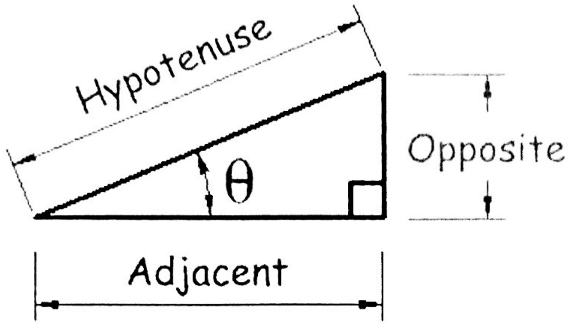
9.1: Right Triangle Trig Review



$\sin\theta = \frac{\text{Opposite}}{\text{hypotenuse}} \left(\frac{O}{H}\right)$

Soh Cah Toa

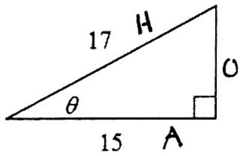
$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \left(\frac{A}{H}\right)$

$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} \left(\frac{O}{A}\right)$

*Remember to rationalize denominators

Example 1: Find each trig ratio:

a) $\cos\theta = \frac{15}{17}$



b) $\sin\theta = \frac{6}{H} = \frac{6}{6\sqrt{5}} = \frac{1}{\sqrt{5}} = \boxed{\frac{\sqrt{5}}{5}}$

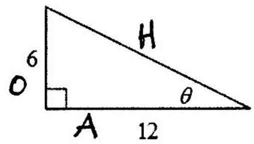
$6^2+12^2 = H^2$

$36+144 = H^2$

$180 = H^2$

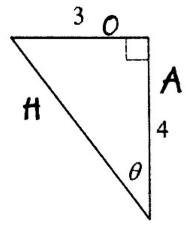
$\sqrt{180} = H$

$6\sqrt{5} = H$



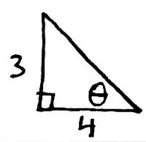
$\frac{1}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$

c) $\cos\theta =$



d) Find $\cos\theta$ if $\tan\theta = \frac{3}{4}\ \frac{O}{A}$

Draw it!



e) Find $\sin\theta$ if $\cos\theta = \frac{8}{17}$

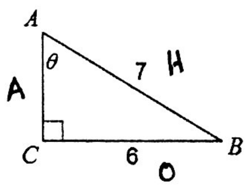
*If you know two sides and need the missing one, use Pythagorean Theorem

$a^2 + b^2 = c^2$

Missing Side *only know one side	Missing Angle
Set up trig ratio & solve for x	Set up trig ratio & use inverse trig

Example 2: Use Trig to find missing sides and angles

a)



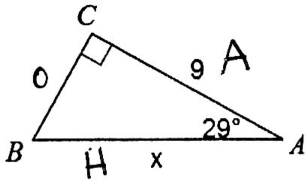
Use sine since we have O & H

$\sin^{-1}(\sin\theta) = \sin^{-1}\left(\frac{6}{7}\right)$

$\theta = \sin^{-1}\left(\frac{6}{7}\right)$

$\theta \approx \boxed{59°}$

b)



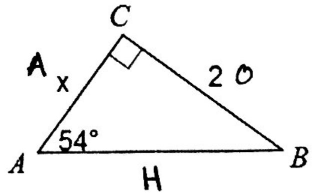
Use cosine since we have A & H

$x \cdot \cos 29 = \frac{9}{x} \cdot x$

$\frac{x\cos 29}{\cos 29} = \frac{9}{\cos 29}$

$x = \frac{9}{\cos 29} \approx \boxed{10.29}$

c)



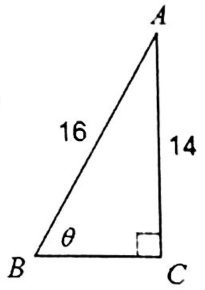
Use tangent since we have O & A

$x \cdot \tan 54 = \frac{2}{x} \cdot x$

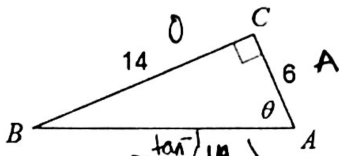
$\frac{x\tan 54}{\tan 54} = \frac{2}{\tan 54}$

$x = \frac{2}{\tan 54} \approx \boxed{1.45}$

)



e)

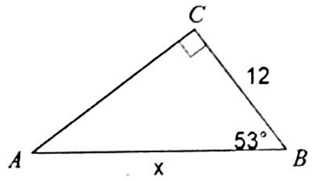


$\tan^{-1}(\tan\theta) = \tan^{-1}\left(\frac{14}{6}\right)$

$\theta = \tan^{-1}\left(\frac{14}{6}\right)$

$\theta \approx \boxed{66.8^\circ}$

f)



SPECIAL RIGHT TRIANGLES

There are two kinds of right triangles where the side lengths have a special relationship based on the angle measures of the triangle.

