Class-X

Mathematics Basic (241)

Section A

1. b) $2^4 \times 7^3$

2. d) Mode = 3 Median − 2 Mean

3. a) $60°$

4. c) 5.5

5. d) $\frac{3}{2}$, -1

6. a) 4

7. b) 5

8. b) $x + y = 19$

Rough

Rough

$\frac{K}{3} = \frac{7}{4}$

9. a) 0

10. c) $\frac{77}{2}\ cm^2$

11. c) 115°

12. a) $\frac{1}{26}$

13. d) 4

14. d) -2

15. d) $\frac{1}{3}$

16. a) $K = \frac{3}{2}$

17. d) -1

18. c) 360

19 c) Assertion (A) is true, but Reason (R) is false

20 b) Both (A) and (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

Section - B

21 a) divisible by 6.
favourable outcomes = 5, Total outcomes ⇒ 30
⇒ No. divisible by 6 are, 6, 12, 18, 24, 30

$P(E) \Rightarrow \frac{5}{30} \Rightarrow \frac{1}{6}$

$P(E) \Rightarrow \frac{1}{6}$ ans

Rough

21. b) greater than 25

Total outcomes $\Rightarrow$ 30

favourable outcomes $\Rightarrow$ 26, 27, 28, 29, 30 $\Rightarrow$

$P(E) \Rightarrow \frac{5}{30} = \frac{1}{6}$

ans $\Rightarrow \frac{1}{6}$

22. a) $5x^2 - 10x + K = 0$

For real and equal roots

$D = 0$

$D = b^2 - 4ac$

$b \Rightarrow -10$, $a \Rightarrow 5$, $c = K$

$0 \Rightarrow (-10)^2 - 4 \times 5 \times K$

$0 \Rightarrow 100 - 20K$

$100 \Rightarrow 20K$

P.T.O.

$K = \frac{100}{20}$

$[K = 5]$ ans

23. $5 \operatorname{cosec}^2 45^\circ - 3 \sin^2 90^\circ + 5 \cos 0^\circ$

$\operatorname{cosec} 45^\circ \Rightarrow \sqrt{2}$, $\sin 90^\circ \Rightarrow 1$

$\cos 0^\circ \Rightarrow 1$

$5(\sqrt{2})^2 - 3 \times (1)^2 + 5 \times (1)$

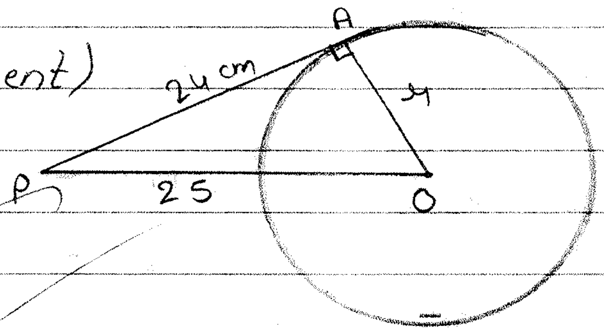
$\Rightarrow 5 \times 2 - 3 + 5$

$, 10 - 3 + 5$

$\Rightarrow 12$ ans

24. Given : $C(O, r)$, $PA = 24$ (Tangent)

$PO = 25$ cm , OA = radius



To find : OA -

P.T.O.

Solution :- $\angle OAP = 90^\circ$ [radius is alway $\perp$ to point of contact on tangent]

ΔAOP is a right angled triangle

$OP^2 = PA^2 + OA^2$ [Pythagoras theorem]

$\Rightarrow (25)^2 \Rightarrow (24)^2 + OA^2$

$625 \Rightarrow 576 + r^2$

$625 - 576 \Rightarrow r^2$

$49 \Rightarrow r^2$

$r = 7$ cm

Ans. Radius $\Rightarrow$ 7 cm

25. b)

