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CLASS 10 MATHEMATICS STATE LEVEL PREPARATORY KEY ANSWERS-2024

1) C) 2

2) B) $\frac{4}{3}\pi r^3$ cubic units

3) D) $b^2-4ac>0$

4) $\sec A = \frac{2}{\sqrt{3}}$

C) $\cos A = \frac{\sqrt{3}}{2}$

5) $x, 21, 18, \ldots$

a_1, a_2, a_3

$a_2 - a_1 = a_3 - a_2$

$21 - x = 18 - 21$

$21 - x = -3$

$-x = -3 - 21$

$-x = -24$

$x = 24$

A) 24

6) $x + 2y = c_1$

$2x + 4y = c_2$

$2c_1 \neq c_2$ then

the eqn: ____

$2c_1 \neq 1c_2$

$\frac{c_1}{c_2} \neq \frac{1}{2}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

D) No soln

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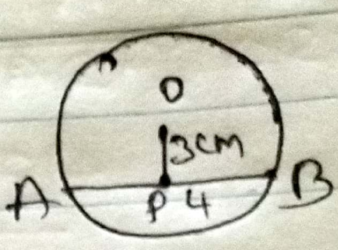
7) $7 \,\underline{|\, 91}$

$\quad 13$

B) 13, 7

8) 

$AB = AP + BP$

$AB = 8\,cm$

A) 8 cm

II 9) $a = 24$

$b = 36$

$L = 72$

$H = ?$

$H \times L = a \times b$

$H = \dfrac{a \times b}{L}$

$H = \dfrac{\cancel{24}^{12} \times \cancel{36}^{1}}{\cancel{72}\,\cancel{2}\,1}$

$H = 12$

10) $(x-1)(x+3) = 0$

$x - 1 = 0 \qquad x + 3 = 0$

$x = 1 \qquad x = -3$

11) $v = \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

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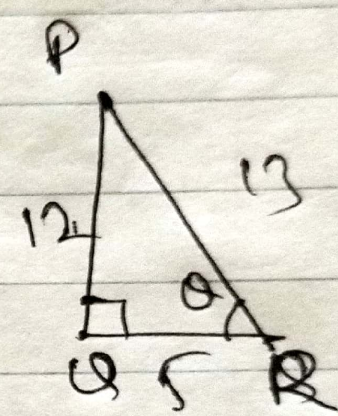
12) $x^2+7x+10$

ax^2+bx+c

$a=1 \quad \alpha+\beta = -\frac{b}{a} = \frac{-7}{1} = -7$

$b=7$



13) $\frac{\sin R}{\cos R} = \tan R = \frac{12}{5}$

14) Impossible event.

15) $\frac{A. \text{ of } \Delta ABC}{A. \text{ of } \Delta PQR} = \frac{AB^2}{PQ^2}$

$\frac{49}{A. \text{ of } \Delta PQR} = \frac{7^2}{9^2}$

$A. \text{ of } \Delta PQR = 81 \text{ cm}^2$

16) $\sin(90-A) = \cos 60°$

$\cos A = \cos 60$

$A = 60°$

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17) Let us assume that $7+\sqrt{5}$ is rational

$7+\sqrt{5} = \frac{P}{q}$ [where P & q are coprime]

$\sqrt{5} = \frac{P}{q} - 7$

$\sqrt{5} = \frac{P-7q}{q}$

$\frac{P-7q}{q}$ is rational

$\therefore \sqrt{5}$ is also rational.

