

10-4 Angles of Elevation and Depression

Do Now

Lesson Presentation

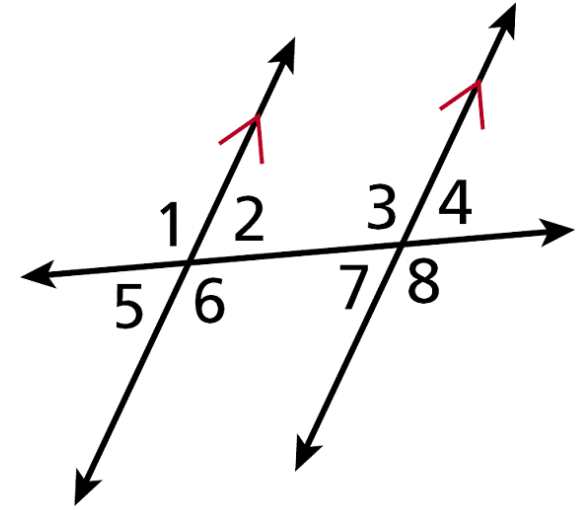
Exit Ticket

10-4 Angles of Elevation and Depression

Do Now #15

1. Identify the pairs of alternate interior angles.

$\angle 2$ and $\angle 7$; $\angle 3$ and $\angle 6$



2. Use your calculator to find $\tan 30^\circ$ to the nearest hundredth.

0.58

3. Solve $\tan 54^\circ = \frac{2500}{x}$. Round to the nearest hundredth.

1816.36

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Connect to Mathematical Ideas (1)(F)

By the end of today's lesson,

SWBAT

- Solve problems involving angles of elevation and angles of depression.

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Vocabulary:

