

Mathematics Standard - 041

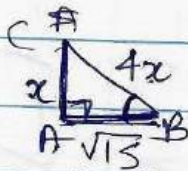


Rough work.

$$x = -5$$

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

$$\sec B = \frac{H}{B}$$



$$\sin B = \frac{1}{4} = \frac{P}{H}$$

$$x = -5$$

$$\frac{4}{\sqrt{15}}$$

$$(4x)^2 - (x)^2$$

$$2(-5) - 1 = 0$$

$$-10 - 1 = 0$$

$$-11 \neq 0$$

$$\frac{4}{\sqrt{15}} = \frac{4x}{\sqrt{15x^2}} \quad \sec B = \frac{4x}{\sqrt{15x^2}}$$

$$\sqrt{15x^2}$$

$$\frac{c}{a} = 1$$

$$\frac{2x}{bx} = 1$$

$$2 = b$$

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

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

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

$$x^2 = 0$$

$$x^2 + 2x = 0$$

$$b^2 - 4ac$$

$$(2)^2 - 4(1)(0) = 0$$

$$4$$

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

$$x = -2 \quad x = 0$$

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

$$b=1 \quad c=1 \quad a=1$$

$$(1)^2 - 4(1)(1) = -3$$

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

$$x^2 + 2x = 0$$

$$a=1 \quad b=2 \quad c=0$$

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

$$4 - 4(1)(0) = 4$$

$$\frac{c}{a} = 1$$

$$\frac{2x}{bx} = 1$$

$$\frac{2x}{bx} = 1$$



SECTION A

Ans 1. (A) No Solution

Ans 2. (D) $\frac{4}{\sqrt{5}}$

Ans 3. (D) Irrational no.

Ans 4. (C) 0.

Ans 5. (A) $x^2 + 2x = 0$

Ans 6. (A) 2

Ans 7. (C) b

Ans 8. (C) 3cm.

Ans 9. (C) 150°



Ans 10. (C) $\frac{3}{4}$

Ans 11. (D) 6cm

Ans 12. (C) $x < y$

Ans 13. (B) 8

Ans 14. (B) 45°

Ans 15. (A) 30°

Ans 16. (C) 2:1

Ans 17. (B) 13 and 12.

Ans 18. (C) 52 is mode of the data

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Question Number

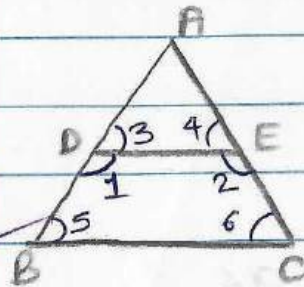
Ans 19. (D) Assertion (A) is false, but Reason, (R) is true.

Ans 20. (D) Assertion (A) is false but Reason (R) is true.

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

SECTION B.

Ans 21.



given = $\triangle ABC$ and $\frac{AD}{BD} = \frac{AE}{EC}$ $\angle BDE = \angle CED$

To prove = $\triangle ABC$ is isosceles triangle

Proof = In $\triangle ABC$, $\frac{AD}{BD} = \frac{AE}{EC}$ then, $DE \parallel BC$ by converse of BPT.

now, $\angle 3 = \angle 5$ and $\angle 4 = \angle 6$ ^① by corresponding angles
($DE \parallel BC$)

Also, $\angle 1 + \angle 3 = 180^\circ$ (linear pair)

$$\angle 3 = 180^\circ - \angle 1 \quad \text{--- ②}$$

$\angle 2 + \angle 4 = 180^\circ$ (linear pair)

$$\angle 4 = 180^\circ - \angle 2 \quad \text{--- ③}$$

As, $\angle 1 = \angle 2$, eqⁿ ② = eqⁿ ③ and $\angle 3 = \angle 4$ --- ④



from eqⁿ ① and ④

$$\angle 5 = \angle 6$$

Then, $AB = AC$

(Sides opposite to equal angles are equal)

As, two sides are equal, $\triangle ABC$ is isosceles $\triangle$

Hence proved!

Ans 22. Probability $P(E)$ of event E ,

$$P(E) = \frac{\text{No. of favourable outcomes}}{\text{No. of all possible outcomes}}$$

✓ ~~④~~ No. of all possible outcomes = $100 - 5 + 1 = 96$.

(i) Event = perfect square

favourable outcomes = 9, 16, 25, 36, 49, 64, 81, 100

No. of favourable outcomes = 8

$$P(\text{perfect square}) = \frac{8}{96} = \frac{1}{12}$$



(ii) ~~Event = a 2 digit~~
No. of favourable outcomes = $100 - 10 + 1 = 91 - 1 = 90$

(ii) ~~Event = a 2 digit no.~~
No. of favourable outcomes = $100 - 10 + 1 - 1 = 90$

$$P(\text{a 2 digit no.}) = \frac{90}{96} = \frac{45}{48}$$

Ans 23. (a) eqⁿ ① = $101x + 102y = 304$ ✓

eqⁿ ② = $102x + 101y = 305$ ✓

eqⁿ ② - eqⁿ ①

$$102x + 101y = 305$$

$$101x + 102y = 304$$

$$x - y = 1 \quad \text{--- eqⁿ ③} \quad \checkmark$$

eqⁿ ① + eqⁿ ②

$$102x + 101y = 305$$

$$101x + 102y = 304$$

$$203x + 203y = 609$$

OR

$$x + y = 3 \quad \text{--- eqⁿ ④} \quad \checkmark$$

RW.

204

101

305.



$$\text{eq}^n \textcircled{3} = x - y = 1$$

$$\text{eq}^n \textcircled{4} = x + y = 3$$

$$\text{eq}^n \textcircled{3} + \text{eq}^n \textcircled{4}$$

$$x - y = 1$$

$$x + y = 3$$

$$\hline 2x = 4$$

$$\boxed{x = 2}$$

putting $x = 2$ in eqⁿ ③

$$2 - y = 1$$

$$y = 2 - 1$$

$$\boxed{y = 1}$$

Thus, $x = 2$ & $y = 1$ is solution of eqⁿs.

Ans 24. (a) $a \sec \theta + b \tan \theta = m$ — eqⁿ ①

~~squaring, a~~

$b \sec \theta + a \tan \theta = n$ — eqⁿ ②

eqⁿ ① squared,

$$(a \sec \theta + b \tan \theta)^2 = m^2$$

$$a^2 \sec^2 \theta + b^2 \tan^2 \theta + 2ab \sec \theta \tan \theta = m^2 \quad \text{--- ③ } \left(\frac{(a+b)^2}{a^2 + b^2 + 2ab} \right)$$

eqⁿ ② squared,

$$(b \sec \theta + a \tan \theta)^2 = n^2$$

$$b^2 \sec^2 \theta + a^2 \tan^2 \theta + 2ab \sec \theta \tan \theta = n^2 \quad \text{--- ④}$$

eqⁿ ③ — eqⁿ ④

$$a^2 \sec^2 \theta + b^2 \tan^2 \theta + 2ab \sec \theta \tan \theta - b^2 \sec^2 \theta - a^2 \tan^2 \theta - 2ab \sec \theta \tan \theta = m^2 - n^2$$

$$a^2 (\sec^2 \theta - \tan^2 \theta) + b^2 (\tan^2 \theta - \sec^2 \theta) = m^2 - n^2$$

$$a^2 - b^2 = m^2 - n^2$$

$$\left(\because \sec^2 \theta - \tan^2 \theta = 1 \right. \\ \left. \tan^2 \theta - \sec^2 \theta = -1 \right)$$

$$\boxed{a^2 + n^2 = b^2 + m^2}$$

hence proved.



