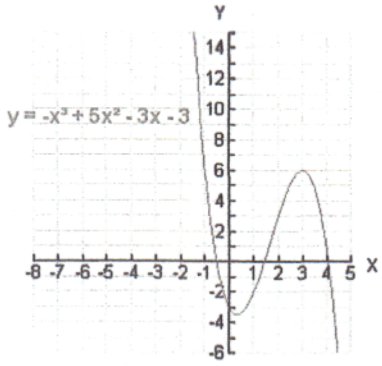
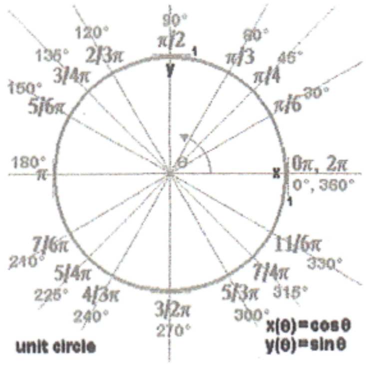
Algebra II & Trigonometry

{Wrap your brain and hands around it!}





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ACTIVITIES

The manipulatives needed are listed in the brackets.

- Preactivities/Table talk/Beach ball toss [Clever Catch Trig. Ball]
- Introduction
- Draw family of functions [dry erase graph mat]
- End behavior of polynomial functions [arms]
- Relations/functions [lids and rope]
- Human number line [cards]
- Matrix multiplication [2 toothpicks]
- Doubling function [paper]
- Word problems (chickens & dogs)
- Quadratic formula song
- Conic sections [cone cups or Play Doh & dental floss]
- Half-life [m & m's, paper plate]
- Be a function/Math aerobics/Be a mathlete [yourself]
- Trig. circle [paper plate]
- Trig. hand jive [hand]
- Make a sin, cos, and tan graph [Ultra-flex ruler]
- Trig. chart [index cards, ruler, tape]
- Trig. ratios/Ambiguous case for Law of Sines [AngLegs]
- Trig. tattoos/inverse functions [patty paper, Miniplot post-it, Georeflector]
- Pendulum/Simple harmonic motion [flexible meter stick, timer, rope, weight]
- Exponent cheer
- Clean up

Thanks to **Classroom Products Warehouse** for donating math supplies.

Human Number Line

$\sqrt{-16}$	i	$\frac{1}{0}$	-3^2
$-\sqrt{16}$	$\log_3 \frac{1}{27}$	$\log \frac{1}{100}$	i^2
$\log_5 1$	5^{-3}	2^{-3}	4^{-1}
$\tan 45^0$	$\sqrt{2}$	$\sqrt{3}$	$9^{\frac{1}{2}}$
3.14	π	$(-3)^2$	$(2\sqrt{3})^2$

Matrix Multiplication
(with toothpicks)

$$\begin{bmatrix} 7 & 3 & -9 \\ 0 & 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

