**Draw Diagrams. Show work. Round off all answers to one decimal place. (3 marks each)**

1.) The angle of elevation of the Rock Mountain fire-control tower from the top of Blue Mountain 3.0 km away (horizontal distance) is 18°. How much higher than Blue Mountain is the fire-control tower?

![Diagram](image1)

\[
\tan 18 = \frac{x}{3.0} \quad x = 0.9747 \quad x = 1.0 \text{ km}
\]

2.) The angle of elevation of the summit from the bottom of the second lift at Snow Bowl is 33.0°. If a skier rides 1000. m on this lift to the summit, what is the vertical distance between the bottom of the lift and the summit? 545 m

![Diagram](image2)

\[
\sin 33 = \frac{x}{1000.} \quad x = 544.639 \quad x = 545 \text{ m}
\]

3.) The angle of depression of an aircraft carrier from an approaching airplane is 52.2°. If the plane is 700. m above level of the deck of the carrier, how far away (horizontally) is the carrier? 537 m

![Diagram](image3)

\[
\tan 52.5 = \frac{700}{x} \quad x = 537.1289 \quad x = 537 \text{ m}
\]

4.) The navigator on a bomber finds that the angle of depression of a target 4.00 km away is 11.4°. At what altitude is the plane flying? 0.807 km

![Diagram](image4)

\[
\tan 11.4 = \frac{x}{4.00} \quad x = 0.8065 \quad x = 0.807 \text{ m}
\]

5.) Billy’s kite has a string 40. m long and is flying 27. m above his eye level. Find the angle of elevation of the kite. 42°

![Diagram](image5)

\[
\sin \theta = \frac{27}{40} \quad \theta = 42.454 \quad x = 42 \text{ m}
\]
6.) At an airport, cars drive down a ramp 96 m long to reach the lower level baggage-claim area 13 m below the main level. What angle does the ramp make with the ground at the lower level? **7.8°**

\[
\sin \theta = \frac{13}{96}, \quad \theta = 7.783, \quad \theta = 7.8° \text{ m}
\]

7.) A surveyor standing in a ravine finds the angle of elevation of the top of one side is 15.13°. If he is standing 14 m from the base of this side, how deep is the ravine? **3.8 m**

\[
\tan 15.13 = \frac{x}{14}, \quad x = 3.785, \quad x = 3.8 \text{ m}
\]

8.) As an airplane flying north passes directly over a civil defense air watch unit, another unit 4.30 km due north finds the angle of elevation of the plane to be 19.17°. Find the altitude of the plane. **1.50 km**

\[
\tan 19.17 = \frac{x}{4.30}, \quad x = 1.495, \quad x = 1.50 \text{ km}
\]

9.) Find the length of the altitude of an isosceles triangle whose base has length 20.0 cm and whose base angles each has a measure of 45°. **10. cm**

\[
\tan 45 = \frac{10.0}{x}, \quad x = 10, \quad x = 10. \text{ cm}
\]

10.) A pendulum 40. cm long is moved 30° from the vertical. How much is the lower end of the pendulum lifted? **5.4 cm**

\[
\cos 30 = \frac{x}{40}, \quad x = 34.64, \quad x = 34.64 \text{ cm}, \quad y = 40.0 - 34.64, \quad y = 5.35, \quad y = 5.4 \text{ m}
\]
11.) The top of a vertical tree broken by the wind hits the ground 25.0 m from the foot of the tree. If the upper portion makes an angle of 30.0° with the horizontal ground, what was the original height of the tree? **43.3 m**

\[ \tan 30 = \frac{x}{25.0} \quad x = 14.4337 \]

\[ \cos 30 = \frac{25.0}{y} \quad y = 28.8675 \]

**height** = **x** + **y**

**height** = **43.3 m**

12.) The angle of elevation of the top of Billings building from the roof of the Wolcott Building (in the same vertical plane) is 33.10°. As well, from the roof of the Wolcott to the 15th floor of the Billings building is 21.50°. If the distance between the roof and the 15th floor is 101 m, how far apart are the buildings? **392 m**

1.) \[ \tan 33.10 = \frac{y + 101}{x} \quad x = \frac{y + 101}{\tan 33.10} \]

2.) \[ \tan 21.50 = \frac{y}{x} \quad x = \frac{y}{\tan 21.50} \]

**Combine 1 and 2**

\[ \frac{y + 101}{\tan 33.10} = \frac{y}{\tan 21.50} \quad \tan 21.50 \frac{y + 101}{\tan 33.10} = y \]

\[ \tan 21.50 (y + 101) = (\tan 33.10)y \]

\[ \tan 21.50 y + \tan 21.50 \times 101 = (\tan 33.10)y \]

\[ \tan 21.50 \times 101 = (\tan 33.10)y - \tan 21.50 y \]

\[ 101.3939 = 0.25798y \quad y = 154.216 \]

\[ x = 391.501 \quad x = 391.501 \text{ m} \]

13.) From a point on the ground 75 m from the base of a building, the angle of elevation of the top of a flagpole on the edge of the roof of the building is 45.20° and the angle of elevation of the bottom of the flagpole is 38.40°. Find the height of the pole. **16 m**

1.) \[ \tan 45.20 = \frac{x}{75} \quad x = 75.525 \]

2.) \[ \tan 38.40 = \frac{y}{75} \quad y = 59.44 \]

**height** = **x** - **y**

**height** = **75.525 - 59.44 m**

**height** = **16.085 m**

14.) How far from the vertical wall of a building is the base of a thirty-foot ladder, which makes a 75° angle with the ground? **7.8 ft**

\[ \cos 75 = \frac{x}{30} \quad x = 7.7645 \quad x = 7.8 \text{ ft} \]