NOTES: TRIGONOMETRIC RATIOS

-Trigonometric Ratios compare the sides of a right triangle.

-The sides are called opposite, adjacent, and hypotenuse depending on where they are in relation to the

 given angle.

 **“opposite”** means “**across from**” the angle. It’s the side that **doesn’t touch** the angle.

 **“adjacent”** means **“next to”** the angle. There are 2 sides that border the angle. The one

 that is not the hypotenuse is the adjacent side.

 “**hypotenuse”** means the side that is across from the right angle. It slants. It is the longest

 side.

 \*Depending on which angle you are using, the “opposite” and “adjacent” sides

 will switch because they are named in relationship to the angle. The

 hypotenuse doesn’t move.

 A B

 B A

DO THIS NOW:

**Practice** labeling “opposite” and “adjacent” and “hypotenuse” on all the problems in the worksheet. You can write “opp”, “adj”, and “hyp” if you want to.

The Trigonometric Ratios are names for dividing two sides of a triangle.

 WRITE IT LIKE THIS TO SOLVE PROBLEMS

 $\frac{opposite}{hypotenuse}$ is called Sine Sin A= $\frac{opposite}{hypotenuse}$

$\frac{adjacent}{hypotenuse} $ is called Cosine Cos A = $\frac{adjacent}{hypotenuse} $

$\frac{opposite}{adjacent}$ is called Tangent Tan A= $\frac{opposite}{adjacent}$

In each equation, there are 3 variables: the angle that goes with the ratio name,

 the side that goes on top (numerator),

 and the side that goes on bottom (denominator).

If you know 2 of them then you can substitute those values and do Algebra to solve for the third variable.

Examples/

 Sin 21° = $\frac{x}{22}$ x= 22 Sin 21° x= 22 (.3584) x= 7.88

Sin 15° = $ \frac{16}{x}$ x = $\frac{16}{Sin 15°}$ X = $\frac{16}{.2588}$ x=61.83

Cos 73°= $ \frac{x}{6}$ x= 6 Cos 73° x= 6 (.2924) x= 1.75

 Cos 72°= $ \frac{6}{x}$ x = $\frac{6}{Cos 72°}$ x= $\frac{6}{.3090}$ x = 19.42

 Tan 37° = $ \frac{x}{12}$ x= 12 Tan 37° x= 12 (.7536) x= 9.04

  Tan 55° = $ \frac{29}{x}$ x= $\frac{29}{Tan 55°}$ x=$ \frac{29}{1.4281}$ x= 20.31

Steps:

1. Use the given sides to decide which ratio to use- Sin A, Cos A, or Tan A
2. Plug in the variables you know and x for the one you don’t.
3. Choose the correct Algebra steps to solve the equation.
4. Check if your answer is reasonable. The legs should never be more than the hypotenuse.

WARNINGS:

Sine, Cosine, and Tangent are NOT VARIABLES. They are names that tell you which sides to use.

You HAVE TO have an angle with the ratio. Otherwise, you won’t know which side is opposite and which side is adjacent. There is no such thing as Sin =$\frac{opposite}{hypotenuse}$ because there is no such thing as opposite or adjacent if you don’t know which angle they are opposite and adjacent to.

Also, you can’t divide both sides by Sin because you can’t separate the Sin and the Angle. Sin doesn’t exist without an angle because opposite sides don’t exist without the angle.

Notes: Trigonometric Ratios when the Angle is the Variable

1. Choose the appropriate ratio- Sin A, Cos A, or Tan A- depending on the

 sides you have.

 2) Form the ratio by filling in the values you know.

 3) Simplify the ratio into a decimal.

 4) Look up the decimal in the table. The angle that it corresponds to is the measure of the

 angle you were trying to find.

Ex/

 1) Sin A because I have the opposite and hypotenuse sides.

 2) sin x = $\frac{11}{27}$

 3) sin x = .4074

 4)

 Angle Sine Cosine Tangent

 

 So I conclude that X≈ 24°

You can also do this algebraically. The inverse operation of Sine is called Arcsine. If you press “2nd” then “sin” on your calculator, you can input the fraction or decimal and get out the angle.

1. sin x = $\frac{11}{27}$
2. x= $sin^{-1}$ (11/27)
3. x= 24.04°

Try it/





**Notes: Trigonometric Ratios Given the Decimal but NO Angle and Only One Side**

 x

 12 x FYI: The Greek letter Theta (Ѳ )

 Ѳ is the symbol for angle

 when it is unknown

**Question:**

If sin Ѳ = .3333, what is the value of x?

TRY IT:

 Ѳ

 48 x

Cos Ѳ = .8

 6

 Ѳ

 X

Tan Ѳ= .25

 **Solution:**

1. sin Ѳ = .3333
2. sin Ѳ = $\frac{1}{3}$
3. $\frac{opposite}{hypotenuse}$ = $\frac{1}{3}$
4. $\frac{12}{x}$ = $\frac{1}{3}$
5. Cross multiply so 36 = x

* Of course, you can always leave the decimal and do the Algebra that way if you’d prefer.