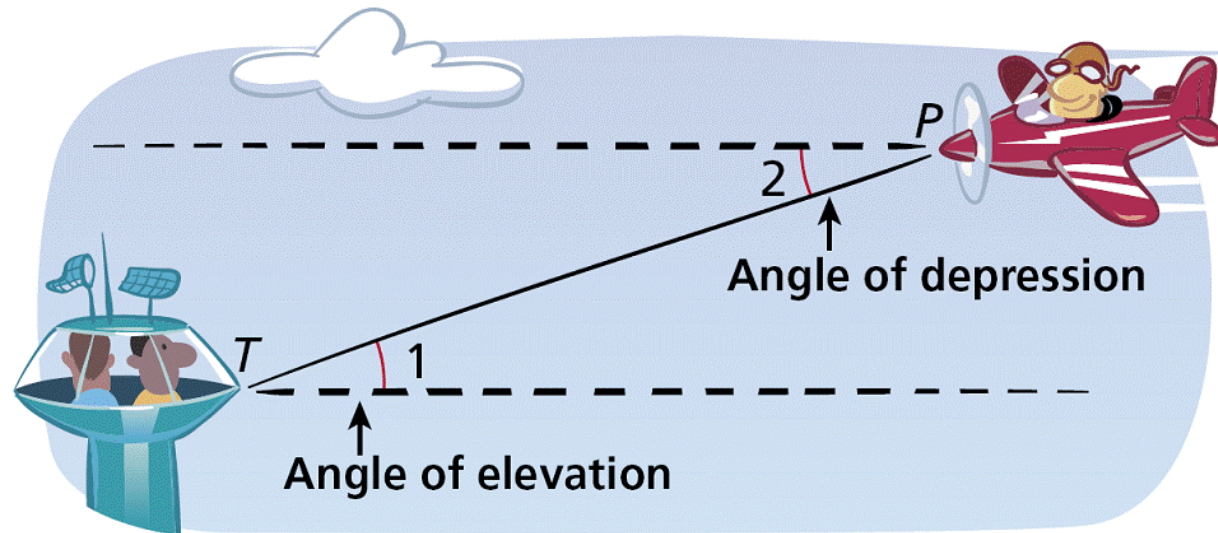
angle of elevation

angle of depression

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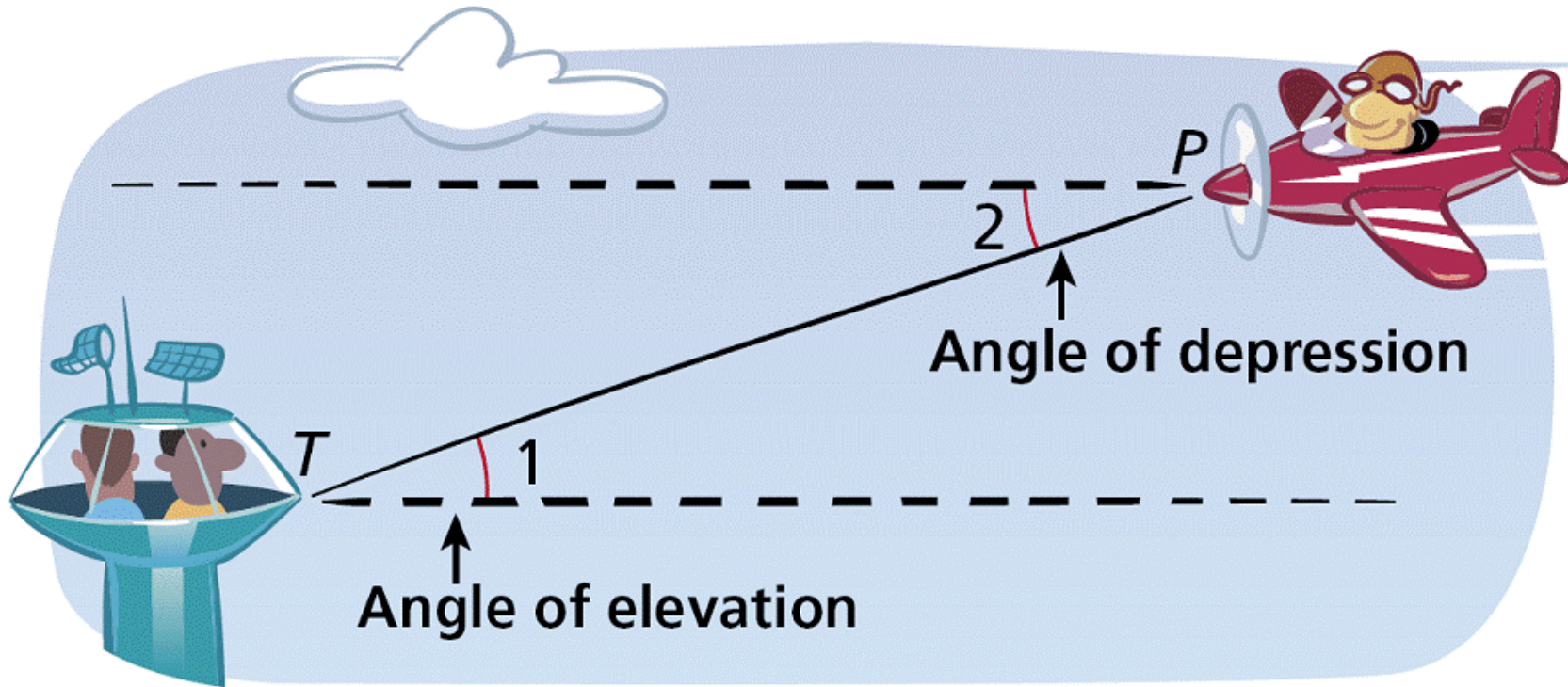
An **angle of elevation** is the angle formed by a horizontal line and a line of sight to a point *above* the line. In the diagram, $\angle 1$ is the angle of elevation from the tower T to the plane P .

An **angle of depression** is the angle formed by a horizontal line and a line of sight to a point *below* the line. $\angle 2$ is the angle of depression from the plane to the tower.



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Since horizontal lines are parallel, $\angle 1 \cong \angle 2$ by the Alternate Interior Angles Theorem. Therefore the angle of elevation from one point is congruent to the angle of depression from the other point.



