

## Bellwork

**1.** Use your calculator to find  $\tan 30^\circ$  to two decimal places.

0.58

**2.** Solve  $\tan 54^\circ = \frac{2500}{x}$ . Round to two decimal places.

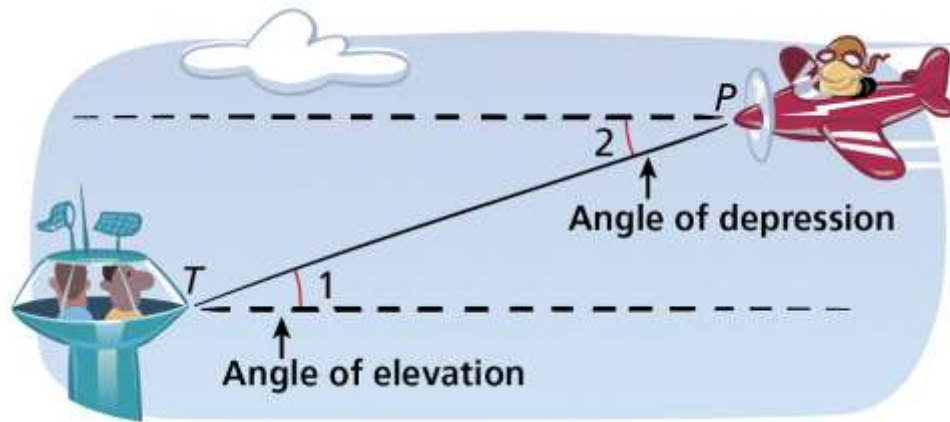
1816.36

## 5.2 Right Triangle Trigonometry

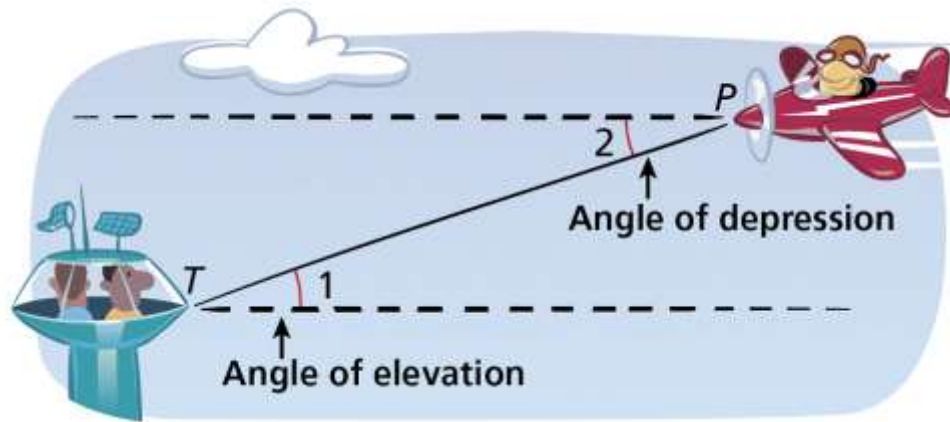
Learning Goal: The student will be able to use right triangle trigonometry to solve applied problems

An **angle of elevation** (**look up**) is the angle formed by a horizontal line and a line of sight to a point *above* the line.

An **angle of depression** (**look down**) is the angle formed by a horizontal line and a line of sight to a point *below* the line.

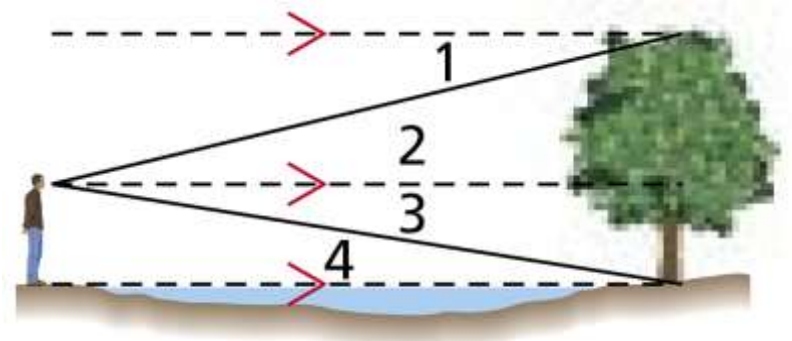


Since horizontal lines are parallel,  $\angle 1 \cong \angle 2$  by the Alternate Interior Angles Theorem. Therefore the angle of elevation from one point is congruent to the angle of depression from the other point.



