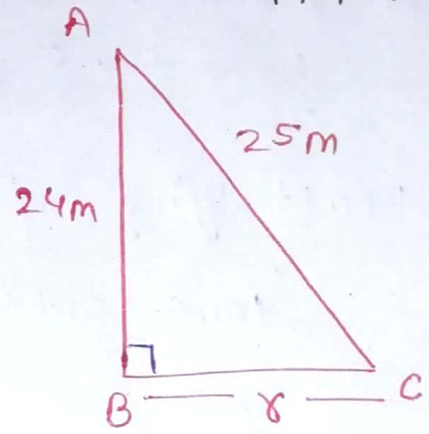
RBSE BOARD . HEIGHT AND DISTANCE

PREVIOUS YEAR PAPER [2015-19]

(1) A CCTV camera is placed on the top of a 24m high pole in such a way that traffic can be seen beyond 25 meter of line of sight of it. Find the area of Green Patch around the pole.

[RBSE 2018 PART-B].

Sol. Using Pythogoras theorem,



$AC^2 = AB^2 + BC^2$

$(25)^2 = (24)^2 + (BC)^2$

$625 = 576 + r^2$

$r^2 = 625 - 576$

$r^2 = 49$

$r = 7m$

Now, Invisible area of circle $= \pi r^2$

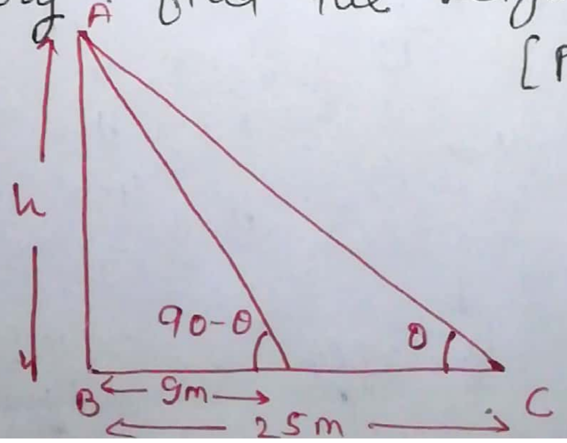
$= \frac{22}{7} \times 7 \times 7$

$= 154 \ m^2$.

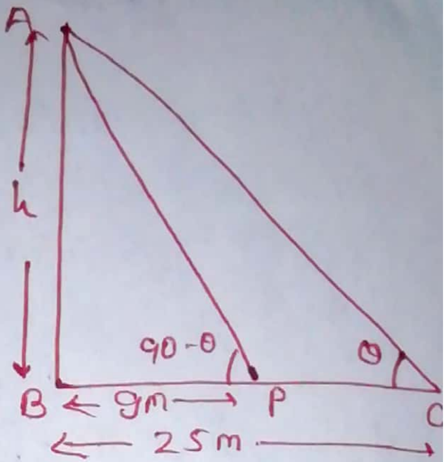
(2) The angle of elevation of the top of a tower from two points at a distance of 9m. And 25m from the base of the tower in the same straight line are complementary, find the height of tower.

[Part-C]

Sol



Sol. simplify the expression



ΔABP

$\frac{h}{9} = \tan\theta$

$\frac{h}{9} = \tan(90-\theta) = \cot\theta$ —(i)

In $\Delta ABQC$

$\frac{h}{25} = \tan\theta$ —(ii)

Multiplying eq^n (i) and (ii)

$\tan\theta \cdot \cot\theta = \frac{h}{9} \times \frac{h}{25}$

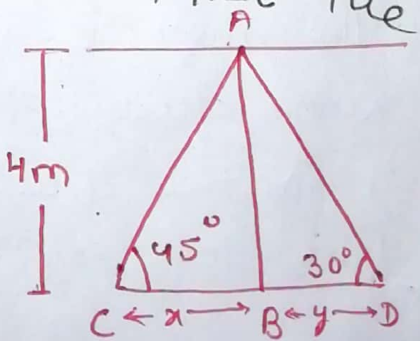
$1 = \frac{h^2}{9 \times 25} \Rightarrow h^2 = (3)^2 \times (5)^2$

$h = 3 \times 5$

$h = 15\text{m}$

[Part - C]
[RBSE - 2015]

(3) From a point on a bridge across a river the angle of depression of the bank on opposite sides of the river are 30° and 45° respectively If the bridge is at a height of 4m from the banks. Find the width of the river.