This contradiction arisen bcz of our wrong assumption

$\sqrt{5}$ is not irrational

$\therefore 7+\sqrt{5}$ is irrational

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18) $3x^2 - 6x + 2 = 0$

$ax^2 + bx + c = 0$

$a = 3$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$b = -6$

$c = 2$ $\quad x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4 \times 3 \times 2}}{2 \times 3}$

$$x = \frac{6 \pm \sqrt{36 - 24}}{6}$$

$$x = \frac{6 \pm \sqrt{12}}{6}$$

$$x = \frac{6 \pm \sqrt{4 \times 3}}{6}$$

$$x = \frac{6 \pm 2\sqrt{3}}{6}$$

$$x = \frac{\cancel{2}(3 \pm \sqrt{3})}{\cancel{6}\,3}$$

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

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19) $4x + y = 15$ — (1) $\quad x + y = 6$ — (2)

(1) − (2)

$$\begin{array}{r} 4x + \cancel{y} = 15 \\ x + \cancel{y} = 6 \\ (-) \quad (-) \quad (-) \\ \hline 3x = 9 \end{array}$$

$x = 3$

$x + y = 6$

$y = 6 - x$

$y = 6 - 3$

$y = 3$

20) $a = 4$

$d = 5$

$n = 20$

$S_{20} = ?$

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

$S_{20} = \frac{20}{2}[2(4) + (20-1)5]$

$S_{20} = 10[8 + 19 \times 5]$

$S_{20} = 10 \times 103$

$\therefore S_{20} = 1030$

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OR

6, 12, 18, ------ 240

$a = 6$ $\qquad S_n = \frac{n}{2}[a + a_n]$

$d = 6$

$a_n = 240$ $\qquad S_{40} = \frac{40}{2}[6 + 240]$

$S_{40} = ?$

$S_{40} = 20 \times 246$

$S_{40} = 4920$

21) $(1, 5)$ $(-4, 0)$ $2 : 3$

$x_1\ y_1 \quad x_2\ y_2 \quad m\ n$

$P(x, y) = \left[\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right]$

$P(x, y) = \left[\frac{2 \times -4 + 3 \times 1}{2+3}, \frac{2 \times 0 + 3 \times 5}{2+3}\right]$

$= \left[\frac{-8+3}{5}, \frac{15}{5}\right]$

$= P\left(\frac{-5}{5}, \frac{15}{5}\right)$

$= P(-1, 3)$

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

$$P(\bar{A}) = 1 - P(A)$$

$$P(\bar{A}) = 1 - \frac{3}{4}$$

$$P(\bar{A}) = \frac{1}{4}$$

$$\therefore P(\bar{A}) \neq \frac{1}{2}$$

23) Construction

24) $$\frac{\cot 45^\circ \cdot \sin 45^\circ}{\sec 30^\circ - \cot 60^\circ}$$

$$\frac{\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}{\frac{2}{\sqrt{3}} - \frac{1}{\sqrt{3}}} = \frac{\frac{1}{2}}{\frac{1}{\sqrt{3}}}$$

$$\frac{1}{2} \times \frac{\sqrt{3}}{1} = \frac{\sqrt{3}}{2}$$

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24 OR

$$\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2\sec A$$

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

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

$$\frac{1 + 1 + 2\sin A}{(1+\sin A)\cos A}$$

$$\frac{2+2\sin A}{(1+\sin A)\cos A}$$

$$\frac{2\cancel{(1+\sin A)}}{\cancel{(1+\sin A)}\cos A}$$

$$2\sec A$$

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iv (25) $P(x) = 3x^3 + 4x^2 - 11x + 35$

$g(x) = x^2 - 2x + 3$

$$
\begin{array}{r}
3x + 10 \\
x^2 - 2x + 3 \,\big)\, 3x^3 + 4x^2 - 11x + 35 \\
\cancel{3x^3} - 6x^2 + 9x \\
(-) \quad (+) \quad (-) \\
\hline
10x^2 - 20x + 35 \\
\cancel{10x^2} \cancel{- 20x} + 30 \\
(-) \quad (+) \quad (-) \\
\hline
5
\end{array}
$$

$q(x) = 3x + 10$

$r(x) = 5$

OR

$\alpha + \beta = -3$ $\qquad$ $x^2 - (\alpha + \beta)x + \alpha\beta$

$\alpha\beta = 2$ $\qquad$ $x^2 + 3x + 2$

$x^2 + 2x + x + 2$

$x(x+2) + 1(x+2)$

$(x+2)(x+1)$

$x + 2 = 0 \qquad x + 1 = 0$

$x = -2 \qquad x = -1$

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26) Theorem

27) Construction

28)