DOUBLING FUNCTION

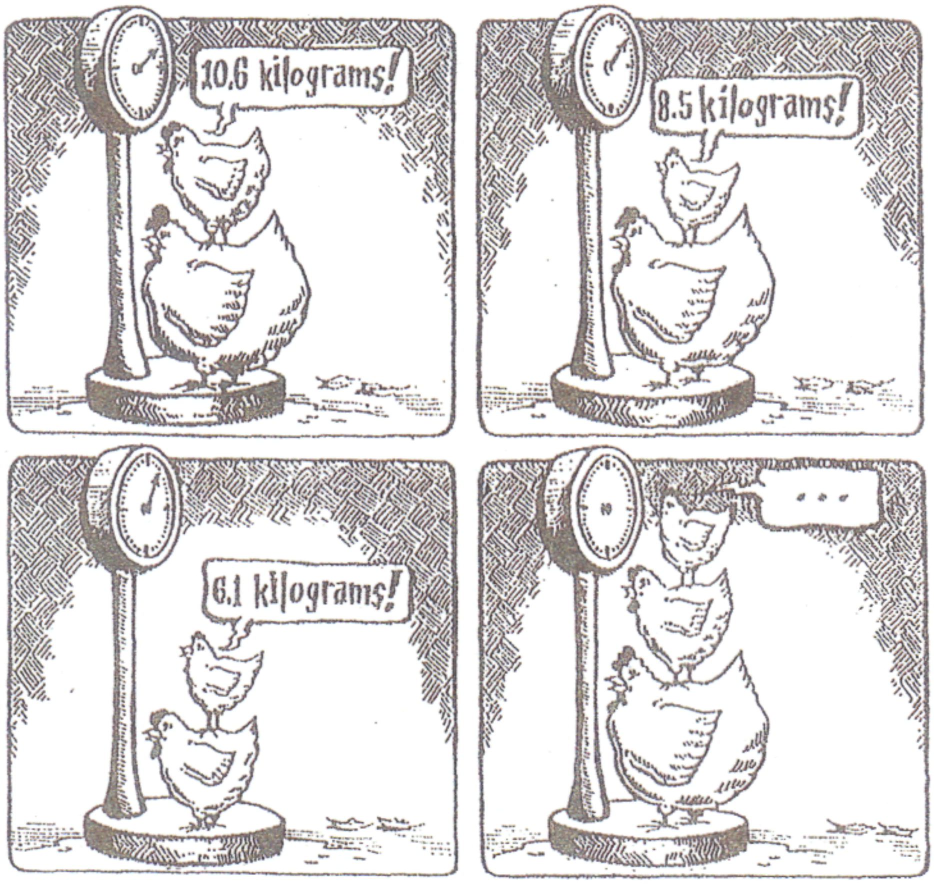
Take the largest thinnest sheet of paper you can find. Fold it in half. Fold it in half again. After seven or eight folds, you will be unable to fold it by hand, as the sheet will have become as thick as a book. If 20 folds were possible, the stack of paper would dwarf your house. At 40, it would be well on its way to the moon. Seventy folds would take it to the nearest star