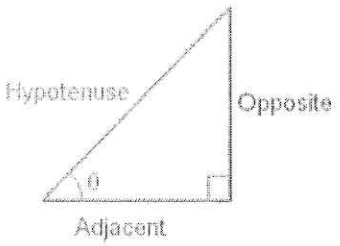
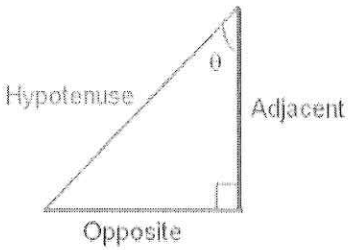
Tigonometry Notes

Key

TRIGONOMETRY IS THE STUDY OF THE RELATIONSHIPS BETWEEN THE SIDES AND ANGLES OF TRIANGLES. A TRIGONOMETRIC RATIO IS A RATIO BETWEEN 2 SIDES OF A RIGHT TRIANGLE.

θ is a symbol for an angle





USING TRIG RATIOS

$\sin\theta = \frac{\text{Length of leg opposite } \angle\theta}{\text{Length of hypotenuse}} = \frac{\text{Opposite}}{\text{Hypotenuse}}$

$\cos\theta = \frac{\text{Length of leg adjacent } \angle\theta}{\text{Length of hypotenuse}} = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

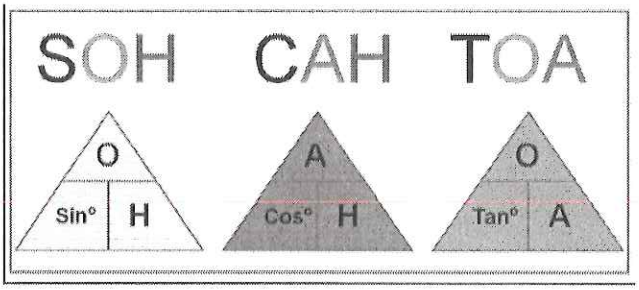
$\tan\theta = \frac{\text{Length of leg opposite } \angle\theta}{\text{Length of leg adjacent } \angle\theta} = \frac{\text{Opposite}}{\text{Adjacent}}$

*****Your opposite and adjacent sides will depend on what non-90°ANGLE you are using!**
NEVER determine opposite/adjacent using the 90° (always hyp)***

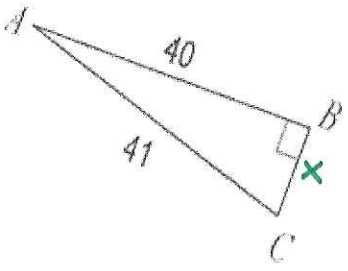
WAYS TO REMEMBER THE TRIGONOMETRIC RATIOS:

SohCanToa

$S\frac{O}{H}\quad C\frac{A}{H}\quad T\frac{O}{A}$



EXAMPLE 1: Find and simplify the trigonometric ratios.



$x^2+40^2=41^2$

$x^2=81$

$x=9$

must. Simplify all Radicals, (No Rads in denom) and Simplify all fractions.

$\sin\angle A = \frac{9}{41}$ $\quad \sin\angle C = \frac{40}{41}$

$\cos\angle A = \frac{40}{41}$ $\quad \cos\angle C = \frac{9}{41}$

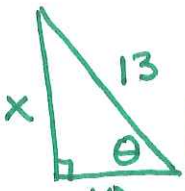
$\tan\angle A = \frac{9}{40}$ $\quad \tan\angle C = \frac{40}{9}$

*****Notice that the $\sin\angle A = \frac{9}{41}$ and $\sin\angle C = \frac{40}{41}$ *****

Different ratios!

