AP Physics 1 /ECE 1201Q Summer Assignment June 20, 2017

Dear AP Physics 1/ECE Physics 1201Q Students and Parents :

Hello ! I am very happy to welcome you to AP Physics 1 and/or ECE Physics 1201 Q this year as I look forward to very educational, fun and demanding course of study. You will have an opportunity to register late if you chose to take the UCONN Credit ECE Physics 1201Q course simultaneously offered within my class but you will have to register by very early September with UCONN. If you interested in receiving possible UCONN ECE Physics 1201Q credit ,please email me this summer ddelgiudice@stamfordct.gov. so I can speak to you about a possible offering as a concurrent class for AP Physics 1 and UCONN ECE 1201Q.

In order to get a head start on AP Physics 1 or UConn ECE Physics 1201Q, one might want to know what you need to start studying over the summer. Many of you have never taken a rigorous physical science course which uses your skills in algebra, geometry and trigonometry. In the first weeks you will be using your math skills to graph and solve problems in motion and forces .The next few pages contain exercise /problems that you should be able to solve using your skills thus far with possibly the exception of vector math. If not you may need to learn/review. Some links you can look at to help you should you have any difficulty:

http://www.aplusphysics.com/courses/ap-1/AP1_Physics.html

http://sites.google.com/site/fregaphysics/physics/math-review

http://www.physicsphenomena.com/PhysicsMathReview.htm

http://www.rtmsd.org/cms/lib/PA01000204/Centricity/Domain/170/new%20math520review.pdf

You may also go to Stamford High Home page on the top so press on Academics then Press on Science then to Mr. DelGiudice page.. Look on the right side you will see AP Physics 1 Videos by Professor Twu.... Review . Please take notes on the any videos that might help you complete the summer work assignments and retain your notes on each video for summer assignment credit. The above reference websites can help you attain the math problem solving you will need for either course.

Lastly if none of these seem to help then Google "You Tube" and look for the topic. Like" vectors and vector addition or subtraction or " Proportions in math problem solving" skills or "basic trigonometric functions" namely: sine, cosine and tangent and their applications to solving triangles lengths and angles for a right triangle. This summer assignment is given to all of Mr DelGiudice's AP1 Physics and ECE 1201Q students .

DUE DATE OF ASSIGNMENT: SEPT 6, 2017 If the assignment is submitted after the last day of the grace period date of SEPT 8, 2017 , the point deductions will incur after this date.Be sure to do the summer packet before coming back from summer break. Make sure to make an appointment with me after school for August 30 or September 1 or 5 if you are finding it difficult.

If you have any questions feel free to email to: ddelgiudice@stamfordct.gov

Have A Great Summer! Email me if you have a question on the summer assignment or interest in possibly signing up for ECE 1201Q as a concurrent UCONN course in the fall within the same AP Physics 1 period you are enrolled. I will tell you more about the unique opportunity.

Best regards,

Mr. D DelGiudice SHS AP Physics 1 /ECE UCONN 1201Q Physics Instructor

AP Physics 1 Summer Assignment

1. Scientific Notation:

The following are ordinary physics problems. Write the answer in scientific notation and simplify the units (π=3).

a. $T_s = 2\pi\sqrt{\dfrac{4.5\times10^{-2}\,kg}{2.0\times10^{3}\,kg/s^2}} =$ T_s=_____

b. $F = \left(9.0\times10^{9}\,\dfrac{N\cdot m^2}{C^2}\right)\dfrac{\left(3.2\times10^{-9}C\right)\left(9.6\times10^{-9}C\right)}{\left(0.32m\right)^2}$ F=_____

c. $\dfrac{1}{R_p} = \dfrac{1}{4.5\times10^{2}\Omega} + \dfrac{1}{9.4\times10^{2}\Omega}$ R_p=_____

d. $K_{max} = \left(6.63\times10^{-34}J\cdot s\right)\left(7.09\times10^{14}s\right) - 2.17\times10^{-19}J$ K_{max}=_____

e. $\gamma = \dfrac{1}{\sqrt{1-\dfrac{2.25\times10^{8}\,m/s}{3.00\times10^{8}\,m/s}}}$ γ=_____

f. $K = \dfrac{1}{2}\left(6.6\times10^{2}\ \text{kg}\right)\left(2.11\times10^{4}\ \text{m/s}\right)^2 =$ K=_____

g. $(1.33)\sin 25.0^\circ = (1.50)\sin\theta$ θ=_____

2. Solving Equations:

Often problems on the AP exam are done with variables only. Solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