and on as far again. Light would take eight years to go from top to bottom. After 100 folds, the paper would be more than 10 billion light years across and span the known universe.

This is the essence of exponential growth: Very small amounts rapidly become astronomically large through simple doubling.

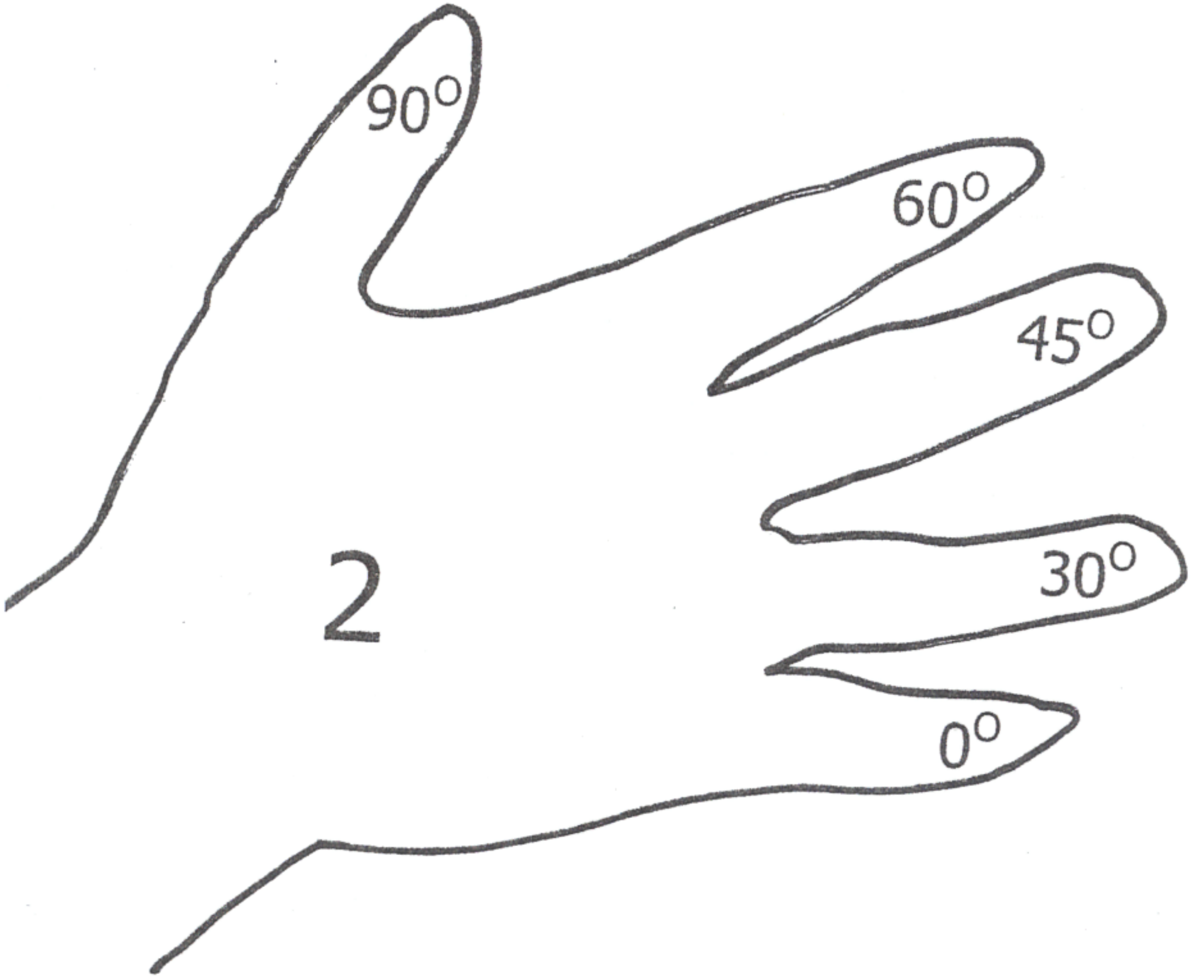
Excerpt from The Mathematics Teacher
Originally from The Globe and Mail, July 29, 1995