$x^2 + 4x - 12$

$\Rightarrow x^2 + 6x - 2x - 12$

$\Rightarrow x(x+6) - 2(x+6)$

$(x-2)(x+6)$

$x - 2 = 0, \quad x + 6 = 0$

$x = 2, \quad x = -6$

Zeroes $\Rightarrow 2, -6$

Section - C

26 Let, $7+4\sqrt{5}$ be a rational number.

$7+4\sqrt{5} = \frac{a}{b}$, $b \neq 0$, a & b are integers (co-prime)

$\therefore \quad 7+4\sqrt{5} = \frac{a}{b}$

$4\sqrt{5} \Rightarrow \frac{a}{b} - 7$

$4\sqrt{5} \Rightarrow \frac{a-7b}{b}$

$\sqrt{5} \Rightarrow \frac{a-7b}{4b}$

Since, a and b are integers. $\frac{a-7b}{4b}$ is rational but we Know that $\sqrt{5}$ is an irrational number.
So, Contradicts by facts, Hence, $7+4\sqrt{5}$ is an irrational number.

27.

$$\frac{1}{x} - \frac{1}{x-2} = 3$$

$$\frac{x-2-x}{x(x-2)} = 3$$

$$\frac{-2}{x^2-2x} \Rightarrow = 3$$

$$-2 \Rightarrow 3x^2 - 6x$$

$$\Rightarrow 3x^2 - 6x + 2 = 0$$

$$D = b^2 - 4ac$$

$$\Rightarrow (-6)^2 - 4\cancel{ac} \times 3 \times 2$$

$$36 - 4 \times 6$$

$$36 - 24$$

$$\Rightarrow 12$$

roots $\Rightarrow \dfrac{-b \pm \sqrt{b^2-4ac}}{2a} \Rightarrow \dfrac{6 + \sqrt{12}}{2\cancel{a}\times 3} \Rightarrow \dfrac{6+2\sqrt{3}}{6} = \cancel{2\sqrt{3}}$

$$\Rightarrow \frac{\cancel{2}\sqrt{3}(1+\sqrt{3})}{\cancel{6}\ 3} \Rightarrow \frac{3+\sqrt{3}}{3}$$

$\Rightarrow$ root $= \dfrac{-(-6) - \sqrt{12}}{2\times 3}$

$$\Rightarrow \frac{6-2\sqrt{3}}{6}$$

$$\Rightarrow \frac{\cancel{2}(3-\sqrt{3})}{\cancel{6}\ 3}$$

$$= \frac{3-\sqrt{3}}{3}$$

Ans $\Rightarrow$ $\boxed{\text{roots} \Rightarrow \dfrac{3+\sqrt{3}}{3}, \dfrac{3-\sqrt{3}}{3}}$

~~28.~~ ~~a)~~ $\cancel{\dfrac{\cot A - \cos A}{\cot A + \cos A} = \dfrac{\cos^2 A}{(1 + \sin A)^2}}$

~~LHS~~ $\Rightarrow$ $\cancel{\dfrac{\cot A - \cos A}{\cot A + \cos A} \times \cot}$

$\Rightarrow$ $\cancel{\dfrac{\cos A}{\sin A} - \cos A}$

28. b) $(\sec\theta + \tan\theta)(1 - \sin\theta) = \cos\theta$

LS $\Rightarrow$ $(\sec\theta + \tan\theta)(1 - \sin\theta)$

$\Rightarrow$ $\left(\dfrac{1}{\cos\theta} + \dfrac{\sin\theta}{\cos\theta}\right)(1 - \sin\theta)$

$\Rightarrow$ $\left(\dfrac{1 + \sin\theta}{\cos\theta}\right) \times (1 - \sin\theta)$

