AI1110 - Assignment 1

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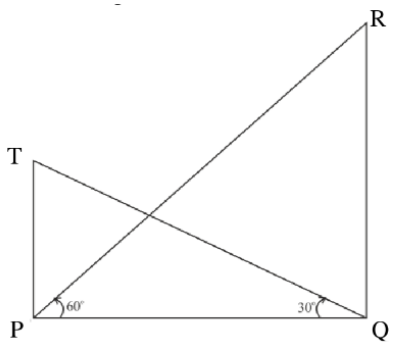
ICSE 2018 Grade 10

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	$\angle QPR$	$60°$
Angle PQT	$\angle PQT$	$30°$
Base PQ	d	???
PT	h_2	???

TABLE I

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

$$\tan(\theta) = \frac{\text{perpendicular}}{\text{base}}$$
$$\Rightarrow \tan(\angle QPR) = \frac{h}{d}$$
$$\Rightarrow d = \frac{h}{\tan(\angle QPR)}$$
$$\Rightarrow d = \frac{50}{\tan(60°)}\, m$$
$$[\because \angle QPR = 60° \,\&\, h = 50m]$$
$$\Rightarrow d = \frac{50}{\sqrt{3}}\, m \quad -(1)$$

Now in ΔPQT, $\angle PQT = 30°$.

$$\therefore \tan(\angle PQT) = \frac{h_2}{d}$$
$$\Rightarrow h_2 = d \times \tan(\angle PQT)$$
$$\Rightarrow h_2 = d \times \tan(30°)$$
$$\Rightarrow h_2 = \frac{50}{\sqrt{3}} \times \tan(30°)\, m$$
$$[using(1)]$$
$$\Rightarrow h_2 = \frac{50}{3}\, m$$

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

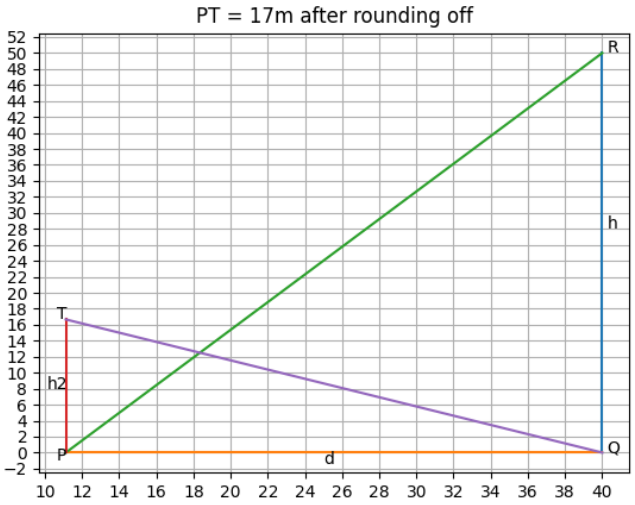


Fig. 0. Plot of the figure and calculated length