Chickens

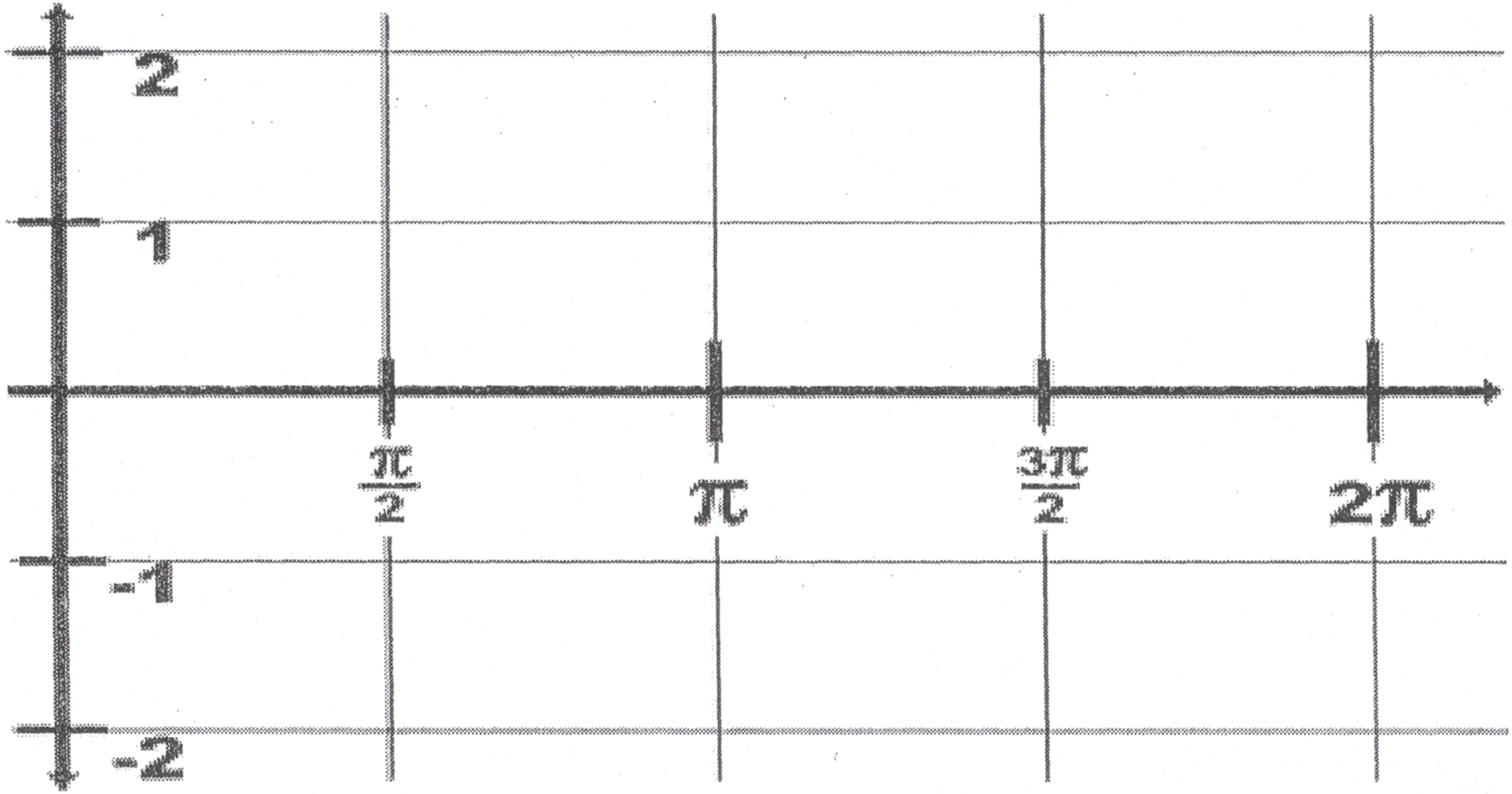
Three chickens weighed themselves in different groupings.



