Trig 1.8 ~ Models and Applications of Right Triangles

In this lesson you will learn to:
- Solve real-life problems involving right triangles
- Solve real-life problems involving directional bearings

Let's use our knowledge of right triangles to solve a few problems.

Example 1: You are standing 100 feet from the base of a platform from which people are bungee jumping. The angle of elevation from your position to the top of the platform is 53º. What is the height of the bungee platform?

✓ a) Draw a sketch of the situation, labeling known and unknown quantities.

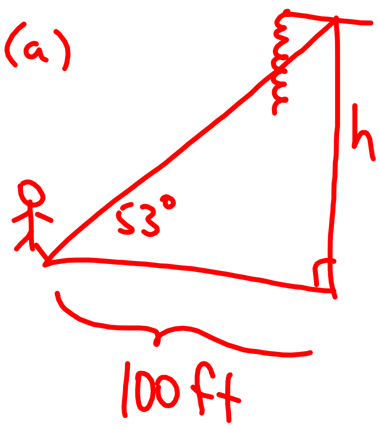
✓ b) Write an equation involving the unknown height of the platform.

c) Find the height of the platform.

(b)

$$\tan 53^\circ = \frac{h}{100}$$

(a)



(c)

$$100 \tan 53^\circ = h$$

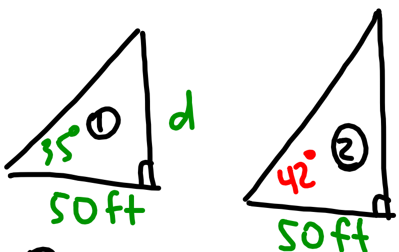
$$h \simeq 119.18 \text{ ft}$$

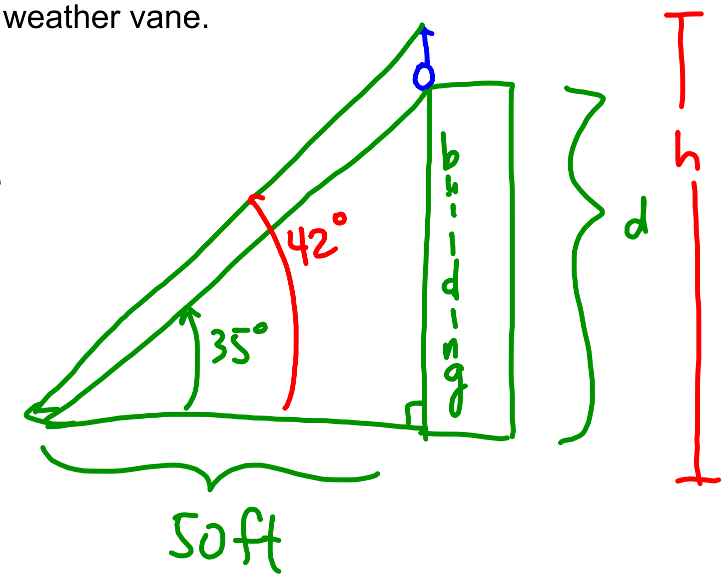
Example 2: From a point 50 feet from the base of a building, the angles of elevation to the base of the weather vane and the peak of the weather vane (located on the corner of the building) are 35º and 42º respectively.

a) Draw a sketch of the situation, labeling known and unknown quantities.

b) Write an equation involving the unknown height of the weather vane.

c) Find the height of the weather vane.





1

$$\tan 35^\circ = \frac{d}{50}$$

$$d = 50\tan 35^\circ$$

2 $$\tan 42^\circ = \frac{h}{50}$$

$$h = 50\tan 42^\circ$$

$\Rightarrow$ height of weather vane

$$= h - d = 50\tan 42^\circ - 50\tan 35^\circ$$

$$\approx 45.02 - 35.01 \approx 10 \text{ ft}$$

Example 3: A tight-rope walker ties a 75-ft rope from the ground to the top of a 40-ft post.

a) Draw a sketch of the situation, labeling known and unknown quantities.

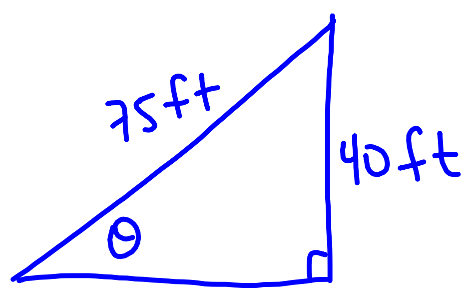
b) Write an equation involving the unknown angle between the rope and ground.

c) Find the angle that the rope makes with the ground.

$$\sin\theta = \frac{40}{75}$$

$$\theta = \arcsin\left(\frac{40}{75}\right)$$

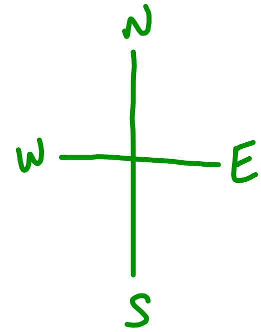
$$\approx 32.2^\circ$$

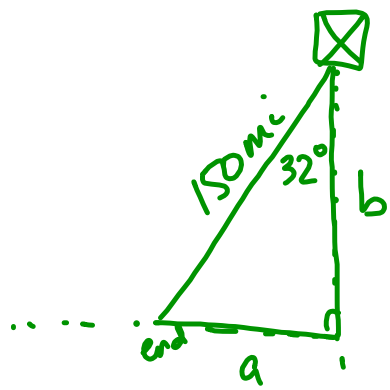


Example 4: A ship travels at a bearing of S 32º W for 150 miles. How many miles south and west of the original position is it?

a) Draw a sketch of the situation.

b) Find the requested distances.





① Find a:

$$\sin 32^\circ = \frac{a}{150}$$

$$a = 150 \sin 32^\circ \simeq 127.2 \text{ mi}$$

(west)

② Find b:

$$\cos 32^\circ = \frac{b}{150}$$

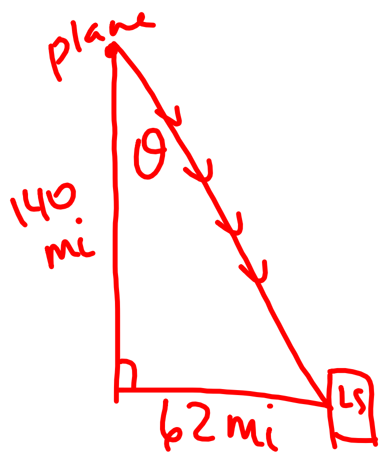
$$b = 150 \cos 32^\circ \simeq 79.5 \text{ mi}$$

(south)

Example 5: A plane is 140 miles north and 62 miles west of the landing strip. What should their bearing be to head directly to the landing strip?

a) Draw a sketch of the situation.

b) Find the requested bearing.



$$\tan\theta = \frac{62}{140}$$

$$\theta = \tan^{-1}\left(\frac{62}{140}\right) \approx 24^\circ$$

bearing: $\boxed{S\ 24^\circ E}$