Solving Triangles

1.)

$m\angle P = 180 - 90 - 43$

$= 47$

$\sin 43 = \dfrac{x}{12}$

$x = 12 \cdot \sin 43$

$x = 8.18$

$\cos 43 = \dfrac{y}{12}$

$y = 12 \cdot \cos 43$

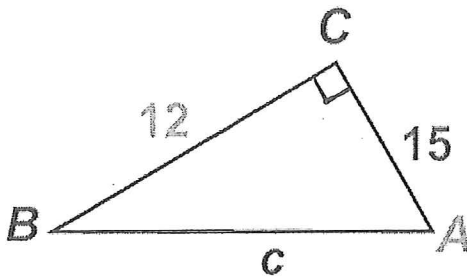$y = 8.78$

$m\angle P = \underline{47°}$

$x = \underline{8.18}$

$y = \underline{8.78}$

2.)

$(12)^2 + (15)^2 = c^2$

$144 + 225 = c^2$

$369 = c^2$

$c = \sqrt{369} = 3\sqrt{41} = 19.21$

$\text{TAN } A = \dfrac{12}{15}$

$A = \text{TAN}^{-1}\left(\dfrac{12}{15}\right)$

$A = 38.66°$

$\text{TAN } B = \dfrac{15}{12}$

$B = \text{TAN}^{-1}\left(\dfrac{15}{12}\right)$ or

$B = 51.34°$

$m\angle A = \underline{38.66°}$

$m\angle B = \underline{51.34°}$

$c = \underline{3\sqrt{41} = 19.21}$

$180 - 90 - 38.66$

$51.34°$

3.) Given $\triangle EMA$, where $\angle A$ is a right angle, $a = 53.3$ and $m = 19.2$. Find the remaining angle and sides. If necessary, round your answers to the nearest 4th decimal place.

$(19.2)^2 + e^2 = (53.3)^2$
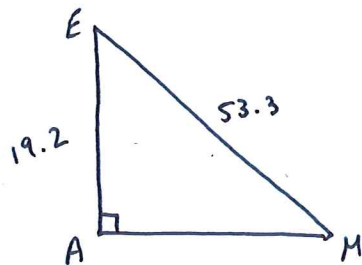
$368.64 + e^2 = 2840.89$

$e^2 = 2472.25$

$e = 49.72$

$\sin M = \dfrac{19.2}{53.3}$
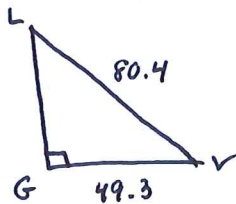
$M = \sin^{-1}\left(\dfrac{19.2}{53.3}\right)$

$M = 21.11°$

$\cos E = \dfrac{19.2}{53.3}$

$E = \cos^{-1}\left(\dfrac{19.2}{53.3}\right)$

$E = 68.89°$

4.) Given $\triangle LVG$, where $\angle G$ is a right angle, $l = 80.4$ and $g = 49.3$. Find the remaining angle and sides. If necessary, round your answers to the nearest 4th decimal place.

$$v^2 + (49.3)^2 = (80.4)^2$$
$$v^2 + 2430.49 = 6464.16$$
$$v^2 = 4033.67$$
$$v = 63.51$$

$$\cos V = \frac{49.3}{80.4}$$
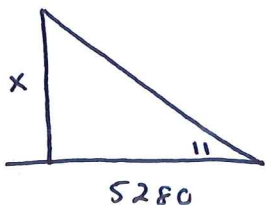$$V = \cos^{-1}\left(\frac{49.3}{80.4}\right)$$
$$V = 52.18°$$

$$\sin L = \frac{49.3}{80.4}$$
$$L = \sin^{-1}\left(\frac{49.3}{80.4}\right)$$
$$L = 37.82°$$

5.) The angle of elevation to the top of the Empire State Building in New York is found to be 11° from the ground at a distance of 1 mile from the base of the building. Using this information, find the height of the Empire State Building. If necessary, round your answers to the nearest 4th decimal place.
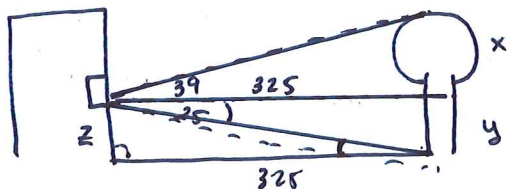
$$\tan 11 = \frac{x}{5280}$$
$$x = 5280 \cdot \tan 11$$
$$x = 1026.3280 \text{ FT}$$

6.) A water tower is located 325 ft from a building. From a window in the building it is observed that the angle of elevation to the top of the tower is 39° and the angle of depression to the bottom of the tower is 25°. How tall is the tower? How high is the window? If necessary, round your answers to the nearest 4th decimal place.