CI	f	x	fx
2 - 6	4	4	16
6 - 10	8	8	64
10 - 14	2	12	24
14 - 18	1	16	16
18 - 22	5	20	100
	N = 20		Σfx = 220

$$\bar{x} = \frac{\Sigma fx}{N} = \frac{22\cancel{0}}{2\cancel{0}} = \frac{11}{1}$$

$\bar{x} = 11$

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Mode

CI	f	
5-15	4	f_0
15-25	8	f_1
25-35	2	f_2
35-45	5	
45-55	1	

$f_0 = 4$

$f_1 = 8$

$f_2 = 2$

$L = 15$

$h = 10$

Mode = ?

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$\text{Mode} = 15 + \left[\frac{8-4}{2\times 8 - 4 - 2}\right] \times 10$$

$$\text{Mode} = 15 + \left[\frac{4}{16-6}\right] \times 10$$

$$\text{Mode} = 15 + \frac{4}{\cancel{10}} \times \cancel{10}$$

$$\therefore \text{Mode} = 19$$

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30) $A(-5,-1)$ $B(3,-5)$ $C(5,2)$
$x_1\ y_1$ $x_2\ y_2$ $x_3\ y_3$

$$A = \frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right]$$

$$A = \frac{1}{2}\left[-5(-5-2)+3(2+1)+5(-1+5)\right]$$

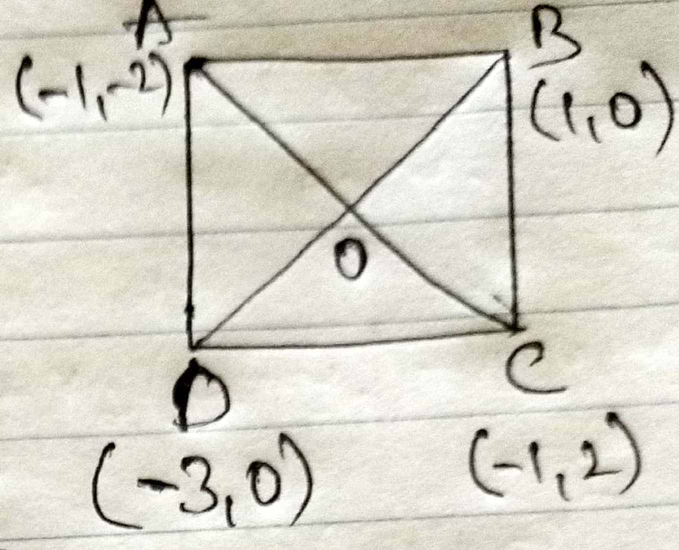
$$A = \frac{1}{2}\left[-5\times-7+3\times3+5\times4\right]$$

