Trig Word Problems
Algebra 2 with Trigonometry

Solve the following word problem. Show your all your work and round to 2 decimal places.
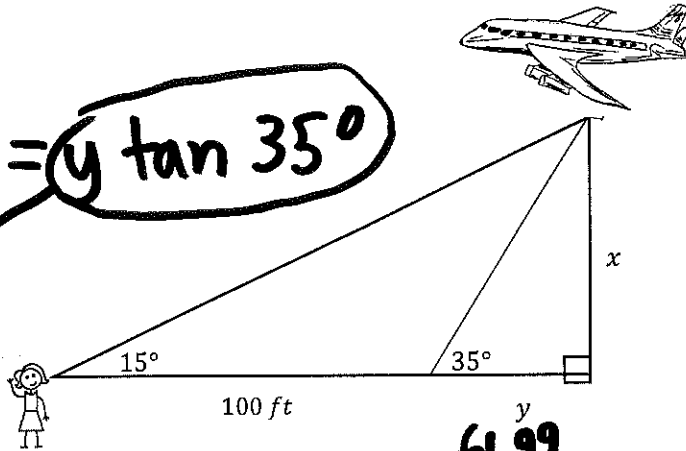
1. Katie sees an airplane in the sky from her spot on the ground. The angle of elevation from Katie to the airplane is 35°. If she steps back 100 feet, the new angle of elevation is 15°.

a.) Solve for y.

$$\tan 35° = \frac{x}{y} \qquad x = \boxed{y \tan 35°}$$

$$\tan 15° = \frac{x}{100+y}$$

$$\tan 15° = \frac{y \tan 35°}{100+y}$$

$$\frac{\tan 15°}{1} = \frac{y \tan 35°}{100+y}$$

$$\overset{61.99}{y \tan 35°} = \tan 15°(100+y)$$

$$y \tan 35° = 100 \tan 15° + y \tan 15°$$

$$-y \tan 15° \qquad\qquad -y \tan 15°$$

$$y \tan 35° - y \tan 15° = 100 \tan 15°$$

$$\frac{y(\tan 35° - \tan 15°)}{\tan 35° - \tan 15°} = \frac{100 \tan 15°}{\tan 35° - \tan 15°}$$

$$\boxed{61.99 \, ft}$$

b.) If Katie is 5.75 feet tall, how far off the ground is the airplane?

$$\tan 35° = \frac{x}{61.99}$$

$$x = 43.41$$
$$+ 5.75$$
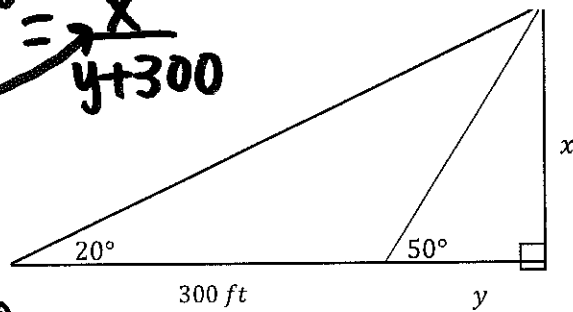
$$\boxed{49.16 \, ft}$$

2. Frankie sees a UFO in the sky from his spot on the ground. The angle of elevation from Frankie to the UFO is 50°. In fear, he runs back 300 feet. His new angle of elevation is 20°.

a.) Solve for y.

$$\tan 50° = \frac{x}{y} \qquad \tan 20° = \frac{x}{y+300}$$

$$\boxed{x = y\tan 50°}$$

20°   50°

300 ft   y

$$\tan 20° = \frac{y\tan 50°}{y+300} \qquad (\tan 20)(y+300) = y\tan 50°$$

$$y\tan 20° + 300\tan 20° = y\tan 50°$$
$$-y\tan 20° \qquad\qquad -y\tan 20°$$

$$\frac{300\tan 20°}{\tan 50° - \tan 20°} = \frac{y(\tan 50° - \tan 20°)}{\tan 50° - \tan 20°}$$

$$\boxed{131.91 \text{ ft}}$$

b.) If Frankie is 6 feet tall, how far off the ground is the UFO?

