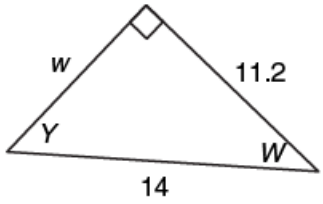
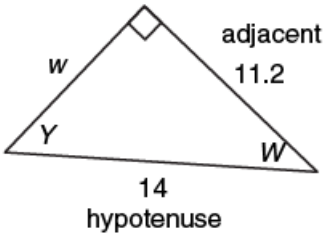
Solving Right Triangles

1. Solve the following triangle. Express angle measures to the nearest degree and lengths to the nearest tenth.



Step 1: Use a trigonometric ratio to determine one of the unknown angle measures from the two known side lengths.



$$\cos\theta = \frac{adj}{hyp}$$

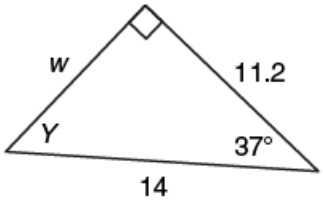
$$\cos W = \frac{11.2}{14}$$

$$W = \cos^{-1}\left(\frac{11.2}{14}\right)$$

$$W = 37°$$

Step 2: Solve for the third angle.

The two acute angles in a right triangle add to 90°.



$$Y + W = 90°$$

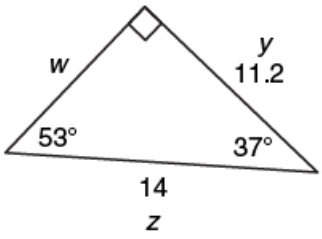
$$Y + 37° = 90°$$

$$Y + 37° - 37° = 90° - 37°$$

$$Y = 53°$$

Step 3: Solve for the third side.

Use the Pythagorean theorem to determine the length of the second leg from the other two known side lengths.

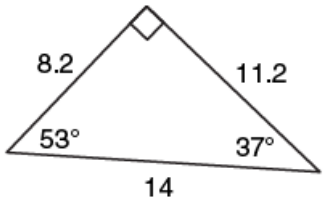


$$w^2 + y^2 = z^2$$
$$w^2 + 11.2^2 = 14^2$$
$$w^2 + 125.44 = 196$$
$$w^2 + \cancel{125.44} - \cancel{125.44} = 196 - 125.44$$
$$w^2 = 70.56$$
$$\sqrt{w^2} = \sqrt{70.56}$$
$$w = 8.4$$

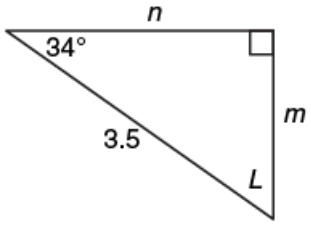
Alternate Solution

$$\sin\theta = \frac{opp}{hyp}$$
$$\sin 37° = \frac{w}{14}$$
$$14 \times \sin 37° = \frac{w}{\cancel{14}} \times \cancel{14}$$
$$8.4 = w$$

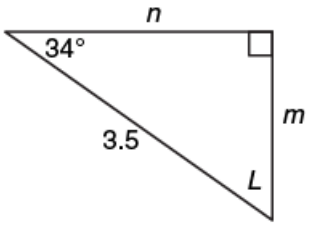
Step 4: Label the diagram with all side lengths and angle measures.



2. Solve the following triangle. Express angle measures to the nearest degree and lengths to the nearest tenth.

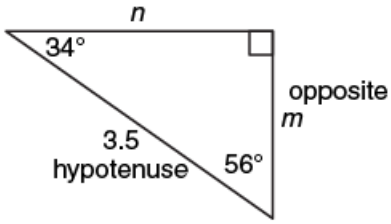


Step 1: Solve for the third angle.
The two acute angles in a right triangle add to 90°.



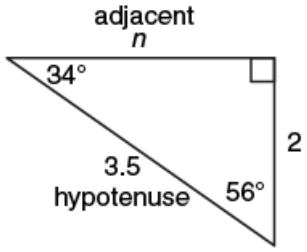
$$L + 34° = 90°$$
$$L + 34° - 34° = 90° - 34°$$
$$L = 56°$$

Step 2: Use a trigonometric ratio to determine one of the unknown side lengths from one of the unknown angle measures and the hypotenuse.



$$\sin\theta = \frac{opp}{hyp}$$
$$\sin\ 34° = \frac{m}{3.5}$$
$$3.5 \times \sin\ 34° = \frac{m}{\cancel{3.5}} \times \cancel{3.5}$$
$$2.0 = m$$

Step 3: Solve for the third side.



$$\cos\theta = \frac{adj}{hyp}$$

$$\cos 34° = \frac{l}{3.5}$$

$$3.5 \times \cos 34° = \frac{l}{\cancel{3.5}} \times \cancel{3.5}$$

$$2.9 = l$$

Alternate Solution

$$m^2 + l^2 = h^2$$

$$2.0^2 + l^2 = 3.5^2$$

$$4.0 + l^2 = 12.25$$

$$4.0 - 4.0 + l^2 = 12.25 - 4.0$$

$$l^2 = 8.25$$

$$\sqrt{l^2} = \sqrt{8.25}$$

$$l = 2.9$$

Step 4: Label the diagram will all side lengths and angle measures.