Marking scheme - HYE - 2023-24.

Class - X (Maths)

Ans-1 (b)	Ans 2 (a)	Ans - 3 (c)	Ans 4 (c)
Ans 5 a	Ans 6 b	Ans-7 d	Ans 8 b
Ans 9 b	Ans 10 d	Ans 11 a	Ans 12 b
Ans 13 d	Ans 14 a	Ans 15 d	Ans 16 b
Ans 17 b	Ans 18 d	Ans 19 d	Ans 20 d.

(Each correct answer of 1-20 is of 1 mark)

Ans-21) Let us assume that $5+2\sqrt{3}$ is a rational no.

$\Rightarrow 5+2\sqrt{3} = \frac{p}{q}$, where p & q are coprime integers, $q \neq 0$ (1)

$\Rightarrow 2\sqrt{3} = \frac{p}{q} - 5 \Rightarrow \sqrt{3} = \frac{p-5q}{2q}$ (1/2)

Now On comparison LHS is irrational, whereas RHS is a rational no. Hence our assumption is wrong. (1/2)

$\therefore$ $5+2\sqrt{3}$ is irrational

OR

$$6^a = (2\times3)^a = 2^a \times 3^a$$

$\therefore$ The prime factorization of 6^a has only 2 and 3 (1)

For a number to end with digit zero, it should have

2×5 as its prime factors] (1/2)

$\therefore 6^a$ can never end with digit 0, as the prime factorization of a no. is unique (By Fund. thm. of arithmetic)]

Ans-22) As $DE \parallel BC$, $\therefore \frac{AD}{DB} = \frac{AE}{EC}$ (By BPT)] (1/2)

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

$\Rightarrow x^2 - x = x^2 - 4 \Rightarrow x = 4$] (1/2)

Ans-23) $p(x) = 6x^2 + 37x - (k-2)$

Let one zero is α, so other zero is $\frac{1}{\alpha}$] (1/2)

$\therefore$ Product of zeroes $= \alpha \times \frac{1}{\alpha} = 1 = \frac{-(k-2)}{6}$] (1)

$\Rightarrow 6 = -k + 2 \Rightarrow 4 = -k \Rightarrow k = -4$] (1/2)

Ans-24) $2x^2 - 9x + 4 = 0$

$\Rightarrow 2x^2 - 8x - x + 4 = 0$

$\Rightarrow 2x(x-4) - 1(x-4) = 0$] (1)

$\Rightarrow (2x-1)(x-4) = 0$

$\Rightarrow x = \frac{1}{2}, x = 4$] (1/2)

Sum of roots $= \frac{1}{2} + 4 = \frac{9}{4}$; Prod. of roots $= \frac{1}{2} \times 4 = 2$] (1/2)

OR

$4x^2 - 5 = 0$, $a = 4$, $b = 0$, $c = -5$

$D = b^2 - 4ac = 0^2 - 4 \times 4(-5) = 80$] (1)

$D = 80 > 0$, $\therefore$ the roots are real and distinct] (1)

Ans-25) In $\triangle AOB$ & $\triangle COD$

$\angle OAB = \angle OCD$ } alternate $\angle$s as

& $\angle ODC = \angle OBA$ } $AB \parallel DC$ (given)] (1)

$\therefore \triangle AOB \sim \triangle COD$ (by AA similarity)

$\Rightarrow \dfrac{OA}{OC} = \dfrac{OB}{OD}$ (by cpst)] (1)

Ans-26) Since the three persons start walking together. $\therefore$ The minimum distance covered by each of them in complete steps = LCM of measures of their steps.] (1/2)

= LCM of 40, 42, 45

$40 = 2^3 \times 5$

$42 = 2 \times 3 \times 7$

$45 = 3^2 \times 5$

$\therefore LCM = 2^3 \times 3^2 \times 5 \times 7 = 2520$] (2)

$\Rightarrow$ Each person should walk a minimum dist. of 2520 cm in complete steps.] (1/2)

Ans-27) $2x + 3y = 7$

$2ax + (a+b)y = 28$

For infinite soln., we have

$$\frac{2}{2a} = \frac{3}{a+b} = \frac{7}{28}$$ $\frac{1}{2}$

$$\Rightarrow \frac{2}{2a} = \frac{7}{28} \Rightarrow \frac{1}{a} = \frac{1}{4} \Rightarrow a = 4 \quad -(1)$$ (1)