$$A = \frac{1}{2}\left[35+9+20\right]$$

$$A = \frac{1}{\cancel{2}}\times\cancel{64}^{32}$$

$\therefore A = 32$ sq units

OR



$A(-1,-2)$ $C(-1,2)$

$x_1\ y_1$ $\quad x_2\ y_2$

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

$$AC = \sqrt{(-1+1)^2+(2+2)^2}$$

$$AC = \sqrt{4^2}$$

$$AC = 4 \text{ units}$$

$B(1,0)$ $D(-3,0)$

$x_1\ y_1$ $\quad x_2\ y_2$

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

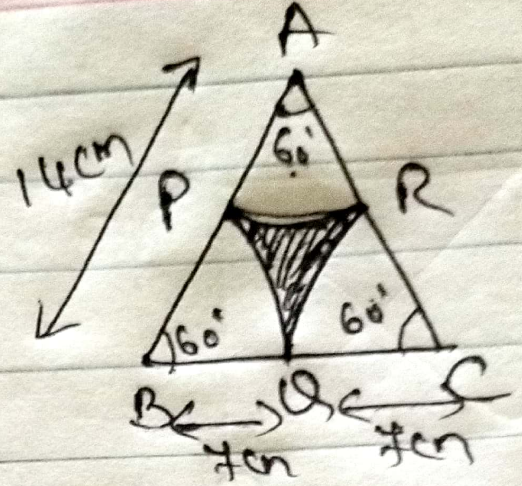
$$BD = \sqrt{(-3-1)^2+(0-0)^2}$$

$$BD = \sqrt{(-4)^2} = \sqrt{16} = 4$$

$$BD = 4 \text{ units}$$

$$O\left(\frac{1-3}{2}, \frac{0+0}{2}\right) = O(-1,0)$$

31)



Sector

$\theta = 60°$

$r = 7cm$

$A = ?$

Area of shaded region

$A =$ Area of equi Δ^{le} - Area of 3 sectors

$A = 49\sqrt{3} - 3 \times \frac{\theta}{360} \times \pi r^2$

$A = 49\sqrt{3} - \cancel{3} \times \frac{\cancel{60}}{\cancel{360}} \times \frac{\cancel{22}}{\cancel{7}} \times 7 \times \cancel{7}$

$A = 49 \times 1.7 - 77$

$A = 83.3 - 77$

$A = 6.3 \ cm^2$

Length of one arc

$$L = \frac{\theta}{360} \times 2\pi r$$

$$L = \frac{\cancel{60}^{1}}{\cancel{360}_{\cancel{6}\,3}} \times \cancel{2}^{1} \times \frac{22}{\cancel{7}} \times \cancel{7}$$

$$L = \frac{22}{3} \text{ cm}$$

Perimeter = 3 × length of arc.

$$P = \cancel{3} \times \frac{22}{\cancel{3}}$$

$$P = 22 \text{ cm}$$

32) Let the speed of the stream be 'x' km/hr.
Speed of boat in still water = 11 km/hr

<u>upstream</u>

$d = 12$ km

Speed = '$11-x$' km/hr

$T = \frac{12}{11-x}$

<u>down stream</u>

$d = 12$ km

Speed = '$11+x$' km/hr

$T = \frac{12}{11+x}$

$$\frac{12}{11-x} + \frac{12}{11+x} = 2\frac{\cancel{45}^{3}}{\cancel{60}_{4}} = \frac{11}{4}$$

$$\frac{12(11+x) + 12(11-x)}{(11-x)(11+x)} = \frac{11}{4}$$

$$\frac{12 \times 11 + \cancel{12x} + 12 \times 11 - \cancel{12x}}{121 - x^2} = \frac{11}{4}$$