## Example 1: Classifying Angles of Elevation and Depression

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



$\angle 2$  It is an angle of Elevation.

$\angle 3$  It is an angle of Depression.

$\angle 1$  It is an angle of Depression.

## Check It Out! Example 2

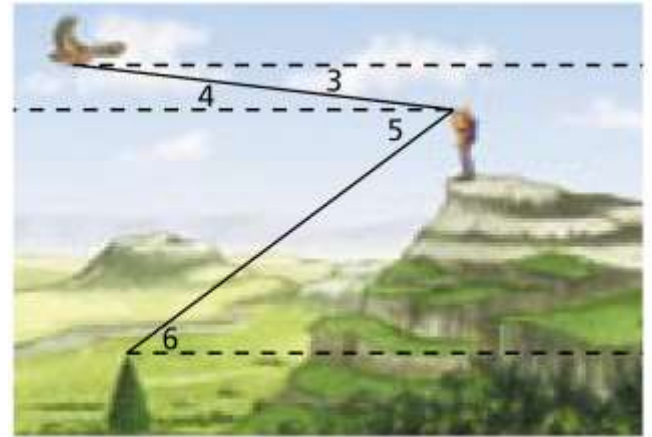
Use the diagram to classify each angle as an angle of elevation or angle of depression.

$\angle 3$  It is an angle of depression.

$\angle 4$  It is an angle of elevation.

$\angle 5$  It is an angle of depression.

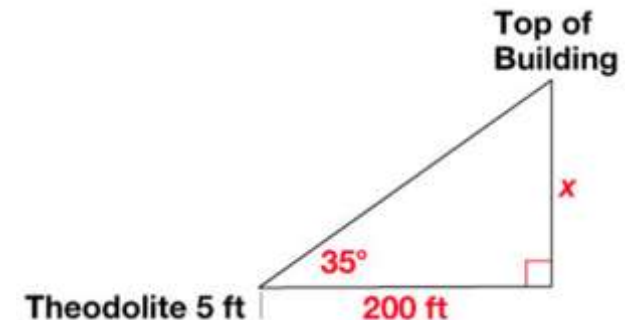
$\angle 6$  It is an angle of elevation.



## Example 3: Finding Distance by Using Angle of Elevation

A surveyor stands 200 ft from a building to measure its height with a 5-ft tall theodolite. The angle of elevation to the top of the building is  $35^\circ$ . How tall is the building?

- 1) Draw a diagram to represent the situation.
- 2) Use a trigonometric function, and solve for  $x$ :  
Tangent = opposite side / adjacent side  
 $\tan 35 = x / 200$  : (multiply both sides by 200)  
 **$200 \tan 35 = x$**



200 **TAN** 35 **ENTER** 140.041508    Use a calculator.

So  $x \approx 140$ .

- 3) To find the height of the building, add the height of the Theodolite, which is 5 ft tall.

Final Answer: The building is about  $140 \text{ ft} + 5 \text{ ft}$ , or **145 ft tall**.

