AP PHYSICS 1 – Summer Assignment 2020 - Cover Sheet

- **FIRST THING TO DO THIS YEAR IS PICK UP A COPY OF THE COLLEGE PHYSICS TEXT BOOK. THEN PLEASE PRINT OUT ALL 11 PAGES OF THIS DOCUMENT.**
- **COMPLETE ALL PAGES OF THE ATTACHED PACKET. Follow all directions. BE SURE TO SHOW YOUR WORK OR ELSE YOU WILL NOT GET CREDIT FOR THE ASSIGNMENT!**
- **NO COPYING OF WORK IS PERMITTED! IF THE WORK FOR THIS ASSIGNMENT IS NOT UNIQUELY YOURS, YOU WILL EARN A ZERO ON THE ASSIGNMENT AND DISCIPLINE ACTION WILL BE TAKEN!**
- **Read Chapters 1,2,3,4,5,6 on Pages (2 to 168) in the COLLEGE PHYSICS TEXT BOOK AND PREPARE OUTLINES (at least 4 pages) FOR EACH OF THE SIX CHAPTERS USING THE INSTRUCTIONS/GUIDELINES LISTED BELOW:**

Instructions/Guidelines for completing the 6 - AP Physics 1 Chapter Outlines:

Each Chapter Outline must be hand written in pen or pencil and the minimum length of at least ½ page per section and 4 pages per outline. You may always go beyond the minimum if you feel it is necessary.

Each Chapter Outline must follow the exact order of material that is presented in the Chapter.

Each Chapter Outline must include all new terms and equations covered in the chapter.

Each Chapter Outline must summarize all of the main ideas and supporting facts for every chapter section.

Each Chapter Outline must show original effort! No two Chapter Outlines should be similar! Copying will result in a 0 for the summer assignment so don't do it!

<u>15 Physics Problems</u> (Write the Chapter #'s and Problem #'s. Show all givens, all physics equations used, all work and box in your final answers.)
Pages 46 & 47 (6,7,8)
Pages 72 & 73 (7,8,9)
Pages 104 (2,3,4)
Page 141 (2,3,4)
Page 170 (7,15,16)

The Summer Assignment is due on the first day of school. Summer Assignments that are turned in late will be deducted half of the total possible points for the assignment. As described in this packet...the AP Physics 1 Summer Assignment has the following 5 main parts:
1). APlus Physics Video Assignment (attached)
2). Read Chapters 1-6 in the College Physics Text Book
3). Outline Chapters 1-6
4). 15 Physics Problems
5). Math Section (attached)

AP PHYSICS 1 SUMMER
ASSIGNMENT 2020

All students should obtain a copy of the textbook (College Physics) from the PAHS office.

The AP Physics 1 summer assignment is due at the beginning of class on the first day of school. The summer assignment is worth a total of 100 points. All work must be shown for math problems, calculations, and/or physics problems. Any assignment that is handed in without all of the work shown will receive a 0. This rule applies for the entire course so please show your work (PSYW)! Any summer assignment handed in after the beginning of the period will be deducted 50 points. No exceptions!

The text book has answers to odd problems in the back of the book. Therefore, you are expected to check the answers to the odd problems.

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PAHS's AP Physics 1. Summer Assignment is listed below:

