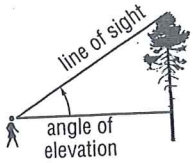
NAME _____ DATE _____ PERIOD ____

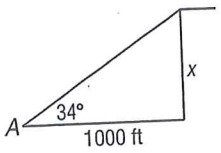
8-5 Study Guide and Intervention

Angles of Elevation and Depression

Angles of Elevation Many real-world problems that involve looking up to an object can be described in terms of an **angle of elevation**, which is the angle between an observer's line of sight and a horizontal line.



Example **The angle of elevation from point A to the top of a cliff is 34°. If point A is 1000 feet from the base of the cliff, how high is the cliff?**



Let x = the height of the cliff.

$\tan 34° = \frac{x}{1000}$ $\tan = \frac{\text{opposite}}{\text{adjacent}}$

$1000(\tan 34°) = x$ Multiply each side by 1000.

$674.5 = x$ Use a calculator.

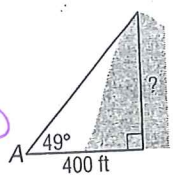
The height of the cliff is about 674.5 feet.

Exercises

Solve each problem. Round measures of segments to the nearest whole number and angles to the nearest degree.

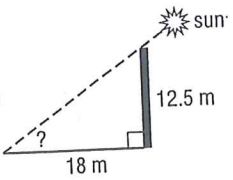
1. The angle of elevation from point A to the top of a hill is 49°. If point A is 400 feet from the base of the hill, how high is the hill?

460 ft $\tan 49° = \frac{x}{400}$



2. Find the angle of elevation of the sun when a 12.5-meter-tall telephone pole casts an 18-meter-long shadow.

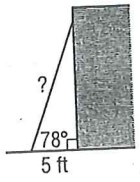
35° $\theta = \tan^{-1}(12.5/18)$



3. A ladder leaning against a building makes an angle of 78° with the ground. The foot of the ladder is 5 feet from the building. How long is the ladder?

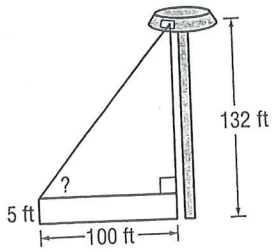
$\cos 78° = \frac{5}{x}$

24 ft



4. A person whose eyes are 5 feet above the ground is standing on the runway of an airport 100 feet from the control tower. That person observes an air traffic controller at the window of the 132-foot tower. What is the angle of elevation?

52° $\theta = \tan^{-1}(127/100)$



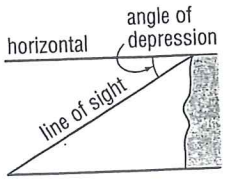
Lesson 8-5

NAME _____ DATE _____ PERIOD ____

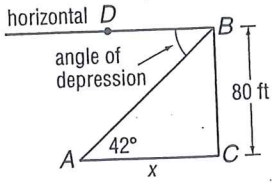
8-5 Study Guide and Intervention *(continued)*

Angles of Elevation and Depression

Angles of Depression When an observer is looking down, the **angle of depression** is the angle between the observer's line of sight and a horizontal line.



Example **The angle of depression from the top of an 80-foot building to point A on the ground is 42°. How far is the foot of the building from point A?**



Let x = the distance from point A to the foot of the building. Since the horizontal line is parallel to the ground, the angle of depression $\angle DBA$ is congruent to $\angle BAC$.

$\tan 42° = \frac{80}{x}$ $\quad \tan = \frac{\text{opposite}}{\text{adjacent}}$

$x(\tan 42°) = 80$ Multiply each side by x.

$x = \frac{80}{\tan 42°}$ Divide each side by tan 42°.

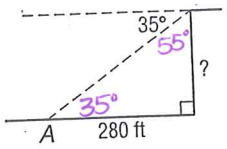
$x \approx 88.8$ Use a calculator.

Point A is about 89 feet from the base of the building.

Exercises

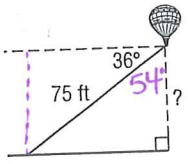
Solve each problem. Round measures of segments to the nearest whole number and angles to the nearest degree.

1. The angle of depression from the top of a sheer cliff to point A on the ground is 35°. If point A is 280 feet from the base of the cliff, how tall is the cliff?



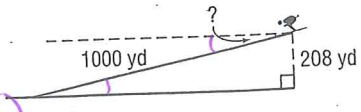
196 ft $\quad \tan 35° = \frac{x}{280}$

2. The angle of depression from a balloon on a 75-foot string to a person on the ground is 36°. How high is the balloon?



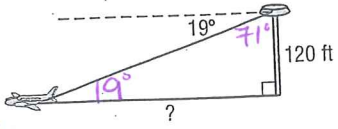
44 ft $\quad \cos 54° = \frac{x}{75}$

3. A ski run is 1000 yards long with a vertical drop of 208 yards. Find the angle of depression from the top of the ski run to the bottom.



12° $\quad \theta = \sin^{-1}(208/1000)$

4. From the top of a 120-foot-high tower, an air traffic controller observes an airplane on the runwa at an angle of depression of 19°. How far from the base of the tower is the airplane?



349 ft $\quad \tan 71° = \frac{x}{120}$