LESSON 1

Finding the missing sides of right triangles.

Remember,

SOHCAHTOA
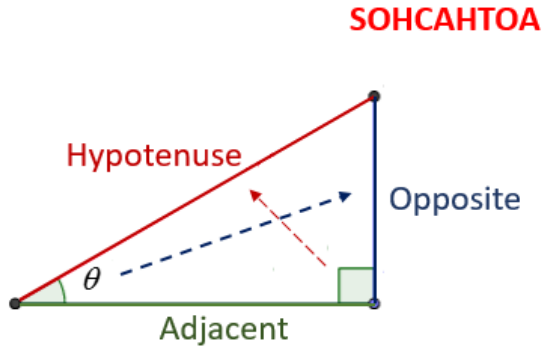
$$SOH \quad Sin\,\theta = \frac{Opposite}{Hypotenuse}$$

$$CAH \quad Cos\,\theta = \frac{Adjacent}{Hypotenuse}$$

$$TOA \quad Tan\,\theta = \frac{Opposite}{Adjacent}$$

When we are asked to solve a triangle, we are being asked to solve for all missing side lengths and angle measurements. In this lesson we will focus on finding the missing side lengths.

Example 1

Find the length of side x in the diagram below:
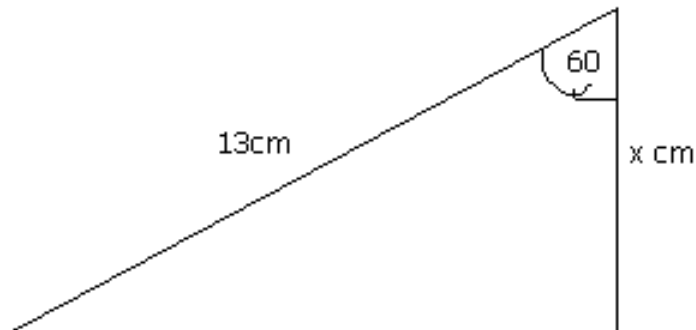
In the above problem we are given an angle of 60 degrees, the hypotenuse of length 13cm, and the adjacent side of length x cm. Since we have the hypotenuse and the adjacent side, we must use the cosine ratio.
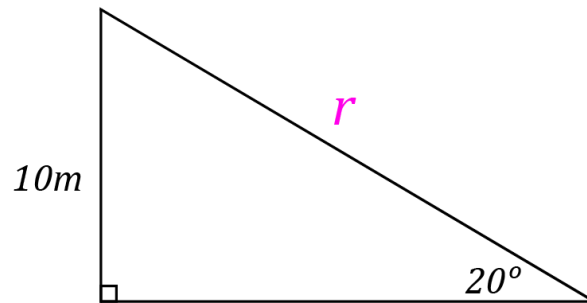
$$\cos 60^0 = \frac{x}{13}$$

$$x = 13\cos 60^0$$

$$x = 13 \times 0.5 = 6.5$$

Example 2

Find the length of side r in the diagram below:

In the above problem we are given an angle of 20 degrees, the hypotenuse of length r, and the opposite side of length x. Since we have the hypotenuse and the opposite side, we must use the sine ratio.
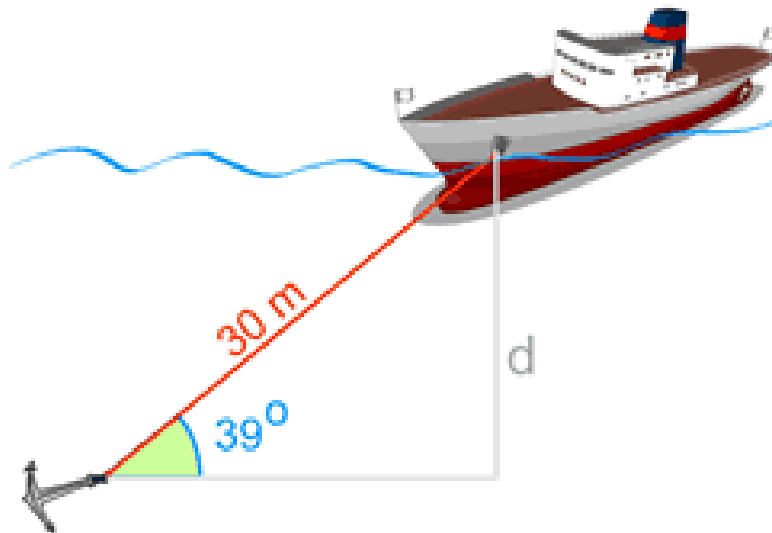
$$\sin 20^0 = \frac{10}{r}$$