	Video Assignment Go to the following web site: **http://www.aplusphysics.com/courses/ap-1/AP1_Physics.html** View the following videos: - Introduction What Is Physics? - Math Review 1. Significant Figures 2. Scientific Notation 3. Metric System 4. Vectors and Scalars - Mechanics ,Kinematics 1. Defining Motion 2. Graphing Motion 3. Kinematic Equations 4. Free Fall 5. Projectile Motion (Horizontal and Angled)	A. Take 1 page of hand written notes of each video. B. The videos have some example problems that must be included in your notes. Write down each question, your work and your answers. **The **aplusphysics** web site is an excellent AP Physics 1. resource. Bookmark it on your computer.
	Complete the **Math Section** included in this packet.	
	• **Read chapters 1-6 in the College Physics Text Book.** • **Outline Chapters 1-6** as specified. • **Do the following Problems:** pages 46&47 (6,7,8) pages 72&73 (7,8,9) page 104 (2,3,4) page 141 (2,3,4) page 170 (7,15,16) Include all units on all numbers.	**Your outlines should include:** key words with definitions, equations, units, concepts, etc. You may use diagrams etc. from the book. These are your notes. You are expected to outline each chapter during the course. When answering questions show all your work. Write neatly and clearly. Show steps. If you have the text book you will find the solutions in the back, use the solutions to check your answers.

AP Physics 1 Summer Assignment - Math Section

1. Scientific Notation:

The following are ordinary physics problems. Write the answer in scientific notation and simplify the units.

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

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

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

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

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

g. $\left(1.33\right)\sin 25.0^\circ = \left(1.50\right)\sin\theta$ 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? Universities want proactive learners that can find information needed to solve a problem (so do employers). To succeed at AP Physics you will need to be a proactive learner. **Hint: Use the Internet?**

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*

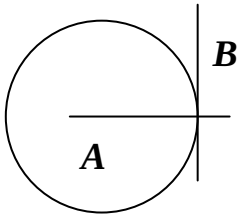
l. 6.23×10^{-7} *m* = _____ *nm*

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.



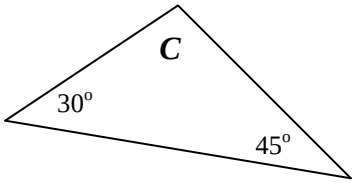
i. What is line ***B*** in reference to the circle?

_____

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

_____

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



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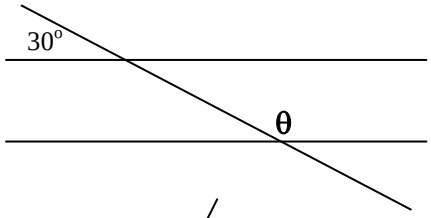
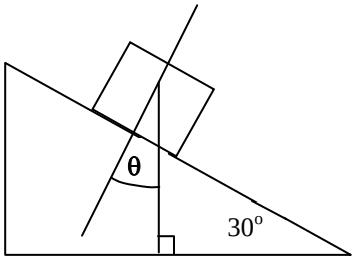
c. What is angle θ ?



_____

d. How large is θ?



_____

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

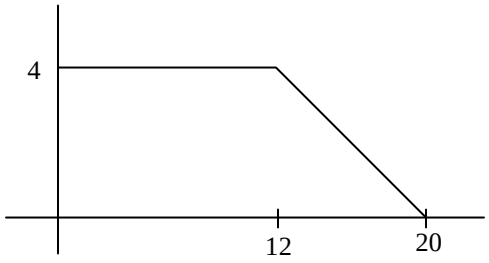
i. What is the circumference in <u>meters</u>?

_____

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

_____

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

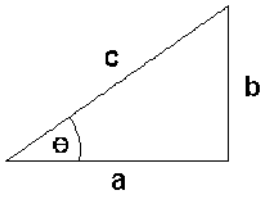


if the x and y axis are in units of meters?

_____

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

_____

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

_____

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

_____

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

_____

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

_____

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

_____

Vectors

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

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 **<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.

Examples: velocity, acceleration, force

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

Negative Vectors

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

$\overrightarrow{\quad A \quad}$ $\qquad$ $\overleftarrow{\quad -A \quad}$

Vector Addition and subtraction

Think of it as vector addition only. The result of adding vectors is called the <u>result</u>ant. $\vec{R}$

$\vec{A}+\vec{B}=\vec{R}$ $\qquad$ $\overrightarrow{\quad A \quad}$ + $\overrightarrow{\quad B \quad}$ = $\overrightarrow{\qquad R \qquad}$

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.

