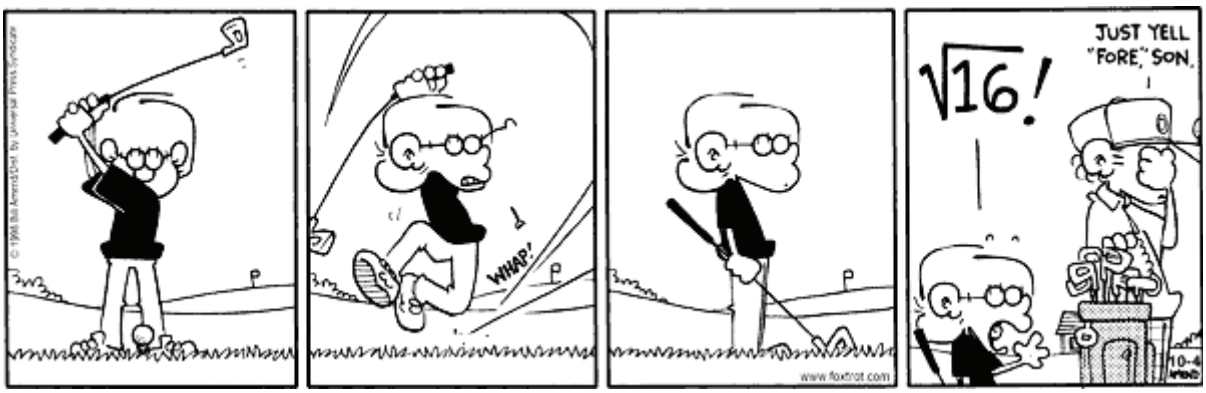
Name:_____ **Period:**_____ **Date:**_____

AP Physics –Math Review



PART I. SOLVING EQUATIONS

Solve the following equations for the quantity indicated.

1. Often problems on the AP exam are done with variables only. Below are various physics formulas. Don't worry about what the variables mean. Just solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

a. $v^2 = v_o^{\,2} + 2a(s - s_o)$, $a =$

b. $K = \frac{1}{2}kx^2$, $x =$

c. $T_p = 2\pi\sqrt{\frac{\ell}{g}}$, $g =$

d. $F_g = G\frac{m_1 m_2}{r^2}$, $r =$

e. $mgh = \frac{1}{2}mv^2$ $, v =$

f. $x = x_o + v_o t + \frac{1}{2}at^2$ $, t =$

g. $B = \frac{\mu_o}{2\pi}\frac{I}{r}$ $, r =$

h. $x_m = \frac{m\lambda L}{d}$ $, d =$

i. $pV = nRT$ $, T =$

j. $\sin\theta_c = \frac{n_1}{n_2}$ $, \theta_c =$

k. $qV = \frac{1}{2}mv^2$ $, v =$

l. $\frac{1}{f} = \frac{1}{s_o} + \frac{1}{s_i}$ $, s_i =$

PART III. FACTOR-LABEL METHOD FOR CONVERTING UNITS (Dimensional Analysis)

A very useful method of converting one unit to an equivalent unit is called the **factor-label method** of unit conversion. You may be given the speed of an object as 25 **km/h** and wish to express it in **m/s.** To make this conversion, you must change **km** to **m** and **h** to **s** by multiplying by a series of factors so that the units you do not want will cancel out and the units you want will remain. Conversion: 1000 **m** = 1 **km** and 3600 **s** = 1 ***h***,

$$\left(\frac{25\ \text{km}}{\text{h}}\right)\left(\frac{1000\ \text{m}}{1\ \text{km}}\right)\left(\frac{1\ \text{h}}{3600\ \text{s}}\right)=$$

What is the conversion factor to convert km/h to m/s?

What is the conversion factor to convert m/s to km/h?

Carry out the following conversions using the factor-label method. <u>Show all your work!</u>

1. How many seconds are in a year?

2. Convert 28 km to cm.

3. Convert 45 kg to mg.

4. Convert 85 cm/min to m/s.

5. Convert the speed of light, $3x10^8$ m/s, to km/day.

6. Convert 823 nm to m

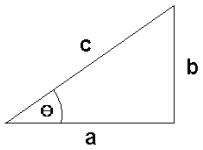
7. 8.5 cm^3 to m^3

PART IV. TRIGONOMETRY AND BASIC GEOMETRY

Solve for all sides and all angles for the following triangles. Show all your work.

Example:

SOH CAH TOA



$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$

Your calculator must be in **degree** mode! **Show all your work.**

1. $\theta = 55^\circ$ and $c = 32$ m, solve for a and b

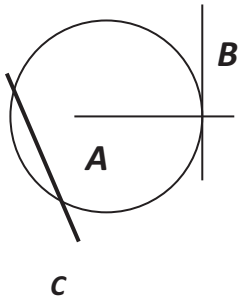
2. $\theta = 45^\circ$ and $a = 15$ m/s, solve for b and c.

3. $b = 17.8$ m and $\theta = 65^\circ$, solve for a and c.

4. Line ***B*** touches the circle at a single point. Line ***A*** extends through the center of the circle.

What is line ***B*** in reference to the circle?

How large is the angle between lines ***A*** and ***B***?