Sol. In ΔABC

$\tan 45° = \frac{P}{B}$

$1 = \frac{4}{x}$

$\boxed{x = 4}$

In ΔABD

$\tan 30° = \frac{P}{B}$

$\frac{\sqrt{3}}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{4}{y}$

$y = \frac{4 \times 3}{\sqrt{3}} = \frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\cancel{12}^{4}\sqrt{3}}{\cancel{3}}$

finally $CD = x + y$

$= 4(1+\sqrt{3})\text{m}$.

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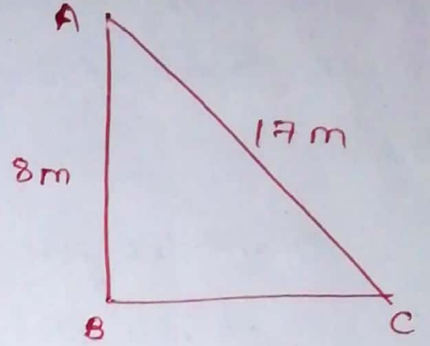
(4) For a traffic control, a CCTV camera is fixed on a 8m straight pole. The camera can see 17m distance sight line from the top. Find the area (pole) visible by camera around the pole. [RBSE 2016] Part B.



Sol Using PT.

$B^2 = H^2 - P^2$

$= 17^2 - 8^2$

$= 289 - 64$

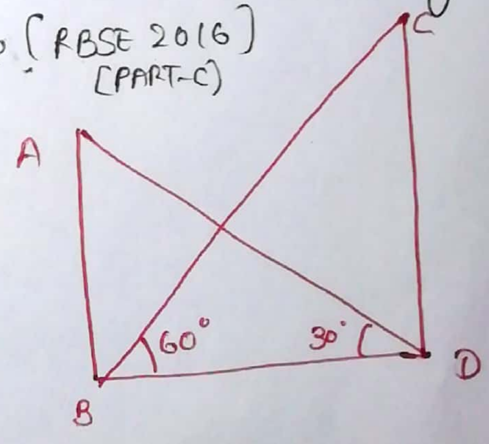
$B^2 = 225$

$B = 15\,m$

Area of $\Delta ABC = \frac{22}{7} \times 15 \times 15$

$= 707.14\,m^2$

(5) The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 48 meter high find the height of the building. [RBSE 2016] [PART-C]



Sol. Let AB be building and CD be the tower

In ΔCDB

$\frac{CD}{BD} = \tan 60°$

$\frac{48}{BD} = \sqrt{3} \Rightarrow BD = \frac{48}{\sqrt{3}}$

In ΔABD

$\frac{AB}{BD} = \tan 30° \Rightarrow AB = \frac{48}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{48}{3} = 16$

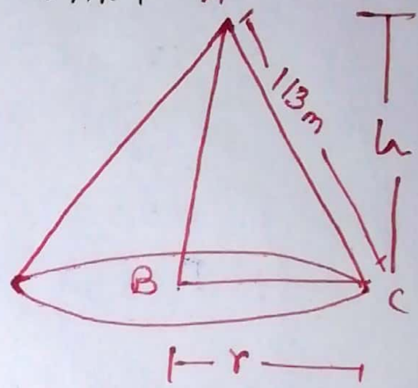
Height of the building = 16 m.

☆ ⑥ For traffic control, a CCTV camera is fixed on a straight line or pole. The camera can see 113 m distance straight line from the top. If the area visible by the camera around the pole is 39424 m^2, then find the height of the pole.

[RBSE-2017]

PART A

Sol. Here,



Slant height, $l = 113$

Area of cone $= 39424$

$\pi r l = 39424$

$\frac{22}{7} \times r \times 113 = 39424$

$r = \frac{39424 \times 7}{22 \times 113} = 111 m$

Now In ΔABC, Using PT

$AC^2 = AB^2 + BC^2$

$(113)^2 = AB^2 + (111)^2$

$AB = h$

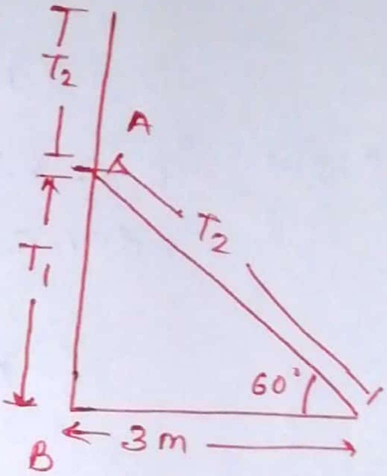
$h^2 = (113)^2 - (111)^2 \Rightarrow h = \sqrt{(113)^2 - (111)^2}$

