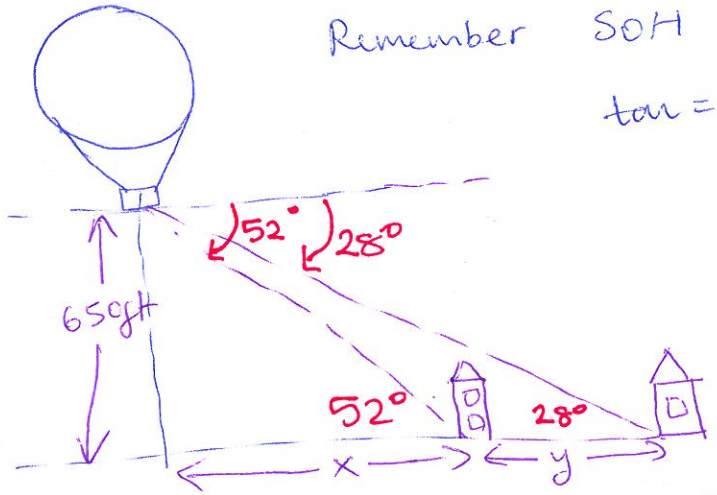
3. **BALLOONING** A hot air balloon that is moving above a neighborhood has an angle of depression of 28° to one house and 52° to a house down the street. If the height of the balloon is 650 feet, estimate the distance between the two houses.



Remember SOH CAH TOA

$\tan = \frac{opp}{adj.}$

Smaller Δ

$\frac{\tan 52^\circ}{1} = \frac{650}{x}$

$\frac{x \tan 52^\circ}{\tan 52^\circ} = \frac{650}{\tan 52^\circ}$

$x = \frac{650}{1.2799}$

$x \approx 507.8 ft$

Bigger Triangle (Δ)

$\frac{\tan 28^\circ}{1} = \frac{650}{x+y}$

substitute $x \approx 507.8 ft$

$(x+y)(\tan 28^\circ) = 650$

$(507.8+y)\,0.5317 = 650$

$269.9 + 0.5317y = 650$

Substract 269.9 from both sides

$269.9 + 0.5317y = 650.0$

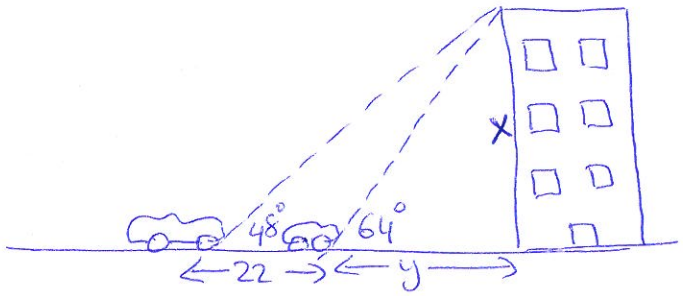
$-269.9 \quad -269.9$

$\frac{0.5317y}{0.5317} = \frac{380.1}{0.5317}$ divide

$y \approx 714.8 ft$

distance between the 2 houses

4. **BUILDINGS** The angle of elevation from a car to the top of an apartment building is 48°. If the angle of elevation from another car that is 22 feet directly in front of the first car is 64°, how tall is the building?



Small Δ

$\tan 64^\circ = \frac{x}{y} \rightarrow x = y \tan 64^\circ$

Bigger Δ

substitute

$\tan 48^\circ = \frac{x}{22+y}$

$\tan 48^\circ = \frac{y \tan 64}{22+y}$

$\frac{1.1106}{1} = \frac{y2.0503}{22+y}$

$1.1106(22+y) = 2.0503y$

$24.4 + 1.1106y = 2.0503y$

$-1.1106y \quad -1.1106y$

$\frac{24.4}{0.9397} = \frac{0.9397y}{0.9397} \rightarrow y \approx 26$

Since we solved $y \approx 26 ft$

$\tan 64^\circ = \frac{x}{y}$

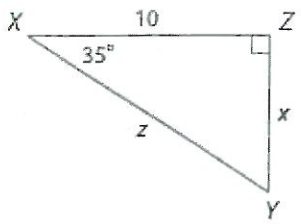
$\frac{2.0503}{1} = \frac{x}{26}$

$x \approx 53 ft$

Solve a Right Triangle: All of the missing sides and angles can ve found by using trig functions and inverse relations.

Examples: **Solve each triangle. Round side lengths to the nearest tenth and angle measures to the nearest degree.**

1.



Using trigonometric functions, we can find x, and z:

$\tan 35^\circ = \frac{x}{10}$

$x = 10 \cdot \tan 35^\circ$

$x = 10 \cdot 0.7002$

$x \approx 7.0$

$\cos 35^\circ = \frac{10}{z}$

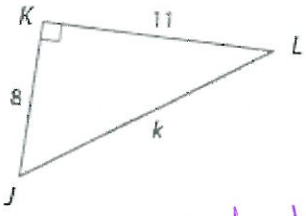
$z \cdot \cos 35^\circ = 10$

$z = \frac{10}{\cos 35^\circ}$

$z = \frac{10}{0.8191}$

$z \approx 12.2$

2.



We can find k, using Pythagorean Theorem,

$k^2 = 8^2 + 11^2$

$\sqrt{k^2} = \sqrt{185}$

$k \approx 13.6$

To find the values of $\angle J$ & $\angle L$, use inverse trig. funct.

$\tan J = \frac{11}{8}$

$\tan^{-1}(\tan J) = \tan^{-1}\left(\frac{11}{8}\right)$

$J \approx 53.97^\circ$

$\angle L = 90^\circ - \angle J$

$\angle L = 90^\circ - 53.97^\circ$

$\angle L \approx 36.03^\circ$