Ans 25. given points $A(7, 1)$ $B(3, 5)$

let coordinates of P be (x, y)

distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

now, as P is equidistant from A & B ,

$$PB = PA$$

OR $PB^2 = PA^2$

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

$$(x-3)^2 + (y-5)^2 = (x-7)^2 + (y-1)^2$$

$$x^2 + 9 - 6x + y^2 + 25 - 10y = x^2 + 49 - 14x + y^2 + 1 - 2y \quad (a^2 + b^2 - 2ab)$$

$$34 - 6x - 10y = 50 - 14x - 2y$$

$$-6x + 14x - 10y + 2y = 50 - 34$$

$$8x - 8y = 16$$

OR $x - y = 2$

$$x = y + 2$$

hence proved! x coordinate (abscissa) is 2 more than y coordinate (ordinate)



SECTION C

Ans 26. (b) given, $\sin \theta + \cos \theta = x$

To prove:

$$\sin^4 \theta + \cos^4 \theta = \frac{2 - (x^2 - 1)^2}{2}$$

LHS,

$$\sin^4 \theta + \cos^4 \theta$$

$$(\sin^2 \theta)^2 + (\cos^2 \theta)^2$$

$$(\sin^2 \theta + \cos^2 \theta)^2 - 2\sin^2 \theta \cos^2 \theta$$

RHS,

$$\sin \theta + \cos \theta = x$$

$$(\sin \theta + \cos \theta)^2 = x^2$$

$$\sin^2 \theta + \cos^2 \theta + 2\sin \theta \cos \theta = x^2$$

$$1 + 2\sin \theta \cos \theta = x^2$$

$$2\sin \theta \cos \theta = x^2 - 1$$



SECTION C.

Ans 26. (b) given, $\sin\theta + \cos\theta = x$

To prove, $\sin^4\theta + \cos^4\theta = 2 - \frac{(x^2 - 1)^2}{2}$

let us work upon 'given'.

$$\sin\theta + \cos\theta = x$$

$$(\sin\theta + \cos\theta)^2 = x^2 \quad (\text{squaring})$$

$$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = x^2 \quad ((a+b)^2 = a^2 + b^2 + 2ab)$$

$$1 + 2\sin\theta\cos\theta = x^2 \quad (\sin^2\theta + \cos^2\theta = 1)$$

$$2\sin\theta\cos\theta = x^2 - 1$$

$$\sin\theta\cos\theta = \frac{x^2 - 1}{2} \quad \text{--- (1)}$$

let us work upon 'to prove.'

LHS,

$$\sin^4\theta + \cos^4\theta$$

$$(\sin^2\theta)^2 + (\cos^2\theta)^2$$

$$(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta$$

$$(\because a^2 + b^2 = (a+b)^2 - 2ab)$$

Space for writing
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$$(1)^2 - 2(\sin\theta\cos\theta)^2$$

$$1 - 2\left(\frac{x^2-1}{2}\right)^2$$

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

$$1 - \frac{(x^2-1)^2}{2}$$

$$\frac{2 - (x^2-1)^2}{2}$$

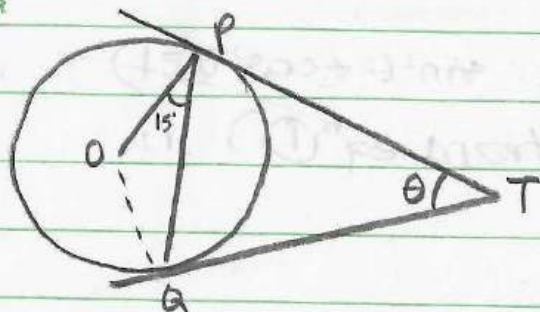
LHS = RHS hence proved!

$$(\because \sin^2\theta + \cos^2\theta = 1)$$

(from eqⁿ ①)



Ans 27



Join OQ

NOTE $\rightarrow$ $\angle P$ is short of $\angle OPA$
 $\angle Q$ is short of $\angle OQP$
 $\angle O$ is short of $\angle POQ$

In $\triangle POQ$, $OP = OQ$ (radii of same circle)

Then, $\angle P = \angle Q$ (angles opposite to equal sides are equal)
 $\therefore \angle P = \angle Q = 15^\circ$ (given $\angle POQ = 15^\circ$)

Now, In $\triangle POQ$, $\angle P + \angle Q + \angle O = 180^\circ$ (ASP of $\triangle$)

$$15^\circ + 15^\circ + \angle O = 180^\circ$$

$$\angle O = 180^\circ - 30^\circ$$

$$\angle O = 150^\circ$$

Also, $\angle OPT = \angle OQT = 90^\circ$ (tangents are perpendicular to radius)

now, In quadrilateral $OPTQ$,

$$\angle POQ + \angle OPT + \angle OQT + \angle PTQ = 360^\circ \text{ (ASP of quad)}$$

$$150^\circ + 90^\circ + 90^\circ + \angle PTQ = 360^\circ$$

$$\angle PTQ = 360^\circ - 330^\circ$$

$$\angle \theta = 30^\circ$$

now,

$$\sin 2\theta = \sin 60^\circ = \frac{\sqrt{3}}{2}$$



Ans 28. (a) let us assume to the contrary that $\sqrt{5}$ is a rational no. of form $\frac{p}{q}$ where p and q are integers and co-prime and $q \neq 0$.

$\therefore$
squaring, $\sqrt{5} = \frac{p}{q}$
 $(\sqrt{5})^2 = \left(\frac{p}{q}\right)^2$

$$5 = \frac{p^2}{q^2}$$

$$q^2 = \frac{p^2}{5} \quad \text{--- (1)}$$

Thus, 5 divides p^2

5 divides p as well. --- (1)

let $p = 5a$.

putting $p = 5a$ in eqⁿ (1)

$$q^2 = \frac{(5a)^2}{5}$$

$$q^2 = 25a^2$$

$$\frac{q^2}{5} = a^2$$

Thus, 5 divides q^2

5 divides q as well --- (2).



From statement ① and ②, it is clear that 5 is common factor of p & q , but we assumed that p and q are co-prime! This contradiction has arisen due to our incorrect assumption that $\sqrt{5}$ is rational.

Hence proved, $\sqrt{5}$ is irrational.

Ans 29. $q(x) = 8x^2 - 2x - 3$

~~$8x^2 - 2x - 3$~~

Let zeroes of $q(x)$ be α and β .

