

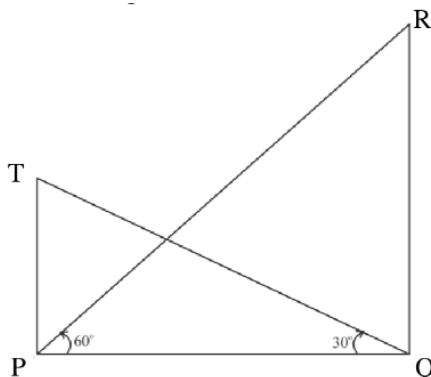
AI1110 - Assignment 1

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Problem Statement

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 the 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,

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

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

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

\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:

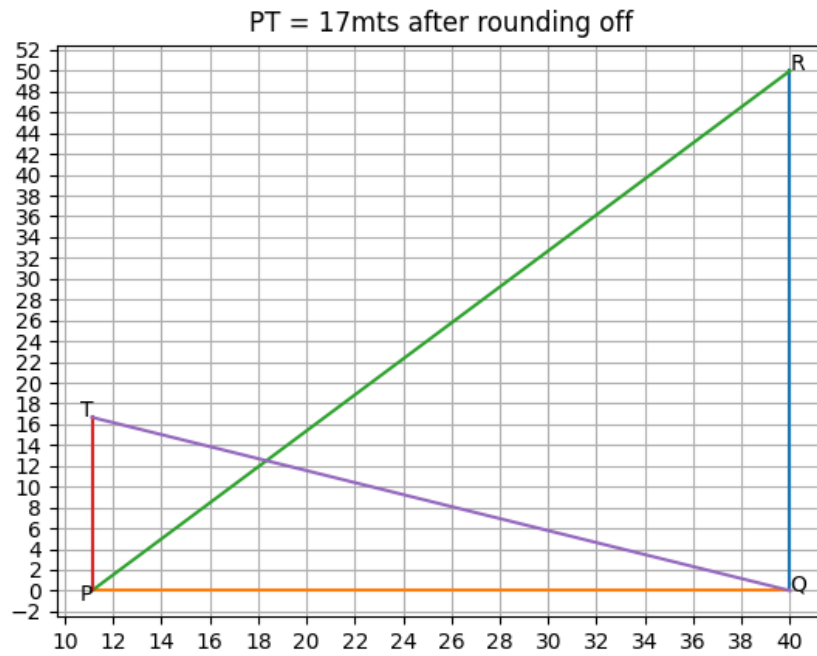


Figure 1: Plot of the figure and calculated length