Also

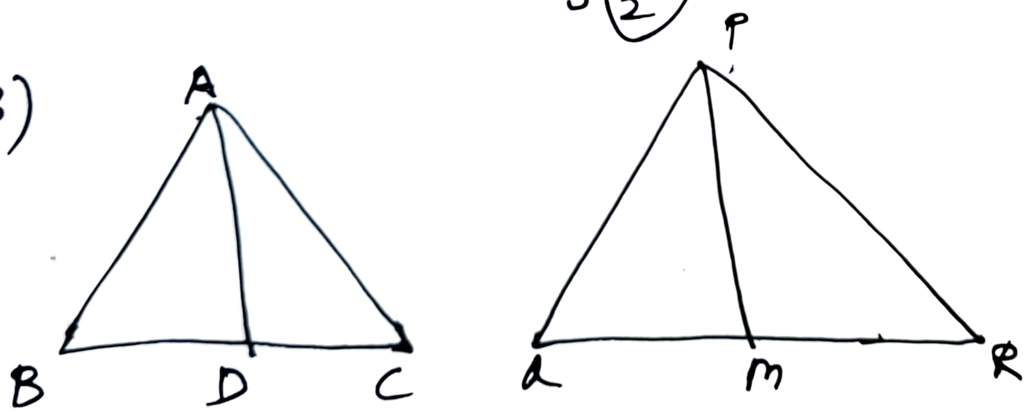
$$\frac{3}{a+b} = \frac{7}{28} \Rightarrow \frac{3}{a+b} = \frac{1}{4}$$

$$\Rightarrow 12 = a+b \quad -(2)$$

Sub (1) in (2) $\Rightarrow 12 = 4+b \Rightarrow b = 8$ (1)

$\therefore a = 4,\ b = 8$ $\frac{1}{2}$

Ans-28)



(1/2)

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM} \quad \text{(given)}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{2BD}{2QM} = \frac{AD}{PM}$$ (as AD & PM are medians) (1)

$\frac{AB}{PQ} = \frac{BD}{QM} = \frac{AD}{PM} \Rightarrow ABD \sim PQM$ (by SSS similarity)

$\therefore \angle B = \angle Q$ (by cpst) — (1)

½

In $\triangle ABC$ & $\triangle PQR$

$\frac{AB}{PQ} = \frac{BC}{QR}$ (given)

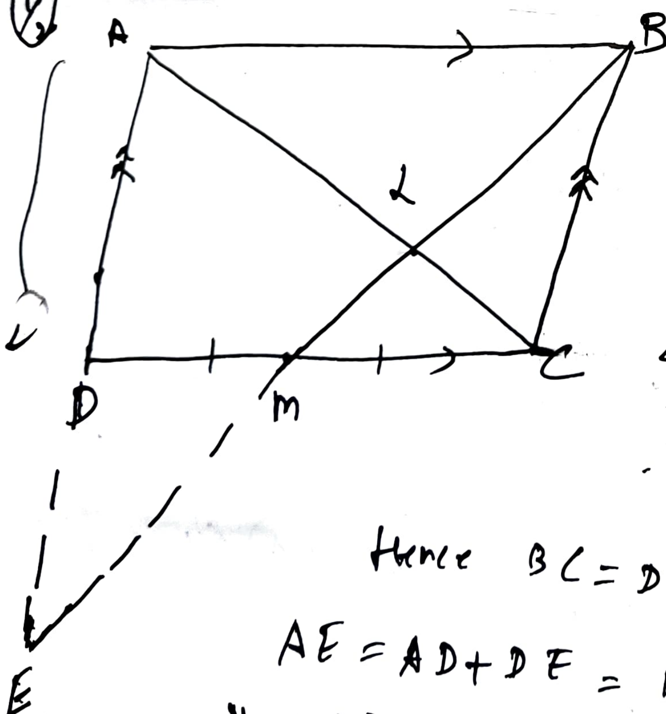
& $\angle B = \angle Q$ (from (1))

$\Rightarrow \triangle ABC \sim \triangle PQR$ (by SAS similarity)

1

OR

½



In $\triangle BMC$ & $\triangle EMD$

$\angle BMC = \angle EMD$ (V.O.A)

$MC = DM$ (given)

$\angle BCM = \angle EDM$ (alt. ∠s)

$\therefore BMC \cong EMD$ (by ASA)

1

Hence $BC = DE$ (by cpct) — (1)

$AE = AD + DE = BC + BC = 2BC$ — (2)

Now $\triangle BLC \sim \triangle ELA$ (by AA sim.)