~~$8x^2 - 2x - 3$~~

$8x^2 - 6x + 4x - 3$

$2x(4x - 3) + 1(4x - 3)$

$(2x + 1)(4x - 3)$

comparing with $k[(x - \alpha)(x - \beta)]$,

$\alpha = -\frac{1}{2}, \beta = \frac{3}{4}$

comparing $q(x)$ with $ax^2 + bx + c$,

$a = 8, b = -2, c = -3$



$$\begin{aligned} \text{now, } \alpha + \beta &= -\frac{b}{a} \\ \alpha + \beta &= -\frac{(-2)}{8} \\ \alpha + \beta &= \frac{1}{4} \end{aligned}$$

$$\begin{aligned} \alpha\beta &= \frac{c}{a} \\ \alpha\beta &= \frac{-3}{8} \end{aligned}$$

now, let the required polynomial be $p(x)$

Then, zeroes of $p(x) \rightarrow \alpha - 2$ & $\beta - 2$

Sum of zeroes $\rightarrow \alpha - 2 + \beta - 2 = \alpha + \beta - 4$

$$= \frac{1}{4} - 4 \quad (\because \alpha + \beta = \frac{1}{4})$$

$$= \frac{1 - 16}{4}$$

$$\text{Sum of zeroes} = -\frac{15}{4}$$

product of zeroes $\rightarrow (\alpha - 2)(\beta - 2) = \alpha\beta - 2\alpha - 2\beta + 4$

$$= (\alpha\beta) - 2(\alpha + \beta) + 4$$

$$= \frac{-3}{8} - 2 \left(\frac{1}{4} \right) + 4 \quad (\because \alpha\beta = \frac{-3}{8} \text{ and } \alpha + \beta = \frac{1}{4})$$

$$= \frac{-3 - 4 + 32}{8}$$

$$= \frac{25}{8}$$



now, $p(x) = k[x^2 - (\alpha + \beta)x + \dots]$
 $p(x) = k[x^2 - \text{sum of zeroes} \times x + \text{product of zeroes}]$
 $= k\left[x^2 - \left(-\frac{15}{4}\right)x + \frac{25}{8}\right]$ where k is a constant
 $= k\left[8x^2 + 30x + 25\right]$

~~also~~ Thus, $p(x) = k\left[8x^2 + 30x + 25\right]$

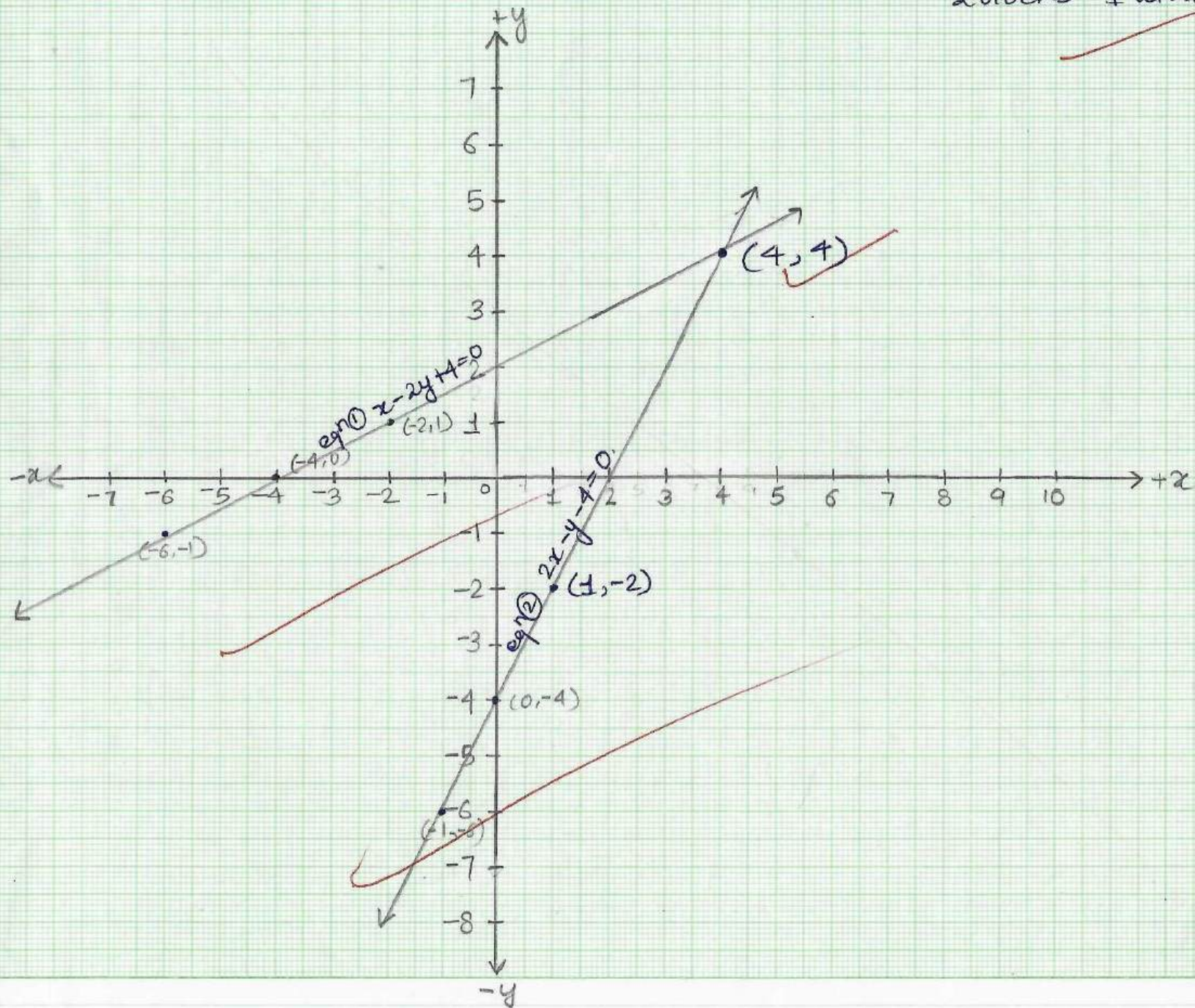
OR if $k = \frac{1}{8}$, $p(x) = 8x^2 + 30x + 25$.