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Example 1: Classifying Angles of Elevation and Depression

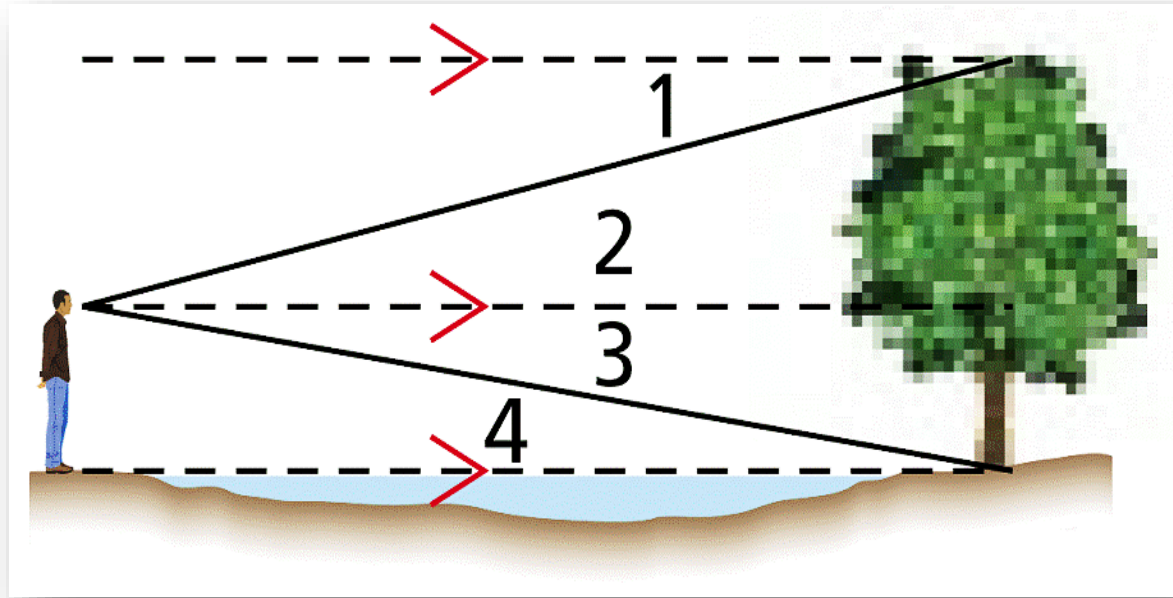
Classify each angle as an angle of elevation or an angle of depression.

$\angle 1$ $\angle 1$ is formed by a horizontal line and a line of sight to a point below the line. It is an angle of depression.

$\angle 2$ $\angle 2$ is formed by a horizontal line and a line of sight to a point above the line. It is an angle of elevation.

$\angle 3$ $\angle 3$ is formed by a horizontal line and a line of sight to a point below the line. It is an angle of depression.

$\angle 4$ $\angle 4$ is formed by a horizontal line and a line of sight to a point above the line. It is an angle of elevation.



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Example 2: Finding Distance by Using Angle of Elevation

The Seattle Space Needle casts a 67-meter shadow. If the angle of elevation from the tip of the shadow to the top of the Space Needle is 70° , how tall is the Space Needle? Round to the nearest meter.

Draw a sketch to represent the given information. Let A represent the tip of the shadow, and let B represent the top of the Space Needle. Let y be the height of the Space Needle.

