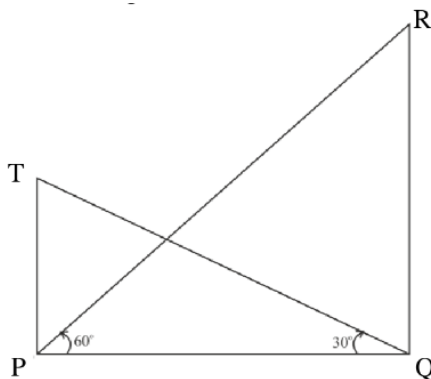# AI1110 - Assignment 1

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Q10-c

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 tower PT, correct to the nearest metre.

Solution

Parameter	Symbol	Value
QR	h	50
Angle QPR	$\angle QPR$	60°
Angle PQT	$\angle PQT$	30°
Base PQ	d	???
PT	$h2$	???

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

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

Hence,

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

Now in ΔPQT, $\angle PQT = 30°$.

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$$\therefore \tan(\angle PQT) = \frac{h_2}{d}$$

$$\Rightarrow h_2 = d \times \tan(\angle PQT)$$

$$\Rightarrow h_2 = d \times \tan(30°)$$

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

$$[using(1)]$$

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

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

This can be verified by plotting QR , $\angle RPQ$ and $\angle PQT$ and approximating the length of PT.

Output

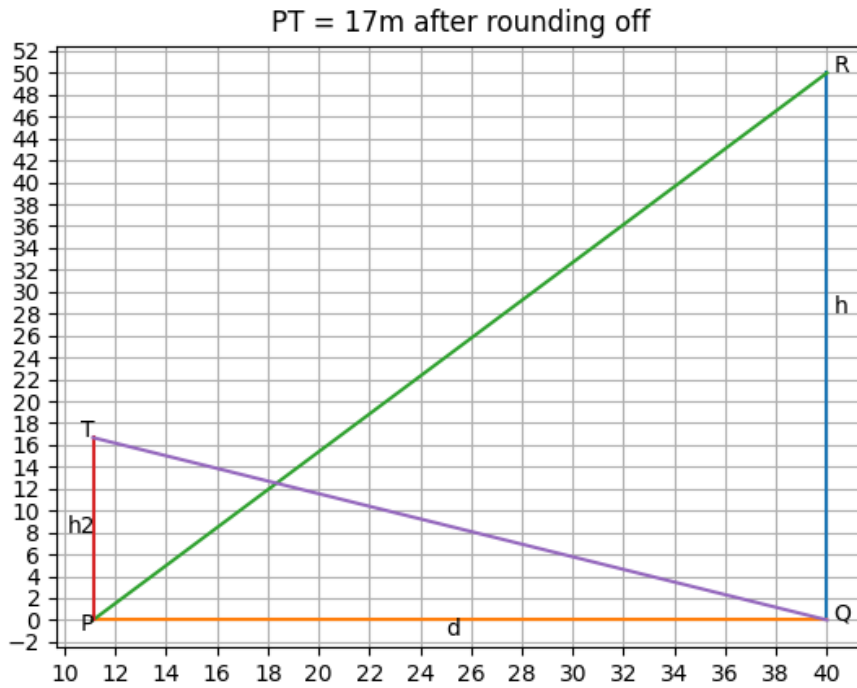The Output of the program used to verify the answer is given below:

Figure 1: Plot of the figure and calculated length

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