Alternate $\rightarrow \alpha = -\frac{1}{2}$, $\beta = \frac{3}{4}$
 let required polynomial be $p(x)$

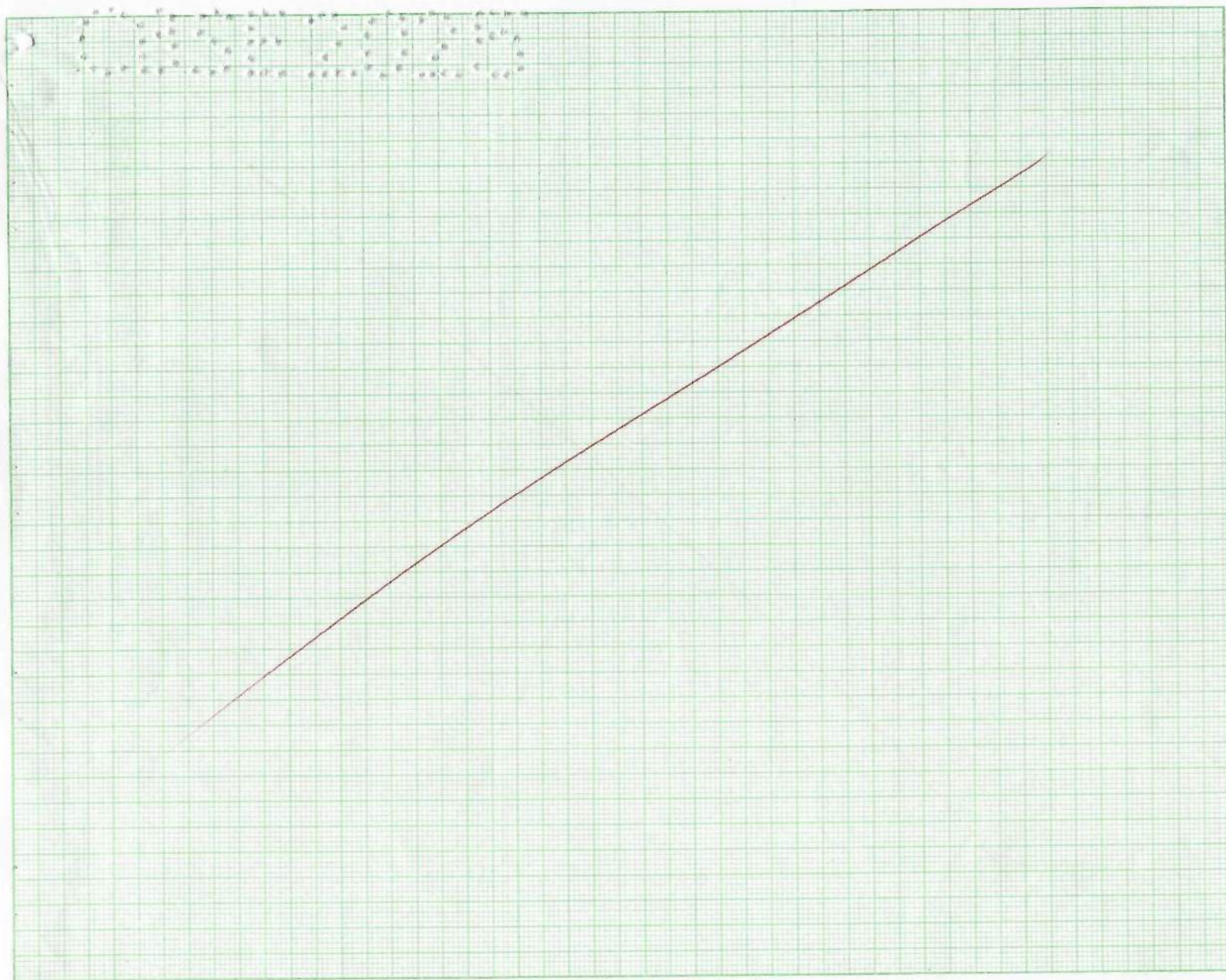
The zeroes of $p(x) = \alpha - 2$ and $\beta - 2$
 $= -\frac{1}{2} - 2$ and $\frac{3}{4} - 2$
 $= -\frac{1.4}{2}$ and $\frac{3-8}{4}$
 $= -\frac{5}{2}$ and $-\frac{5}{4}$

$q(x) = k[x^2 - \text{sum of zeroes} \times x + \text{product of zeroes}]$
 $= k\left[x^2 - \left[-\frac{5}{2} - \frac{5}{4}\right]x + \left(-\frac{5}{2} \times -\frac{5}{4}\right)\right]$
 $= k[8x^2 + 30x + 25]$ where $k = \frac{1}{8}$.

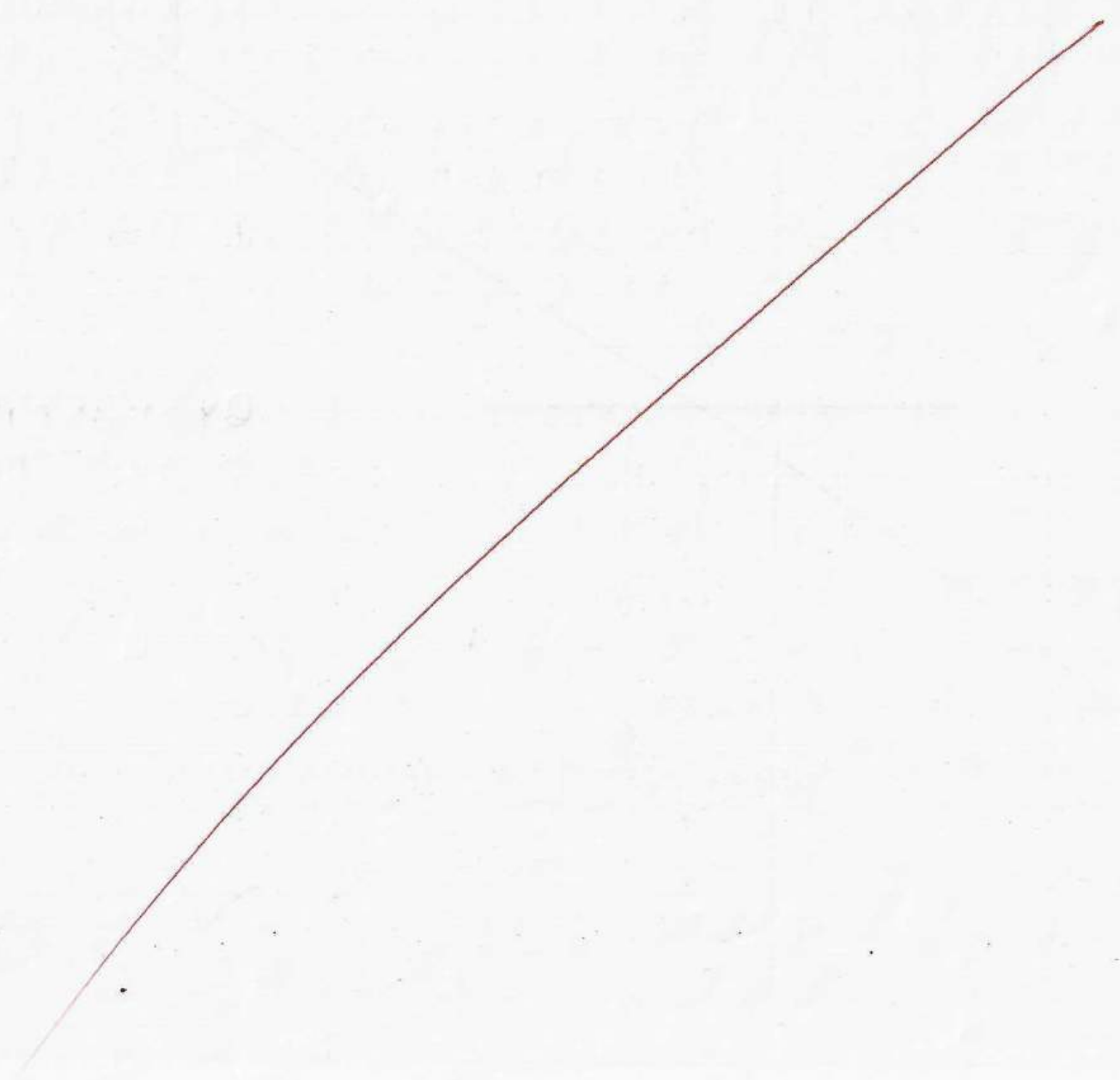
scale,
on x & y axis
2 blocks = 1 unit.