## Example 4: Finding Distance by Using Angle of Depression

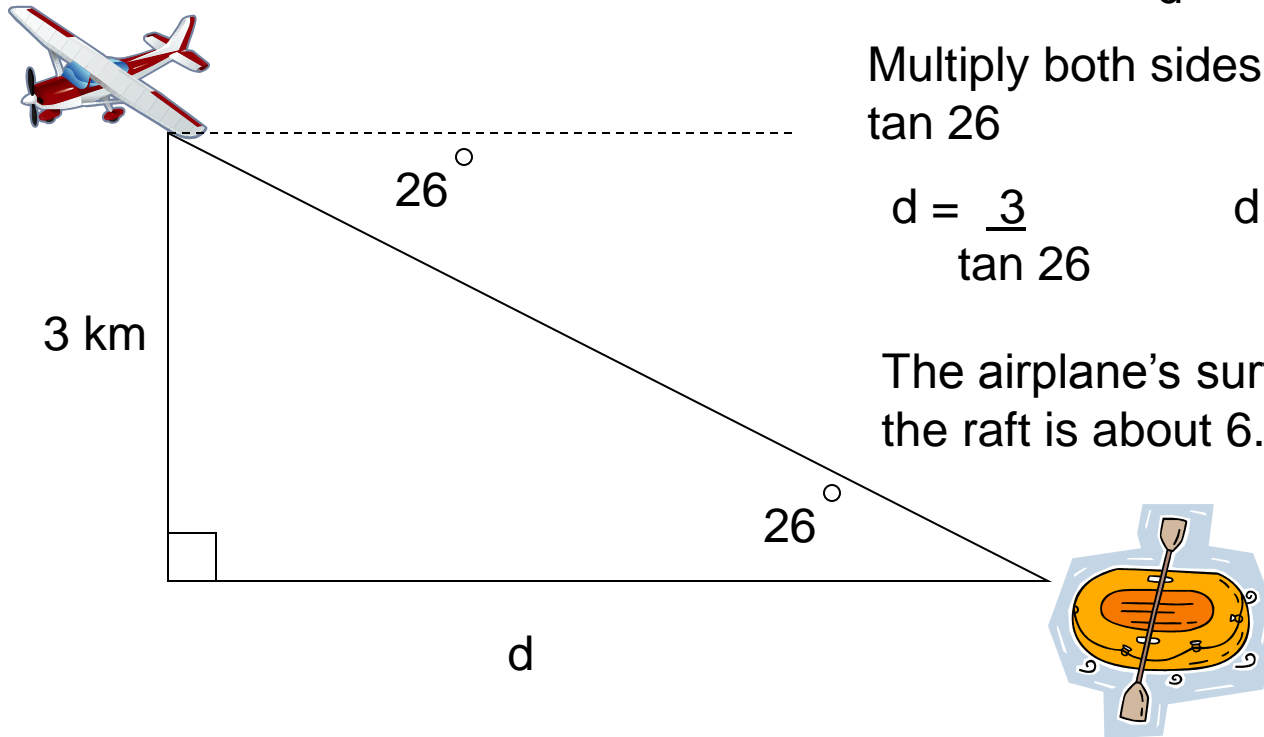
An airplane pilot sights a life raft at a 26 degree angle of depression. The airplane's altitude is 3 km. What is the airplane's surface distance  $d$  from the raft?

$$\tan 26 = \frac{3}{d}$$

Multiply both sides by  $d$ , then divide by  $\tan 26$

$$d = \frac{3}{\tan 26} \quad d = 6.2 \text{ km}$$

The airplane's surface distance from the raft is about 6.2 km





## Example 5: Finding the Angle of Depression

- An airplane is flying at a height of 2 miles above the ground. The distance along the ground from the airplane to the airport is 5 miles. What is the angle of depression from the airplane to the airport?

