AP Physics 1 – Summer Assignment

Welcome to AP Physics 1! I am very glad you are interested in physics and I look forward to investigating energy, matter and well the universe with you next year. We will be spending most of next year investigating relationships between various properties of objects, what we call variables (because they can constantly change). We need to have a tool to describe these relationships and to apply them to other situations, that tool is mathematics. In fact, one of the most famous physicist, Sir Isaac Newton, developed calculus along with his scientific work so he would have a way to describe his work and make predictions. Even though AP Physics 1 doesn't require that you know any calculus, it does require that you have mastered the fundamentals of Algebra and Geometry.

In the pages that follow you will find review questions on mathematics and the basics of science, which you should already be familiar with. Please complete the entire review over the summer. If you do not know how to complete a section, do not worry. This does not mean that you are not cut out for AP Physics, just that you may need to do a little more review on that topic. Below are just a few websites you can visit to help review.

http://www.aplusphysics.com/courses/ap-1/AP1_Physics.html
https://sites.google.com/site/fregaphysics/physics/math-review
http://www.physicsphenomena.com/PhysicsMathReview.htm
And the link below will take you to document of a more thorough review of mathematics with a detailed explanation. I highly suggest you look over this document as well and try some of the problems.
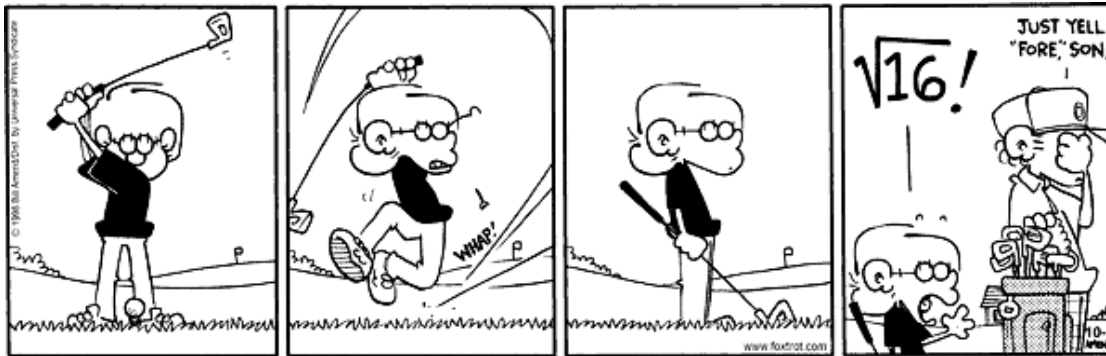http://www.rtmsd.org/cms/lib/PA01000204/Centricity/Domain/170/new%20math%20review.pdf

This assignment is worth 2 homework grades for 1st Quarter, and is due Wednesday August 20th, 2014.

If you have any questions you can come by and see me in room 101 or email me at akoch@pasco.k12.fl.us.

I look forward to seeing you next year,
                            Mr. Koch

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

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

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

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

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

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

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

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

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

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

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

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, 3×10^8 m/s, to km/day.
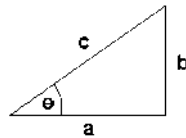
6. Convert 823 nm to m

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

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

Your calculator must be in **degree** mode! <u>**Show all your work.**</u>
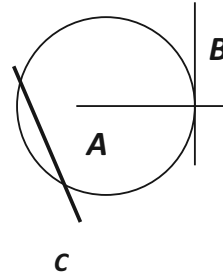
1. $\theta = 55°$ and $c = 32$ m, solve for a and b

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

3. $b = 17.8$ m and $\theta = 65°$, 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?

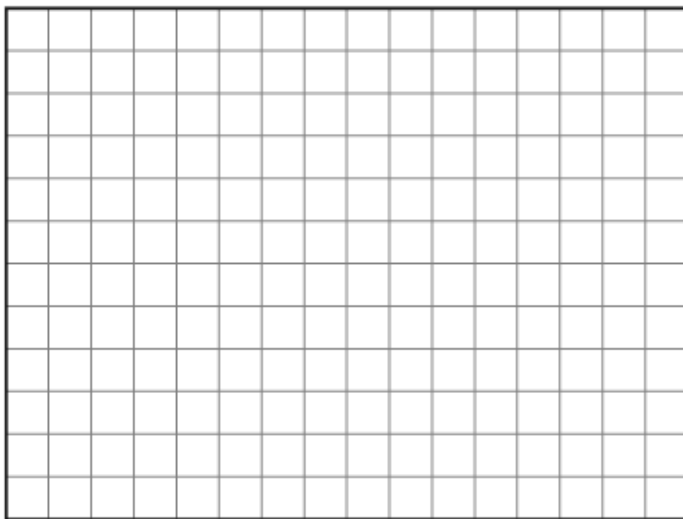How large is the angle between lines **A** and **B**?

B

A

C

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:

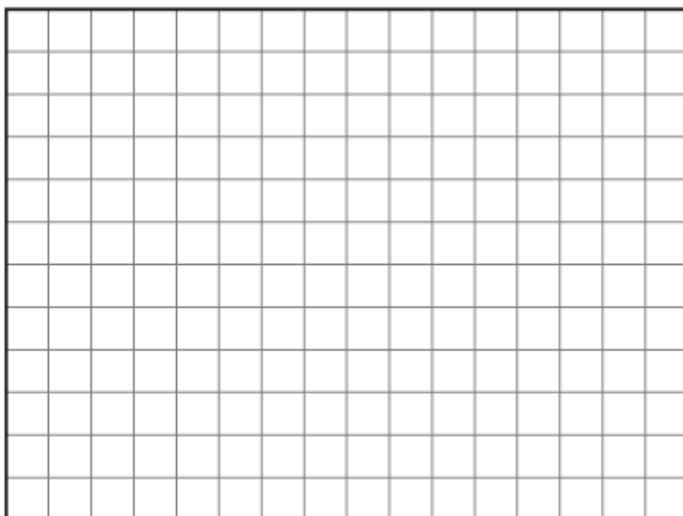| Velocity	Time
(ft/s)	(s)
32	1
63	2
97	3
129	4
159	5
192	6
225	7

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?