2000





Ans 30. $eq^n ① = x - 2y + 4 = 0$ ✓
 $eq^n ② = 2x - y - 4 = 0$ ✓

comparing $eq^n ①$ with $a_1x_1 + b_1y_1 + c_1 = 0$, $a_1 = 1$ $b_1 = -2$ $c_1 = 4$

comparing $eq^n ②$ with $a_2x_2 + b_2y_2 + c_2 = 0$, $a_2 = 2$ $b_2 = -1$ $c_2 = -4$

$$\frac{a_1}{a_2} = \frac{1}{2} \quad \frac{b_1}{b_2} = \frac{-2}{-1} = 2 \quad \frac{c_1}{c_2} = \frac{4}{-4} = -1$$

as $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ equations are consistent with unique solⁿ.

from $eq^n ①$,

$$x - 2y + 4 = 0$$

$$x = 2y - 4$$

when $y = -1$,

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

$$x = -2 - 4$$

$$x = -6$$

when $y = 0$,

$$x = 2(0) - 4$$

$$x = -4$$

when $y = 1$,

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

$$x = 2 - 4$$

$$x = -2$$

$eq^n ①$

x	-6	-4	-2
y	-1	0	1



from eqⁿ ②,
 $2x - y - 4 = 0$
 $y = 2x - 4$

when $x = -1$

$$y = 2(-1) - 4$$

$$y = -2 - 4$$

$$y = -6$$

when $x = 0$

$$y = 2(0) - 4$$

$$y = -4$$

when $x = 1$,

$$y = (2)(1) - 4$$

$$y = 2 - 4$$

$$y = -2$$

eqⁿ ②

x	-1	0	1
y	-6	-4	-2

(Solved on graph pg-18)

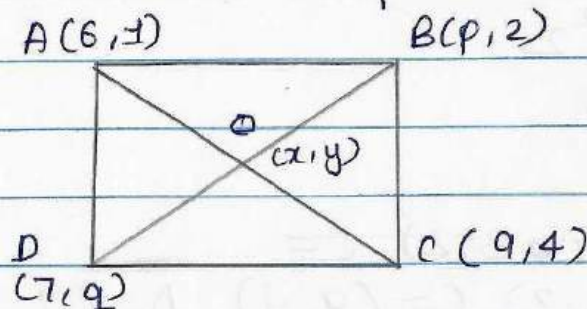
from graph, solution of equations,

$$\boxed{x=4 \quad y=4}$$



SECTION D

Ans 31. given points $\Rightarrow A(6, 1) \quad B(p, 2) \quad C(9, 4) \quad D(7, q)$



let diagonals AC & BD intersect at $O(x, y)$

we know, diagonals of parallelogram bisect each other. Thus, O is midpoint of AC and BD.

midpoint formula, $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

considering AC, $x, y = \frac{6+9}{2}, \frac{1+4}{2}$
 $x, y = \frac{15}{2}, \frac{5}{2}$

considering BD, $x, y = \frac{7+p}{2}, \frac{q+2}{2}$
 $\frac{15}{2}, \frac{5}{2} = \frac{7+p}{2}, \frac{q+2}{2}$

$\Rightarrow$

comparing x coordinates, $\frac{15}{2} = \frac{7+p}{2}$

$$15 = 7 + p \quad \boxed{p = 8}$$



comparing y coordinates,

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

$$5 = q + 2$$

$$\boxed{q = 3}$$

Thus, ~~$A = (6, 1)$ $B = (3, 2)$ $C =$~~

$A = (6, 1)$ $B(8, 2)$ $C = (9, 4)$ $D = (7, 3)$

now distance formula $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$AC = \sqrt{(9-6)^2 + (4-1)^2} = \sqrt{(3)^2 + (3)^2} = 3\sqrt{2} \text{ units}$$

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

As $AC \neq BD$, diagonals are not equal
hence, Parallelogram ABCD is not a rectangle.

SECTION D.

Ans 32. No. of members. No. of Bungalows. cf_i

CI.	f_i	cf_i
0-2	10	10 ✓
2-4	p	10+p ✓
4-6	60	70+p ✓
6-8	q	70+p+q ✓
8-10	5	75+p+q ✓

$$\sum f_i = 120 \quad \checkmark$$

now, $75 + p + q = 120$ ✓

$$p + q = 120 - 75, \quad p + q = 45 \quad \text{--- (1)}$$

now, median = 5 ✓

median class = 4-6 ✓

$$l = 4 \quad \checkmark$$

$$h = 2 \quad \checkmark$$

$$f = 60 \quad \checkmark$$

$$cf = 10 + p \quad \checkmark$$

$$\frac{n}{2} = 60 \quad \checkmark$$

$$\text{median} = l + h \left[\frac{\frac{n}{2} - cf}{f} \right]$$

$$5 = 4 + 2 \left[\frac{60 - 10 - p}{60} \right]$$

$$1 = 2 \left[\frac{50 - p}{60} \right]$$

$$60 = 100 - 2p$$

$$2p = 40$$

$$p = 20 \quad \checkmark$$

$$\begin{array}{r} \text{R.W.} \\ 110 \\ - 75 \\ \hline 45 \\ 0 \\ 75 \\ + 45 \\ \hline 120 \end{array}$$



putting $p=20$ in eqⁿ ①
 $20+q=45$
 $\boxed{q=25}$

Thus, $\boxed{p=20}$ $\boxed{q=25}$

Ans 33 (b) eqⁿ $\Rightarrow x^2 - 2(p+1)x + p^2 = 0$
 comparing eqⁿ with $ax^2 + bx + c = 0$
 $a=1$ $b=-2(p+1)$ $c=p^2$

