

**Objective:** To apply right triangle trigonometry.

**Warm Up:** Quinn was given a 3, 4, 5 triangle and asked to evaluate all six trig functions. He's struggling... Help him out!

$$\sin \theta = \frac{4}{5}$$

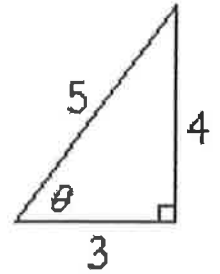
$$\csc \theta = \frac{5}{4}$$

$$\cos \theta = \frac{3}{5}$$

$$\sec \theta = \frac{5}{3}$$

$$\tan \theta = \frac{4}{3}$$

$$\cot \theta = \frac{3}{4}$$



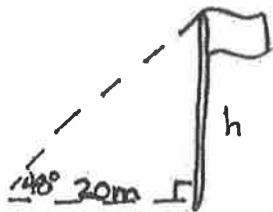
### Vocabulary:

**Angle of Elevation:** An angle formed from a line parallel to the ground looking upward

**Angle of Depression:** An angle formed from a line parallel to the ground looking downward

**Examples:** Solve the following problems.

- A.) At a point 20 meters from the base of a flagpole, the angle of elevation to the top of the flagpole is  $48^\circ$ . How tall is the flagpole?

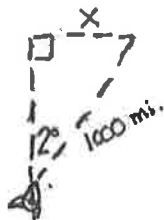


$$\tan 48^\circ = \frac{h}{20}$$

$$h = 20 \tan 48^\circ$$

$$h = 22.2 \text{ m}$$

- B.) If a rocket is designed to fly straight up into the sky. If it flies  $2^\circ$  off course for 1000 miles, how far from the correct path will the rocket be?



$$\sin 2^\circ = \frac{x}{1000}$$

$$x = 1000 \sin 2^\circ$$

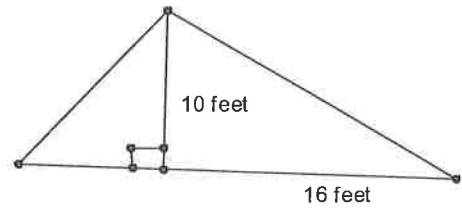
$$x = 34.9 \text{ mi}$$

- C.) A roof is constructed as shown in the diagram. Find the pitch (angle of elevation) of the right side of the roof.

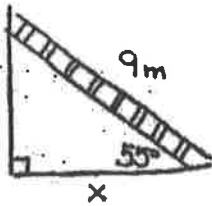
$$\tan \theta = \frac{10}{16}$$

$$\theta = \tan^{-1} \left( \frac{10}{16} \right)$$

$$\theta = 32^\circ$$



- D.) As it leans against a building, a 9-meter ladder makes an angle of  $55^\circ$  with the ground. How far is the bottom of the ladder from the base of the building?



$$\cos 55^\circ = \frac{x}{9}$$

$$x = 9 \cos 55^\circ$$

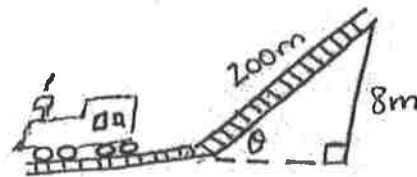
$$x = 5.2 \text{ m}$$

- E.) A train decreases its altitude by 8m when traveling along 200m of track. Find the angle of depression.

$$\sin \theta = \frac{8}{200}$$

$$\theta = \sin^{-1} \left( \frac{8}{200} \right)$$

$$\theta = 2.3^\circ$$



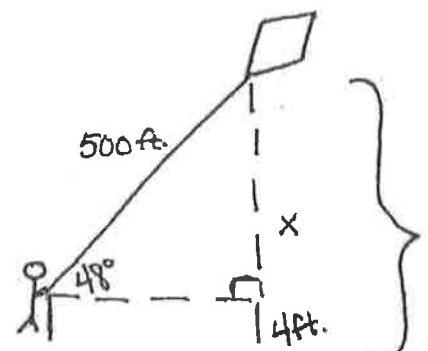
- F.) You are flying a kite 4 feet above the ground and are using 500 feet of kite line. At what altitude is the kite flying if the string is at a 48-degree angle?

$$\sin 48^\circ = \frac{x}{500}$$

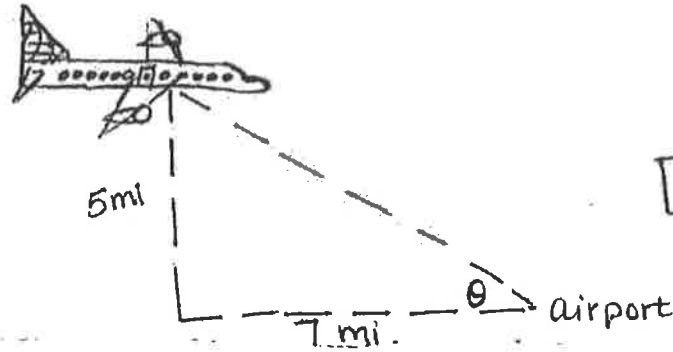
$$x = 500 \sin 48^\circ$$

$$x = 371.6 \text{ ft.}$$

$$\text{altitude} = 371.6 + 4 = 375.6 \text{ ft.}$$



G.) An airplane is flying at a height of 5 miles above the ground. The distance along the ground from the airplane to the airport is 7 miles. What is the angle of depression from the airplane to the airport?

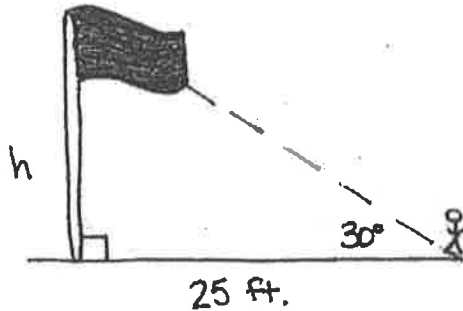


$$\tan \theta = \frac{5}{7}$$

$$\theta = \tan^{-1}\left(\frac{5}{7}\right)$$

$$\theta = 35.5^\circ$$

H.) You are standing 25 feet from the base of a flagpole. The angle of elevation to the top of the flagpole is 30 degrees. What is the height of the flagpole to the nearest tenth?



$$\tan 30^\circ = \frac{h}{25}$$

$$h = 25 \tan 30^\circ$$

$$h = 14.4 \text{ ft.}$$