1

$\frac{BL}{EL} = \frac{BC}{AE}$ (by cpct) $\Rightarrow \frac{BL}{EL} = \frac{BC}{2BC}$

$\Rightarrow \frac{BL}{EL} = \frac{1}{2} \Rightarrow EL = 2BL$

$\frac{1}{2}$

Ans-29) As $\sin(A-B) = 0$

$\Rightarrow A - B = 0$ — (1)] (1)

Also $2\cos(A+B) = 1 \Rightarrow \cos(A+B) = \frac{1}{2}$

$\Rightarrow A + B = 60^\circ$ — (2)] (1)

Adding (1) & (2)

$2A = 60^\circ \Rightarrow A = 30^\circ$ — (3)

Substituting (3) in (2)

$B = 30^\circ \Rightarrow A = 30^\circ, B = 30^\circ$] (1)

Ans-30) $\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos A}$

LHS $\frac{1+\sec A}{\sec A} = \frac{1+\frac{1}{\cos A}}{\frac{1}{\cos A}} = \frac{\frac{\cos A + 1}{\cos A}}{\frac{1}{\cos A}}$] (1)

$= \cos A + 1$

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

$= 1+\cos A$

$\therefore$ LHS = RHS] $\frac{1}{2}$

2am pm

$$4\cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + p = \frac{3}{4}$$

$$\Rightarrow 4 \times 1^2 - (2)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + p = \frac{3}{4}$$ $1\frac{1}{2}$

$$\Rightarrow 4 \times 1 - 4 + \frac{3}{4} + p = \frac{3}{4}$$

$$\Rightarrow p = \frac{3}{4} - \frac{3}{4} = \cancel{\frac{16+3}{4}} / \cancel{4} \; \cancel{18} \quad 0$$ $1\frac{1}{2}$

$$\Rightarrow p = 0$$

OR

If $\cos A + \cos^2 A = 1$

$\Rightarrow \cos A = 1 - \cos^2 A$ $1\frac{1}{2}$

$\Rightarrow \cos A = \sin^2 A$

Hence

~~RHS~~ $\sin^4 A + \sin^2 A$

$= \cos^2 A + \cos A$ $1\frac{1}{2}$

$= 1$

Ans-32) Let the initial speed $= x$ km/hr.

$\therefore$ New speed $= (x+6)$ km/hr. $\frac{1}{2}$

A.T.Q

$$\frac{63}{x+6} + \frac{54}{x} = 3$$ 1

$$\Rightarrow 63x + 54(x+6) = 3x(x+6)$$

$$\Rightarrow 63x + 54x + 324 = 3x^2 + 18x$$

$\Rightarrow 3x^2 + 18x - 63x \mp 54x \mp 324 = 0$

$\Rightarrow \cancel{3x^2 \mp 99x \pm 324 = 0}$

$\Rightarrow \cancel{x^2 \mp 33x \pm 108 = 0}$ (2)

$\Rightarrow 3x^2 - 99x - 324 = 0$

$\Rightarrow x^2 - 33x - 108 = 0$

$\Rightarrow x^2 - 36x + 3x - 108 = 0$

$\Rightarrow x(x-36) + 3(x-36) = 0$

$\Rightarrow (x+3)(x-36) = 0$ $\left(1\frac{1}{2}\right)$

$\Rightarrow x = -3$ (rejected) or $x = 36$, $\therefore x = 36$

$\therefore$ Average speed $= 36$ km/hr.

OR

Let us assume that the tap with smaller diameter fills the tank in x hours. $\left(\frac{1}{2}\right)$

Then, the tap with larger diameter fills the tank in $(x-2)$ hrs.