If roots are real, $D \geq 0$

$$b^2 - 4ac \geq 0$$

$$[-2(p+1)]^2 - 4(1)(p^2) \geq 0$$

$$4(p^2 + 1 + 2p) - 4p^2 \geq 0$$

$$4p^2 + 4 + 8p - 4p^2 \geq 0$$

$$8p + 4 \geq 0$$

$$4(2p+1) \geq 0$$

$$2p+1 \geq 0$$

$$2p \geq -1$$

$$p \geq -\frac{1}{2}$$

$$(a+b)^2 = a^2 + b^2 + 2ab$$



Smallest value of p so obtained $= -\frac{1}{2}$

putting $p = -\frac{1}{2}$ in eqⁿ,

$$x^2 - 2\left(-\frac{1}{2} + 1\right)x + \left(-\frac{1}{2}\right)^2 = 0$$

$$x^2 - 2\left(\frac{1}{2}\right)x + \frac{1}{4} = 0$$

$$x^2 - x + \frac{1}{4} = 0$$

$$\frac{4x^2 - 4x + 1}{4} = 0$$

$$4x^2 - 4x + 1 = 0$$

$$4x^2 - 2x - 2x + 1 = 0$$

$$2x(2x - 1) - 1(2x - 1) = 0$$

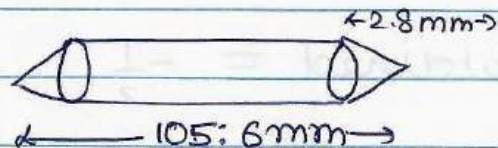
$$(2x - 1)(2x - 1) = 0$$

$$x = \frac{1}{2}, \frac{1}{2}$$

Thus, roots of equation $\Rightarrow \boxed{x = \frac{1}{2}, \frac{1}{2}}$



Ans 34.



given $\rightarrow$ diameter, $2r = 4.2 \text{ mm}$

radius, $r = 2.1 \text{ mm}$

height of cone, $h = 2.8 \text{ mm}$

length of entire pencil = 105.6 mm

Height of cylinder, $H = \text{length} - 2h$

$$= 105.6 - 2 \times 2.8$$

$$= 105.6 - 5.6$$

$$= 100 \text{ mm}$$

Thus, $H = 100 \text{ mm}$.

now, slant height ^{of cone} $l = \sqrt{r^2 + h^2}$

$$l = \sqrt{(2.1)^2 + (2.8)^2}$$

$$l = \sqrt{12.25}$$

$$l = 3.5 \text{ mm}$$



Total surface area of pencil

$$= \text{C.S.A of cylinder} + 2 \times \text{C.S.A of cone}$$

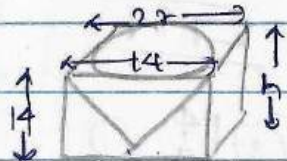
$$= 2\pi rH + 2\pi rl$$

$$= 2 \times 22 \times 2.1 \times 100 + 2 \times 22 \times 2.1 \times 3.5$$

$$= 1320 + 46.2$$

$$= 1366.2 \text{ mm}^2$$

Ans 35



side of cube = 14 cm

If largest possible cone is carved out,

radius = side = 7 cm

height = side = 14 cm

now, slant height, $l = \sqrt{r^2 + h^2}$

$$= \sqrt{(7)^2 + (14)^2}$$

$$= \sqrt{49 + 196}$$

$$= \sqrt{245}$$

$$= 7\sqrt{5} = 7 \times 2.2 = 15.4 \text{ cm.}$$

$$\begin{array}{r} 1320 \\ 46.2 \\ \hline 1366.2 \end{array}$$

$$\begin{array}{r} 31 \\ 2.2 \\ \times 7 \\ \hline 154 \\ \text{PW} \end{array}$$

$$\begin{array}{r} 44 \\ 3 \\ \hline 1320 \end{array}$$

$$\begin{array}{r} 35 \\ 3 \\ \hline 105 \end{array}$$

$$\begin{array}{r} 105 \\ 44 \\ \hline 420 \end{array}$$

$$\begin{array}{r} 420 \\ 4620 \\ \hline 05 \end{array}$$

$$\begin{array}{r} 44 \\ 3 \\ \hline 132 \end{array}$$

$$\begin{array}{r} 35 \\ 35 \\ \hline 1225 \end{array}$$

$$\begin{array}{r} 1320 \\ 46.2 \\ \hline 1366.2 \end{array}$$

$$\begin{array}{r} 1320 \\ 46.2 \\ \hline 1366.2 \end{array}$$



P.W.

① $14 \overline{) 114}$
 $\underline{56}$
 $14 \times 8 = 112$
 $114 - 112 = 2$
 14 goes into 114 8 times with a remainder of 2.

② $196 \overline{) 1906}$
 $\underline{196}$
 $1906 - 196 = 1710$
 $196 \times 9 = 1764$
 $1710 - 1764 = -54$
 196 goes into 1906 9 times with a remainder of 54.

③ $196 \overline{) 2744}$
 $\underline{196}$
 $2744 - 196 = 2548$
 $196 \times 13 = 2548$
 $2548 - 2548 = 0$
 196 goes into 2744 14 times exactly.

$$\begin{array}{r} 196 \text{ (2)} \\ 2 \overline{) 392} \\ \underline{392} \\ 0 \end{array}$$

③ 196
 214
 784
 196x
 2744

③ 196
 214
 784
 196x
 2744

③ 196
 214
 784
 196x
 2744

③ 196
 214
 784
 196x
 2744

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \times \\ \hline 2156 \end{array}$$

$$\begin{array}{r} 718.66 \\ \times 6 \\ \hline 4311.96 \end{array}$$

$$\begin{array}{r} 2156 \\ - 21 \downarrow \\ \hline 51 \\ - 3 \downarrow \\ \hline 26 \\ - 24 \downarrow \\ \hline 2 \end{array}$$

$$\begin{array}{r} 117313 \\ \times 6 \\ \hline 703878 \end{array}$$

$$\begin{array}{r} 154 \\ \times 22 \\ \hline 308 \\ 308 \times \\ \hline 3388 \end{array}$$

$$\begin{array}{r} 13 \\ \times 13 \\ \hline 169 \end{array}$$

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \times \\ \hline 2156 \end{array}$$

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$$\begin{array}{r} 117313 \\ \times 6 \\ \hline 703878 \end{array}$$

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$$\begin{array}{r} 13 \\ \times 13 \\ \hline 169 \end{array}$$