PTO

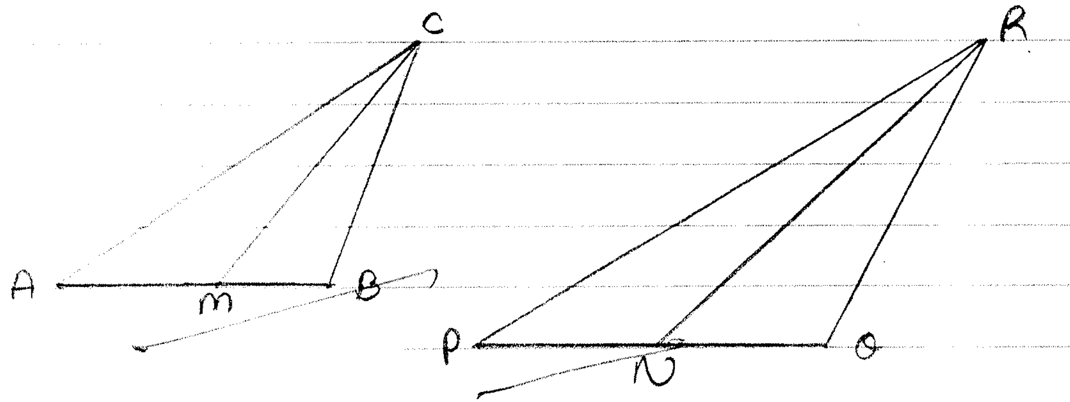
$\Rightarrow \dfrac{1 - \sin^2\theta}{\cos\theta}$

$\Rightarrow \dfrac{\cos^{\cancel{2}}\theta}{\cancel{\cos\theta}}$ $\left[\sin^2\theta + \cos^2\theta = 1\right]$

$\Rightarrow \cos\theta$

LHS = RHS , $\cos\theta = \cos\theta$

29. b)



Given :- CM and RN are medians respectively of ΔABC and ΔPQR. $\Delta ABC \sim \Delta PQR$

To prove : $\Delta AMC \sim \Delta PNR$

proof : $\Delta ABC \sim \Delta PQR$ (given)

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

$\angle A = \angle P$, $\angle B = \angle Q$, $\angle C = \angle R$

$\therefore$ $\dfrac{AB}{PQ} = \dfrac{2AM}{2PN}$ [AM and RN are medians]

$\therefore$ In ΔAMC and ΔPNR

$\dfrac{AC}{PR} = \dfrac{AM}{PN}$ [each equal to $\dfrac{AB}{PQ}$]

$\angle A = \angle P$ (given)

$\Delta AMC \sim \Delta PNR$ (By SAS similarity)

Hp

~~30~~.

30.

Family size	No. of families	C.F.
1 – 3	7	7
3 – 5	8	15
5 – 7	2	17
7 – 9	2	19
9 – 11	1	20

median class

$\frac{N}{2} \Rightarrow \frac{20}{2} \Rightarrow 10$

median $\Rightarrow l + \left(\frac{N/2 - cf}{f}\right) \times h$

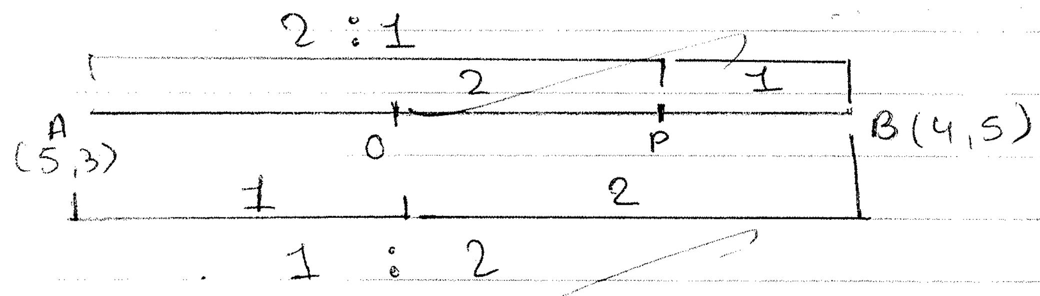
$\Rightarrow 3 + \left(\frac{10-7}{8}\right) \times 2$

$3 + \frac{3}{\cancel{8}4} \times \cancel{2}$

$\Rightarrow 3 + \frac{3}{4} \Rightarrow \frac{15}{4}$

$\Rightarrow 3.75$

31.



