Terms:
- horizon – the straight, flat line that travels away from the observer with no rise or fall in altitude; it is perpendicular to the pull of gravity.
- horizontal – the direction that is parallel with the horizon; usually parallel with the ground.
- vertical – the direction perpendicular with the horizon. Vertical is parallel with the pull of gravity. It is usually thought of as straight up or straight down.
- angle of elevation – the angle a line of sight makes from a lower observer to a higher distant point. It is the angle formed looking up relative to the horizon (ground).
- angle of depression – the angle a line of sight makes from a higher observer to a lower distant point. It is the angle formed looking down relative to the horizon.
- $\theta$ – the Greek letter Theta which is used to represent an unknown angle.

Notice that the trig function used is tangent – that is not coincidental. When considering vertical and horizontal distances, the hypotenuse is not involved. It turns out also that, as we will see much later, that the tangent is used in determining slope and rates.

Vertical distances are determined using horizontal distances multiplied by the tangent of the angle of depression (or elevation), whereas vertical distances are determined by dividing horizontal distances by the same tangent. If the angle of elevation is $45^\circ$, then the tangent has a value of 1, meaning that horizontal and vertical distances are the same.

**Activity 1:** Use the image to the right to determine the unknown value.

**Activity 2:** The land below an airplane is flat. If the pilot looks down at an angle of depression of $12^\circ$ and sees a park 12 km away, determine the plane’s height above the ground.
Homework: 1. Use the information in each diagram to solve the problem. Show work.

2. Word problems are given. For each one draw a simple diagram and solve. Show work.

a) Beth is flying a plane and looks down at an angle of depression of 30°. If the plane is 2000 m off the ground, how far away is the spot she is looking at?

b) Josh looks up at an angle of elevation of 65° at the top of a tree. If he is 40 feet away from the base of the tree, how tall is the tree? Add 6 feet to compensate for his point of view.

c) The top of a water tower is 300 ft above the ground. The angle of elevation from a certain point is 15°. What is the distance between that point and the water tower?

d) A person on the earth looks up at night and sees a satellite in the sky. The angle of elevation is 70°. If the horizontal distance to the satellite is 50 km, what is the vertical distance?

e) A hunter in a tree hide looks through his scope at an angle of depression of 10°. His rifle is 5 m above the ground. Assuming flat ground, how far away is his target?

f) A fly on top of a light in a parking lot looks down at an angle of depression of 75° at a scrap of food. If the light is 27 feet tall, how far away is the scrap?