

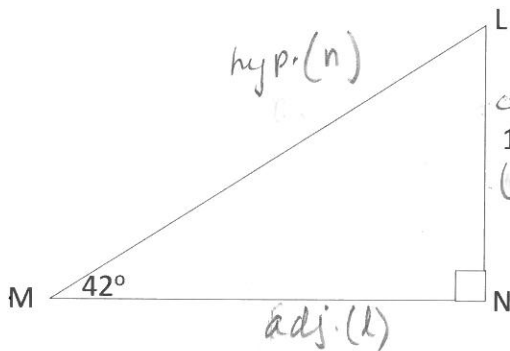
# Lesson Five: Solving a Triangle

**Goals:**

- Use trigonometry to solve for all the unknown side lengths and angle measures in a right triangle.

To **solve a triangle** means that you must find the lengths of all the unknown sides and the sizes of all of the unknown angles. Usually, we are given three measurements and have to solve for the remaining three parts of the triangle.

**Example 1** Solve triangle LMN.



Adjacent side:

$$\tan \theta = \frac{\text{opp}}{\text{adj.}}$$

$$\tan 42^\circ = \frac{13.5}{\text{adj.}}$$

$$\text{adj.} = \frac{13.5}{\tan 42^\circ}$$

$$13.5 \div \tan 42$$

ENTER

$$\text{adj.} = 15 \text{ cm}$$

Hypotenuse

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 42^\circ = \frac{13.5}{\text{hyp.}}$$

$$\text{hyp.} = \frac{13.5}{\sin 42^\circ}$$

$$13.5 \div \sin 42 \text{ ENTER}$$

$$\text{hyp.} = 20.18 \text{ cm}$$

$$\text{Angle L} = 180^\circ - 90^\circ - 42^\circ$$

$$\angle L = 48^\circ$$

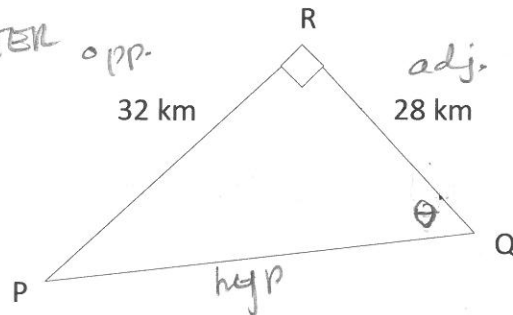
**Example 2** Solve triangle PQR.

① To find angle Q, use  $\tan \theta = \frac{\text{opp}}{\text{adj}}$

$$\tan \theta = \frac{32}{28}$$

using calculator:  $2 \text{nd} \mid \tan \mid 32 \mid \div \mid 28 \mid \text{ENTER}$

$$\angle Q = 48.81^\circ$$



② To find angle P:

$$\angle P = 180^\circ - 90^\circ - 48.81^\circ$$

$$\angle P = 41.19^\circ$$

③ To find hypotenuse:

$$\text{use } c^2 = a^2 + b^2$$

$$c^2 = 32^2 + 28^2$$

$$c^2 = 1024 + 784 \Rightarrow$$

$$c^2 = 1808$$

$$c = \sqrt{1808}$$

$$c = 42.52 \text{ km}$$