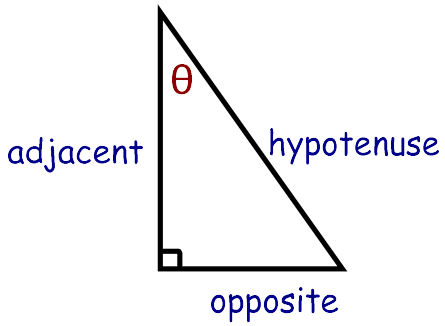
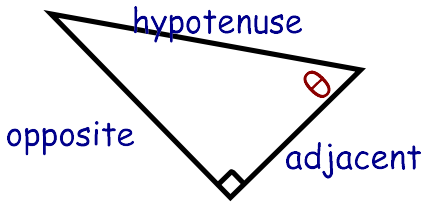
1.3 Primary Trig Ratios

Trigonometric ratios are based on sides, relative to a given angle.

hypotenuse: the side across from the right angle.
opposite: the side *across* from a given angle θ.
adjacent: the side that is *beside* a given angle θ.





Let's Explore...

1) Draw a RIGHT triangle with an angle of 25°.

2) Using the 25° as your reference angle (θ), label the sides

   opposite, adjacent, hypotenuse.

3) Measure the side lengths, and label these on the triangle.

4) Complete the following table. Compare with some classmates. What do you notice?

Trig Ratio	Ratios using measured sides from your triangle	As a decimal
$\frac{O}{H}$	$\frac{\quad}{\quad}$	
$\frac{A}{H}$	$\frac{\quad}{\quad}$	
$\frac{O}{A}$	$\frac{\quad}{\quad}$	

is it close to 0.4?

is it close to 0.9?

is it close to 0.5?

5) Draw a RIGHT triangle with an angle of 30°. Repeat #1-4 above. Make sure you compare with classmates, and discuss what you notice.

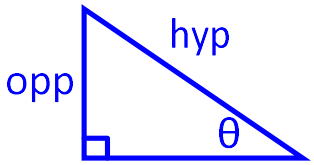
Try it with a few triangles that are 25° to compare with your first results

https://www.geogebra.org/m/N5K7XhXb

In right angle triangles, there are 3 primary trig ratios.

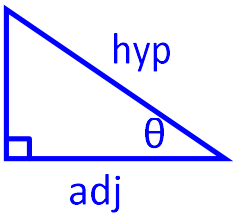
The Sine Ratio

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$



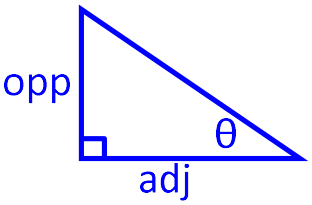
The Cosine Ratio

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$



The Tangent Ratio

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$



θ → The Greek letter "theta" - represents an ANGLE

https://www.geogebra.org/m/N5K7XhXb

* If we know the side lengths of a triangle, we can find the angles.
* If we know the angles of a triangle, we can find the side lengths.

Solving for an Unknown Angle

Ex. 1 Determine the angle measure, to the nearest degree, for the following trig ratios. **Make sure your calculator is in degree mode!**

a) $\sin\theta = 0.5432$ $\theta \doteq 32.9^\circ$

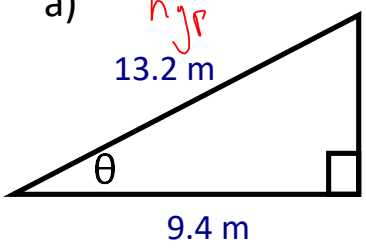
b) $\tan A = \frac{3}{4}$ $A = 36.9^\circ$

c) $\cos\theta = \frac{8}{9}$ $\theta = 27.2^\circ$

** Since you are finding an angle, you need to work backwards. This means using the 2nd button on your calculator.

Ex. 2 Solve for the unknown angle.

a)



hyp

adj

CAH

$\cos\theta = \frac{adj}{hyp}$

$\cos\theta = \frac{9.4}{13.2}$

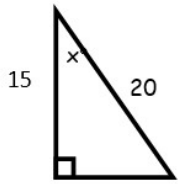
$\cos\theta \doteq 0.71212\ldots$

$\theta \doteq 44.6^\circ$

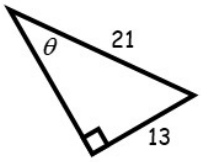
Try some: Solve for the unknown angle.

- Label the sides
  - > opposite/adjacent/hypotenuse
- Choose the Trig Ratio
  - > SOH CAH TOA
- Set up the Ratio
- Solve for the angle
  - > Dont forget: 2nd Function!!