$$\tan 70^\circ = \frac{y}{67}$$

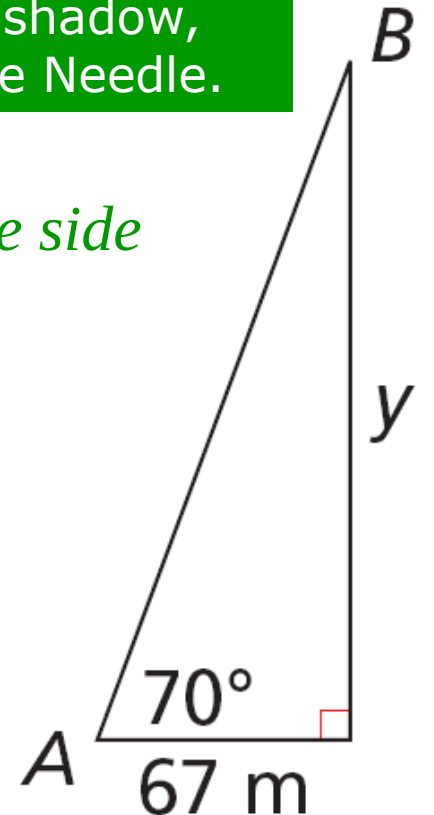
You are given the side adjacent to $\angle A$, and y is the side opposite $\angle A$. So write a tangent ratio.

$$y = 67 \tan 70^\circ$$

Multiply both sides by 67.

$$y \approx 184 \text{ m}$$

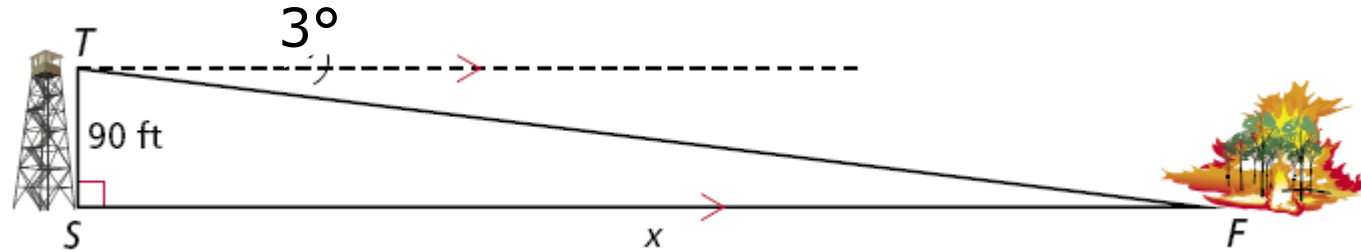
Simplify the expression.



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Example 3: Finding Distance by Using Angle of Depression

What if...? Suppose the ranger sees another fire and the angle of depression to the fire is 3° . What is the horizontal distance to this fire? Round to the nearest foot.



By the Alternate Interior Angles Theorem, $m\angle F = 3^\circ$.

$$\tan 3^\circ = \frac{90}{x}$$

Write a tangent ratio.

$$x = \frac{90}{\tan 3^\circ}$$

Multiply both sides by x and divide by $\tan 3^\circ$.

$$x \approx 1717 \text{ ft}$$

Simplify the expression.

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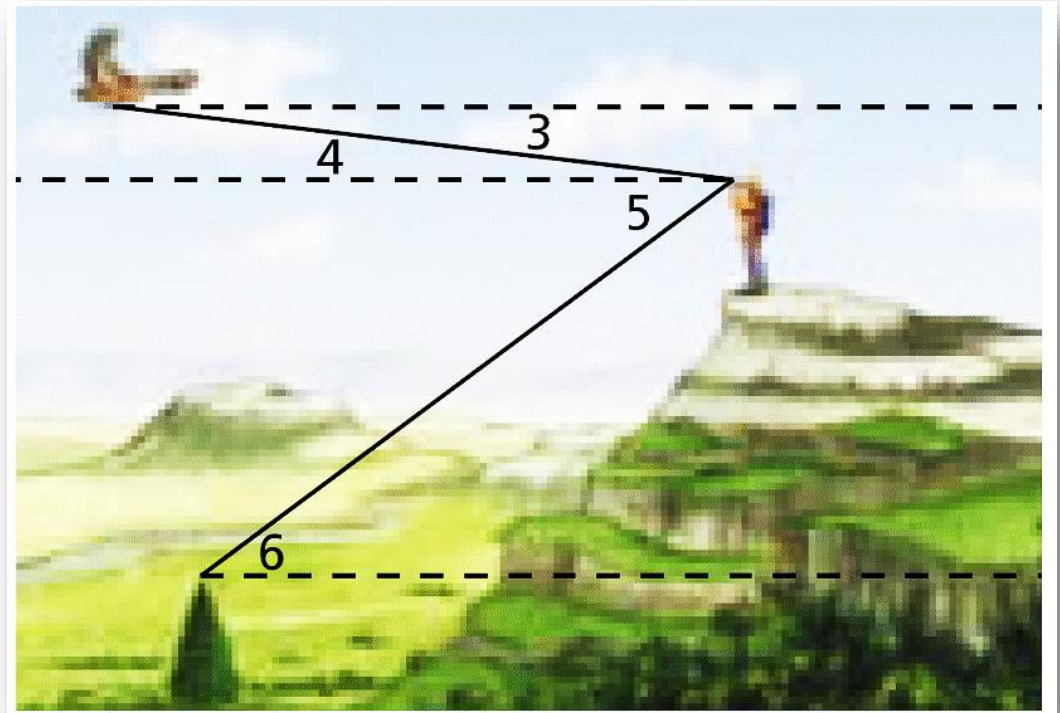
Got It ? Solve With Your Partner