Trig. Hand Jive



- ☐ Use left hand
- ☐ Pull in finger
- ☐ Radicals in numerators
- ☐ 2 in denominators
- ☐ Cos on top
- ☐ Sin on bottom
- ☐ Tan on flip side
- ☐ Carpal tunnel?



2
1
-1
-2
π/2
π
3π/2
2π

TRIGONOMETRY TABLE

DEGREES																	
RADIANS																	
Sin θ																	
Cos θ																	
Tan θ																	
Cot θ																	
Sec θ																	
Csc θ																	

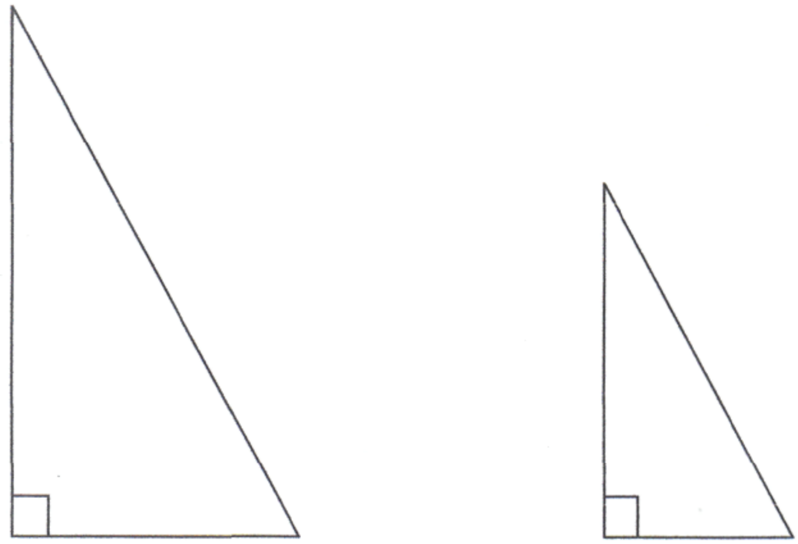
AngLegs

12 of each length, 2 snap-on protractors

Orange	5	cm
Purple	7.07	cm
Green	8.66	cm
Yellow	10	cm
Blue	12.24	cm
Red	14.14	cm

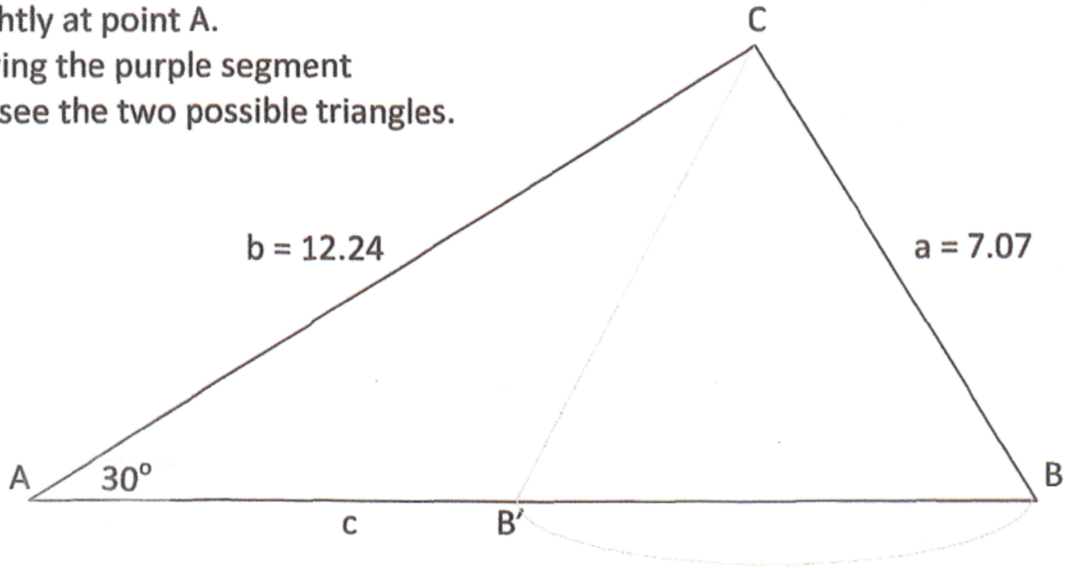
<u>Trig. Ratios</u>

Build two 30-60-90 triangles (red, blue, purple and yellow, green, orange)
Measure angles and sides to verify
Draw and label angles and sides
Determine trig. ratios (sine, cosine, tangent) for each triangle



Ambiguous case for Law of Sines (Two solution case)

Build a triangle (red, blue, purple)
Hold the blue and red segments
tightly at point A.
Swing the purple segment
to see the two possible triangles.



$$\frac{\sin 30°}{7.07} = \frac{\sin B}{12.24}$$

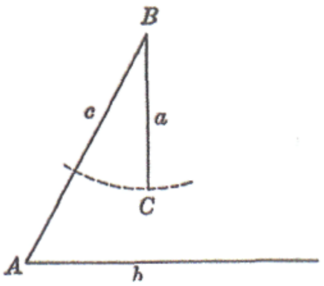
$$\sin B = \frac{12.24 \sin 30°}{7.07}$$

$B = 60°$ (first quadrant answer)

Since sine is also positive in the second quadrant

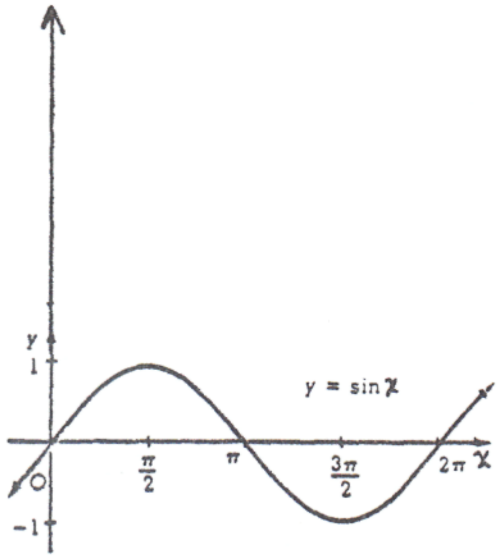
$B = 180° - 60° = 120°$ (second quadrant answer)

