 − 20.5	60	90
20.5 − 30.5	80	170
30.5 − 40.5	170	340
40.5 − 50.5	200	540
50.5 − 60.5	180	720
60.5 − 70.5	140	860
70.5 − 80.5	70	930
80.5 − 90.5	40	970
90.5 − 100.5	30	1000

$\frac{N}{2} = \frac{1000}{2} = 500$

$\boxed{\text{Median} = 49}$

Contribution ₹45 or more $\boxed{= 56\%}$



(8) (i) (a) APN, ANP, PNA, PAN, NAP, NPA

No. of combinations = 6

(b) $\frac{1}{6}$

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

(ii) $\frac{x}{a} = \frac{y}{b} = \frac{z}{c} = k$

$x = ak,\ y = bk,\ z = ck$

LHS:

$\frac{ax-by}{(a+b)(x-y)} + \frac{by-cz}{(b+c)(y-z)} + \frac{cz-ax}{(c+a)(z-x)}$

$\frac{a^2k-b^2k}{(a+b)(a-b)k} + \frac{(b^2-c^2)k}{(b+c)(b-c)k} + \frac{(c^2-a^2)k}{(c+a)(c-a)k}$

$= 1+1+1 = 3 =$ RHS

(iii) $V_{cone} = 1232 m^3$

$\frac{1}{3}\pi r^2 h = 1232$ —— (1)

Area of base = 154

$\pi r^2 = 154$ —— (2)

(1) ÷ (2)

$\frac{1}{3} \times 154 \times h = 1232$

$h = \frac{1232 \times 3}{154} = 8 \times 3$

$\boxed{h = 24 m}$

from (2)

$r^2 = \frac{154 \times 7}{22} = 7 \times 7$

$\boxed{r = 7m}$

$l = \sqrt{r^2+h^2} = \sqrt{49+576} = 25m$

$\pi r l$ = Area of canvas = $l_1 \times b$

$\frac{22}{\cancel{7}} \times \cancel{7} \times 25 = l_1 \times 2$

$\frac{22 \times 25}{2} = l_1$

$11 \times 25 = \boxed{275m = l_1}$

(9) (i) $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$

(a) $A - B = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$

(b) $A^2 - AB + 2B$

$\begin{bmatrix} 18 & 7 \\ 14 & 11 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix} + \begin{bmatrix} 2 & 0 \\ -4 & 2 \end{bmatrix}$

$\begin{bmatrix} 18 & 6 \\ 14 & 10 \end{bmatrix}$

(ii) $a + d + a + 6d = 30$

$2a + 7d = 30$ —— (1)

$a + 14d = 2(a + 7d) - 1$

$a + \cancel{14d} = 2a + \cancel{14d} - 1$

In (1) $\boxed{a = 1}$

$2 + 7d = 30$

$7d = 28$

$\boxed{d = 4}$

$1, 5, 9, 13, ----$

(iii) (i) Draw a triangle with given data

(ii) Draw bisector of $\angle ABC$,

(iii) Draw perpendicular bisector of AB.

(iv) Both intersecting at point P.

(v) P is equidistant from AB & BC and also from points A & B.

Q10 (i) $2x^2 + px - 15 = 0$

$2(-5)^2 - 5p - 15 = 0$

$50 - 15 = 5p$

$\frac{35}{5} = p = 7$

$p(x^2 + x) + k = 0$ has equal roots

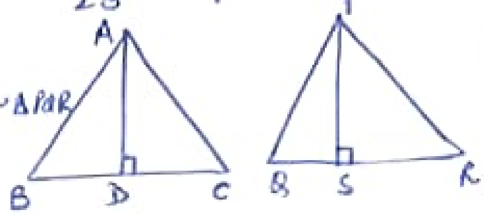
i.e. $b^2 - 4ac = 0$

$p^2 - 4 \times p \times k = 0$

$49 - 28k = 0$

$k = \frac{49}{28} = \frac{7}{4}$

(ii) Given: $\Delta ABC \sim \Delta PQR$



T.P.

$\frac{AB}{PQ} = \frac{AD}{PS}$

Proof: In ΔABD & ΔPQS

$\angle B = \angle Q$ ($\because \Delta ABC \sim \Delta PQR$)

and $\angle ADB = \angle PSQ = 90°$

$\Rightarrow \Delta ABD \sim \Delta PQS$ (AA)

$\Rightarrow \frac{AB}{PQ} = \frac{AD}{PS}$ (by similarity)

H.P.

(iii) Let the usual speed be x km/h

Increased speed = $(x + 250)$ km/h

As per the condition

$\frac{1500}{x} - \frac{1500}{x + 250} = \frac{30}{60} = \frac{1}{2}$

$\frac{\cancel{x} + 250 - \cancel{x}}{x^2 + 250x} = \frac{1}{3000}$

$x^2 + 250x - 750000 = 0$

$x^2 + 1000x - 750x - 750000 = 0$

$x(x + 1000) - 750(x + 1000) = 0$

$(x - 750)(x + 1000) = 0$

$x = 750$

$\therefore$ Usual speed of the plane is 750 km/hr.