Directions: Solve the following application problems, draw a picture for each problem. Show the trigonometric ratios used and solve showing ALL work. Round all measures of segments to the nearest hundredth and round all angle measures to the nearest degree.

1. A tree casts a shadow 21m long. The angle of elevation of the sun is 51°. What is the height of the tree?

2. You are flying a kite and have let out 80m of string. The kite's angle of elevation with the ground is 40°. If the string is stretched straight, how high is the kite above the ground?

3. A 15m pole is leaning against a wall. The foot of the pole is 10m from the base of the wall. Find the angle that the pole makes with the ground.

4. A guy wire reaches from the top of a 120m television transmitter tower to the ground. The wire makes a 63° angle with the ground. Find the length of the guy wire.

5. An airplane climbs at an angle of 18° with the ground. Find the ground distance the plane travels as it moves 2,500m through the air.

6. A lighthouse operator at point P 25m above sea level sights a sailboat at point S. The angle of depression of the sighting is 10°. How far is the boat from the base of the lighthouse?

7. Two trees stand opposite one another, at points A and B, on opposite banks of a river. Distance AC along one bank is perpendicular to AB, and is measured to be 100 feet. Angle ACB is measured to be 79°. How far apart are the two trees?

8. Find the measure of height, h, of a flagpole when the shadow is 100 feet from its base (point P). The angle of elevation from point P to the top of the flagpole is 37° as shown in the diagram below.

9. A lighthouse is 62 feet tall. If the angle of depression the light house keeper has to the boat is 36°, how far away is the boat from the light house?

10. Triangle ABC and triangle MNL are similar triangles. If BC = 10, ML = 30, and sinM = $^2/_5$, what is the length of AC? What is the measure of angle M?

11. A ladder makes a 21° angle with the ground. How long is the ladder if it reaches 19 feet up the wall?

12. A 12 foot ladder is leaning against the wall of a building. If the ladder makes a 38° angle with the wall, how far is the base of the ladder from the wall?

13. A plane took off from the runway. When the plane had flown 4km, it had covered a horizontal distance of 3.6km. Find the angle of elevation at which the plane rose from the ground.

14. Jane is standing 40 feet from the base of an oak tree. She measures the angle of elevation of the line of sight from a point on the ground to the top of the tree to be 62°. How tall is the tree?