Right Triangle Applications (Solution)

Complete the following exercises without using a calculator.

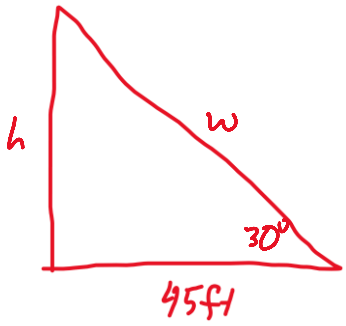
1. A radio tower is anchored to the ground by a guy wire 45 feet from the base of the tower with an angle of elevation of 30° Assume that the tower is on flat, level ground.

   a) How tall is the tower?

$$\tan 30° = \frac{h}{45}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{45}$$

$$h = \frac{45}{\sqrt{3}} \text{ ft}$$



   b) How long must the wire be to reach the tower?

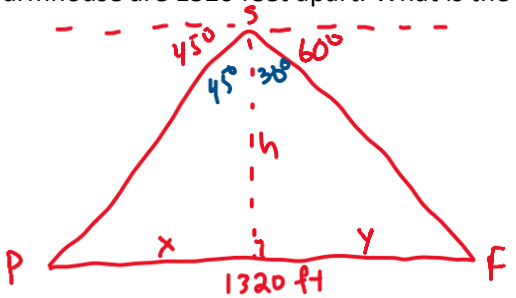
$$\cos 30° = \frac{45}{w}$$

$$\frac{\sqrt{3}}{2} = \frac{45}{w}$$

$$\sqrt{3}w = 90$$

$$w = \frac{90}{\sqrt{3}} \text{ ft} \quad \text{or} \quad 30\sqrt{3} \text{ ft}$$

2. Susan is in a hot-air-balloon. On her right, she notices a farmhouse at an angle of depression of 60°. While on her left, she sees a pond at an angle of depression of 45°. The tour guide indicates that he knows that the pond and the farmhouse are 1320 feet apart. What is the altitude of the balloon?



$$\tan 45° = \frac{x}{h}$$

$$1 = \frac{x}{h}$$

$$h = x$$

$$\tan 30° = \frac{y}{h}$$

$$\frac{\sqrt{3}}{1} = \frac{y}{h}$$

$$\sqrt{3}h = y$$

$$x + y = 1320$$

$$h + \sqrt{3}h = 1320$$

$$h(1+\sqrt{3}) = 1320$$

$$h = \frac{1320}{1+\sqrt{3}} \text{ ft}$$