Example 2 If $\cos\theta = \frac{10}{13}$, what is $\sin\theta$? What is $\tan\theta$?

adj / hyp



$10^2 + x^2 = 13^2$

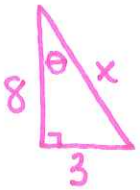
$x = \sqrt{69}$

$\sin\theta = \frac{\sqrt{69}}{13}$

$\tan\theta = \frac{\sqrt{69}}{10}$

Example 3: If $\tan\theta = \frac{3}{8}$, what is $\sin\theta$? What is $\cos\theta$?

op / adj



$3^2 + 8^2 = x^2$

$\sqrt{73} = x$

$\sin\theta = \frac{3}{\sqrt{73}}$ must get $\sqrt{}$ out of denom.

$\sin\theta = \frac{3\sqrt{73}}{73}$

$\cos\theta = \frac{8}{\sqrt{73}}$ get $\sqrt{}$ out of denom.

$\cos\theta = \frac{8\sqrt{73}}{73}$

Using Your Calculator with Trigonometry! Must set calculator to degrees NO Radians

1. $\sin(57°) =$ 0.8387

2. $\cos(41°) =$ 0.7547

Trig ratios can be expressed by decimals. They are just a number.

3. $\sin(47°) = \frac{x}{9}$ · 9

9 [x] [sin] [(] 47 [)] [=]

$9 \cdot \sin(47) = x$ ← exact value

$6.5822 \approx x$ ← rounded value

4. $\tan(61°) = \frac{9}{x}$ · x

plug in 9 [÷] [tan] (61)

$x \cdot \tan(61) = 9$

$\frac{x \cdot \tan(61)}{\tan(61)} = \frac{9}{\tan(61)}$

$x = \frac{9}{\tan(61)}$ ← exact value

$x \approx 4.9888$ ← Rounded Value.

5. $\theta = \tan^{-1}\left(\frac{5}{6}\right)$ Recall θ is an angle measure and a variable.

$\theta \approx 39.8056°$

6. $\theta = \sin^{-1}\left(\frac{9}{17}\right)$

$\theta \approx 31.9657°$

7. $\tan\theta = \frac{20}{35}$ take the inverse

$\theta = \tan^{-1}\left(\frac{20}{35}\right)$

$\theta \approx 29.7449°$

8. $\cos\theta = \frac{5}{7}$

$\theta = \cos^{-1}\left(\frac{5}{7}\right)$ ← exact value

$\theta \approx 44.4153°$ ← Rounded Value

Trigonometry – Finding Missing Angles

What do we do if the angle of our triangle is unknown?

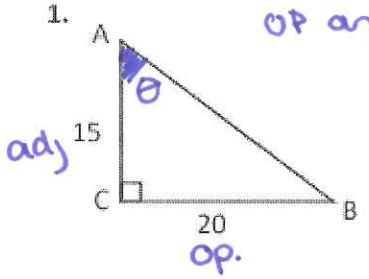
USE "INVERSE TRIG" – now we will give the calculator the ratio and it will tell us the angle in degrees

INVERSE SINE	INVERSE COSINE	INVERSE TANGENT
$\sin^{-1}\left(\frac{O}{H}\right)=\theta$	$\cos^{-1}\left(\frac{A}{H}\right)=\theta$	$\tan^{-1}\left(\frac{O}{A}\right)=\theta$

Example 1-3: Find the measure of Angle B in each triangle below. Round to the nearest tenth of a degree.

Since we are given OP and adj legs we use tangent.

1.



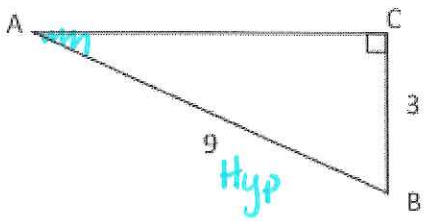
$\tan A = \frac{20}{15}$ Ratio

$\angle A = \tan^{-1}\left(\frac{20}{15}\right)$ ∠ exact value

$\angle A \approx 53.1301°$ Rounded Value

$\angle A \approx 53.1°$

2.