Two pipes together can fill the tank in $\frac{15}{8}$ hrs. (1)

So $\frac{1}{x} + \frac{1}{x-2} = \frac{8}{15}$

$$\Rightarrow \frac{(x-2)+x}{x(x-2)} = \frac{8}{15}$$

$$(2x-2)\times 15 = 8(x^2-2x)$$

$$\Rightarrow 30x - 30 = 8x^2 - 16x$$

$$\Rightarrow 8x^2 - 16x - 30x + 30 = 0$$

$$\Rightarrow 8x^2 - 46x + 30 = 0$$

$$\Rightarrow 4x^2 - 23x + 15 = 0$$

$1\frac{1}{2}$

$$\Rightarrow 4x^2 - 20x - 3x + 15 = 0$$

$$\Rightarrow 4x(x-5) - 3(x-5) = 0$$

$$\Rightarrow (4x-3)(x-5) = 0$$

$$\Rightarrow x = \frac{3}{4} \quad \text{or} \quad x = 5$$

$1\frac{1}{2}$

$$\Rightarrow x = 5$$

$\therefore$ pipe with smaller diameter fills the tank in 3 hrs.
and the pipe with large diameter fills the tank in 5 hrs.

$\frac{1}{2}$

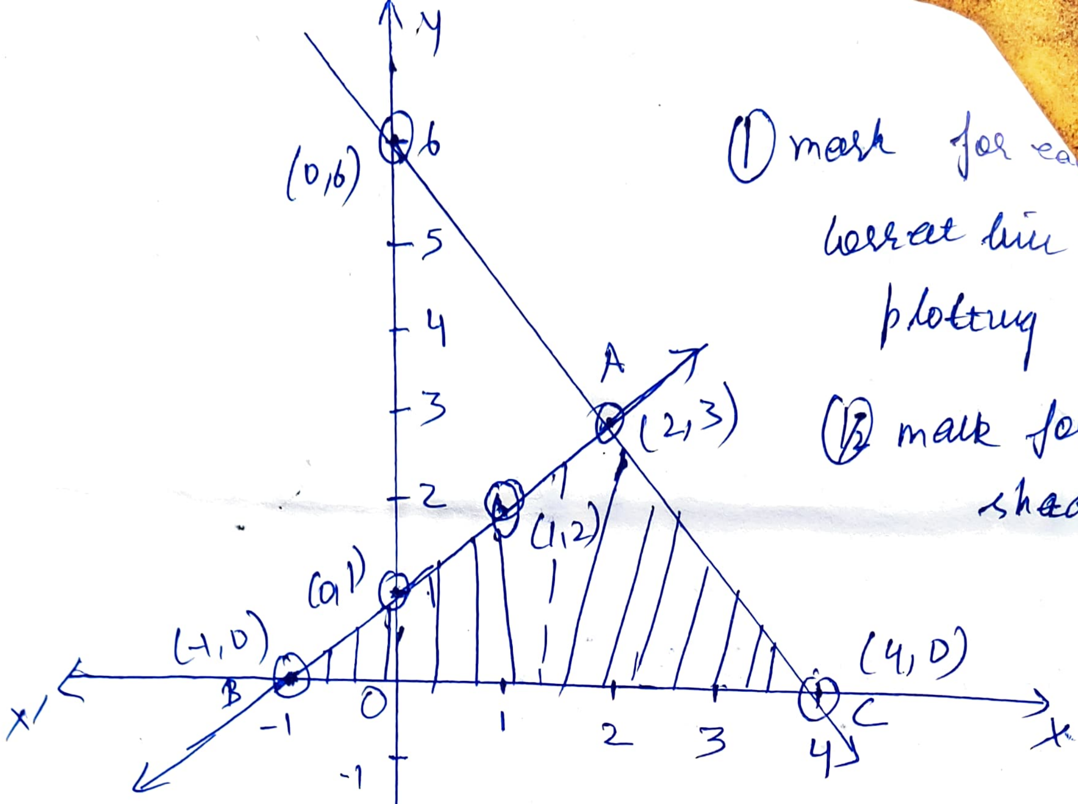
Ans-33) $x - y + 1 = 0 \Rightarrow x = y - 1$ — (1)