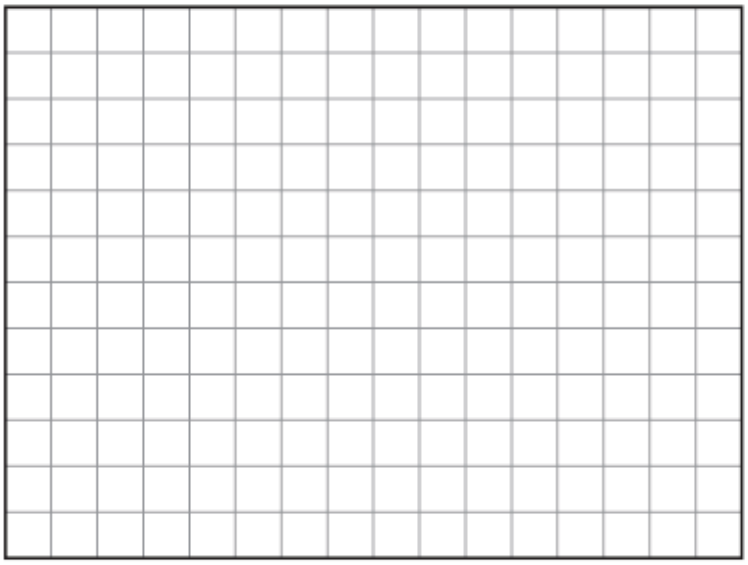
What is line ***C*****?**

PART V. GRAPHING TECHNIQUES

Graph the following sets of data using proper graphing techniques.

The first column refers to the *y*-axis and the second column to the *x*-axis

1. Plot a graph for the following data recorded for an object falling from rest:



Velocity (ft/s)	**Time** (s)
32	1
63	2
97	3
129	4
159	5
192	6
225	7

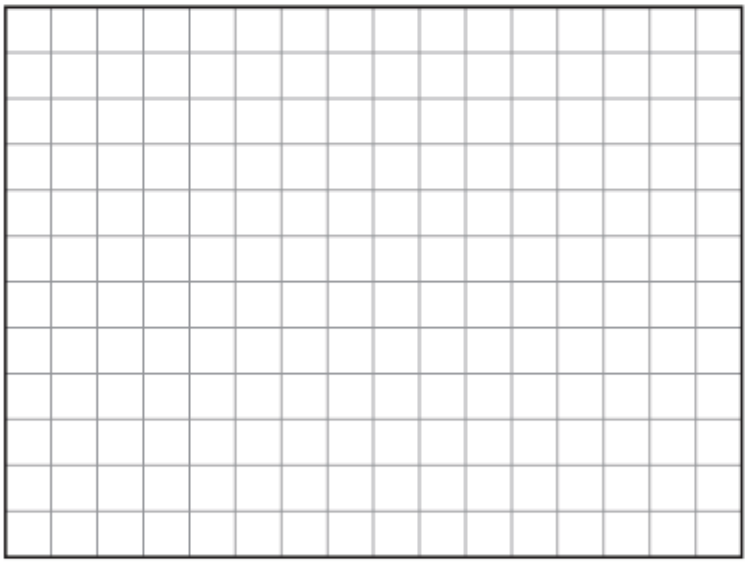
a. What kind of curve did you obtain?

b. What is the relationship between the variables?

c. What do you expect the velocity to be after 4.5 s?

d. How much time is required for the object to attain a speed of 100 ft/s?

2. Plot a graph showing the relationship between frequency and wavelength of electromagnetic waves:



Frequency (kHz)	**Wavelength** (m)
150	2000
200	1500
300	1000
500	600
600	500
900	333

a. What kind of curve did you obtain?

b. What is the relationship between the variables?

c. What is the wavelength of an electromagnetic wave of frequency 350 Hz?

d. What is the frequency of an electromagnetic wave of wavelength 375 m?

Vectors

Most of the quantities in physics are vectors. ***<u>This makes proficiency in vectors extremely important</u>***.

Magnitude: Size or extent. The numerical value.

Direction: Alignment or orientation of any position with respect to any other position.

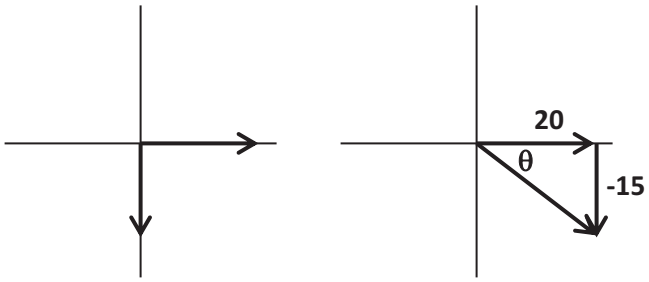
Scalars: A physical quantity described by a single number and units. A quantity described by **<u>magnitude only</u>**.

Examples: time, mass, and temperature

Vector: A physical quantity with **<u>both a magnitude and a direction</u>**. A directional quantity.

11. Given two component vectors solve for the resultant vector. This is the opposite of number 11 above. Use Pythagorean Theorem to find the hypotenuse, then use inverse (arc) tangent to solve for the angle.

Example: ***x*** = 20, ***y*** = -15



$R^2 = x^2 + y^2$ $\quad \tan\theta = \frac{opp}{adj}$

$R = \sqrt{x^2 + y^2}$ $\quad \theta = \tan^{-1}\left(\frac{opp}{adj}\right)$

$R = \sqrt{20^2 + 15^2}$ $\quad \theta = \tan^{-1}\left(\frac{y}{x}\right)$

$R = 25$

a. ***x*** = 600, ***y*** = 400, *R = ?, θ = ?*

b. ***x*** = -0.75, ***y*** = -1.25, *R = ?, θ = ?*

c. ***x*** = -32, ***y*** = 16, *R = ?, θ = ?*

d. ***x*** = 0.0065, ***y*** = -0.0090, *R = ?, θ = ?*

That's a wrap folks! See you in August!