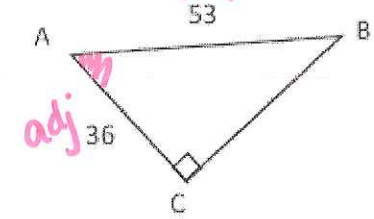
$\sin A = \frac{3}{9}$

$\angle A = \sin^{-1}\left(\frac{3}{9}\right)$

$m\angle A \approx 19.4712°$

$m\angle A \approx 19.5°$

3.



$\cos A = \frac{36}{53}$

$\angle A = \cos^{-1}\left(\frac{36}{53}\right)$

$m\angle A \approx 47.2153$

$m\angle A \approx 47.2°$

must show: Ratio
Inverse
Rounded

FINDING MISSING SIDES NOTES

(FROM WORKSHEET B)

Find the missing side(s) of each right triangle. Round to the nearest tenth.

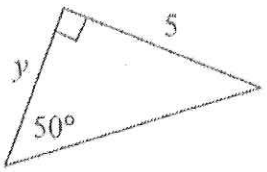
7.

$8 \cdot \sin(36) = \frac{x}{8} \cdot 8$

$4.7024 \approx x$

$4.7 \approx x$

8.



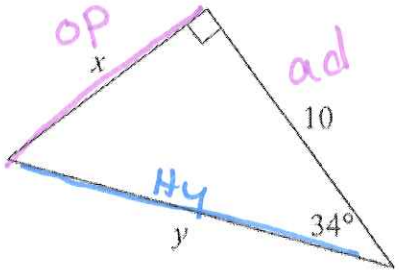
$\tan(50) = \frac{5}{y}$

$y\tan(50) = 5$

$y = \frac{5}{\tan(50)}$

$y \approx 4.2$

9.



$\tan(34) = \frac{x}{10}$

$x \approx 6.7$

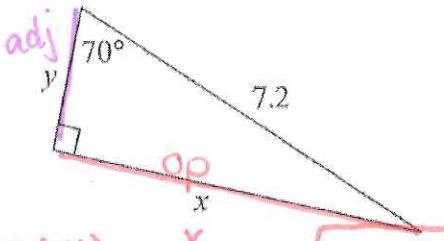
$\cos(34) = \frac{10}{y}$

$y\cos(34) = 10$

$y = \frac{10}{\cos(34)}$

$y \approx 12.1$

10.



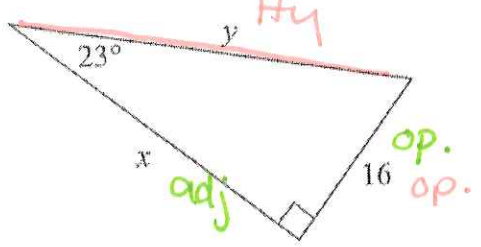
$\sin(70) = \frac{x}{7.2}$

$x \approx 6.8$

$\cos(70) = \frac{y}{7.2}$

$y \approx 2.5$

11.



$\tan(23) = \frac{16}{x}$

$x = \frac{16}{\tan(23)}$

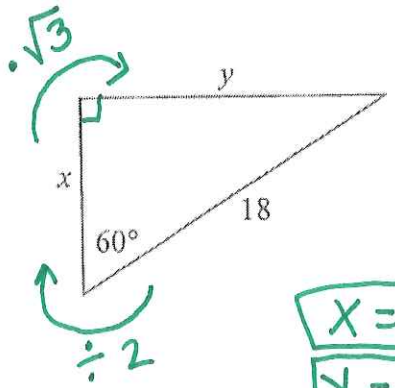
$x \approx 37.7$

$\sin(23) = \frac{16}{y}$

$y = \frac{16}{\sin(23)}$

$y \approx 40.9$

12. Special Right Triangle (find EXACTLY)



$x = 9$

$y = 9\sqrt{3}$