A ⇒ 5,3 B ⇒ 4,5

- At O ratio ⇒ 1 : 2

$\therefore$ O(x, y)

$$x = \frac{m x_2 + n x_1}{m+n}$$

$$\Rightarrow \quad x \Rightarrow \frac{1 \times 4 + 2 \times 5}{1+2}$$

$$x \Rightarrow \frac{4+10}{3} \Rightarrow \frac{14}{3}$$

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

$$\therefore \quad O(x, y) \Rightarrow O\left(\frac{14}{3}, \frac{11}{3}\right)$$

- At P ratio ⇒ 2 : 1

P(x, y) ⇒

PTO

$x = \frac{2 \times 4 + 1 \times 5}{2+1}$

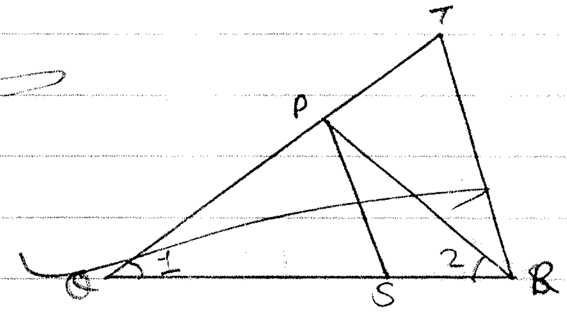
$x \Rightarrow \frac{8+5}{3} \Rightarrow \frac{13}{3}$

$y = \frac{2 \times 5 + 1 \times 3}{3} = \frac{13}{3}$

$\therefore P(x, y) \Rightarrow P\left(\frac{13}{3}, \frac{13}{3}\right)$ = Ans

Section - D

32. b) given : $\frac{QR}{QS} = \frac{QT}{PR}$, $\angle 1 = \angle 2$



To prove : $\Delta PQS \sim \Delta TQR$

proof : In ΔPQR

$\angle 1 = \angle 2$

$PQ = PR$ [sides opposite to equal angles are equal]

PTO

In ΔPQS and ΔTQR

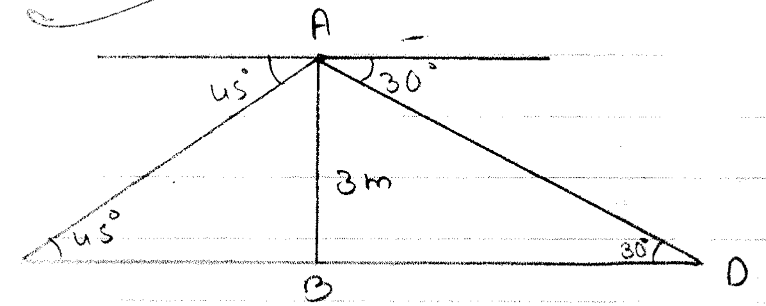
$\angle Q = \angle Q$ [common]

$\frac{QR}{QS} = \frac{QT}{PR}$ (given)

& $\frac{QR}{QS} = \frac{QT}{PQ}$ [$PR = PQ$]

$\therefore$ $\Delta PQS \sim \Delta TQR$ [By SAS similarity]

32. a)



Given, AB = height of bridge = 3m

$\therefore$ In ΔABC

$\tan 45° = \frac{AB}{BC}$

PTO

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

$BC = 3\,m$

In ΔABD,

$\tan 30^\circ = \frac{AB}{BD}$

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

$BD = 3\sqrt{3}\,m$

$\therefore$ width of river $= BC + BD = CD$

$3 + 3\sqrt{3}$

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

$= 3 \times 2.73$

$= 8.19\,m$

34. First term = a, common difference = d

$a_4 + a_8 \Rightarrow 24$

$a_6 + a_{10} \Rightarrow 44$

$\Rightarrow a + 3d + a + 7d \Rightarrow 24$

$2a + 10d = 24$

$a + 5d = 12$

$a + 5d + a + 9d \Rightarrow 44$

$2a + 14d \Rightarrow 44$

$a + 7d \Rightarrow 22$

From ① and ②

$$\begin{aligned} \cancel{a} + 5d &= 12 \\ -\cancel{a} - 7d &= -22 \\ \hline 2d &= 10 \end{aligned}$$

$\boxed{d = 5}$

put (d) in eq (1)