Problem 1 Classifying Angles of Elevation and Depression

Classify each angle as an angle of elevation or an angle of depression.

∠5 ∠5 is formed by a horizontal line and a line of sight to a point below the line. It is an angle of depression.

∠6 ∠6 is formed by a horizontal line and a line of sight to a point above the line. It is an angle of elevation.



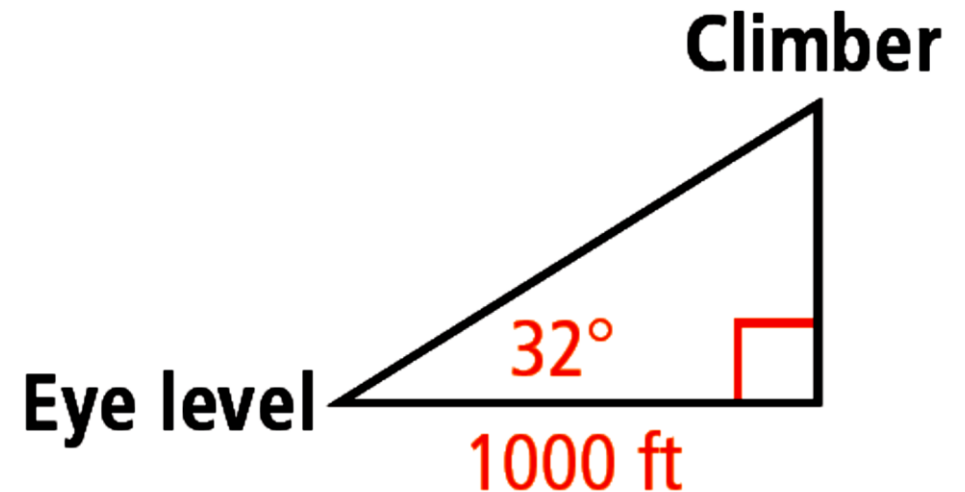
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Got It ? Solve With Your Partner

Problem 2 Using the Angle of Elevation

You sight a rock climber on a cliff at a 32° angle of elevation. Your eye level is 6 ft above the ground and you are 1000 ft from the base of the cliff. What is the approximate height of the rock climber from the ground?