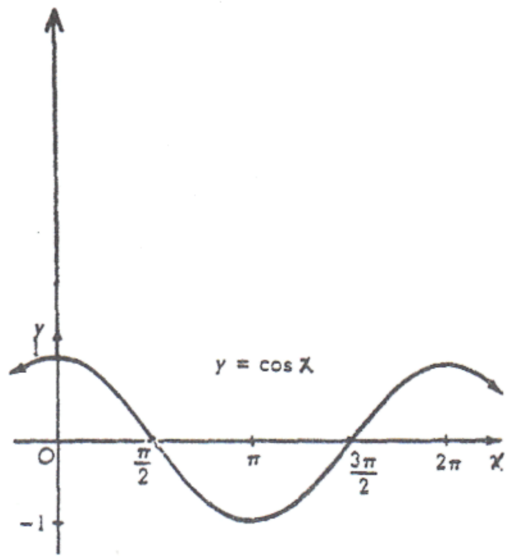
Ambiguous case for Law of Sines (No solution case)



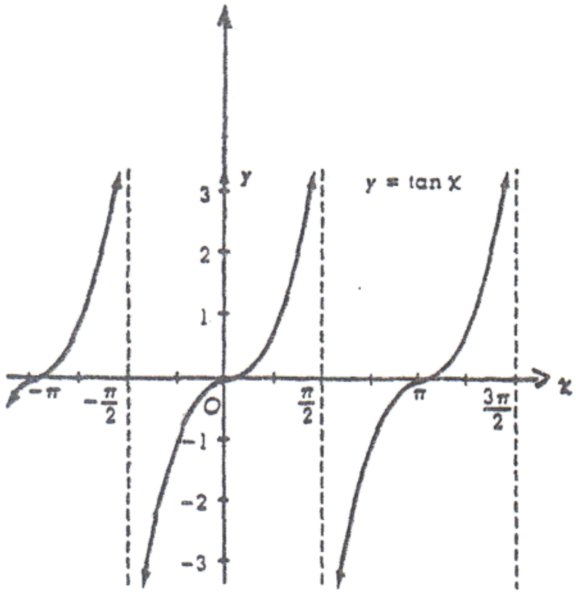
TRIGONOMETRIC INVERSES **NAME**______________________

1. The equation of the line for finding an inverse is: ________
2. Place a piece of tracing paper over the sine graph; using a pencil, trace the x and y axes and the sine curve.
3. Flip the tracing paper and line up the axes. Trace the sine curve, leaving a light impression on the worksheet.
4. Draw the inverse of the sine curve.
5. Highlight the section of the curve that will determine a function. Complete the information in the chart.
6. Repeat for cosine and tangent.





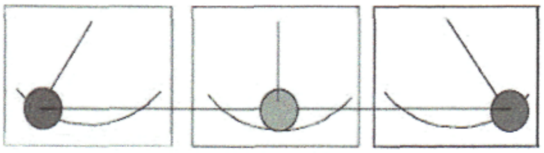
y = sin x	y = arcsin x	y = cos x	y = arccos x
D:	D:	D:	D:
R:	R:	R:	R:



y = tan x	y = arctan x
D:	D:
R:	R:

Simple Harmonic Motion

Modeling Periodic Behavior using Sine and Cosine



If the equation describing the displacement y of an object at time t is

$$y = a \sin kt \quad \text{or } y = a \cos kt$$

then the object is in simple harmonic motion. In this case,

amplitude = $|a|$ Maximum displacement of the object

period = $\frac{2\pi}{k}$ Time required to complete one cycle

frequency = $\frac{k}{2\pi}$ Number of cycles per unit of time

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Example: A pendulum makes one complete cycle in 4 seconds, swinging a maximum of 12 cm from its center point. Find a and k to complete the equation of simple harmonic motion. $y = a\ sin\ kt$

Solution: Since the pendulum swings a maximum of 12 cm from the center, then the amplitude, a, is 12. To find k set the time equal to $\frac{2\pi}{k}$. Solve $4 = \frac{2\pi}{k}$ to get $k = \frac{\pi}{2}$, therefore the function is $y = 12 \sin\frac{\pi}{2}t$.

Use the rope and a weight to create a pendulum.
Use the flexible meter stick and timer to collect data.
Create an equation that models the behavior of the pendulum.
Graph and label the results.