$$4(132 + 132) = 11(121 - x^2)$$

$$4 \times \cancel{264}^{24} = \cancel{11}(121 - x^2)$$

$$121 - x^2 = 96$$

$$-x^2 = 96 - 121$$

$$\cancel{-}x^2 = \cancel{-}25$$

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$x^2 = 25$

$x = \sqrt{25}$

$x = 5$

$\therefore$ Speed of Stream $= x = \underline{5 \text{ km/hr}}$

OR

Let the age be 'x' yrs

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

$x+5$ Reciprocal $\frac{1}{x+5}$

$$\frac{1}{x-3} + \frac{1}{x+5} = \frac{1}{3}$$

$$\frac{x+5+x-3}{(x-3)(x+5)} = \frac{1}{3}$$

$$\frac{2x+2}{x^2-3x+5x-15} = \frac{1}{3}$$

$$\frac{2x+2}{x^2+2x-15} = \frac{1}{3}$$

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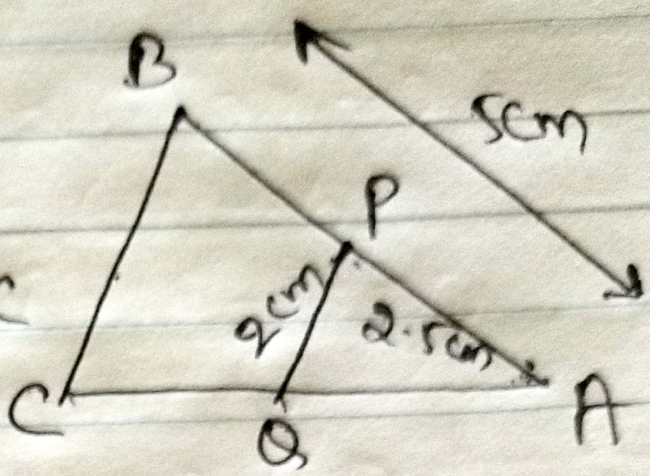
$$x^2+2x-15=3(2x+2)$$
$$x^2+2x-15=6x+6$$
$$x^2+2x-6x-15-6=0$$
$$x^2-4x-21=0$$
$$x^2-7x+3x-21=0$$
$$x(x-7)+3(x-7)=0$$
$$x-7=0$$
$$x=7$$

$\therefore$ Present age is 7 years

33)

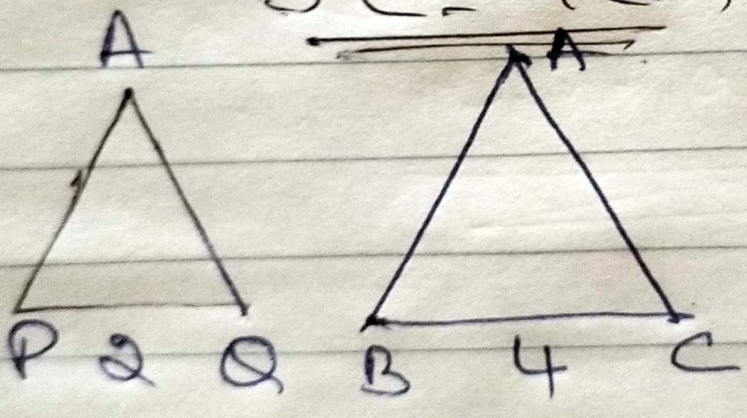


In ΔAPQ & ΔABC

$$\frac{PQ}{BC} = \frac{AP}{AB}$$

$$\frac{2}{BC} = \frac{2.5}{5}$$

$$BC = 4\,cm$$



$$\frac{A \cdot of\ \Delta APQ}{A \cdot of\ \Delta ABC} = \frac{PQ^2}{BC^2}$$

$$\frac{A \cdot of\ \Delta APQ}{A \cdot of\ \Delta ABC} = \frac{2^2}{4^2}$$

$$\frac{A \cdot of\ \Delta APQ}{A \cdot of\ \Delta ABC} = \frac{2 \times 2}{4 \times 4} = \frac{1}{4}$$

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(34) $a_{32} = 157$

$a + 31d = 157$

$a + 31(5) = 157$

$a + 155 = 157$

$a = 157 - 155$

$a = 2$

$a, a+d, a+2d, \ldots$

$2, 2+5, 2+2(5), \ldots$

$2, 7, 12, \ldots$

(or)

$a_2 + a_4 = 22$

$a + d + a + 3d = 22$

$2a + 4d = 22$

$a + 2d = 11$

$a = 11 - 2d$

$S_{11} = 253$

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

$S_{11} = \frac{11}{2}[2(11 - 2d) + (11-1)d]$

$\cancel{253}^{23} = \frac{\cancel{11}^{1}}{2}[22 - 4d + 10d]$

$2 \times 23 = [22 + 6d]$

$6d = 46 - 22$

$6d = 24$

$d = 4$

$a = 11 - 2d$

$a = 11 - 2(4) \Rightarrow \underline{a = 3}$

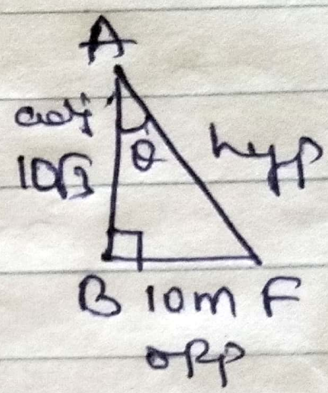
$a, a+d, a+2d, ---$

$3, 3+4, 3+2(4), --$

$3, 7, 11, ----$

35) graph. 36 Theorem.