631 ft



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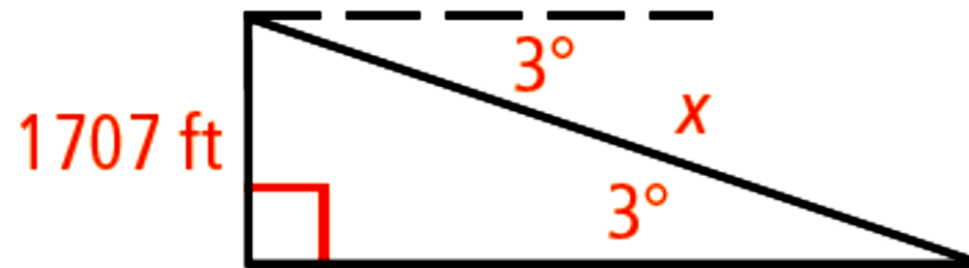
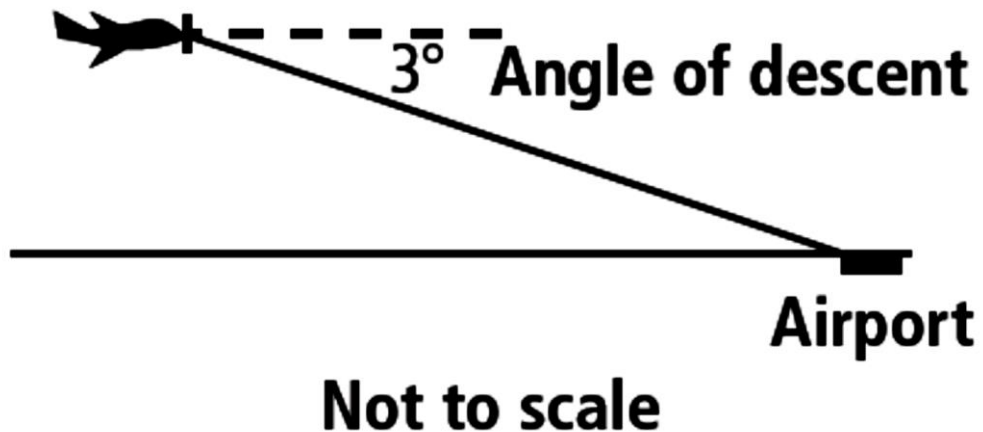
Got It ? Solve With Your Partner

Problem 2 Using the Angle of Depression

To approach runway 17 of the Ponca City Municipal Airport in Oklahoma, the pilot must begin a 3° descent starting from a height of 2714 ft above sea level. The airport is 1007 ft above sea level. To the nearest mile, how far from the runway is the airplane at the start of the descent?

The airplane is $2714 - 1007$, or 1707 ft, above the level of the airport.

Hint: How far is the airplane above the level of the airport?



approximately 6.2 mi

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Closure: Communicate Mathematical Ideas (1)(G)

If two buildings are 30 ft apart and the angle of elevation from the top of the first to the top of the second is 19° .

A. What is the angle of depression from the top of the second to the top of the first?

19°

B. What is the difference in their heights to the nearest tenth of a foot?

10.3 ft

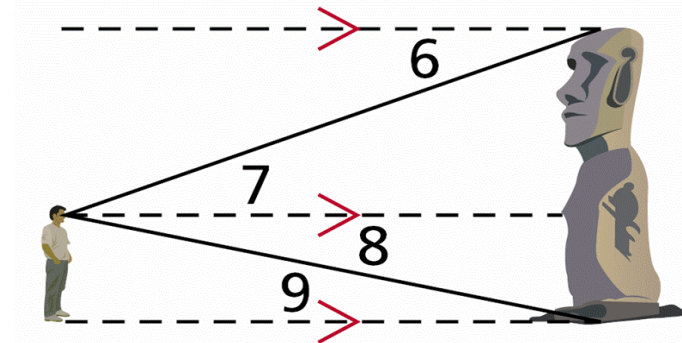
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Exit Ticket: Apply Mathematics (1)(A)

Classify each angle as an angle of elevation or angle of depression.

1. $\angle 6$ angle of depression

2. $\angle 9$ angle of elevation



3. A plane is flying at an altitude of 14,500 ft. The angle of depression from the plane to a control tower is 15° . What is the horizontal distance from the plane to the tower? Round to the nearest foot. **54,115 ft**
4. A woman is standing 12 ft from a sculpture. The angle of elevation from her eye to the top of the sculpture is 30° , and the angle of depression to its base is 22° . How tall is the sculpture to the nearest foot? **12 ft**