x	0	1	2
y	1	2	3

Also $3x + 2y = 12 \Rightarrow y = \dfrac{12-3x}{2}$

x	0	2	4
y	6	3	0

1



(1) mark for each correct line plotting

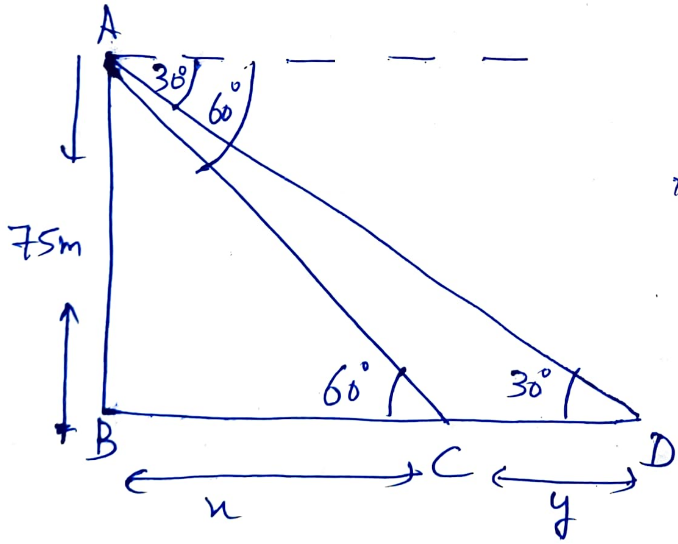
(1/2) mark for shading

Co-ordinates of vertices of ΔABC

A (2, 3), B (-1, 0), C (4, 0)

$1\frac{1}{2}$

Ans-34)



AB is the tower

C & D are the two cars

$1\frac{1}{2}$

In ΔABC

$\tan 60^\circ = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{75}{x}$

$\Rightarrow x = \frac{75}{\sqrt{3}}$ — (1)

(1)

ABD

$\tan 30^\circ = \dfrac{AB}{BD} \Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{75}{x+y}$ (1)

$\Rightarrow x + y = 75\sqrt{3}$

$\Rightarrow \dfrac{75}{\sqrt{3}} + y = 75\sqrt{3} \Rightarrow y = 75\sqrt{3} - \dfrac{75}{\sqrt{3}}$

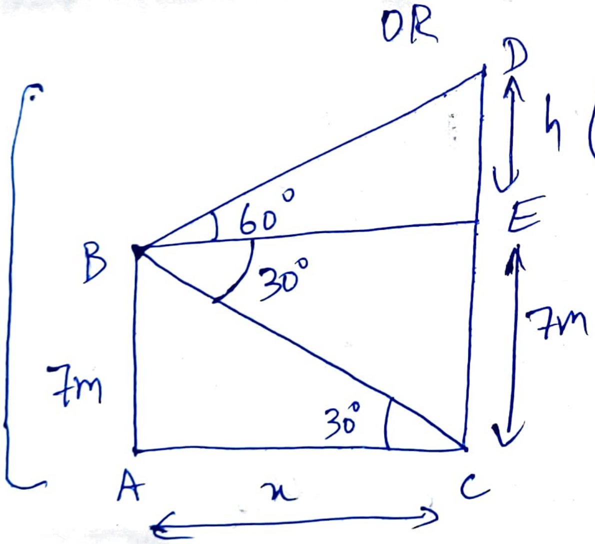
$\Rightarrow y = \dfrac{75 \times 3 - 75}{\sqrt{3}} = \dfrac{150}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}}$ (1)

$y = 50\sqrt{3} = 50 \times 1.73 = 86.5$

$\therefore$ Distance between the two cars = 86.5 m ($\frac{1}{2}$)

OR

(1)



($\frac{1}{2}$) AB is the building = 7m

CD is the tower = (7+h) m

In Δ ABC

$\tan 30^\circ = \dfrac{AB}{AC}$ ($1\frac{1}{2}$)

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{7}{x} \Rightarrow x = 7\sqrt{3}$

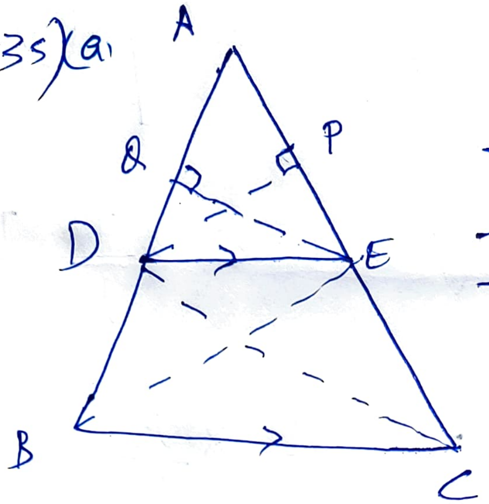
Also in Δ BDE, $\tan 60^\circ = \dfrac{DE}{BE}$ ($1\frac{1}{2}$)

$\Rightarrow \sqrt{3} = \dfrac{h}{x} \Rightarrow x\sqrt{3} = h$

$\Rightarrow h = 7\sqrt{3} \times \sqrt{3} = 7 \times 3 = 21$

$\therefore$ height of tower $= h + 7 = 21 + 7 =$

Ans-35) (a)



Given A Δ ABC in which $DE \parallel BC$

T.P $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

Const Draw $DP \perp AC$ and $EQ \perp AB$. Join CD and BE.

