

## Lesson 8-10: Angles of Elevation and Depression

### AGENDA:

- Check HW 8-9
- Notes 8.10 with Applications

### HOMWORK:8-10

- Worksheet 8-10- Complete Packet

Geometry LAB      Name: \_\_\_\_\_      Date: \_\_\_\_\_      Section: \_\_\_\_\_

Lesson 8-10 Notes: Angles of Elevation / Depression  
See Holt Textbook 8-3 & 8-4 for Additional Examples

$$\sin^{-1}\left(\frac{\text{Opp}}{\text{Hyp}}\right) = \theta ; \cos^{-1}\left(\frac{\text{Adj}}{\text{Hyp}}\right) = \theta ; \tan^{-1}\left(\frac{\text{Opp}}{\text{Adj}}\right) = \theta$$

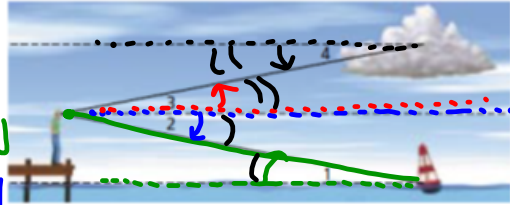
**Angles of Elevation/Depression**

An angle of *elevation* is an angle formed by a horizontal line and a line of sight to a point *above* the line.

An angle of *depression* is an angle formed by a horizontal line and a line of sight to a point *below* the line.

The diagram shows a cat on the left and a bird in a cage on the right. A horizontal dashed line extends from the cat's eye level to the cage. The angle between this horizontal line and the line of sight to the bird is labeled 'ANGLE OF ELEVATION'. The angle between the horizontal line and the line of sight to the bird from the bird's perspective is labeled 'ANGLE OF DEPRESSION'. A green circle highlights the horizontal line from the cat's perspective.

**Example 1:** Given the drawing with the cloud, person, and buoy,



- Classify each as an angle of elevation or depression and from / to which objects

$\angle 1$ : ELEV. from BUOY to PERSON

$\angle 2$ : DEPR from PERSON to BUOY

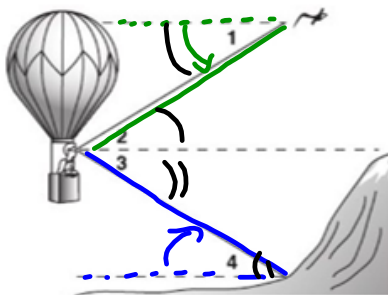
$\angle 3$ : ELEV from PERSON to CLOUD

$\angle 4$ : DEPR from CLOUD to PERSON

- Label the pairs of congruent angles on the drawing!

$$\begin{aligned} \angle 1 &\cong \angle 2 \\ \angle 3 &\cong \angle 4 \end{aligned}$$

**Practice**



Given the drawing with the hot air balloon,

A. The angle of elevation from the base of the cliff to the balloon is 4

B. The angle of depression from the bird to the balloon is RIDER

C. Describe  $\angle 2$  in relation to the objects it connects:

Angle of ELEVATION from the B. RIDER to the BIRD

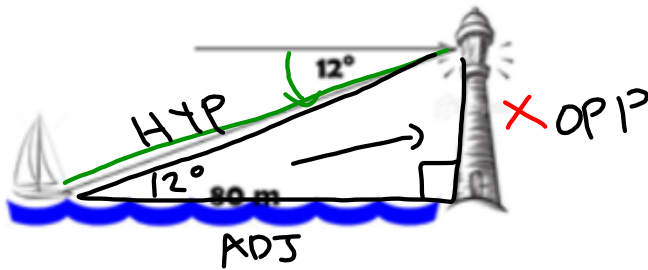
D. Mark the pairs of congruent angles on the drawing.

When working with angles of elevation and depression,

1. Keep in mind the horizontal line of sight and draw in the right triangle you want to use.
2. Label the sides opposite, hypotenuse, and adjacent for your selected reference angle (one of the acute angles).
3. Set up the appropriate trig ratio.
4. Solve for the desired length/distance or angle measure.
5. Round at the end!

Example 1: Finding Distance

A lighthouse operator sights a sailboat at an angle of depression of 12 degrees. If the sailboat is 80 m away, how tall is the lighthouse?