$$\tan 39 = \frac{x}{325} \quad + \quad \tan 25 = \frac{y}{325}$$
$$x = 325 \cdot \tan 39 \quad + \quad y = 325 \cdot \tan 25$$
$$263.18 \quad + \quad 151.55$$
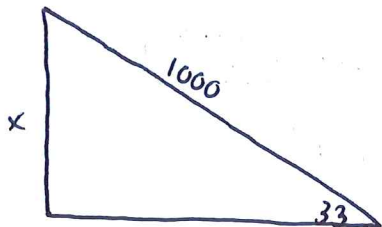$$414.73 \text{ FT}$$
WATER TOWER

$$\tan 25 = \frac{z}{325}$$
$$z = 325 \cdot \tan 25$$
$$z = 151.55 \text{ FT}$$
WINDOW HEIGHT

6.) The angle of elevation from the bottom of the lift to the top of Snow Bowl is 33°. If a skier rides 1,000 feet on this lift to the top, what is the vertical distance between the bottom of the lift and the top?

$$\sin 33 = \frac{x}{1000}$$
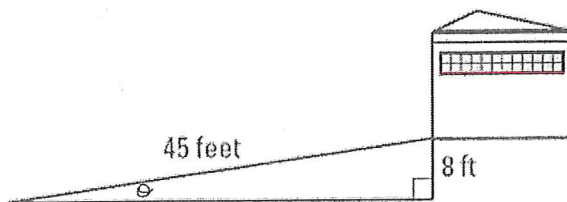$$x = 1000 \cdot \sin 33$$
$$x = 544.64 \text{ FT}$$

7.) A garage is 8 feet above the level street. The driveway from the street to the garage is 45 feet long. Find the driveway's angle of incline.
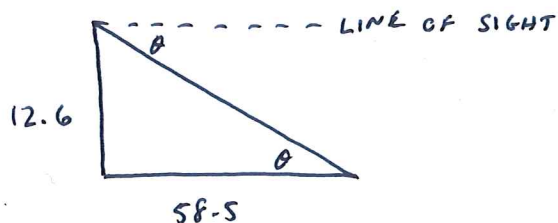
$$SIN\ \theta = \frac{8}{45}$$

$$\theta = SIN^{-1}\left(\frac{8}{45}\right)$$

$$\theta = 10.24°$$

45 feet

8 ft

8.) A person stands at the window of a building so that his eyes are 12.6 meters above the level ground. An object is on the ground 58.5 meters away from the building on a line directly beneath the person. Compute the angle of depression of the person's line of sight to the object on the ground.
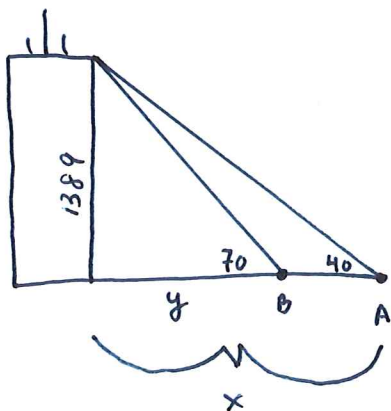
LINE OF SIGHT

12.6

58.5

$$TAN\ \theta = \frac{12.6}{58.5}$$

$$\theta = TAN^{-1}\left(\frac{12.6}{58.5}\right)$$

$$\theta = 12.15°$$

9.) The Trump Tower in Chicago measure 1389 feet tall. From a distance at point A on the ground, the angle of elevation to the top of the building is 40°. From a little nearer at point B, the angle of elevation is 70°. Find the distance from point A to point B.

1389

70   40

y   θ   A

x

$$TAN\ 40 = \frac{1389}{x}$$

$$x \cdot TAN\ 40 = 1389$$

$$x = \frac{1389}{TAN\ 40}$$

$$x = 1655.35$$

$$TAN\ 70 = \frac{1389}{y}$$

$$y \cdot TAN\ 70 = 1389$$

$$y = \frac{1389}{TAN\ 70}$$

$$y = 505.55$$

$$1655.35 - 505.55 = 1149.80\ FT$$

OR

$$TAN\ 70 = \frac{1389}{y} \qquad\qquad TAN\ 40 = \frac{1389}{x}$$

$$y \cdot TAN\ 70 = 1389 \qquad\qquad x \cdot TAN\ 40 = 1389$$
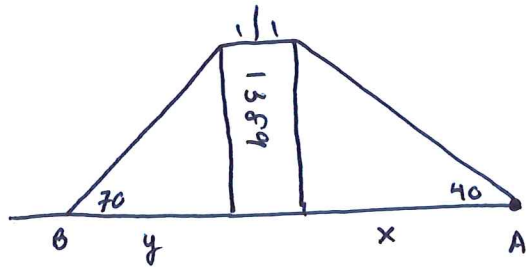
$$y = \frac{1389}{TAN\ 70} \qquad\qquad x = \frac{1389}{TAN\ 40}$$

$$y = 505.55 \qquad\qquad x = 1655.35$$

$$505.55 + 1655.35 = 2160.90\ FT$$