37 In ΔABF



$\tan\theta = \frac{BF}{AB}$

$\tan\theta = \frac{10}{10\sqrt{3}}$

$\tan\theta = \frac{1}{\sqrt{3}}$

$\tan\theta = \tan 30^\circ$

$\theta = 30^\circ$

$\therefore$ the angle of depression formed from the top of the light to the ship is 30°

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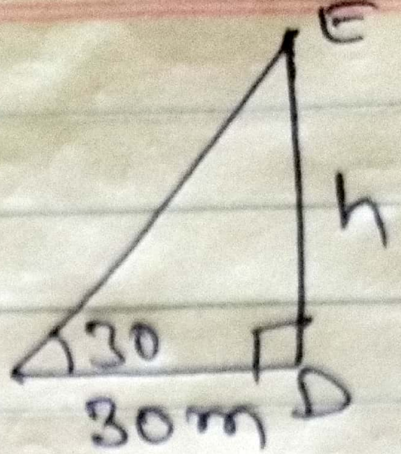
In ΔAED

$\tan\theta = \frac{DE}{AD}$



$\tan 30^\circ = \frac{h}{30}$

$\frac{1}{\sqrt{3}} = \frac{h}{30}$

$h = \frac{30}{\sqrt{3}} = \frac{\cancel{\sqrt{3}} \times \sqrt{3} \times 10}{\cancel{\sqrt{3}}}$

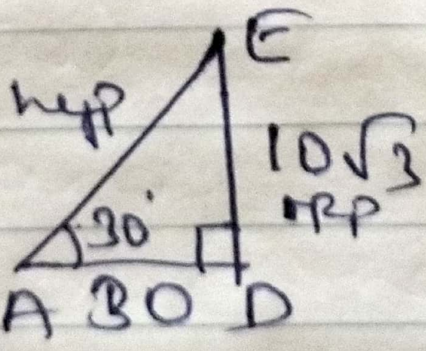
$h = 10\sqrt{3}\,m$

$\therefore$ height of the tower $= CD + DE$

height $= 10\sqrt{3} + 10\sqrt{3}$

$= 20\sqrt{3}\,m$

$\sin\theta = \frac{10\sqrt{3}}{AE}$



$\sin 30^\circ = \frac{10\sqrt{3}}{AE}$

$\frac{1}{2} = \frac{10\sqrt{3}}{AE}$

$AE = 2 \times 10\sqrt{3}$

$AE = 20\sqrt{3}\,m$

$\therefore$ distance b/w tops is $20\sqrt{3}\,m$

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(38) Cone

$r = 8cm$

$h = 15cm$

$l = \sqrt{r^2 + h^2}$

$l = \sqrt{8^2 + 15^2}$

$l = \sqrt{64 + 225}$

$l = \sqrt{289}$

$l = 17cm$

Cylinder

$d = 16cm$

$r = 8cm$

$h = 45 - 15 = 30cm$

$TSA = \pi r l + 2\pi r h + \pi r^2$

$TSA = \pi r(l + 2h + r)$

$TSA = \frac{22}{7} \times 8(17 + 2 \times 30 + 8)$

$TSA = \frac{176}{7} \times 85$

$TSA = \frac{14960}{7}$

$TSA = 2137.14 cm^2$

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

$$V = \pi r^2\left(\frac{1}{3}h + h\right)$$

$$V = \frac{22}{7} \times 8 \times 8 \left(\frac{1}{\cancel{3}} \times \cancel{15}^{5} + 30\right)$$

