# 8-5 Angles of Elevation and Depression

Name_____
Date_____ Block_____

- **Angle of Elevation** is the angle between the ___line___ of ___sight___ and the ___horizontal___ when an observer looks ___up___.
- **Angle of Depression** is the angle between the ___line___ of ___sight___ and the ___horizontal___ when an observer looks ___down___.
- Horizontal lines are **parallel**, so the angle of elevation and the angle of depression are always ___≅___ because ___alt. int. ∠s are ≅ !___.


The man in the house spots a deer on the mountain. Name the angle of elevation and the angle of depression in the figure using 3 letters.

Angle of elevation: ___∠ABC___

Angle of depression: ___∠DCB___
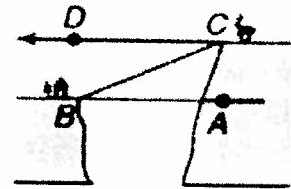
Example of a real-world example that requires trigonometry to solve it:
The fire marshal in a helicopter flying at 1,500 feet sees smoke at a 15° angle of depression. How far from the helicopter is the fire?

15° angle of depression

1500 ft

15° angle of elevation
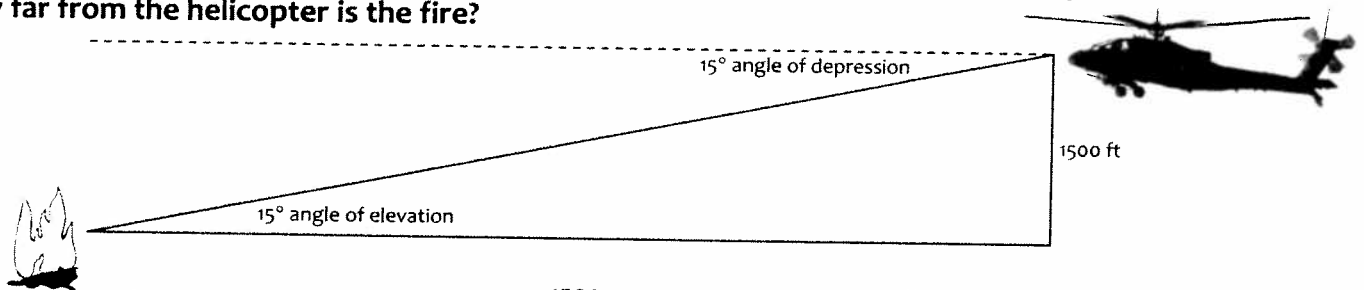
Solve: $\sin 15° = \dfrac{1500}{x}$ $x = \dfrac{1500}{\sin 15}$ $x = 5795.55$ ft

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Draw a picture and use trigonometry to solve the problem.

5. From her position in a hot-air balloon, Angie can see her car parked in a field. If the angle of depression is 8° and Angie is 38 meters above the ground, what is the straight-line distance from Angie to her car? Round to nearest whole meter.

$$\sin 8 = \frac{38}{x}$$

$$x = \frac{38}{\sin 8}$$

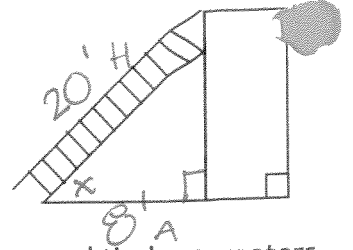$$x = 273.04$$

$8°$ x $8°$ 38m

273 meter
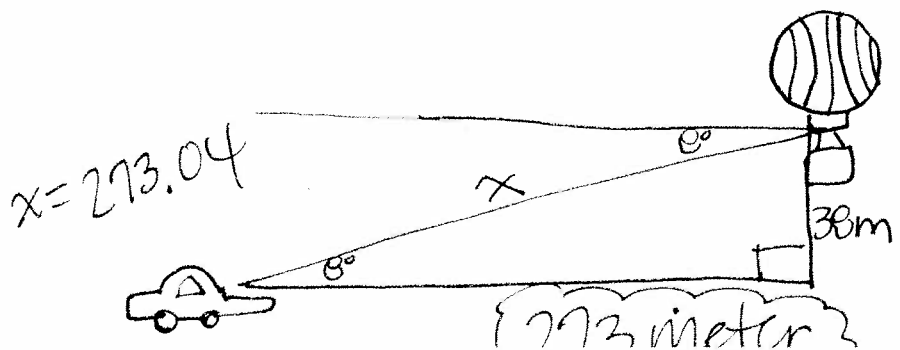
Solve each problem. Round segments to the nearest hundredth and angles to the nearest degree.

6. A 20-foot ladder leans against a wall so that the base of the ladder is 8 feet from the base of the building. What angle does the ladder make with the ground?

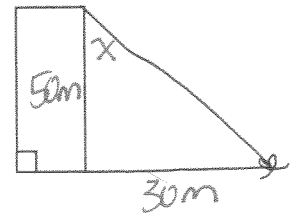$$\cos x = \frac{8}{20} \qquad x = 66.4218$$

$$66.42$$

$$\boxed{66°}$$

7. A 50-meter vertical tower is braced with a cable secured at the top of the tower and tied 30 meters from the base. What angle does the cable form with the vertical tower?
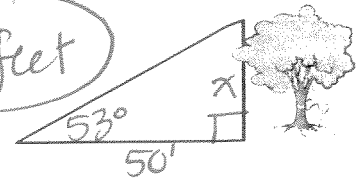
$$\tan x = \frac{30}{50}$$

$$x = 30.96$$

$$\boxed{31°}$$

8. At a point on the ground 50 feet from the foot of a tree, the angle of elevation to the top of the tree is 53°. Find the height of the tree.

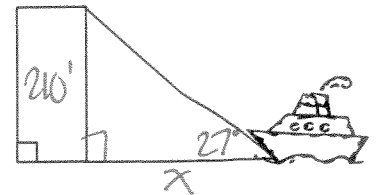$$\tan 53 = \frac{x}{50} \qquad x = 50 \tan 53$$

$$x = 66.3522$$

$$\boxed{66.35 \text{ feet}}$$

9. From the top of a 210 feet lighthouse (built at sea level), the angle of depression of a boat is 27°. Find the distance from the boat to the foot of the lighthouse.

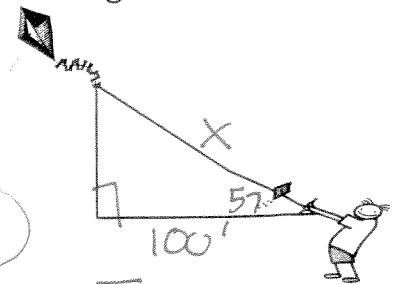$$\tan 27 = \frac{210}{x} \qquad x = \frac{210}{\tan 27} \qquad 412.148$$

$$\boxed{412.15 \text{ feet}}$$

10. Richard is flying a kite. The kite string makes an angle of 57° with the ground. If Richard is standing 100 feet from a point on the ground directly below the kite, find the length of the kite string.

$$\cos 57 = \frac{100}{x} \qquad x = \frac{100}{\cos 57} \qquad x = 183.6078$$

$$\boxed{183.61 \text{ feet}}$$

11. An airplane rises vertically 1000 feet over a horizontal distance of 1 mile. What is the angle of elevation of the airplane's path?

$$\tan x = \frac{1000}{5280} \qquad x = 10.724$$

$$\boxed{11°}$$

1 mi = 5280 feet