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

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

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

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

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

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

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

h. $pV = nRT$, $T =$ _____

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

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

3. Conversion

Science uses the ***KMS*** system (***SI***: System Internationale). ***KMS*** stands for kilogram, meter, second. These are the units of choice of physics. The equations in physics depend on unit agreement. So you must convert to ***KMS*** in most problems to arrive at the correct answer.

kilometers (*km*) to meters (*m*) and meters to kilometers
centimeters (*cm*) to meters (*m*) and meters to centimeters
millimeters (*mm*) to meters (*m*) and meters to millimeters
nanometers (*nm*) to meters (*m*) and metes to nanometers
micrometers (μm) to meters (*m*)
gram (*g*) to kilogram (*kg*)
Celsius (^oC) to Kelvin (*K*)
atmospheres (*atm*) to Pascals (*Pa*)
liters (*L*) to cubic meters (m^3)
Other conversions will be taught as they become necessary.

What if you don't know the conversion factors? Colleges want students who can find their own information (so do employers). Hint: Try a good dictionary and look under "measure" or "measurement". Or the Internet? Enjoy.

a. 4008 *g* = _____ *kg*

b. 1.2 *km* = _____ *m*

c. 823 *nm* = _____ *m*

d. 298 *K* = _____ ^oC

e. 0.77 *m* = _____ *cm*

f. 8.8×10^{-8} *m* = _____ *mm*

g. 1.2 *atm* = _____ *Pa*

h. 25.0 μm = _____ *m*

i. 2.65 *mm* = _____ *m*

j. 8.23 *m* = _____ *km*

k. 40.0 *cm* = _____ *m*

l. 6.23×10^{-7} *m* = _____ *nm*

m. 1.5×10^{11} *m* = _____ *km*

4. Geometry

Solve the following geometric problems.

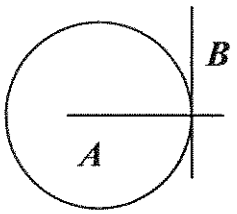
a. Line ***B*** touches the circle at a single point. Line ***A*** extends through the center of the circle.

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

_____

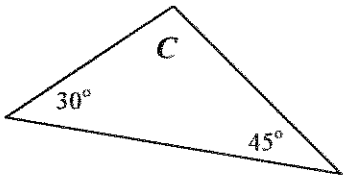
ii. How large is the angle between lines ***A*** and ***B***?

_____



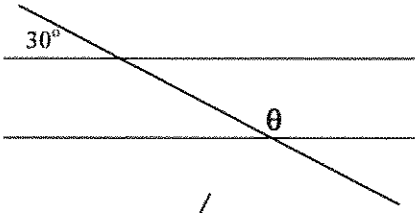
b. What is angle ***C***?

_____



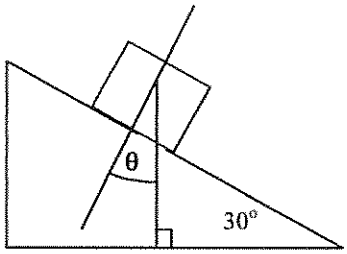
c. What is angle θ ?

_____



d. How large is ***θ***?

_____



e. The radius of a circle is 5.5 *cm*,

i. What is the circumference in <u>meters</u>?

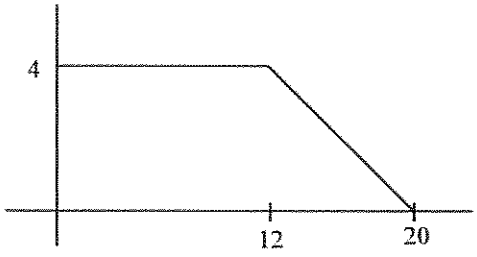
_____

ii. What is its area in <u>square meters</u>?

_____

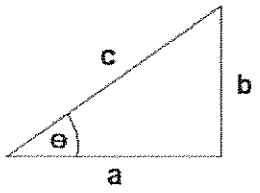
f. What is the area under the curve at the right?

_____



5. Trigonometry

Using the generic triangle to the right, Right Triangle Trigonometry and Pythagorean Theorem solve the following. ***Your calculator must be in degree mode.***



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

_____

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

_____

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

_____

j. $a = 250\ m$ and $b = 180\ m$, solve for θ and c.