$$V = \frac{22 \times 64 \times \cancel{35}^{5}}{\cancel{7}}$$

$$V = 110 \times 64$$

$$V = 7040\ cc$$

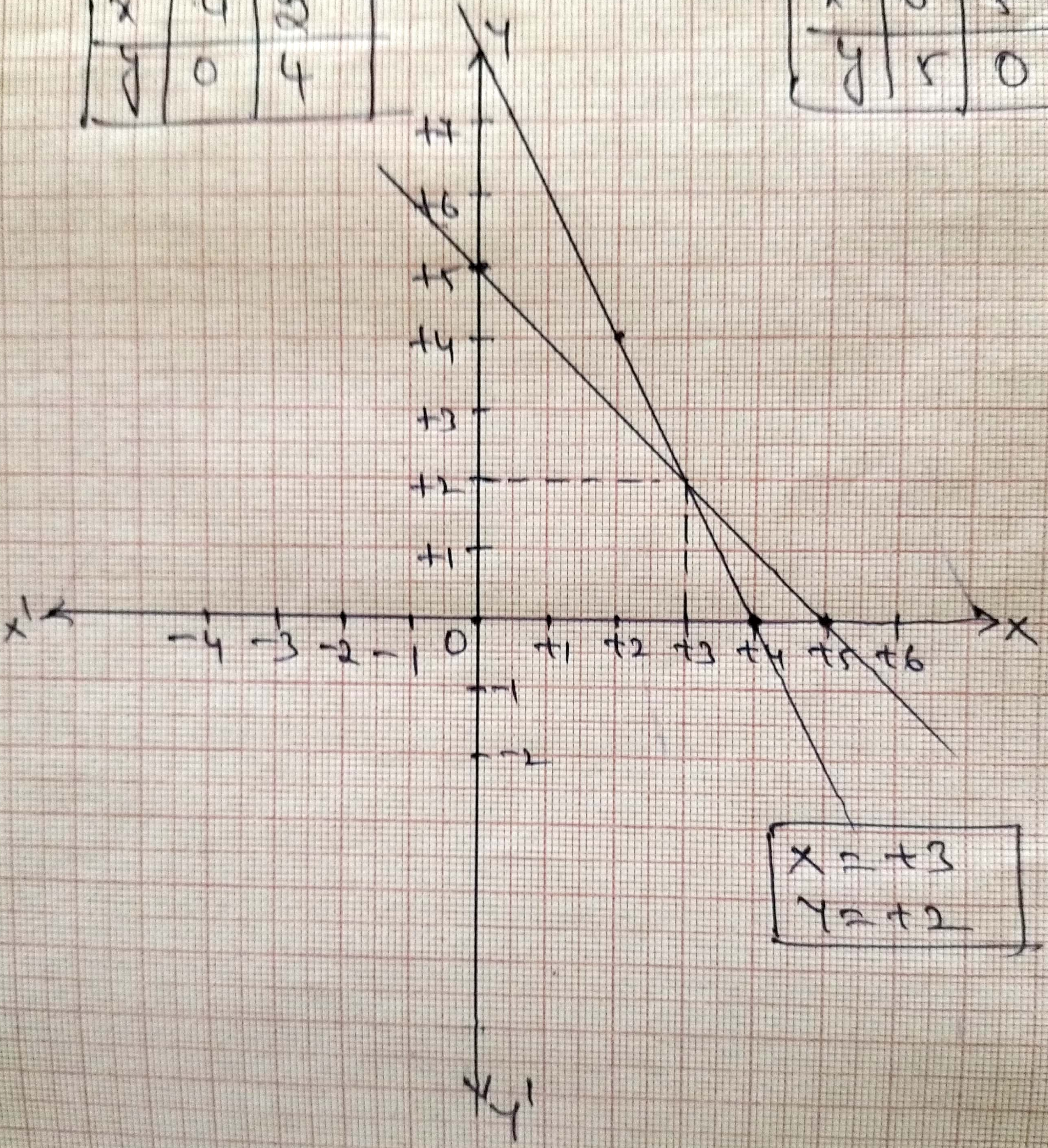
35

$2x+y=8$

x	4	2
y	0	4

$x+y=5$

x	0	5
y	5	0



