

Angles of Elevation and Depression

Begin each question by drawing a large clear diagram.

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 47.3 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? Draw the triangle.
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. The tallest freestanding structure in the world is the 553 meter tall CN tower in Toronto, Ontario. Suppose that at a certain time of day it casts a shadow 1100 meters long on the ground. What is the angle of elevation of the sun at that time of day?
4. When surveyors measure land that slopes significantly, the distance which is measured will be longer than the horizontal distance which must be drawn on a map. Suppose that the distance from the top edge of the Okapilco Creek bed to the edge of the water is 37.8 meters. The land slopes downward at 27.6° to the horizontal.
 - a) What is the horizontal distance from the top of the banks to the edge of the creek?
 - b) How far is the surface of the creek below the level of the surrounding land?
5. 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? What horizontal distance is it from its starting point?
6. A ladder of length 4 m rests against a vertical wall so that the angle between the ladder and the ground is 66° . How far up the wall does the ladder reach?

7. From a distance of 20 m the angle of elevation to the top of a tower is 35° . How high is the tower? From the top of a tower of height 75 m, a guard sees two prisoners, both due East of him. If the angles of depression of the two prisoners are 10° and 17° , calculate the distance between them.
8. A boat C is 200 m from the foot B of a vertical cliff, which is 40 m high. What is the angle of depression of the boat from the top of the cliff?
9. A straight tunnel is 80 m long and slopes downwards at an angle of 11° to the horizontal. Find the vertical drop in travelling from the top to the bottom of the tunnel.
10. A flagpole stands on level ground. From a point on the ground 30 m away from its foot, the angle of elevation of the top of the pole is 22° . Find the height of the pole.
11. A is a point (2, 0), B is (, 0) and C is (8, 5). Calculate the angle between AC and the x-axis.