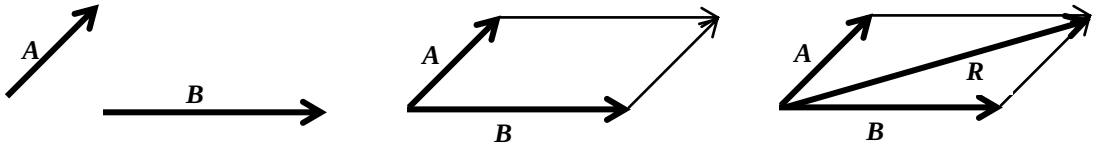
A negative vector has the same length as its positive counterpart, but its direction is reversed.
So if ***A*** has a magnitude of 3 and ***B*** has a magnitude of 2, then ***R*** has a magnitude of 3+(-2)=1.

<u>This is very important</u>. 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^o apart).

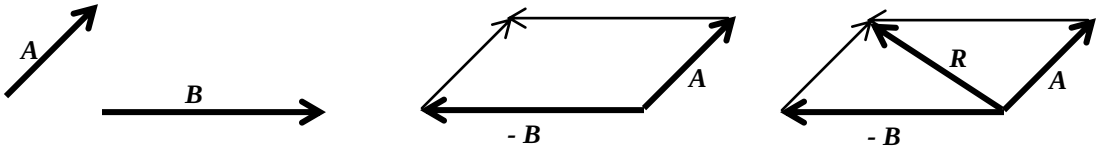
There are two methods of adding vectors

Parallelogram

A + ***B***

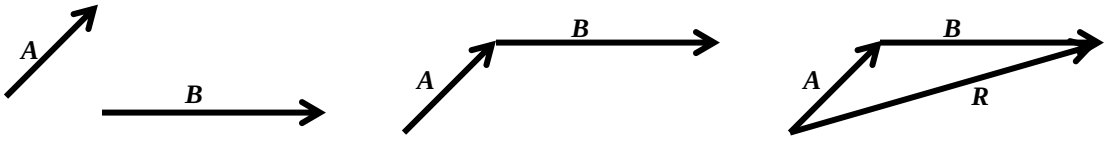


A – ***B***

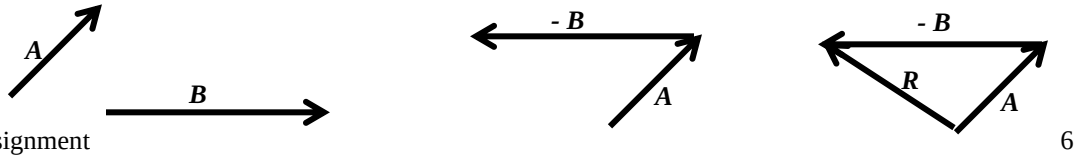


Tip to Tail

A + ***B***

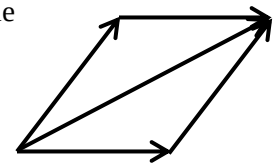


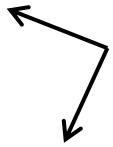
A – ***B***

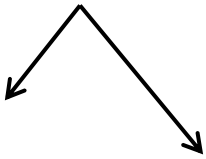


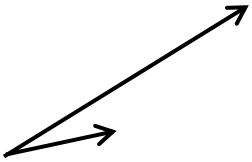
6. Drawing Resultant Vectors

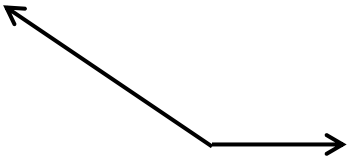
Draw the resultant vector using the parallelogram method of vector addition.

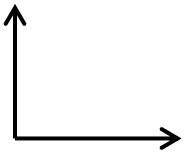
Example 

b. 