~~S~~  $\frac{O}{H} = \frac{A}{H}$   $\left(\frac{O}{A}\right)$

$$\tan 12^\circ = \frac{x}{80}$$

$$80(\tan 12^\circ) = x$$

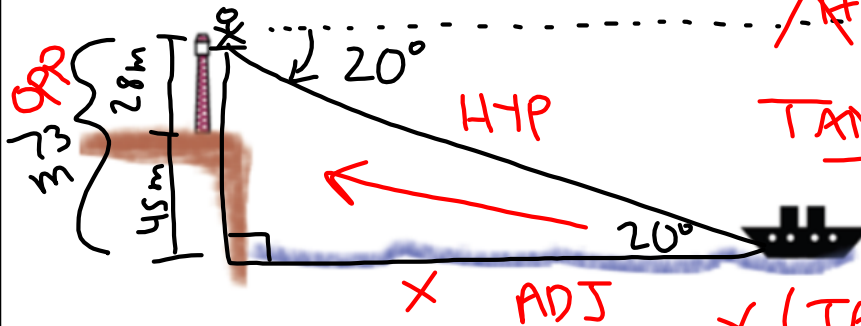
$$17.0045 \text{ m}$$

$$\boxed{17.0 \text{ m}}$$

LIGHTHOUSE

Example 2: Finding Distance w/Segment Addition

Standing on the gallery of a lighthouse (the deck at the top of a lighthouse), a person spots a ship at an angle of depression of 20°. The lighthouse is 28 m tall and sits on a cliff 45 m tall as measured from sea level. What is the horizontal distance between the lighthouse and the ship? Sketch a diagram to support your answer.



~~S~~  $\frac{O}{H} = \frac{A}{H}$   $\left(\frac{O}{A}\right)$

$$\tan 20^\circ = \frac{73}{x}$$

$$x(\tan 20^\circ) = 73$$

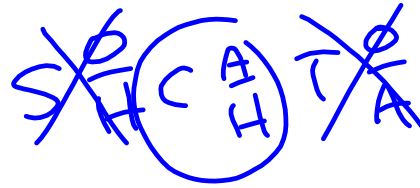
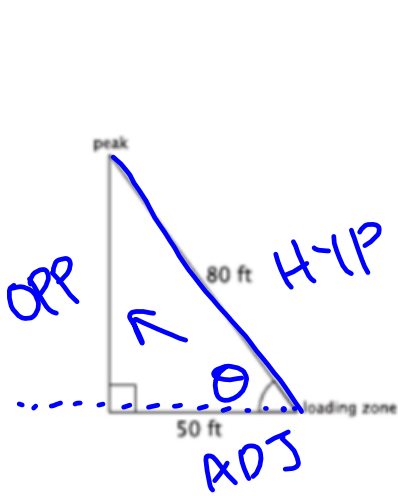
$$x = \frac{73}{\tan 20^\circ}$$

$$200.5658 \dots$$

$$\boxed{200.6 \text{ m}}$$

Example 3 - Finding the Angle of Elevation/Depression

A roller coaster travels 80 ft of track from the loading zone before reaching its peak. The horizontal distance between the loading zone and the base of the peak is 50 ft. What is the angle of elevation up to the peak of the roller coaster?



$$\cos \theta = \frac{50}{80}$$

$$\cos^{-1}\left(\frac{50}{80}\right) = \theta$$

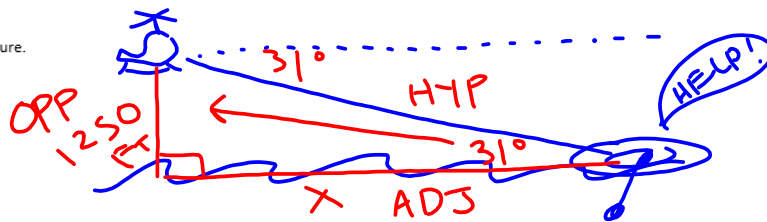
$$51.3178\dots$$

51.3°

Example 4: Time

The pilot of a rescue helicopter is flying east over the ocean at an altitude of 1250 feet. The pilot sees a life raft at an angle of depression of 31°.

A. Draw a picture.



B. What is the horizontal distance from the helicopter to the life raft, to the nearest foot?

~~S~~ ~~H~~ ~~C~~ ~~A~~ ~~H~~ ~~T~~ ~~A~~

$$\tan 31^\circ = \frac{1250}{x}$$

$$x(\tan 31^\circ) = 1250$$

C. If the helicopter is traveling at 150 ft/sec, how many seconds will the helicopter need to be directly over the raft to deploy a rescue diver?

$$x = \frac{1250}{\tan 31^\circ}$$

$$2080.3493\dots$$

2080 FT

$$d = vt$$

$$\frac{d}{v} = t$$

$$\frac{2080.3493 \text{ FT}}{150 \text{ FT/SEC}}$$

$$13.8689 \text{ SEC}$$

13.9 SEC

## Attachments

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Bridge to 8.docx

Quiz 1 L.pdf