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \times \\ \hline 2156 \end{array}$$

$$\begin{array}{r} 718.66 \\ \times 6 \\ \hline 4311.96 \end{array}$$

$$\begin{array}{r} 2156 \\ - 21 \downarrow \\ \hline 51 \\ - 3 \downarrow \\ \hline 26 \\ - 24 \downarrow \\ \hline 2 \end{array}$$

$$\begin{array}{r} 117313 \\ \times 6 \\ \hline 703878 \end{array}$$

$$\begin{array}{r} 154 \\ \times 22 \\ \hline 308 \\ 308 \times \\ \hline 3388 \end{array}$$

$$\begin{array}{r} 13 \\ \times 13 \\ \hline 169 \end{array}$$

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \times \\ \hline 2156 \end{array}$$

$$\begin{array}{r} 718.66 \\ \times 6 \\ \hline 4311.96 \end{array}$$

$$\begin{array}{r} 2156 \\ - 21 \downarrow \\ \hline 51 \\ - 3 \downarrow \\ \hline 26 \\ - 24 \downarrow \\ \hline 2 \end{array}$$

$$\begin{array}{r} 117313 \\ \times 6 \\ \hline 703878 \end{array}$$

$$\begin{array}{r} 154 \\ \times 22 \\ \hline 308 \\ 308 \times \\ \hline 3388 \end{array}$$

$$\begin{array}{r} 13 \\ \times 13 \\ \hline 169 \end{array}$$

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \times \\ \hline 2156 \end{array}$$

$$\begin{array}{r} 718.66 \\ \times 6 \\ \hline 4311.96 \end{array}$$

$$\begin{array}{r} 2156 \\ - 21 \downarrow \\ \hline 51 \\ - 3 \downarrow \\ \hline 26 \\ - 24 \downarrow \\ \hline 2 \end{array}$$

$$\begin{array}{r} 117313 \\ \times 6 \\ \hline 703878 \end{array}$$

$$\begin{array}{r} 154 \\ \times 22 \\ \hline 308 \\ 308 \times \\ \hline 3388 \end{array}$$

$$\begin{array}{r} 13 \\ \times 13 \\ \hline 169 \end{array}$$

$$\begin{array}{r} 14 \\ \times 7 \\ \hline 98 \end{array}$$

$$\begin{array}{r} 98 \\ \times 22 \\ \hline 196 \\ 196 \\ \hline 2156 \end{array}$$

$$\begin{array}{r} 196 \\ \times 6 \\ \hline 1176 \end{array}$$

$$\begin{array}{r} 718.66 \\ \times 6 \\ \hline 4311.96 \end{array}$$

$$\begin{array}{r} 2156 \\ - 21 \downarrow \\ \hline 51 \\ - 3 \downarrow \\ \hline 26 \\ - 24 \downarrow \\ \hline 2 \end{array}$$

$$\begin{array}{r} 154 \\ \times 22 \\ \hline 308 \\ 308 \\ \hline 3388 \end{array}$$

$$\begin{array}{r} 13 \\ \times 13 \\ \hline 154 \\ 169 \\ \hline 169 \end{array}$$



SECTION E.

RW.

Ans 36 (i) AP so formed = 400, 407.6, 415.2, ...

$$a = 400$$

$$d = 7.6$$

now, 6th lane = a_6

$$a_6 = a + 5d$$

$$a_6 = 400 + 5 \times 7.6$$

$$a_6 = 400 + 38$$

$$a_6 = 438 \text{ m}$$

Thus, sixth lane is 438m long.

$$\begin{array}{r} 407.6 \\ 7.6 \\ \hline 415.2 \end{array}$$

$$\begin{array}{r} 37.6 \\ 1.5 \\ \hline 380 \end{array}$$

$$\begin{array}{r} 47.6 \\ 1.7 \\ \hline 532 \end{array}$$

$$\begin{array}{r} 7.6 \\ 3 \\ \hline 22.8 \end{array}$$

$$\begin{aligned} \text{(ii)} \quad a_8 &= a + 7d \\ &= 400 + 53.2 \\ &= 453.2 \text{ m} \end{aligned}$$

$$\begin{aligned} a_4 &= a + 3d \\ &= 400 + 22.8 \\ &= 422.8 \end{aligned}$$

$$\Rightarrow a_8 - a_4$$

$$\Rightarrow 453.2 - 422.8$$

$$\Rightarrow 30.4 \text{ m}$$

Thus, 8th lane is 30.4m longer than 4th.

$$\begin{array}{r} 49 \\ 14 \\ \hline 53 \end{array}$$

$$\begin{array}{r} 7.6 \\ 1.7 \\ \hline 532 \end{array}$$

$$\begin{array}{r} 415.2 \\ 7.6 \\ \hline 228 \end{array}$$

$$\begin{array}{r} 453.2 \\ 422.8 \\ \hline 30.4 \end{array}$$



(iii) (a) Total distance covered = S_6 .

$$S_6 = \frac{n}{2} [2a + (n-1)d]$$

or ~~$S_6 = \frac{n}{2} [a + l]$~~ (we know length of 6th lane from (i))

$$S_6 = \frac{6}{2} [2 \times 400 + 5 \times 7.6]$$

$$S_6 = 3 [800 + 38]$$

$$S_6 = 3(838)$$

$$S_6 = 2514\text{m}$$

hence, she ran 2514m.

RU

RU

(2)

0838

25

25

(2)

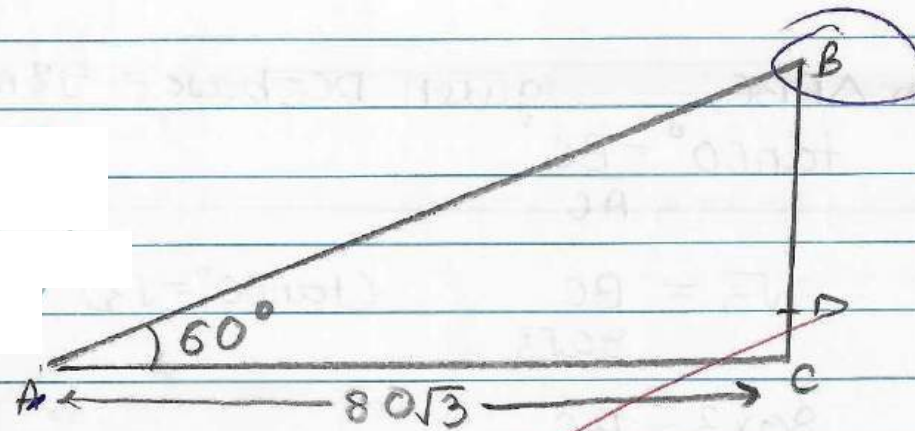
0838

25

2514

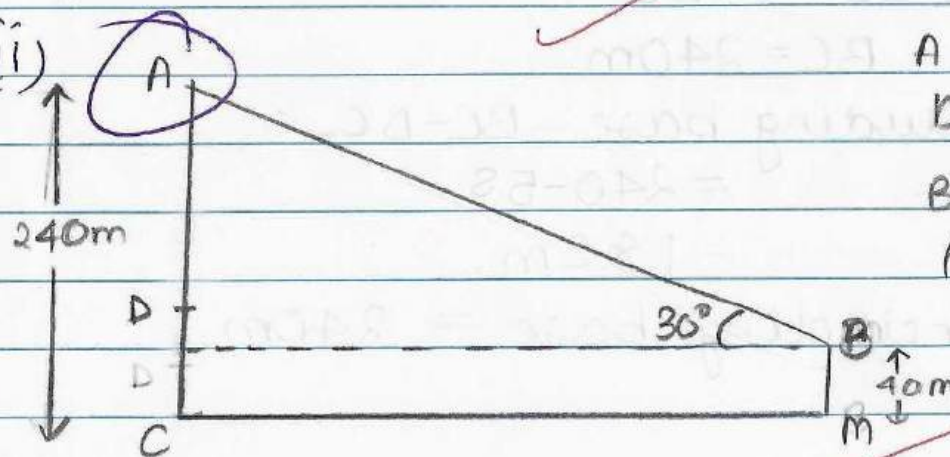
Space for writing
Question Number

Ans 37 (i)



BC is statue.
C is base.
AC is distance
between A and base.
DC is base.

