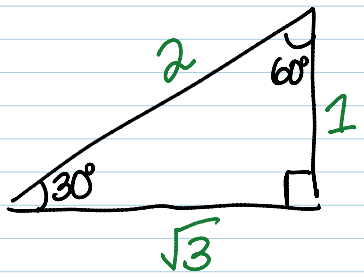
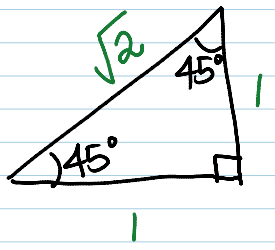
13.1 Continued: Special Right Triangles & Angle of Elevation & Depression



$\sin 30° = \frac{1}{2}$ $\quad \sin 60° = \frac{\sqrt{3}}{2}$

$\cos 30° = \frac{\sqrt{3}}{2}$ $\quad \cos 60° = \frac{1}{2}$

$\tan 30° = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\quad \tan 60° = \sqrt{3}$



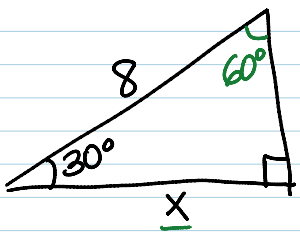
$\sin 45° = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \csc 45° = \sqrt{2}$

$\cos 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \sec 45° = \sqrt{2}$

$\tan 45° = \frac{1}{1} = 1$ $\quad \cot 45° = 1$

EX:

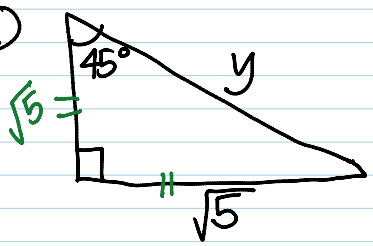
Find the missing side of the triangle.

① 

$\frac{8}{2} = \frac{x}{\sqrt{3}}$

$\frac{2x}{2} = \frac{8\sqrt{3}}{2}$

$x = 4\sqrt{3}$

② 

$\cos 45° = \frac{\sqrt{5}}{y}$

$\frac{\sqrt{5}}{1} = \frac{y}{\sqrt{2}}$

$(\sqrt{5})^2 + (\sqrt{5})^2 = y^2$

$10 = y^2$

$y = \sqrt{10}$

$= \quad \frac{2x}{2} = \frac{8\sqrt{3}}{2}$

$x = 4\sqrt{3}$

$(\sqrt{5})^2 + (\sqrt{5})^2 = y^2$

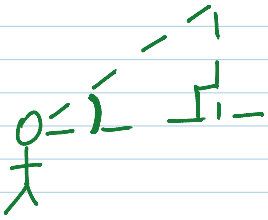
$10 = y^2$

$y = \sqrt{10}$

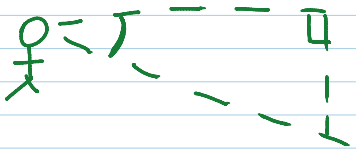
1 $\sqrt{2}$

$y = \sqrt{10}$

Angle of Elevation

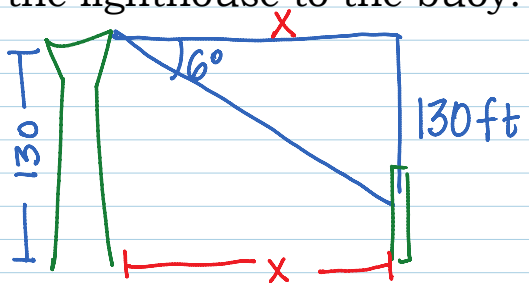


Angle of Depression



*IMPORTANT! THIS IS ALWAYS MADE WITH THE hypoteneuse & the horizontal leg

1. The angle of depression of a buoy from the top of a lighthouse 130 feet above the surface of the water is 6°. Find the distance, x, from the base of the lighthouse to the buoy.

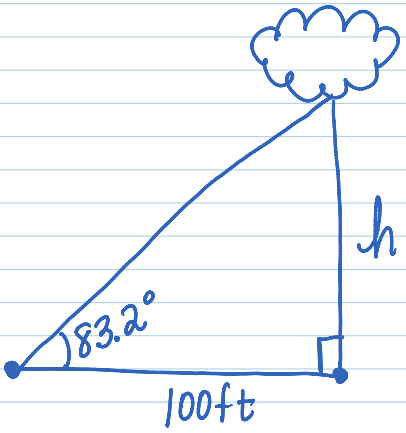


$x \tan 6° = \frac{130}{x} \cdot x$

$\frac{x \tan 6°}{\tan 6°} = \frac{130}{\tan 6°}$

$x \approx 1236.87 \text{ ft}$

2. Carl loves clouds. Carl wants to know how high the cloud is above the ground because he wants to see if he can touch it! He remembers from his earth science class, taught by Mr. McCloud himself, that in order to measure the height of a cloud he needs to place a searchlight directly under the cloud and shine the beam straight up. He then walks 100 feet away from the light and measures the angle of elevation from his line of sight to the cloud as 83.2°. Can you help Carl determine how high the cloud is? (Carl's height from his eyes to the ground is 5'9".)

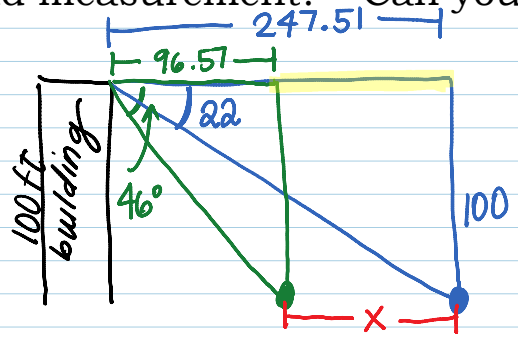


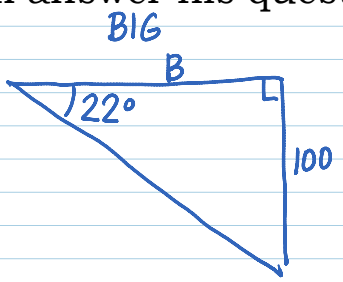
$\tan 83.2 = \frac{h}{100}$

$100 \tan 83.2 = h$

$h = 838.64 ft$

3. A man is standing on a 100 foot tall building and sees a car traveling toward it. Seeing an opportunity to apply trig to the real world around him, he measures the angle of depression to the top of the car as 22°. As the car continues to travel toward the building, he measures the angle of depression again and gets 46°. He wonders to himself, "How far did the car travel from when I took my first measurement to when I took the second measurement?" Can you help him answer his question?

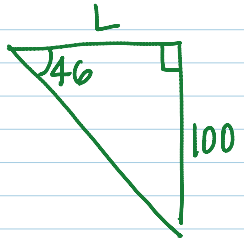




$\tan 22 = \frac{100}{B}$

$B = \frac{100}{\tan 22} \approx 247.51$

LITTLE



$\tan 46 = \frac{100}{L}$

$L = \frac{100}{\tan 46} \approx 96.57$

BIG - LITTLE

$247.51 - 96.57$

$150.94 ft$