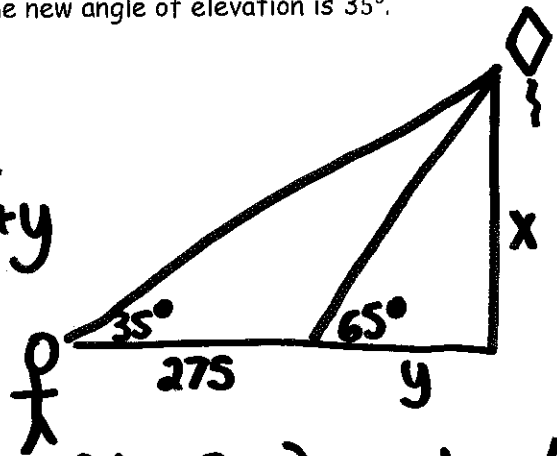$$\tan 50° = \frac{x}{131.91}$$

$$x = 157.20$$
$$+6$$

$$\boxed{163.20 \text{ ft}}$$

3. Brendan sees a kite in the sky from his spot on the ground. The angle of elevation from Brendan to the kite is 65°. If he steps back 275 feet, the new angle of elevation is 35°.

a.) Solve for y.

$$\tan 65° = \frac{x}{y} \qquad \tan 35° = \frac{x}{275+y}$$

$$x = y\tan 65°$$

$$\frac{\tan 35°}{1} = \frac{y\tan 65°}{275+y} \qquad (\tan 35°)(275+y) = y\tan 65°$$

$$275\tan 35° + y\tan 35° = y\tan 65°$$
$$-y\tan 35° \qquad -y\tan 35°$$

$$\frac{275\tan 35°}{\tan 65° - \tan 35°} = \frac{y(\tan 65° - \tan 35°)}{\tan 65° - \tan 35°}$$

$$y = \boxed{133.32 \text{ ft}}$$

b.) If Brendan is 6.25 feet tall, how far off the ground is the kite?

$$\tan 65° = \frac{x}{133.32}$$
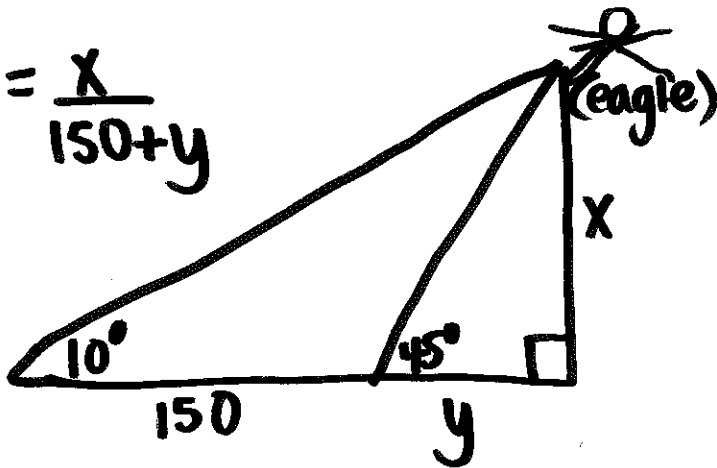
$$x = 285.91$$
$$+6.25$$

$$\boxed{292.16 \text{ ft}}$$

4. John sees an eagle in the sky from his spot on the ground. The angle of elevation from John to the eagle is 45°. In fear, he runs back 150 feet. His new angle of elevation is 10°.

a.) Solve for y.

$\tan 45° = \dfrac{x}{y}$ $\quad \tan 10° = \dfrac{x}{150+y}$

$x = y \tan 45°$

$\tan 10° = \dfrac{y \tan 45°}{150+y}$

$(\tan 10°)(150+y) = y \tan 45°$

$150 \tan 10° + y \tan 10° = y \tan 45°$

$\qquad\qquad -y \tan 10° \quad -y \tan 10°$

$\dfrac{150 \tan 10°}{\tan 45° - \tan 10°} = \dfrac{y(\tan 45° - \tan 10°)}{\tan 45° - \tan 10°}$

$\boxed{y = 32.11 \text{ ft}}$

b.) If John is 5.5 feet tall, how far off the ground is the eagle?

$\tan 45° = \dfrac{x}{32.11}$

$X = 32.11$

$\quad + 5.5$

$\quad \overline{37.61}$

$\boxed{37.61 \text{ ft}}$