1. Find to the nearest tenth, the length of each side.
\[
\sin 71^\circ = \frac{18.5}{y} \quad \tan 71^\circ = \frac{18.5}{x}
\]
\[
y = \frac{18.5}{\sin 71^\circ} \quad x = \frac{18.5}{\tan 71^\circ}
\]
\[
y = 19.6 \quad x = 6.4
\]

2. Find to the nearest tenth, the length of the diagonal of the rectangle.
\[
\sin 57^\circ = \frac{36.8}{d}
\]
\[
d = \frac{36.8}{\sin 57^\circ} = 43.9
\]

3. The sun produces the shadow of a flagpole on the ground. The distance from the base of the pole to the tip of the shadow is 62 feet. The sun's rays makes a 29° angle with the ground. To the nearest foot, how tall is the flagpole?
\[
\tan 29 = \frac{x}{62}
\]
\[
x = 62 \tan 29 \approx 34 \text{ ft}
\]

4. A 7 meter ladder leans against a building. It forms an angle with the building measuring 16°. How far is the foot of the ladder from the base of the building to the nearest meter?
\[
\sin 16 = \frac{x}{7}
\]
\[
x = 7 \sin 16 \approx 2 \text{ m}
\]

5. An 8-foot pole and an 18-foot pole are braced by two guy wires, each extending from the bottom of one pole to the top of the other. How far apart are the poles if the guy wires intersect at right angles?
\[
\tan x = \frac{8}{y} \quad \tan x = \frac{y}{18}
\]
\[
\frac{8}{y} = \frac{y}{18}
\]
\[
y^2 = 8 \cdot 18
\]
\[
y = \sqrt{144} = 12
\]
Angle of Elevation and Angle of Depression

6. From the lighthouse window, the angle of depression of a boat is 38°. The height to the lighthouse window is 120 feet. Find the line of sight distance from the lighthouse to the boat to the nearest foot.

\[
\sin 38° = \frac{120}{x}
\]

\[
x = \frac{120}{\sin 38°}
\]

\[
x = 195 \text{ ft}
\]

7. A ski lift's cable makes an angle of depression of 50°. The mountain is 1800 feet tall. Find the length of the cable to the nearest foot.

\[
\sin 50° = \frac{1800}{x}
\]

\[
x = \frac{1800}{\sin 50°} = 2350 \text{ ft}
\]

8. Tim is standing 40 feet from the foot of a tree. The angle of elevation to the top of the tree is 45°. Find the height of the tree to the nearest foot.
9. From the top of a lighthouse 180 feet high, the angle of depression of a tugboat out at sea is 26°. Find the distance from the tugboat to the base of the lighthouse to the nearest foot. (The base of the lighthouse is at sea level.)

\[
\tan 26^\circ = \frac{180}{x}
\]

\[
x = \frac{180}{\tan 26^\circ} = 369\text{ ft}
\]

10. At a point 15 feet from the base of a church, the angle of elevation of the top of the church is 43°. Find the height of the church to the nearest foot.

\[
\tan 43^\circ = \frac{x}{15}
\]

\[
x = 15 \tan 43^\circ \\
x \approx 14\text{ ft}
\]

11. The angle of depression from the top of the lighthouse to the top of the lobster trap is 16°. Find to the nearest foot, the line of sight distance from the top of the lighthouse to the top of the lobster trap.

\[
\sin 16^\circ = \frac{117}{x}
\]

\[
x = 117 \sin 16^\circ \approx 42.4\text{ ft}
\]

12. From problem #11, find, to the nearest foot, the distance from the top of the lobster trap to the cliff.

\[
\tan 16^\circ = \frac{117}{x}
\]

\[
x = \frac{117}{\tan 16^\circ} = 408\text{ ft}
\]
13. An airplane is flying at an altitude of 3000 feet. The angle of depression to the top of the tower is $27^\circ$ and the tower is 30 feet tall. Find the line of sight distance, to the nearest foot, between the airplane and the top of the tower.

\[
\sin 27^\circ = \frac{2970}{x}
\]

\[
x = \frac{2970}{\sin 27^\circ} \approx 6542 \text{ ft}
\]

14. A student looks out of a second story window of a school and sees the top of the flagpole at an angle of elevation of $15^\circ$. The student is 16 feet above the ground and 25 feet from the flagpole. Find the height of the flagpole to the nearest foot.

\[
\tan 15^\circ = \frac{x}{25}
\]

\[
x = 25\tan 15^\circ \approx 7 \text{ ft}
\]

15. You are standing 75 feet from the base of a flagpole. The flagpole is 25 feet tall. Find the angle of elevation to the top of the flagpole to the nearest tenth of a degree.

\[
\tan x = \frac{25}{75}
\]

\[
x \approx 18.4^\circ
\]

16. You are standing on a roof of a stadium and you are looking down at the base of a tree that is 20 feet away. The stadium is 16 feet tall. Find the angle of depression from the top of the stadium to the base of the tree.

\[
\tan x = \frac{16}{20} \approx 38.7^\circ
\]
17. When the angle of elevation of the sun is $27^\circ$, the shadow of a tree is 25 meters long. How tall is the tree to the nearest meter?

$$\tan 27^\circ = \frac{x}{25}$$

$$x = 25 \tan 27^\circ$$

$$x \approx 13 \text{ m}$$

18. To find the height of a mountain peak two points, A and B, were located on a plain in line with peak and the angles of elevation were measured from each point. The angle at A was $36^\circ$ and the angle at B was $21^\circ$. The distance from A to B was 570 feet. How high is the peak above the level of the plain? Find it to the nearest foot.

$$\tan 36^\circ = \frac{x}{y}$$

$$y = \frac{x}{\tan 36^\circ}$$

$$x = y \tan 36^\circ$$

$$x \approx 464 \text{ ft}$$

19. A TV tower is 250 meters high and casts a shadow 176 meters long. Find the angle of elevation of the sun to the nearest degree.

$$\tan \theta = \frac{250}{176}$$

$$\theta \approx 55^\circ$$

20. A mountain peak stands near a level plain on which are two farm houses C and D that are in a straight line from the peak. The angle of depression from the peak to C is $49^\circ$, and the angle of depression to D is $26^\circ$. The peak is known to be 1004 feet above the level of the plain. Find the distance from C to D to the nearest foot.

$$\tan 26^\circ = \frac{1004}{x + \frac{1004}{\tan 49}}$$

$$x + \frac{1004}{\tan 49} * \tan 26^\circ = 1004$$

$$x = \frac{1004 - 1004 \tan 26^\circ}{\tan 26^\circ}$$

$$x \approx 1186 \text{ ft}$$