$$r = \frac{10}{\sin 20}$$

$$r = 29.24$$

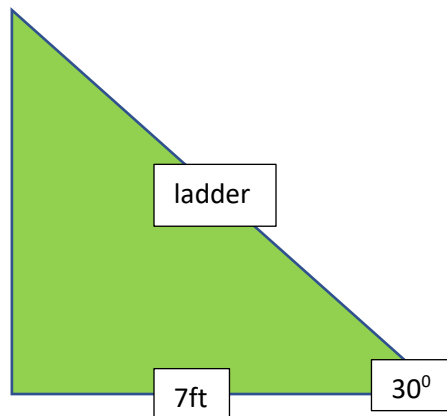**Example 3**

Find the length of side d in the diagram below:

In the above problem we are given an angle of 39 degrees, the hypotenuse of length 30, and the opposite side of length d. Since we have the hypotenuse and the opposite side, we must use the sine ratio.

$$\sin 39^o = \frac{d}{30}$$

$$d = 30\sin 39^o = 18.88 \text{ meters}$$

Example 4

A ladder leaning against a house makes an angle of 30° with the ground. The foot of the ladder is 7 feet from the foot of the house. How long is the ladder?

In the above problem we are given an angle of 30 degrees, and the adjacent side of length 7ft. The ladder is the hypotenuse, and we are given the adjacent side, therefore we must use the cosine ratio.
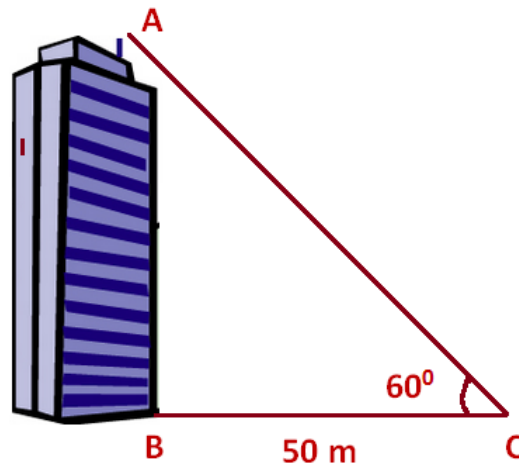
$$\cos 30^0 = \frac{7}{x}$$

$$x = \frac{7}{\cos 30^0}$$

$$x = \frac{7}{0.866} = 8.08$$

Example 5

A firetruck ladder is leaning against the top of a building. It makes an angle of 60° with the ground. The distance from the foot of the ladder to of the house is 50 m. How long is the ladder?

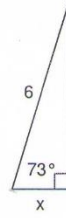$$\cos 60^0 = \frac{50}{x}$$

$$x = \frac{50}{\cos 60^0} = 100m$$

Lesson 1 Exercise
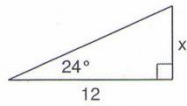
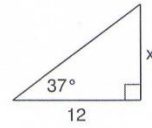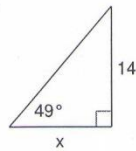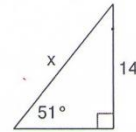**Find the missing side. Round to the nearest tenth.**

1)

x
72°
6

2)

6
73°
x

3)

24°
12
x

4)

37°
12
x

5)

14
49°
x

6)

x
14
51°

7)

x
16
63°

8)

x
15°
16