AI1110 - Assignment 1

Kushagra Gupta
CS21BTECH11033

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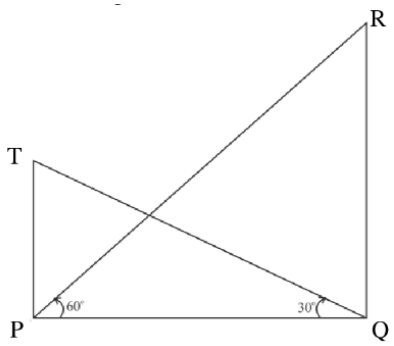
Q10-c: The angle of elevation from a point P of the top of a tower QR, 50m high is $60°$ and that of the tower PT from a point Q is $30°$. Find the height of tower PT, correct to the nearest metre.



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

TABLE I

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

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

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

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

$$\Rightarrow d = \frac{50}{\tan(60°)}\, m \tag{4}$$

$$[\because \alpha = 60° \,\&\, h = 50m] \tag{5}$$

$$\Rightarrow d = \frac{50}{\sqrt{3}}\, m \tag{6}$$

Now in ΔPQT, $\beta = 30°$.

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

$$\Rightarrow h_2 = d \times \tan(\beta) \tag{8}$$

$$\Rightarrow h_2 = d \times \tan(30°) \tag{9}$$

$$\Rightarrow h_2 = \frac{50}{\sqrt{3}} \times \tan(30°)\, m \tag{10}$$

$$[using(6)] \tag{11}$$

$$\Rightarrow h_2 = \frac{50}{3}\, m \tag{12}$$

$\therefore h_2(PT) \approx \boxed{17}$ metres after rounding off.
This can be verified by plotting h , α and β and approximating the length of h_2.
Output: The Output of the program used to verify the answer is given below:

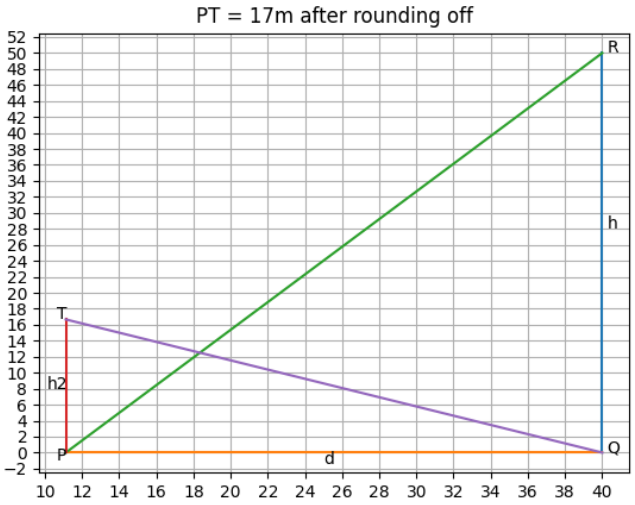


Fig. 1. Plot of the figure and calculated length