$a + 5d = 12$

$a + 5 \times 5 = 12$

$a + 25 = 12$

$\boxed{a = -13}$

AP is ⇒ $-13, -8, -3, 2, \ldots$

$S_{25} \Rightarrow \frac{n}{2}(2a + (n-1)d]$

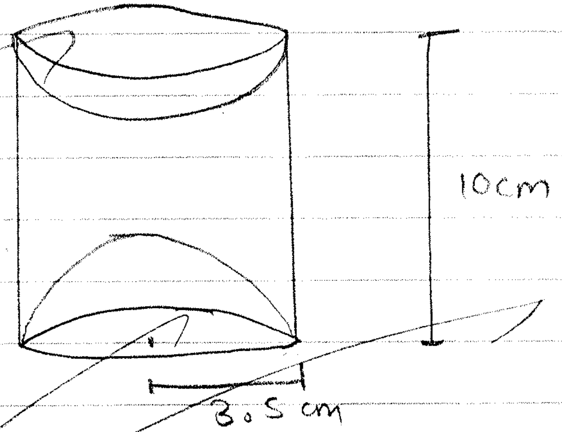
$S_{25} \Rightarrow \frac{25}{2}\left(2 \times -13 + (24) \times 5\right)$

$\frac{25}{2} \times \left(-26 + 120\right)$

$\frac{25}{\cancel{2}} \times \cancel{94}^{47}$

⇒ 1175

35. height of cylinder ⇒ 10 cm
radius ⇒ 3.5 cm ⇒ $\frac{7}{2}$ cm



TSA of article ⇒
CSA of cylinder +
2 × CSA of hemisphere

⇒ $2\pi rh + 2 \times 2\pi r^2$

⇒ $2\pi r[h + 2r]$

⇒ $\cancel{2} \times \frac{22}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \left(10 + \cancel{2} \times \frac{7}{\cancel{2}}\right)$

22×17

⇒ $374\ cm^2$

Section - E

36. i) B is midpoint of AC

$\therefore AB = BC$

$AC = 2AB$

$AC = 2 \times 20$

$\Rightarrow AC = 40m$

ii) shortest distance of road from the village = radius.

