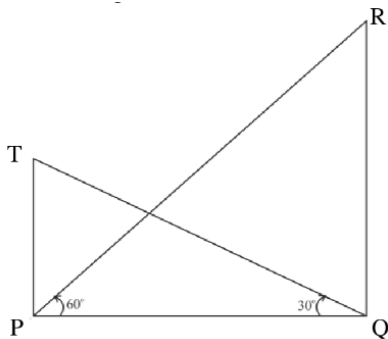


AI1110 - Assignment 1

Kushagra Gupta
CS21BTECH11033

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Q10-c: The angle of elevation from a point P of the top of a tower QR, 50m high is 60° and that of the tower PT from a point Q is 30° . Find the height of tower PT, correct to the nearest metre.



Parameter	Symbol	Value
QR	h	50
Angle QPR	α	60°
Angle PQT	β	30°
Base PQ	d	???
PT	h_2	???

TABLE I

Solution: In $\triangle PQR$, using basic trigonometric equation in a right-angled triangle, we know that,

$$\tan(\theta) = \frac{\text{perpendicular}}{\text{base}} \quad (1)$$

$$\Rightarrow \tan(\alpha) = \frac{h}{d} \quad (2)$$

$$\Rightarrow d = \frac{h}{\tan(\alpha)} \quad (3)$$

$$\Rightarrow d = \frac{50}{\tan(60^\circ)} m \quad (4)$$

$$[\because \alpha = 60^\circ \text{ \& } h = 50m] \quad (5)$$

$$\Rightarrow d = \frac{50}{\sqrt{3}} m \quad (6)$$

Now in $\triangle PQT$, $\beta = 30^\circ$.

$$\therefore \tan(\beta) = \frac{h_2}{d} \quad (7)$$

$$\Rightarrow h_2 = d \times \tan(\beta) \quad (8)$$

$$\Rightarrow h_2 = d \times \tan(30^\circ) \quad (9)$$

$$\Rightarrow h_2 = \frac{50}{\sqrt{3}} \times \tan(30^\circ) m \quad (10)$$

$$[\text{using}(6)] \quad (11)$$

$$\Rightarrow h_2 = \frac{50}{3} m \quad (12)$$

$\therefore h_2(PT) \approx \boxed{17}$ metres after rounding off.

This can be verified by plotting QR, α and β and approximating the length of PT.

Output: The Output of the program used to verify the answer is given below:

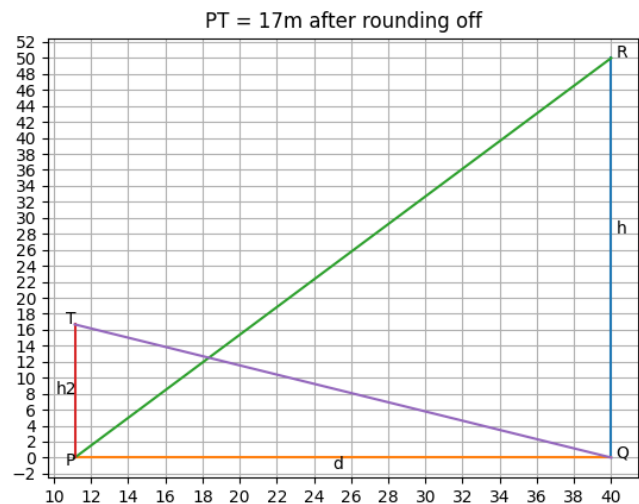


Fig. 1. Plot of the figure and calculated length