Solve each problem. Remember to draw the picture.

1) Suppose you have been assigned to measure the height of the local water tower. Climbing makes you dizzy, so you decide to do the whole job at ground level. From a point 47 meters from the base of the water tower, you find that you must look up at an angle of 53° to see the top of the tower. How tall is the tower?

2) You lean a ladder 6.7 meters long against the wall. It makes an angle of 63° with the level ground. How high up is the top of the ladder?

3) You must order a new rope for the flagpole. To find out what length of rope is needed, you observe that the pole casts a shadow 11.6 meters long on the ground. The angle between the sun’s rays and the ground is 36.8°. How tall is the pole?

4) A submarine at the surface of the ocean makes an emergency dive, its path making an angle of 21° with the surface. If it goes for 300 meters along its downward path, how deep will it be?

5) An observer 5.2 kilometers from the launch pad observes a missile ascending. At a particular moment, the angle of elevation is 37.6°. How high is the missile at that time?

6) A loading dock has been constructed at a warehouse. The ramp must have an incline of exactly 25°. The ramp meets the building wall 15 feet above the ground. How long is the ramp?

7) If the distance of a person from a tower is 100 meters and the angle of depression by the top of the tower with the ground is 31°, what is the height of the tower?

8) A 6.1 meter ladder leans against a wall. The angle formed by the ladder and the ground is 71°.
   a) How far is the foot of the ladder from the wall?
   b) How high up the wall does the ladder reach?

9) A kite has a string 200m long. The string makes an angle of 43° with the ground. Determine the height of the kite.

10) A tree casts a 23m shadow when the angle of elevation of the sun is 52°.
   a) Find the height of the tree.
   b) Find the length of the shadow when the angle of elevation of the sun is 38°.