

AP Physics 1 and Applied Physics Honors

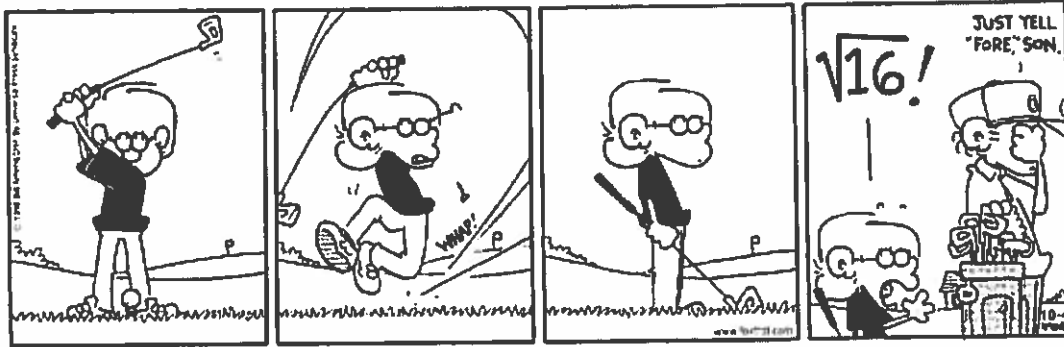
Summer Packet

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Physics problems often involve math. The attached review is designed to practice mathematical manipulations that will be used often throughout the year. Do your best to answer every problem. Success in upper level physics courses will be achieved by students who are willing to work hard, take risks and try. If you are stuck on a particular problem, show your work and come to school in September with questions. This assignment will count as your first homework grade for marking period 1 and will be collected on the first day of school. Late assignments will be collected for partial credit.

Enjoy your summer! We look forward to meeting you 😊

AP Physics –Math Review



PART I. SOLVING EQUATIONS

Solve the following equations for the quantity indicated.

- 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. $F_g = G\frac{m_1m_2}{r^2}$, $r =$

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

f. $x = x_0 + v_0t + \frac{1}{2}at^2$, $t =$

g. $B = \frac{\mu_0 I}{2\pi r}$, $r =$

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. Show all your work!

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

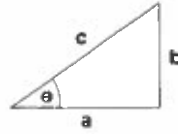
7. 8.5 cm^3 to m^3

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



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

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

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

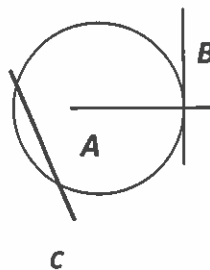
2. $\theta = 45^\circ$ and $a = 15$ m/s, solve for b and c .

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*?



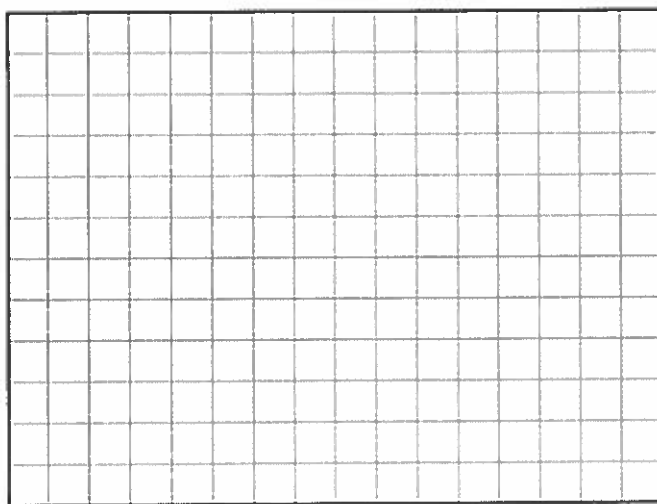
What is line *C*?

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

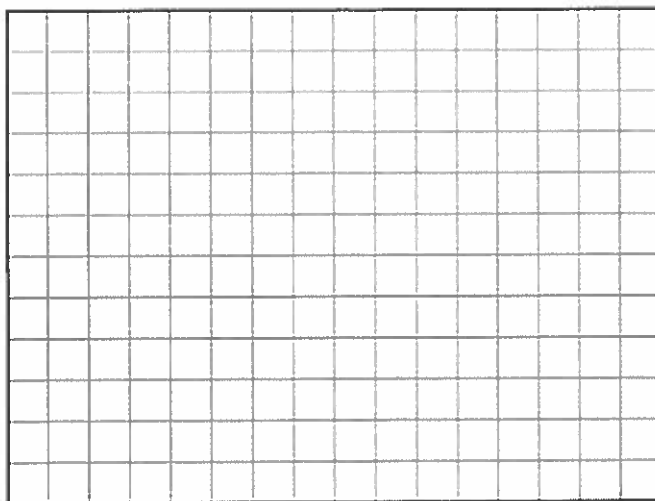
a. What kind of curve did you obtain?

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?