$h = \sqrt{12769 - 12321}$

$h = 22 m$ Ans

(7) A tree breaks due to storm and the broken part bends so that the top of the tee touches the ground making an angle of 60° with it. The distance b/w the feet of the tree to the point where top touches the ground is 3 m. Find the height of the tree. [RBSE 2017] [PART- C]

Sol. Simplify the expression,



Here in ΔABC

$$\tan 60° = \frac{T_1}{3}$$

$$T_1 = 3\sqrt{3} \quad (\tan 60° = \sqrt{3})$$

Now, again in ΔABC

$$\cos 60° = \frac{BC}{AC}$$

$$\frac{1}{2} = \frac{3}{T_2} \Rightarrow T_2 = 6$$

Now, height of tree $= T_1 + T_2 = 6 + 3\sqrt{3}$

$= 6 + 3 \times (1.73)$

$= 6 + 5.19$

$= 11.19$ m

(8) From a point on the ground which is 120 m away from the foot of the unfinished tower, the angle of elevation of the top of the top of the tower is found to be 30°. Find how much height of tower to increase so that its angle of elevation at same point become ~~30°~~ 60°.

(RBSE 2019) [PART- B]

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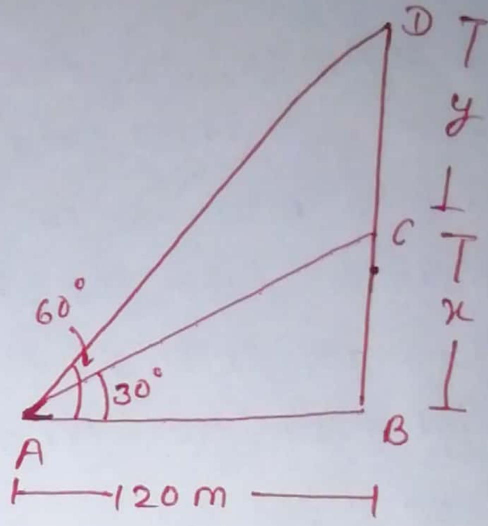
Sol. In ΔABC

$$\tan 30^\circ = \frac{x}{120}$$

$$\frac{1}{\sqrt{3}} = \frac{x}{120}$$

$$x = \frac{120}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\overset{40}{\cancel{120}}\sqrt{3}}{\cancel{3}}$$

$$x = 40\sqrt{3}$$



Now, in ΔADB

$$\tan 60^\circ = \frac{x+y}{120}$$

$$\sqrt{3} \times 120 = x + y \Rightarrow x + y = 120\sqrt{3}$$

$$y = 120\sqrt{3} - 40\sqrt{3}$$

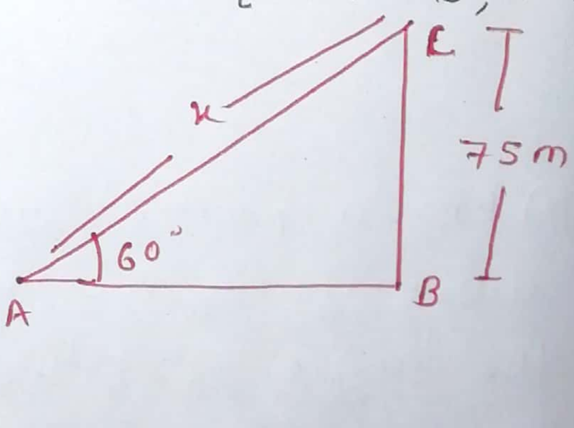
$$y = 80\sqrt{3}$$

Hence increase the height of tower $y = 80\sqrt{3}$ m.

Q9. A kite is flying at a height of 75 metres from the level of ground attached to a string inclined at 60° to horizontal. Find height of string.

[RBSE 2019, PART-

Sol. Let $AC = x$



$$\sin 60^\circ = \frac{75}{x}$$

$$\frac{\sqrt{3}}{2} = \frac{75}{x}$$

$$\Rightarrow x = \frac{150}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{150\sqrt{3}}{3} = 50\sqrt{3}$$

So, height of string $= 50\sqrt{3}$