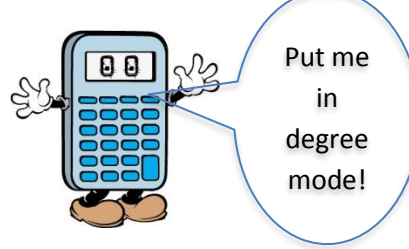


Name: \_\_\_\_\_

**UNIT 6**



Date: \_\_\_\_\_

**LESSON 4**

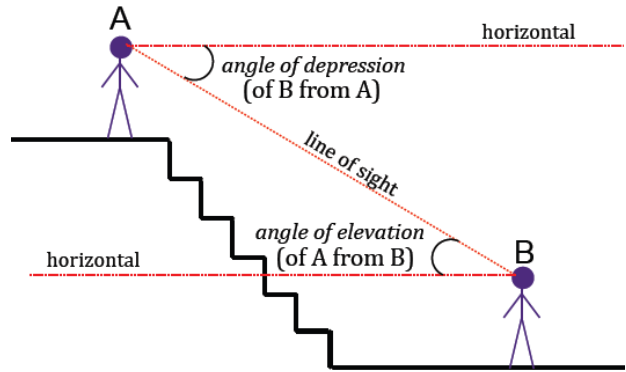
**AIM: HOW DO WE EVALUATE PROBLEMS INVOLVING ANGLE OF ELEVATION/ANGLE OF DEPRESSION?**

*Do Now:* Consider the image to the right.

a. How would you describe the angle of elevation?

b. How would you describe the angle of depression?

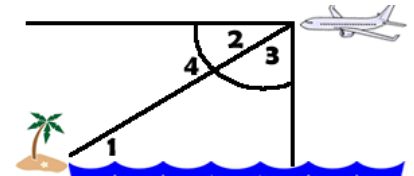
c. In a case where two viewers can observe each other, such as in the above diagram, what do you notice about the angle of elevation and the angle of depression? Why?



1. In the diagram to the right a line of sight is shown from a plane to an island. Fill in the blanks below using the diagram.

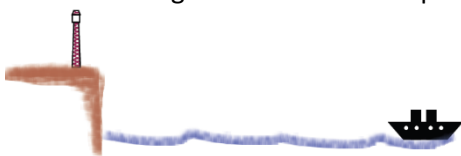
a. In the diagram the angle of elevation is \_\_\_\_\_

b. In the diagram the angle of depression is \_\_\_\_\_



2. Jason, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over his location. He sees the airplane at an angle of elevation of  $12^\circ$  and notes that it is maintaining a constant altitude of 7000 feet. Determine the horizontal distance from Jason to a point directly below airplane at this time, to the nearest tenth.

3. Standing on the gallery of a lighthouse, a person spots a ship at an angle of depression of  $20^\circ$ . The lighthouse is 28 m tall and sits on a cliff 45 m tall as measured from sea level. What is the horizontal distance, to the nearest meter, between the lighthouse and the ship? Sketch a diagram to support your answer.



4. Kevin, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over his location. He sees the airplane at an angle of elevation of  $22^\circ$  and notes that it is maintaining a constant altitude of 5145 feet.

a) Determine the horizontal distance from Kevin to a point directly below airplane at this time, to the nearest tenth.

b) One minute later, he sees the airplane maintaining the constant altitude but now at an angle of elevation of  $48^\circ$ . Determine the horizontal distance from Kevin to a point directly below the airplane at this time, to the nearest tenth.

c) How far has the airplane traveled in this one minute time frame, to the *nearest foot*?

d) Determine and state the speed of the airplane, to the *nearest mile per hour*. [Use the conversions chart from your reference sheet below.]

Common Core High School Math Reference Sheet  
(Algebra I, Geometry, Algebra II)

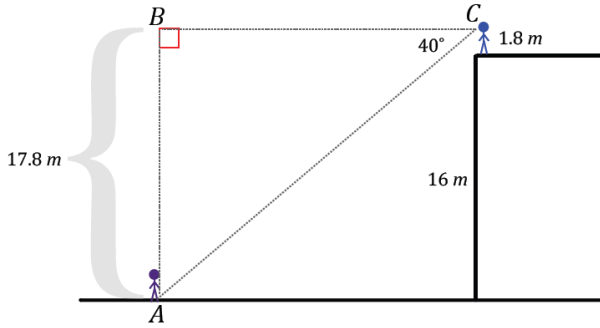
CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilograms	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

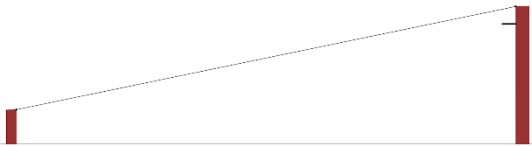
5. Scott, whose eye level is 1.5 m above the ground, stands 30 m from a tree. The angle of elevation of a bird at the top of the tree is  $36^\circ$ . How far above ground, to the nearest tenth of a meter, is the bird?