$OA^2 = AB^2 + OB^2$

$\Rightarrow (25)^2 = (20)^2 + OB^2$

$625 - 400 = OB^2$

$225 = OB^2$

$[OB = 15\ m]$

$\therefore$ Shortest distance $= 15m$

iii) a) Circumference $\Rightarrow 2\pi r$

$\Rightarrow 2 \times \frac{22}{7} \times 15$

$\Rightarrow \frac{44 \times 15}{7}$

$\frac{660}{7}$ cm

$\Rightarrow 94\frac{2}{7}$ cm or 94.183 cm

37. i) area of square $\Rightarrow$ side^2

$\Rightarrow 8 \times 8 \Rightarrow 64\ cm^2$

ii) length of diagonal $\Rightarrow \sqrt{2}a$

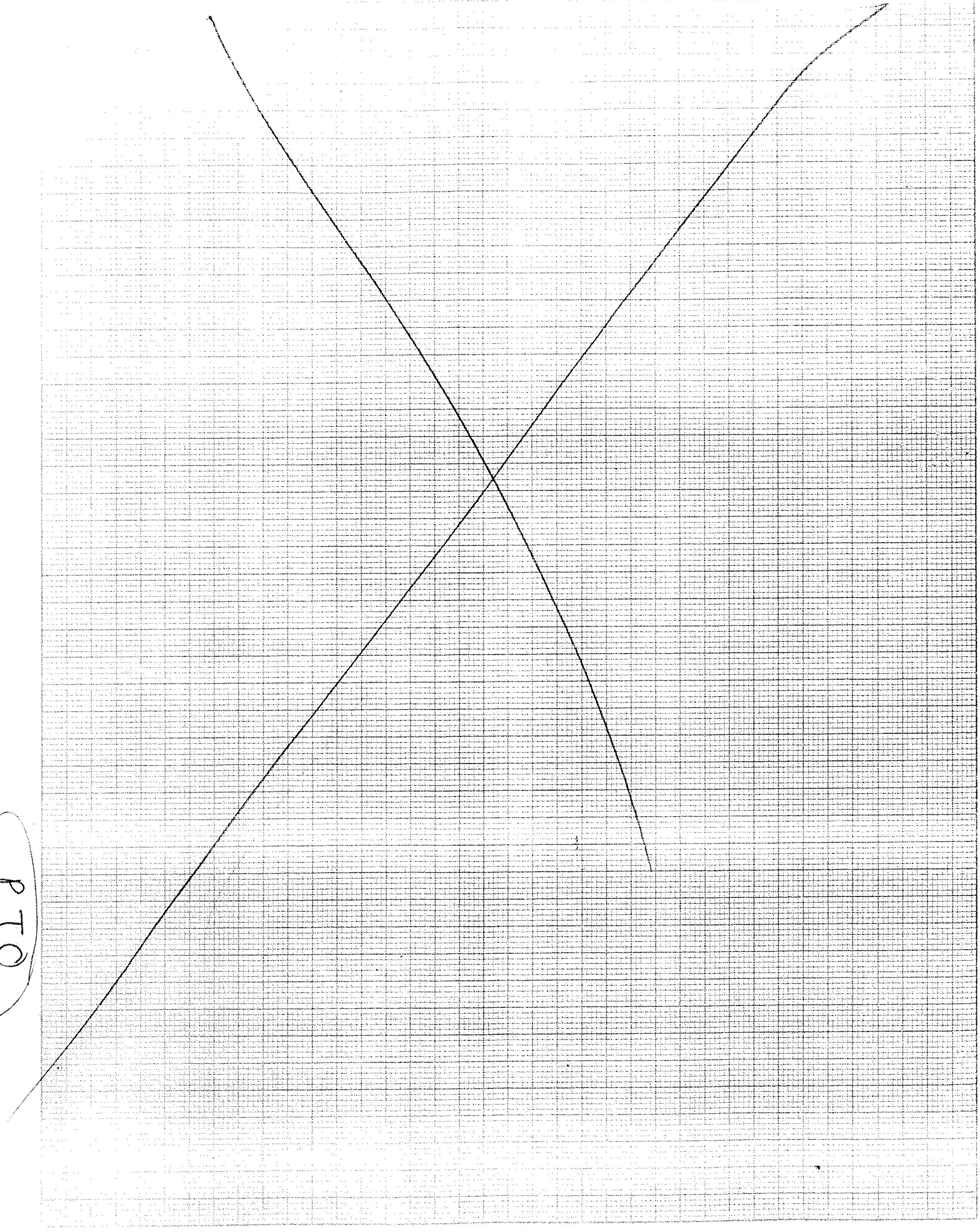
$\Rightarrow 8 \times \sqrt{2} \Rightarrow 8\sqrt{2}$ cm

iii) side $\Rightarrow$ diameter, diameter $\Rightarrow$ 8 cm

radius $\Rightarrow$ 4 cm

area of sector $\Rightarrow \frac{\pi r^2 \theta}{360^\circ} \Rightarrow \frac{22}{7} \times 4 \times \cancel{4} \times \frac{\cancel{90}}{\cancel{360}_{4}} \Rightarrow \frac{88}{7}\ cm^2$

$\Rightarrow \frac{88}{7}\ cm^2$ or $12.57\ cm^2$



PTO

PTO

38.

Let, the fixed charge be ₹ x
Let, the charges per Km be ₹ y

$\therefore$ $x + 10y = 105$ — (1)
$x + 15y = 155$ — (2)

$5y = 50$

$\boxed{y = 10}$

$\therefore x + 10 \times 10 = 105$

$x = 105 - 100$

$\boxed{x = 5}$

i) fixed charges = ₹ 5
ii) Charges per Km = ₹ 10
iii) fixed charge = ₹ 20, charges per Km = ₹ 10

$\therefore$ pay for 10 Km = $20 + 10 \times 10$
$= 20 + 100 = ₹ 120$

Hp