Proof $\dfrac{Ar(\Delta ADE)}{Ar(BDE)} = \dfrac{\frac{1}{2} \times AD \times EQ}{\frac{1}{2} \times BD \times EQ} = \dfrac{AD}{BD}$ --- (i)

Also $\dfrac{Ar(\Delta ADE)}{Ar(\Delta CDE)} = \dfrac{\frac{1}{2} \times AE \times DP}{\frac{1}{2} \times CE \times DP} = \dfrac{AE}{CE}$ --- (ii)

Also $Ar(BDE) = Ar(CDE)$ [as of Δs. on the same base and between same parallels] --- (iii)

From (i), (ii) & (iii), we can say that

$$\frac{AD}{BD} = \frac{AE}{CE}$$

Hence Proved.

2

In fig. DE || BC, $\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{1.5}{3} = \frac{1}{EC} \Rightarrow EC = 2$

$\therefore AC = 1 + 2 = 3$ cm

1½

36) (i) $20x + 5y = 9000$ ...(i)

$5x + 25y = 26000$ ...(ii)

1

(ii)

$100x + 25y = 45000$

$5x + 25y = 26000$

(−) (−) (−)

$95x = 19000$

$\Rightarrow x = \frac{19000}{95} = 200$

$\therefore$ monthly fee paid by a poor child = Rs 200

2

OR

$x = 200$ finding x, then.

$20 \times 200 + 5y = 9000$

$\Rightarrow 5y = 9000 - 4000 = 5000$

$\Rightarrow y = \frac{5000}{5} = 1000$

2

(iii) Total collection =
$5 \times 10 + 25 \times 20 = 50 + 500 =$ Rs 550

Ans-37) (i) In Δ BPO

$$\frac{OP}{OB} = \cos 30^\circ$$

$$\Rightarrow \frac{36}{OB} = \frac{\sqrt{3}}{2} \Rightarrow \frac{72}{\sqrt{3}} = OB$$

$\Rightarrow OB = 24\sqrt{3}$ cm. (1)

Ans-37(ii) In Δ BPO

$$\frac{PB}{OP} = \tan 30^\circ \Rightarrow \frac{PB}{36} = \tan 30^\circ$$

$$\Rightarrow \frac{PB}{36} = \frac{1}{\sqrt{3}} \Rightarrow PB = \frac{36}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 12\sqrt{3} \text{ cm}$$ (1)

Also In Δ APO $\quad \frac{AP}{PO} = \tan 45^\circ$

$$\Rightarrow \frac{AP}{36} = 1 \Rightarrow AP = 36$$ (1)

$\therefore AB = 36 - 12\sqrt{3}$

OR

$Ar(\Delta OPB) = \frac{1}{2} \times PB \times OP$

finding PB, which $= 12\sqrt{3}$

$Ar(OPB) = \frac{1}{2} \times 12\sqrt{3} \times 36$

$= 216\sqrt{3}$ cm^2 (2)

...ight of section A from base of tower

$= PA = 36$ cm — (1)

...n-38) (i) $(18+x)(12+x) = 18 \times 12 \times 2$ (1)

(ii) $(18+x)(12+x) = 18 \times 12 \times 2$

$\Rightarrow 216 + 18x + 12x + x^2 = 432$ (2)

$\Rightarrow x^2 + 30x - 216 = 0$

(iii) Now solving $x^2 + 30x - 216 = 0$

$\Rightarrow x^2 + 36x - 6x - 216 = 0$

$\Rightarrow x(x+36) - 6(x+36) = 0$

$\Rightarrow (x+36)(x-6) = 0$

$\Rightarrow x = -36$ (rej) or $x = 6$ (2)

$\therefore x = 6$

$\therefore$ New dimensions are 24 cm and 18 cm.

...should have