6. From an angle of depression of  $40^\circ$ , John watches his friend approach his building while standing on the rooftop. The rooftop is 16 m from the ground, and John's eye level is at about 1.8 m from the rooftop. What is the distance, to the nearest tenth of a meter, between John's friend and the building?



7. Samuel is at the top of a tower and will ride a trolley down a zip-line to a lower tower. The total vertical drop of the zip-line is 40 ft. The zip line's angle of elevation from the lower tower is  $11.5^\circ$ . What is the horizontal distance between the towers?



8. An anchor cable supports a vertical utility pole forming a  $51^\circ$  angle with the ground. The cable is attached to the top of the pole. If the distance from the base of the pole to the base of the cable is 5 meters, how tall, to the nearest hundredth of a meter, is the pole?

9. Suppose the angle of elevation to the top of a light pole is  $20^\circ$ . The light pole is 50 feet tall. How far are you standing from the pole?

10. Zoha, who is training to use a radar system, detects a blimp flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of  $24^\circ$  and notes that it is maintaining a constant altitude of 1050 feet.



a) Determine the horizontal distance from Zoha to a point directly below airplane at this time, to the nearest tenth.

b) One minute later, she sees the airplane maintaining the constant altitude but now at an angle of elevation of  $68^\circ$ . Determine the horizontal distance from Zoha to a point directly below the airplane at this time, to the nearest tenth.

c) How far has the airplane traveled in this one minute time frame, to the *nearest foot*?

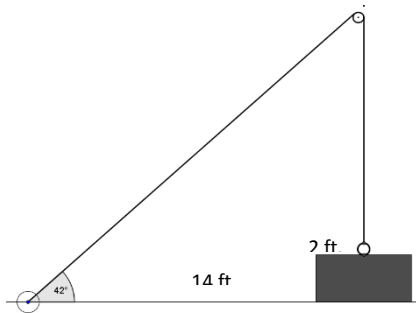
d) Determine and state the speed of the airplane, to the *nearest mile per hour*. [Use the conversions chart from your reference sheet below.]

**Common Core High School Math Reference Sheet  
(Algebra I, Geometry, Algebra II)**

**CONVERSIONS**

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
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1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

11. A winch is a tool that rotates a cylinder, around which a cable is wound. When the winch rotates in one direction, it draws the cable in. Joey is using a winch and a pulley (as shown in the diagram) to raise a heavy box off the floor and onto a cart. The box is 2 ft. tall, and the winch is 14 ft. horizontally from where cable drops down vertically from the pulley. The angle of elevation to the pulley is  $42^\circ$ . What is the approximate length of cable required to connect the winch and the box?



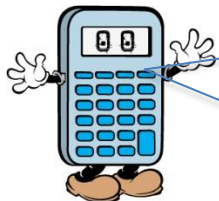
12. Suppose the angle of elevation of the top of a tree is  $50^\circ$ . If you are standing 35 feet from the tree, how tall is the tree?

13. At an angle of depression of  $42^\circ$ , an airplane pilot is able to view a target that is at a distance of 1,000 meters from the pilot. Find to the nearest 10 meters, the altitude of the plane.

14. A man observes the angle of depression from the top of a cliff overlooking the ocean to a ship to be  $37^\circ$ . If at this moment the ship is 1,000 meters from the foot of the cliff, find, to the nearest meter, the height of the cliff.

Name: \_\_\_\_\_

**UNIT 6**



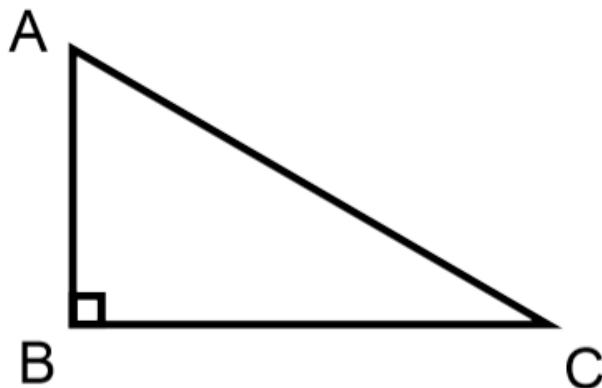
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**LESSON 4**

**HOMEWORK**

1. Triangle  $ABC$  is shown below, with  $\overline{AB} \perp \overline{BC}$ . Using a compass and straightedge, construct  $\Delta A'B'C'$ , the dilation of  $\Delta ABC$  centered at  $B$  with a scale factor of 2. [Leave all construction marks.]



Is  $\Delta ABC$  similar to  $\Delta A'B'C'$ ? Explain why.

If  $AB = 4$  and the  $BC = 6$ , find the measure of  $\overline{A'C'}$ . Round your answer to the nearest hundredth.

**\*\*ADD MORE PROBLEMS FOR NEXT YEAR!\*\***