2 is opposite

5 is adjacent

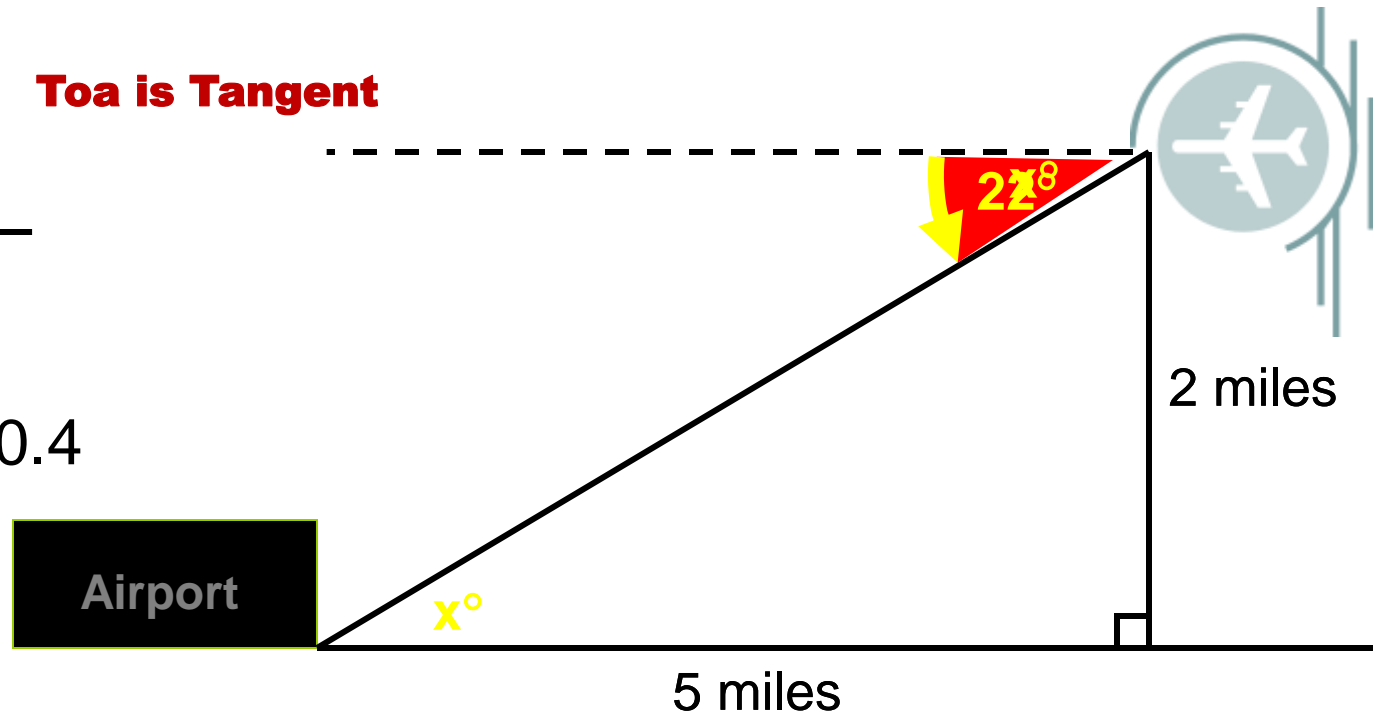
Toa is Tangent

$$\tan x = \frac{2}{5}$$

$$\tan x = 0.4$$

$$x = (\tan^{-1}) 0.4$$

$$x \approx 22^\circ$$



## Lesson Practice : Part I

1. A plane is flying at an altitude of 14,500 ft. The angle of depression from the plane to a control tower is  $15^\circ$ . What is the horizontal distance from the plane to the tower? Round to the nearest foot. **54,115 ft**

2. A woman is standing 12 ft from a sculpture. The angle of elevation from her eye to the top of the sculpture is  $30^\circ$ , and the angle of depression to its base is  $22^\circ$ . How tall is the sculpture to the nearest foot?

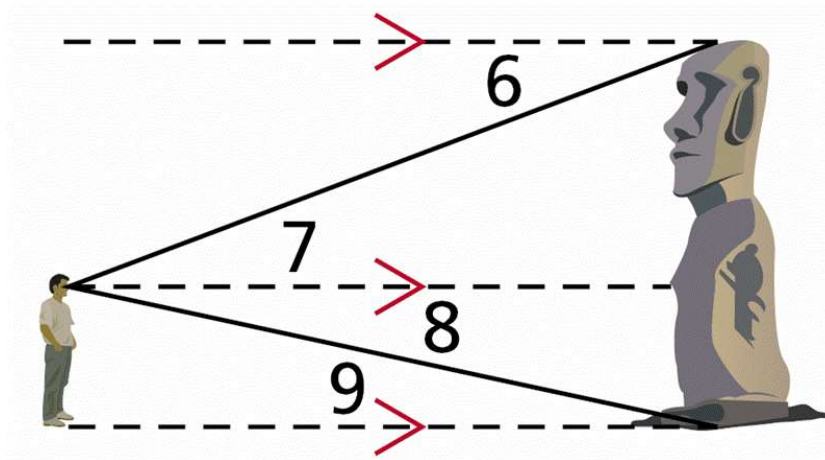
**12 ft**

3. Calculate the angle of elevation of the line of sight of a person whose eye is **1.7 m above the ground**, and is looking at the top of a tree which is **27.5 m away on level ground** and **18.6 m high**.

**Angle of elevation of this person  
line of sight is  $31.57^\circ$**

## Lesson Practice: Part II

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



4.  $\angle 6$

5.  $\angle 9$

6.  $\angle 7$

7.  $\angle 8$

## Lesson Practice: Answers

1. 54,115 ft
2. 12 ft
3. Angle of elevation of this person line of sight is  $31.57^\circ$
4. angle of depression
5. angle of elevation
6. angle of elevation
7. angle of depression