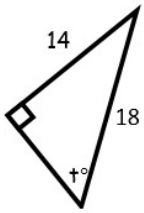
a)



b)



c)



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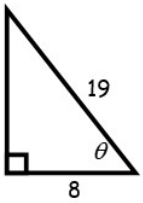
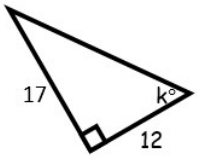
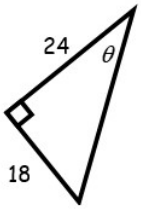


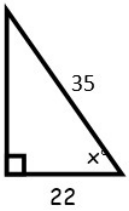
e)



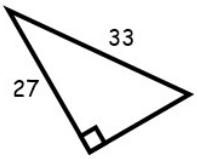
f)



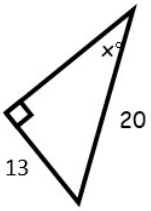
g)



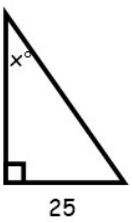
h)



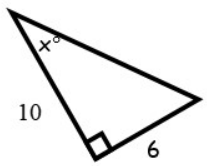
i)



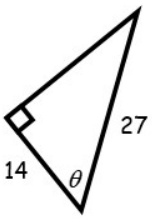
j)



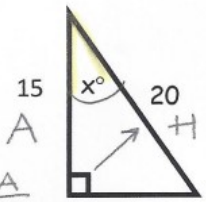
k)



l)



a)



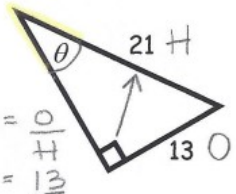
$\cos x = \frac{A}{H}$

$\cos x = \frac{15}{20}$

$x = \cos^{-1}(15 \div 20)$

$x \doteq 41°$

b)



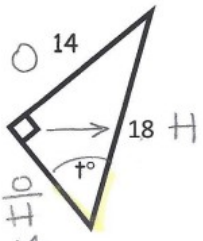
$\sin\theta = \frac{O}{H}$

$\sin\theta = \frac{13}{21}$

$\theta = \sin^{-1}(13 \div 21)$

$\theta \doteq 38°$

c)



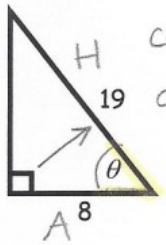
$\sin t = \frac{O}{H}$

$\sin t = \frac{14}{18}$

$t = \sin^{-1}(14 \div 18)$

$t \doteq 51°$

d)



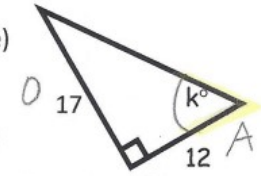
$\cos\theta = \frac{A}{H}$

$\cos\theta = \frac{8}{19}$

$\theta = \cos^{-1}(8 \div 19)$

$\theta \doteq 65°$

e)



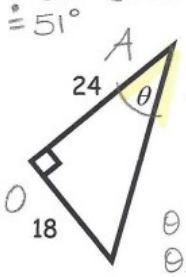
$\tan K = \frac{O}{A}$

$\tan K = \frac{17}{12}$

$K = \tan^{-1}(17 \div 12)$

$K \doteq 55°$

f)



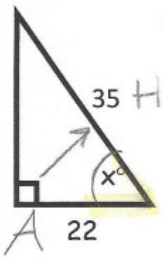
$\tan\theta = \frac{O}{A}$

$\tan\theta = \frac{18}{24}$

$\theta = \tan^{-1}(18 \div 24)$

$\theta \doteq 37°$

g)



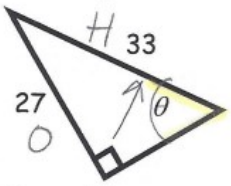
$\cos x = \frac{A}{H}$

$\cos x = \frac{22}{35}$

$x = \cos^{-1}(22 \div 35)$

$x \doteq 51°$

h)



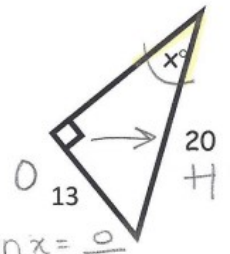
$\sin\theta = \frac{O}{H}$

$\sin\theta = \frac{27}{33}$

$\theta = \sin^{-1}(27 \div 33)$

$\theta \doteq 55°$

i)



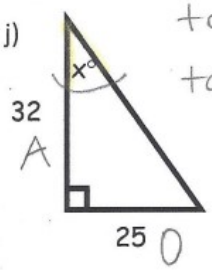
$\sin x = \frac{O}{H}$

$\sin x = \frac{13}{20}$

$x = \sin^{-1}(13 \div 20)$

$x \doteq 41°$

j)



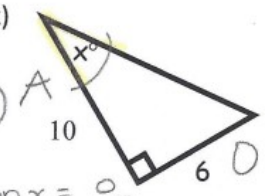
$\tan x = \frac{O}{A}$

$\tan x = \frac{25}{32}$

$x = \tan^{-1}(25 \div 32)$

$x \doteq 38°$

k)



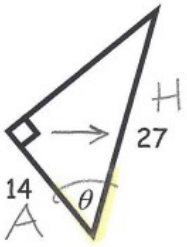
$\tan x = \frac{O}{A}$

$\tan x = \frac{6}{10}$

$x = \tan^{-1}(6 \div 10)$

$x \doteq 31°$

l)



$\cos\theta = \frac{A}{H}$

$\cos\theta = \frac{14}{27}$

$\theta = \cos^{-1}(14 \div 27)$

$\theta \doteq 59°$

HOMEWORK

Set 1: p. 362 #1ab,4eh,5d,

p. 372 #1a,2a,6ac,7ac,8a,9a

Set 2: p. 362 #1b,4eh,5d,15

p. 372 # 1a,2a,6ac,7ac,8a,9a,25