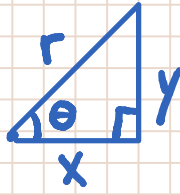


# Section 5.2: Right Triangle Trig!

## Six trigonometric ratios

sine, cosine,  
tangent, cotangent,  
secant and cosecant



$$\sin \theta = \frac{y}{r} = \frac{\text{opp}}{\text{hyp}}$$

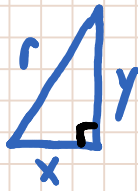
$$\cos \theta = \frac{x}{r} = \frac{\text{adj}}{\text{hyp}}$$

$$\tan \theta = \frac{y}{x} = \frac{\text{opp}}{\text{adj}}$$

$$\cot \theta = \frac{x}{y} = \frac{\text{adj}}{\text{opp}}$$

$$\sec \theta = \frac{r}{x} = \frac{\text{hyp}}{\text{adj}}$$

$$\csc \theta = \frac{r}{y} = \frac{\text{hyp}}{\text{opp}}$$

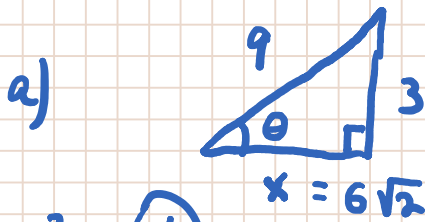


SOH-CAH-TOA

← quiz

also called  
trig functions of  
 $\theta$

ex Find the six trig fctn of...



$$\sin \theta = \frac{3}{9} = \frac{1}{3}$$

$$\cos \theta = \frac{6\sqrt{2}}{9} = \frac{2\sqrt{2}}{3}$$

$$x^2 + 9 = 81$$

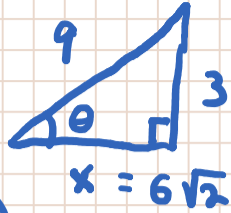
$$\sqrt{x^2} = \sqrt{72}$$

$$x = \sqrt{72}$$

$$x = \sqrt{36 \cdot 2}$$

$$x = \sqrt{36} \cdot \sqrt{2}$$

$$= 6\sqrt{2}$$

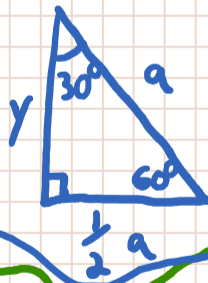
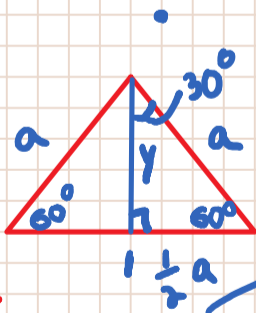


$$\begin{aligned} \sin \theta &= \frac{3}{9} = \frac{1}{3} \\ \cos \theta &= \frac{6\sqrt{2}}{9} = \frac{2\sqrt{2}}{3} \\ \tan \theta &= \frac{3}{6\sqrt{2}} = \frac{1}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4} \\ \cot \theta &= 2\sqrt{2} \\ \sec \theta &= \frac{3}{2\sqrt{2}} \\ \csc \theta &= 3 \end{aligned} \quad \tan \theta = \frac{\sin \theta}{\cos \theta}$$

$\theta$	$\sin \theta$	$\cos \theta$	$\tan \theta$
$30^\circ = \frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
$45^\circ = \frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$60^\circ = \frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$

quiz

Partial Proof:



this is says  
 $\sin 60^\circ = \frac{\sqrt{3}}{2}$

$$\sin 60^\circ = \frac{y}{a} = \frac{\frac{\sqrt{3}}{2} a}{a} = \frac{\sqrt{3}}{2}$$

scratch  
 work to get  
 y

time-out:

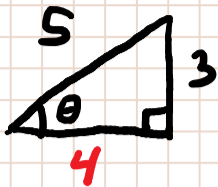
$$y^2 + \left(\frac{1}{2}a\right)^2 = a^2$$

$$y^2 + \frac{1}{4}a^2 = \frac{4}{4}a^2$$

$$\sqrt{y^2} = \sqrt{\frac{3}{4}a^2} \rightarrow y = \frac{\sqrt{3}}{2}a$$

(ex) Given  $\sin \theta = \frac{3}{5}$ . Find  $\sec \theta$ .

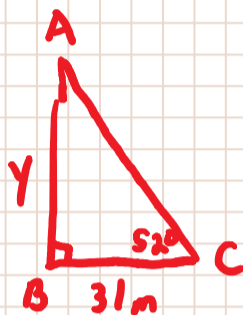
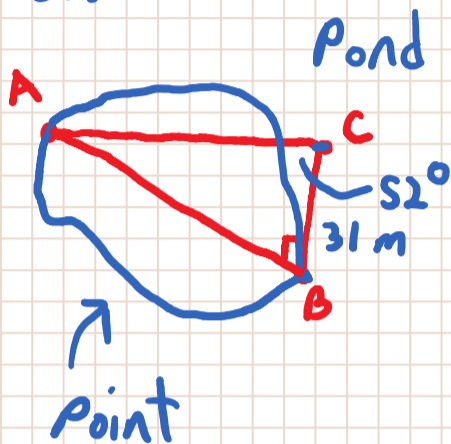
Helper  $\triangle$



$\cos \theta = \frac{4}{5}$   
 $\sec \theta = \frac{5}{4}$

rec. is cos

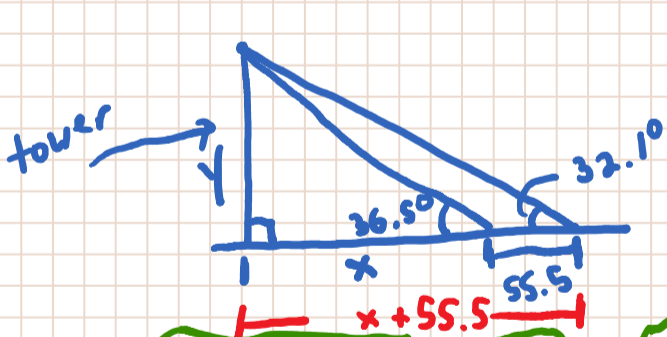
(ex) #52 on 5.2



$31 \tan 52^\circ = \frac{Y}{31}$

$Y = 31 \tan 52^\circ$   
 $= 39.7 \text{ m}$

#68 p 454



Find tower height, Y

$\tan 36.5^\circ = \frac{Y}{x}$

$\tan 32.1^\circ = \frac{Y}{x+55.5}$

$Y = x \tan 36.5^\circ$

$Y = (x+55.5) \tan 32.1^\circ$

$x \tan 36.5^\circ = (x+55.5) \tan 32.1^\circ$

$Y \approx 229 \text{ ft}$