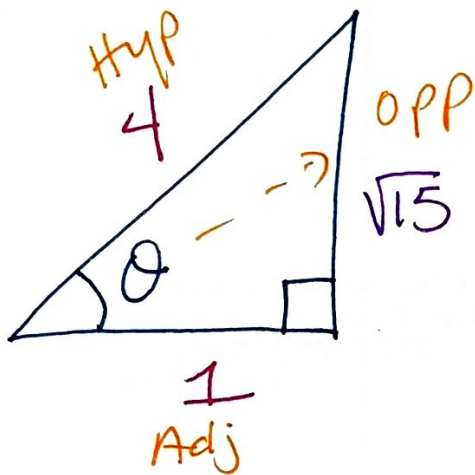


# 4.3 Right Triangle Trigonometry

ex: If  $\sec \theta = 4$ , find the ratios of the other 5 trig. functions.



$$\sin \theta = \frac{\sqrt{15}}{4}$$

$$\cos \theta = \frac{1}{4}$$

$$\tan \theta = \sqrt{15}$$

$$\csc \theta = \frac{4}{\sqrt{15}} = \frac{4\sqrt{15}}{15}$$

$$\sec \theta = \frac{4}{1} = 4$$

$$\cot \theta = \frac{1}{\sqrt{15}} = \frac{\sqrt{15}}{15}$$

$$1^2 + b^2 = 4^2$$

$$\sqrt{b^2} = \sqrt{15}$$

$$b = \sqrt{15}$$

$$0 \leq \theta \leq \frac{\pi}{2}$$

ex: Find  $\theta$  for values between  $\underbrace{[0, \frac{\pi}{2}]}_{\text{Q I}}$  when...

a)  $\tan \theta = \frac{\sqrt{3}}{3}$

$$\theta = \frac{\pi}{6}$$

b)  $\sec \theta = 2$

$$\theta = \frac{\pi}{3}$$

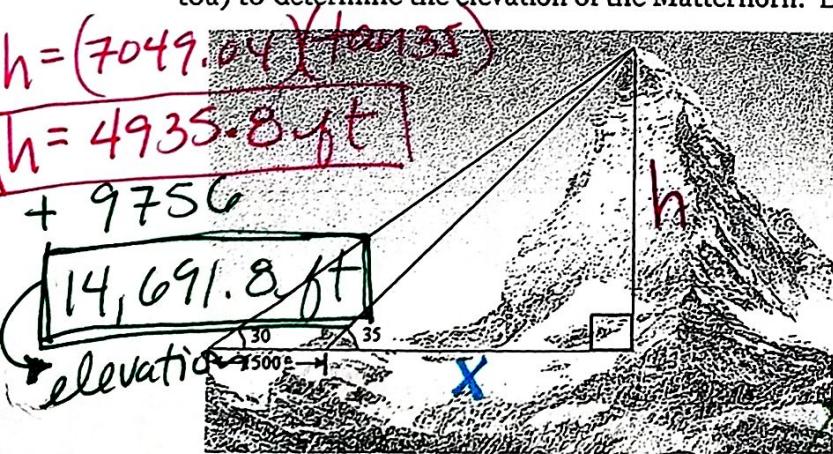
$$\frac{1}{\cos \theta} = \frac{2}{1}$$

$$\cos \theta = \frac{1}{2}$$

Use your unit circle to fill in the chart below:

angle	sin	cos	tan	csc	sec	cot
0	0	1	0	und	1	und
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{\sqrt{3}}{3}$	2	$\frac{2\sqrt{3}}{3}$	$\sqrt{3}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$
$\frac{\pi}{2}$	1	0	und	1	und	0

Welcome to the Matterhorn in Switzerland! As a surveyor it is your job to estimate the elevation of the mountain. Using a device called a theodolite, you measure two angles from the horizontal plane to the top of the mountain as shown below. You also record the distance between the two measurements to be 1500 ft. Your elevation is known to be at 9,756 ft. above sea level. Use the Law of Sines and right triangle trigonometry (soh-cah-toa) to determine the elevation of the Matterhorn. Explain how you got your answer.



$$h = (7049.04) (\tan 35)$$

$$h = 4935.8 \text{ ft}$$

$$+ 9756$$

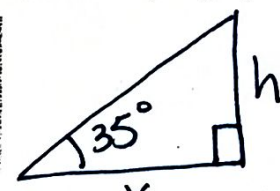
$$14,691.8 \text{ ft}$$

elevation

$$.123x = 866.025$$

$$\begin{array}{r} .123 \\ \underline{.123} \end{array} \quad \begin{array}{r} .123 \\ \underline{.123} \end{array}$$

$$x = 7049.04 \text{ ft}$$



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

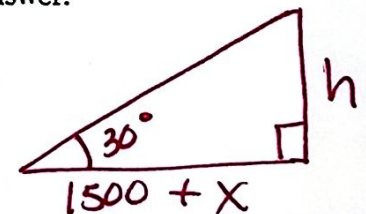
$$h = x (\tan 35^\circ)$$

$$x (\tan 35^\circ) = (1500 + x) (\tan 30^\circ)$$

$$.700x = (1500 + x) (.577)$$

$$.700x = 866.025 + .577x$$

$$-.577x$$



$$\tan 30^\circ = \frac{h}{1500 + x}$$

$$h = (1500 + x) (\tan 30^\circ)$$

$$x (\tan 35^\circ) = (1500 + x) (\tan 30^\circ)$$

$$.700x = (1500 + x) (.577)$$

$$.700x = 866.025 + .577x$$

$$-.577x$$