_____

k. $a = 25\ cm$ and $c = 32\ cm$, solve for b and θ.

_____

l. $b = 104\ cm$ and $c = 65\ cm$, solve for a and θ.

_____

Vectors

Most of the quantities in physics are vectors. ***This makes proficiency in vectors extremely important.***

Magnitude: Size or extend. 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 **magnitude only**.

Examples: time, mass, and temperature

Vector: A physical quantity with **both a magnitude and a direction**. A directional quantity.

Examples: velocity, acceleration, force

Notation: $\vec{A}$ or $\overrightarrow{A}$ Length of the arrow is proportional to the vectors magnitude. Direction the arrow points is the direction of the vector.

Negative Vectors

Negative vectors have the same magnitude as their positive counterpart. They are just pointing in the opposite direction.

$\vec{A}$ $-\vec{A}$

Vector Addition and subtraction

Think of it as vector addition only. The result of adding vectors is called the resultant. $\vec{R}$

$\vec{A}+\vec{B}=\vec{R}$ $\vec{A}$ + $\vec{B}$ = $\vec{R}$

So if ***A*** has a magnitude of 3 and ***B*** has a magnitude of 2, then ***R*** has a magnitude of 3+2=5.

When you need to subtract one vector from another think of the one being subtracted as being a negative vector. Then add them.

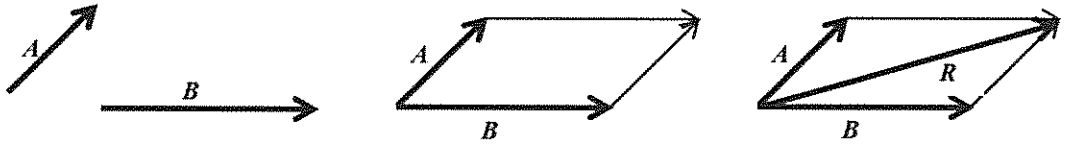
A negative vector has the same length as its positive counterpart, but its direction is reversed.
So if ***A*** has a magnitude of 3 and ***B*** has a magnitude of 2, then ***R*** has a magnitude of 3+(-2)=1.

This is very important. In physics a negative number does not always mean a smaller number. Mathematically –2 is smaller than +2, but in physics these numbers have the same magnitude (size), they just point in different directions (180° apart).

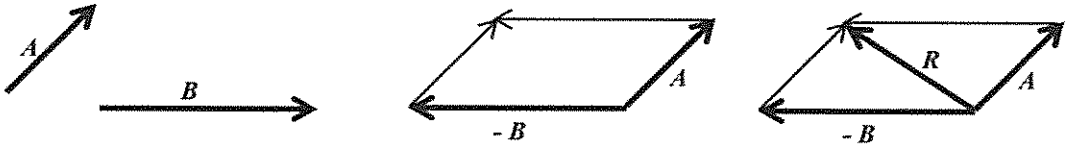
There are two methods of adding vectors

Parallelogram

$A+B$

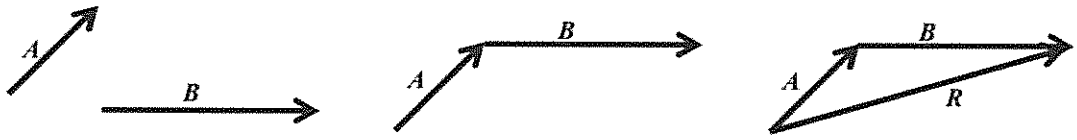


$A-B$

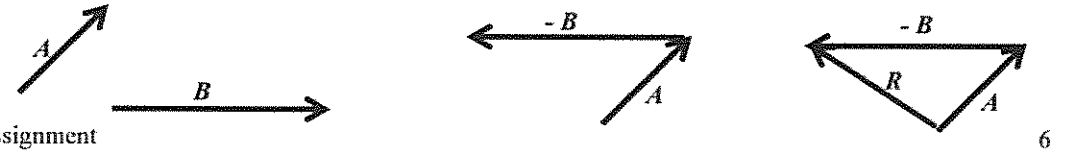


Tip to Tail

$A+B$

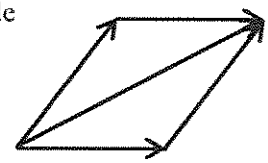


$A-B$

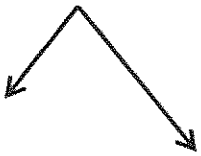


6. Drawing Resultant Vectors

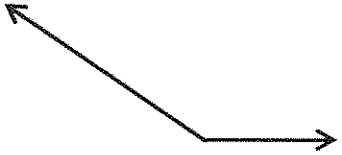
Draw the resultant vector using the parallelogram method of vector addition.