$\boxed{\begin{array}{l} X = +3 \\ Y = +2 \end{array}}$

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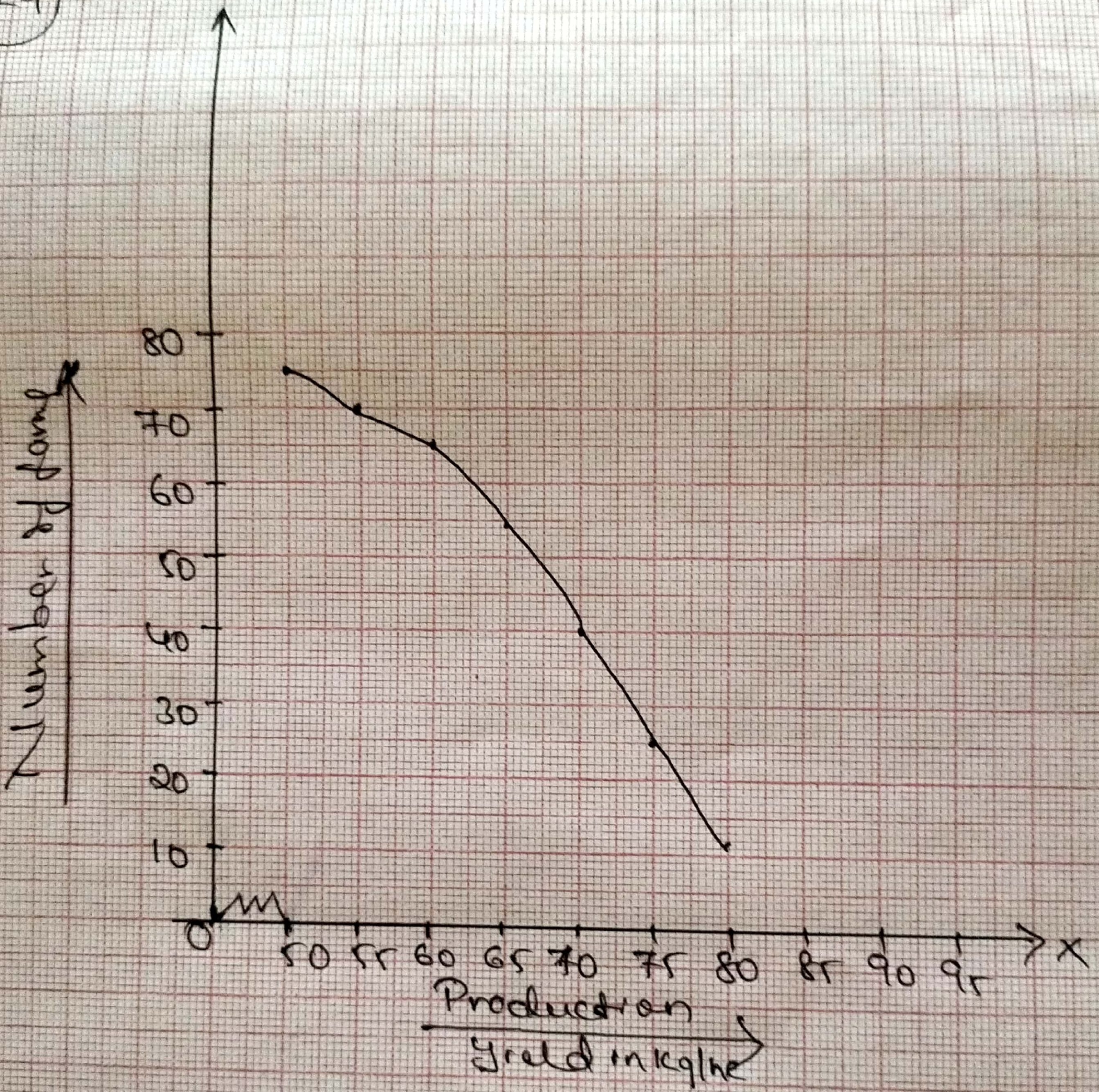

Number of farms
80
70
60
50
40
30
20
10
0
50 55 60 65 70 75 80 85 90 95
X
Production
Yield in kg/ha