

# AI1110 - Assignment 1

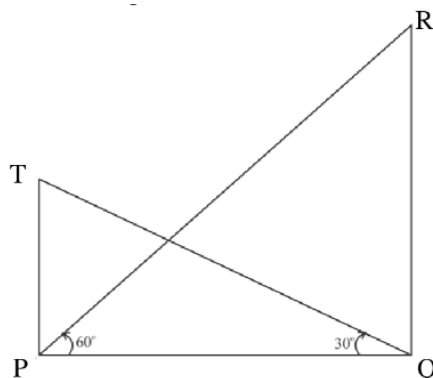
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ICSE 2018 Grade 10

Q10-c

## Problem Statement

The angle of elevation from a point P of the top of a tower QR, 50m high is  $60^\circ$  and that of the tower PT from a point Q is  $30^\circ$ . Find the height of tower PT, correct to the nearest metre.



## Solution

In  $\triangle PQR$ ,  
 $\angle RPQ = 60^\circ$  and  $QR = 50\text{m}$ , using basic trigonometric equation in a right-angled triangle, we know that,

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

Hence,

$$\begin{aligned}\tan(\angle RPQ) &= \frac{QR}{PQ} \\ \Rightarrow PQ &= \frac{QR}{\tan(\angle RPQ)} \\ \Rightarrow PQ &= \frac{50}{\tan(60^\circ)} m \\ [\because \angle RPQ = 60^\circ \text{ \& } QR = 50\text{m}] \\ \Rightarrow PQ &= \frac{50}{\sqrt{3}} m \quad \text{--- (1)}\end{aligned}$$

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

$$\begin{aligned}\therefore \tan(\angle PQT) &= \frac{PT}{PQ} \\ \Rightarrow PT &= PQ \times \tan(\angle PQT) \\ \Rightarrow PT &= PQ \times \tan(30^\circ) \\ \Rightarrow PT &= \frac{50}{\sqrt{3}} \times \tan(30^\circ) m \\ [\text{using (1)}] \\ \Rightarrow PT &= \frac{50}{3} m\end{aligned}$$

$\therefore PT \approx 17$  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:

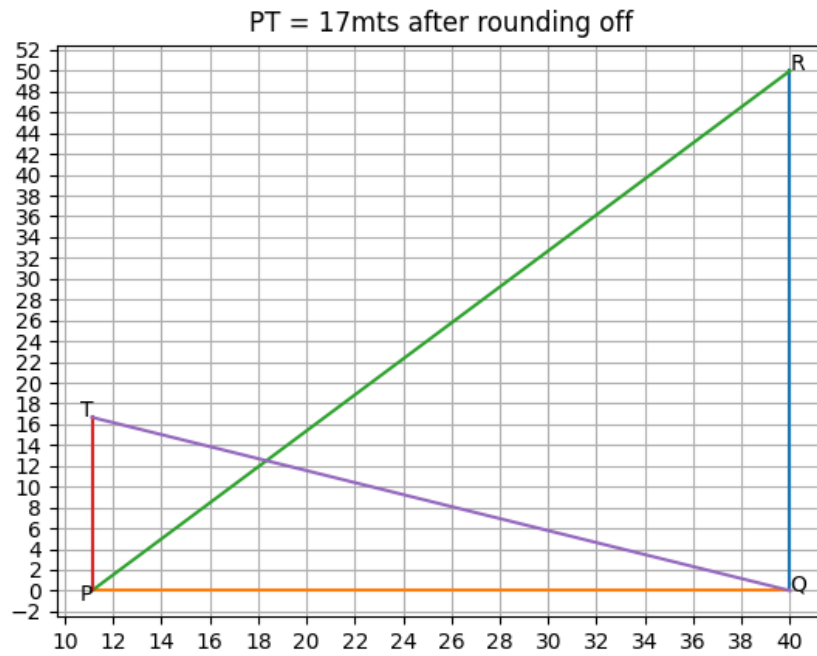


Figure 1: Plot of the figure and calculated length