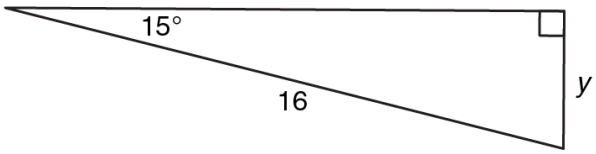
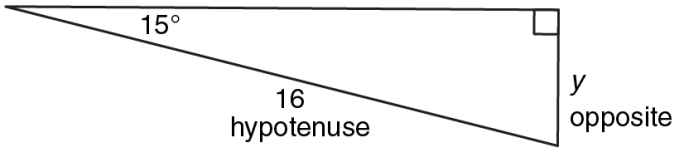
Solving for Unknown Side Lengths Using Sine and Cosine

1. Determine the length of side *y*, to the nearest tenth.



Step 1: Identify and label the sides as being adjacent to, opposite, or the hypotenuse, in relation to the angle indicated.



Step 2: State the appropriate ratio.

$$sine\ of\ \ angle\ \theta = \frac{length\ opposite\ \theta}{hypotenuse}$$

Step 3: Substitute known values, and calculate the unknown value.

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

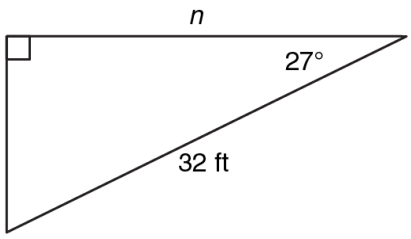
$$\sin 15° = \frac{y}{16}$$

$$16 \times \sin 15° = \frac{y}{\cancel{16}} \times \cancel{16}$$

$$4.1 = y$$

The length of side y is approximately 4.1.

2. Determine the length of side *n*, to the nearest tenth of a foot.



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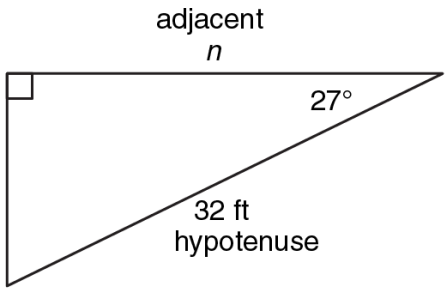


Step 2: State the appropriate ratio.

$$cosine\ of\ \ angle\ \theta = \frac{length\ adjacent\ \ to\ \theta}{hypotenuse}$$

Step 3: Substitute known values, and calculate the unknown value.

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

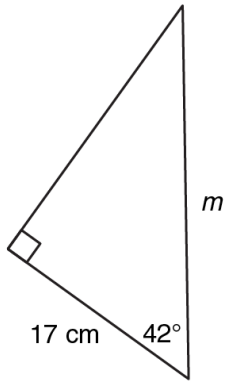
$$\cos 27° = \frac{n}{32\ ft}$$

$$32\ ft\ \times \cos 27° = \frac{n}{\cancel{32\ ft}} \times \cancel{32\ ft}$$

$$28.5\ ft = n$$

The length of side n is approximately 28.5 feet.

3. Determine the length of side *m*, to the nearest tenth of a centimetre.



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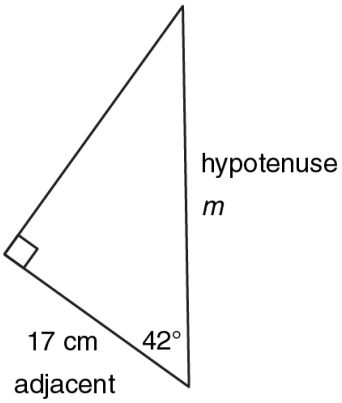


Step 2: State the appropriate ratio.

$$cosine\ of\ \ angle\ \theta = \frac{length\ adjacent\ \ to\ \theta}{hypotenuse}$$

Step 3: Substitute known values, and calculate the unknown value.

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

$$\cos 42° = \frac{17\ cm}{m}$$

$$m \times \cos 42° = \frac{17\ cm}{\cancel{m}} \times \cancel{m}$$

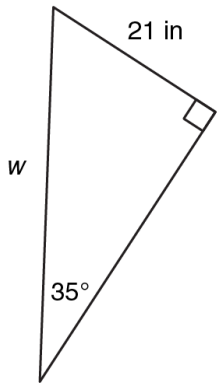
$$m \times \cos 42° = 17\ cm$$

$$\frac{m \times \cancel{\cos 42°}}{\cancel{\cos 42°}} = \frac{17\ cm}{\cos 42°}$$

$$m = 22.9\ cm$$

The length of side m is approximately 22.9 cm.

4. Determine the length of side *w*, to the nearest tenth of an inch.



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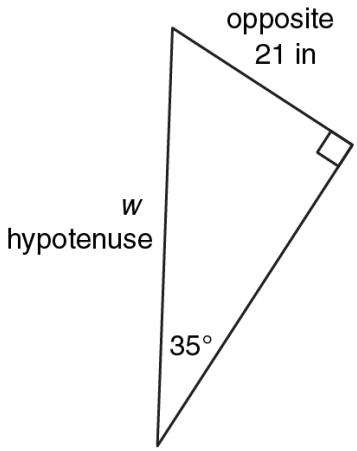

Step 2: State the appropriate ratio.

$$sine\ of\ \ angle\ \theta = \frac{length\ opposite\ \theta}{hypotenuse}$$

Step 3: Substitute known values, and calculate the unknown value.

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

$$sin35° = \frac{21\ in}{w}$$

$$w \times sin\ 35° = \frac{21\ in}{\cancel{w}} \times \cancel{w}$$

$$w \times sin\ 35° = 21\ in$$

$$\frac{w \times \cancel{sin35°}}{\cancel{sin35°}} = \frac{21\ in}{sin35°}$$

$$w = 36.6\ in$$

The length of side w is approximately 36.6 inches.