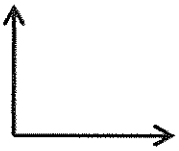
Example 

b. 

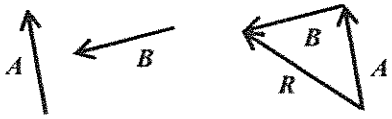
d. 

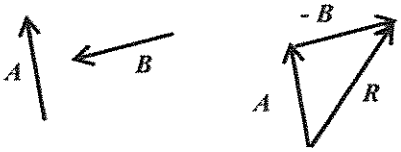
a. 

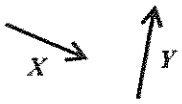
c. 

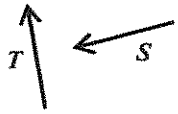
e. 

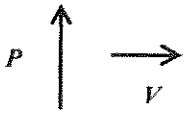
Draw the resultant vector using the tip to tail method of vector addition. Label the resultant as vector ***R***

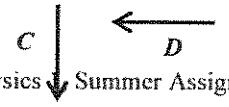
Example 1: $A + B$ 

Example 2: $A - B$ 

f. $X + Y$ 

g. $T - S$ 

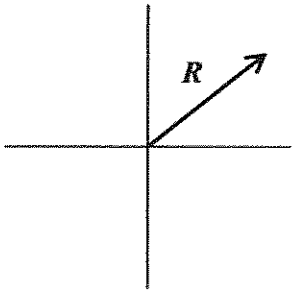
h. $P + V$ 

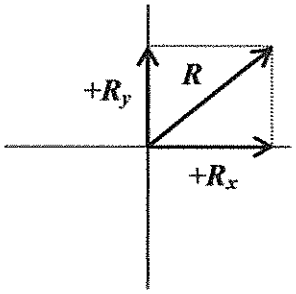
i. $C - D$ 

Component Vectors

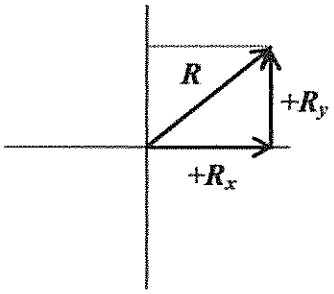
A resultant vector is a vector resulting from the sum of two or more other vectors. Mathematically the resultant has the same magnitude and direction as the total of the vectors that compose the resultant. Could a vector be described by two or more other vectors? Would they have the same total result?

This is the reverse of finding the resultant. You are given the resultant and must find the component vectors on the coordinate axis that describe the resultant.





or

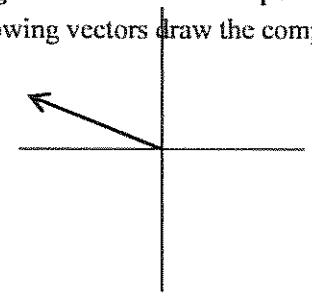


Any vector can be described by an x axis vector and a y axis vector which summed together mean the exact same thing. The advantage is you can then use plus and minus signs for direction instead of the angle.

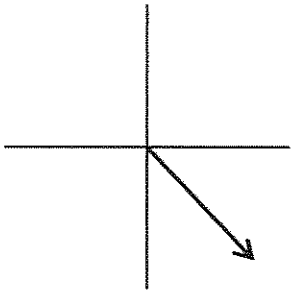
7. Resolving a vector into its components

For the following vectors draw the component vectors along the x and y axis.

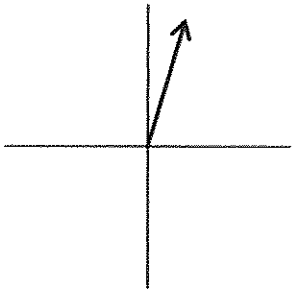
a.



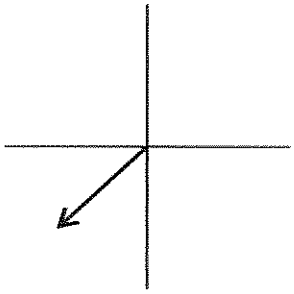
c.



b.



d.



Obviously the quadrant that a vector is in determines the sign of the x and y component vectors.