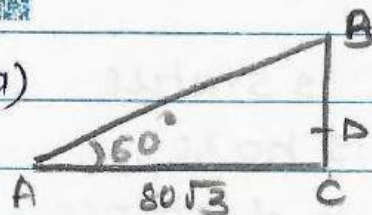
(ii)



AC is height of Statue.
DC is base.
BM is height of B
from ground = 40m.



(iii) (a)



In $\triangle ABC$, given $DC = \text{base} = 58\text{m}$.
 $\tan 60^\circ = \frac{BC}{AC}$

$$\sqrt{3} = \frac{BC}{80\sqrt{3}} \quad (\tan 60^\circ = \sqrt{3})$$

$$80 \times 3 = BC$$

$$BC = 240\text{m}$$

$$\begin{aligned} \text{height of tower excluding base} &= BC - DC \\ &= 240 - 58 \\ &= 182\text{m}. \end{aligned}$$

$$\text{height of tower including base} = 240\text{m}.$$

RUO

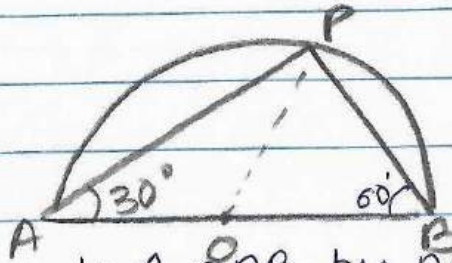
$$\begin{array}{r} 131 \\ 240 \\ -58 \\ \hline \end{array}$$

$$\begin{array}{r} 131 \\ 240 \\ -58 \\ \hline 182 \end{array}$$

$$\begin{array}{r} 13 \\ 240 \\ -58 \\ \hline 182 \end{array}$$

space for writing
Question Number

Ans 38



(i) $\angle P = 90^\circ$ (angle in semicircle)
join OP

In $\triangle APB$, by ASP of $\triangle$, $\angle B = 180^\circ - \angle A - \angle P$
 $\angle B = 60^\circ$

now, $OP = OB = \text{radii}$

Thus, $\angle OPB = \angle PBO = 60^\circ$ (angles opposite to equal sides)

by ASP of $\triangle$, $\angle POB = 60^\circ$

now, $\angle POA + \angle POB = 180^\circ$ (linear pair)

$$\angle POA = 180^\circ - 60^\circ$$

$$\boxed{\angle POA = 120^\circ}$$

(ii) If entire piece is of land is semicircle.

Length of wire needed = perimeter of semicircle.

diameter = 70m.

radius, $r = 35$ m.

$$\text{Perimeter} = 2\pi r + 2r$$

$$= 2 \times \frac{22}{7} \times 35 + 2 \times 35$$

$$= 154 + 70$$

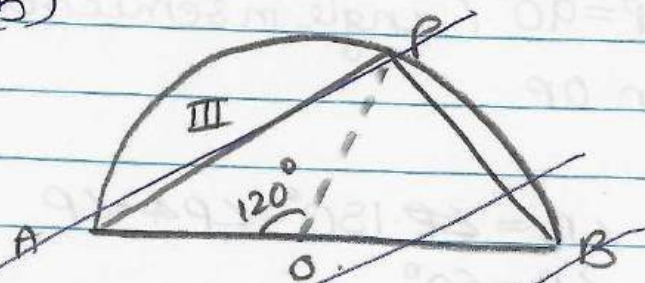
$$= 180 \text{ m}$$

22

① 22
x 5
110

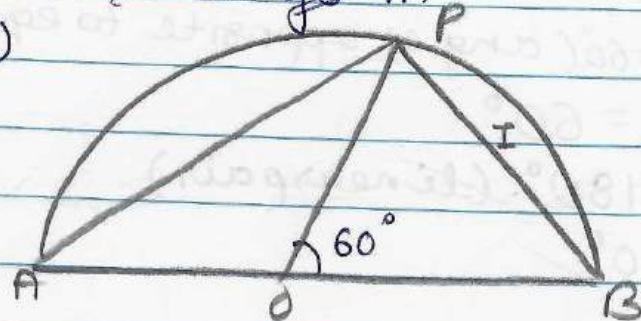


(iii) (b)



from our findings in

(iii) (a)



$$\text{radius}^r = 35\text{m}$$

from our findings in part (i) $\angle POB = 60^\circ$.

now, As in $\triangle POB$, $\angle OPB = \angle PBO = \angle POB = 60^\circ$ [from part (i)]

$\triangle POB$ is equilateral triangle with $a = r = 35\text{m}$.

Area of part I

= Area of sector POB - Area of equilateral $\triangle POB$

$$= \frac{\theta}{360^\circ} \times \pi r^2 - \frac{\sqrt{3}}{4} a^2$$



$$= \frac{601 \times 22 \times 35 \times 35}{360 \times 37} - \frac{\sqrt{3} \times 35 \times 35}{4}$$

$$= \left(\frac{1925}{3} - \frac{1225\sqrt{3}}{4} \right) m^2$$

OR $\left(641.66 - \frac{1225\sqrt{3}}{4} \right) m^2$

$$\begin{array}{r} 641.66 \\ 3 \overline{) 1925} \\ \underline{18} \\ 12 \end{array}$$

$$\begin{array}{r} 35 \\ 3 \overline{) 1925} \\ \underline{105} \\ 875 \\ \underline{840} \\ 35 \end{array}$$

$$\begin{array}{r} 35 \\ 4 \overline{) 385} \\ \underline{140} \\ 245 \\ \underline{210} \\ 35 \end{array}$$

$$\begin{array}{r} 1925 \\ 4 \overline{) 385} \\ \underline{154} \\ 231 \\ \underline{208} \\ 23 \end{array}$$

$$\begin{array}{r} 1925 \\ 2 \overline{) 385} \\ \underline{192} \\ 193 \\ \underline{174} \\ 19 \end{array}$$

$$\begin{array}{r} 1925 \\ 2 \overline{) 385} \\ \underline{192} \\ 193 \\ \underline{174} \\ 19 \end{array}$$

$$\begin{array}{r} 35 \\ 3 \overline{) 1925} \\ \underline{105} \\ 875 \\ \underline{840} \\ 35 \end{array}$$

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$$\begin{array}{r} 35 \\ 3 \overline{) 1925} \\ \underline{105} \\ 875 \\ \underline{840} \\ 35 \end{array}$$

$$\begin{array}{r} 35 \\ 4 \overline{) 385} \\ \underline{140} \\ 245 \\ \underline{210} \\ 35 \end{array}$$

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