APPLICATIONS OF TRIGONOMETRY
(Each correctly worked problem with all work shown is worth 1 extra credit point.)

1. The picture above shows a police helicopter chasing a stolen car. The sighted angle of depression is 70 degrees. How far is the helicopter from the car? Find the distance from the stolen car to a point directly below the helicopter.

2. At a certain time of day, the angle of elevation of the sun is 57 degrees. Find the height of the tree if its shadow length is 45 feet. What is the distance from the top of the tree to the point in the ground made by the shadow?
3. The figure above shows a 58 degree angle of elevation from a point on the ground that is 130 feet from the base of a radio tower to its top. How tall is the radio tower?

4. The helicopter in the picture is hovering 1250 feet above a small island. The angle of depression from the helicopter to the point P on the mainland is 38 degrees. How far is the island from the point P on the mainland? How far is the helicopter from the point P on the mainland? What are the degree measures of the two "?" shown in the picture?
5. The jet shown in the picture has just taken off from the airport. The angle of elevation from an observer on the ground at point A to the jet is 15 degrees. If the 2500-foot runway extends from point A to point C, what is the jet's altitude? How far is the jet from the observer?

6. The roadway in the picture is inclined at an angle of 7 degree (called a 7 degree grade). After driving 3500 feet along the road, find the driver's increase in altitude. What is the distance from point C to point A?

7. To find the distance across the lake, a surveyor at point A took the measurements shown in the picture. How far is it across the lake from point B to point C? How far is it from the surveyor to point C?

8. The tallest television-transmitting tower in the world is in the state of North Dakota. From a point on level ground one mile from the base of the tower, the angle of elevation is 21 degrees. To the nearest foot, how high is this tower? (Draw a picture to help visualize the situation.)

9. The angle of elevation from an observer on the deck of a ship in New York Harbor to the very top of the Statue of Liberty is measured to be 24 degrees. If the ship is 685 feet from the base of the statue, how tall is the Statue of Liberty, to the nearest foot? (Draw a picture to help visualize the situation.)

10. A 300-meter cliff drops vertically into the ocean. If the angle of depression from the top of the cliff to a ship off shore is 68 degrees, how far is the ship to the shore, to the nearest meter? (Draw a picture to help visualize the situation.)
11. A kite flies at a height of 300 feet when 450 feet of string is let out. If the string is in a straight line, what is the angle of elevation with the ground? (Draw a picture to help visualize the situation.)

12. A wheelchair ramp is to be built beside the steps to the Monroe Library. Find the angle of elevation of the 27-foot ramp, to the nearest tenth of a degree, if its final height is six feet? (Draw a picture to help visualize the situation.)

13. In the figure below, observers are standing at points A and B. Use this figure to answer the questions that follow.

a. What are the degree measures of $\angle BCD$, $\angle ABC$, and $\angle ACB$?
b. How far is the observer at point B from the top of the mountain?
c. How far is the observer at point A from the top of the mountain?
d. How tall is the mountain?
e. How far is the observer at point B from point D?
f. How far is the observer at point A from point D?

14. In the figure below, an observer is standing where indicated. Use this figure to answer the questions that follow.
a. How far is the observer standing from point K?
b. How tall is the building?
c. How far is the observer from the base of the flagpole?
d. How far is the observer from the top of the flagpole?
e. How tall is the flagpole?

15. An industrial ladder is 35 feet long and has its base in the street. The ladder makes an angle of 30 degrees with the street when its top rests on the roof of a building on one side of the street, and it makes an angle of 25 degrees when its top rests on roof of the building on the other side of the street. See the figure below.

![Diagram of ladder and buildings](image)

a. How tall is each building?
b. How wide is the street?

16. The figure below shows a pond and the distances from point C to point A and from point C to point B. Answer the questions below the figure.

![Diagram of pond and distances](image)

a. How far is it across the pond from point B to point A?
b. What is the degree measure of \( \angle BAC \)?
c. What is the degree measure of \( \angle ABC \)?

17. Two nuclear submarines, one cruising at 30 knots and the other at 35 knots, left a naval base at the same time. Three hours later they were 115 nautical miles apart. What was the measure of the angle between their courses? (1 knot = 1 nautical mile per hour)