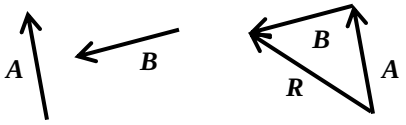
d. 

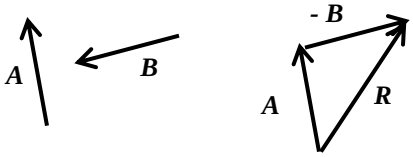
a. 

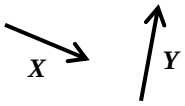
c. 

e. 

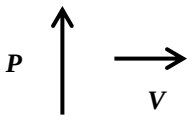
Draw the resultant vector using the tip to tail method of vector addition. Label the resultant as vector ***R***

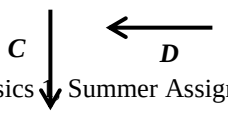
Example 1: ***A*** + ***B*** 

Example 2: ***A*** – ***B*** 

f. ***X*** + ***Y*** 

g. ***T*** – ***S*** 

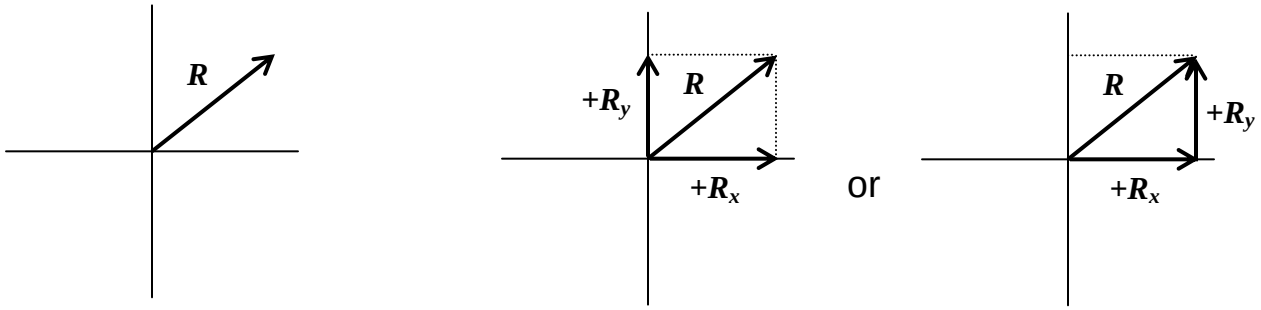
h. ***P*** + ***V*** 

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.

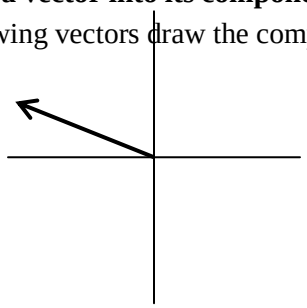


Any vector can be described by an ***x*** axis vector and a ***y*** axis vector which summed together mean the exact same thing. The advantage is you can then use plus and minus signs for direction instead of the angle.

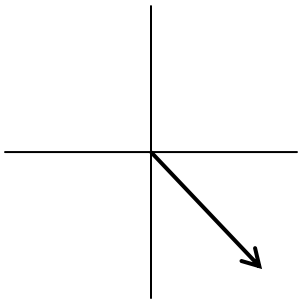
7. Resolving a vector into its components

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

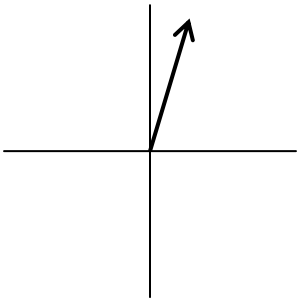
a.



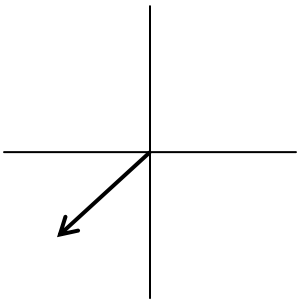
c.



b.



d.



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