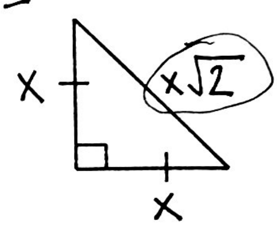
Use Pythagorean Theorem to help you fill out the information in the table below. Then, using the information in the table, answer the questions that follow.

Side length opposite 45° angle	Side length opposite 45° angle	Hypotenuse Length
1	1	$1^2+1^2=c^2$ $2=c^2$ $\sqrt{2}=c$ $\sqrt{2}$
2	2	$2^2+2^2=c^2$ $4+4=c^2$ $8=c^2$ $\sqrt{8}=c$ $\sqrt{8}$ $2 \cdot 4$ $2\sqrt{2}$
3	3	$3^2+3^2=c^2$ $9+9=c^2$ $18=c^2$ $\sqrt{18}=c$ $\sqrt{18}$ $2 \cdot 9$ $3\sqrt{2}$
4	4	$4\sqrt{2}$

What are the patterns that you notice with a 45°-45°-90° triangle?

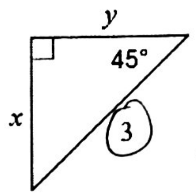
The two side lengths are the same,
the hypotenuse is $\sqrt{2}$ times the side length

The 45°-45°-90° triangle



Find the missing side indicated:

a)

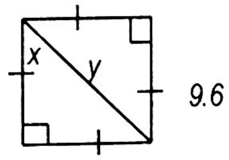


$\frac{3}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$

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

$\boxed{x = y = \frac{3\sqrt{2}}{2}}$

b)

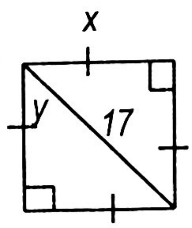


$\boxed{x = 9.6}$

$y = 9.6\sqrt{2}$

$\boxed{y \approx 13.58}$

c)



$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{17}{\sqrt{2}}$

$x = \frac{17}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\boxed{x = y = \frac{17\sqrt{2}}{2}}$

* Leave as a decimal if it was given as a decimal

$\sin 30^\circ = \frac{1}{2} \quad \frac{O}{H}$ This means the hypotenuse is always double the side opposite the 30° angle

o the same process with a 30°-60°-90° triangle.

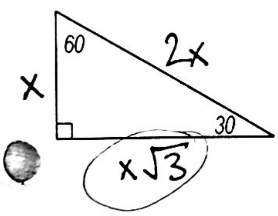
Side length opposite 30° angle	Side length opposite 60° angle	Hypotenuse Length
1		2
2		4
3		6
4		8

What are the patterns that you notice with a 30°-60°-90° triangle?

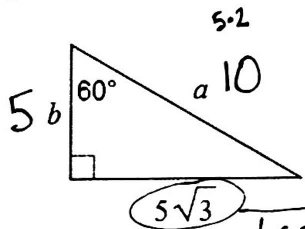
The hypotenuse is twice as much as the side across from the 30° angle

The side across from the 60° angle is $\sqrt{3}$ times the side across from the 30° angle

The 30°-60°-90° triangle



d)

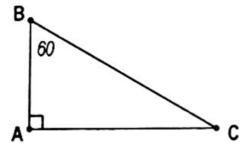


$x\sqrt{3} = 5\sqrt{3}$

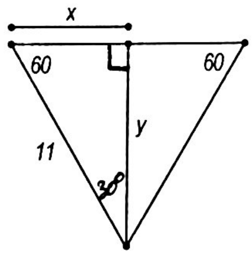
$x = 5$

$\boxed{\begin{array}{l} a = 10 \\ b = 5 \end{array}}$

e)



f)



$\boxed{\begin{array}{l} x = \frac{11}{2} \\ y = \frac{11\sqrt{3}}{2} \end{array}}$

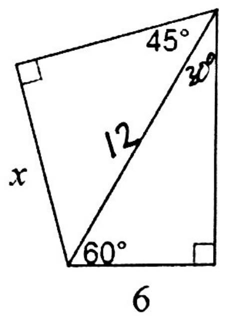
$11 = 2x$

$x = \frac{11}{2}$

$y = \frac{11}{2} \cdot \sqrt{3}$

$= \frac{11\sqrt{3}}{2}$

g)



Hypotenuse is double side across from 30°

$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{12}{\sqrt{2}}$

$x = \frac{12}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$x = \frac{12\sqrt{2}}{2}$

$\boxed{x = 6\sqrt{2}}$