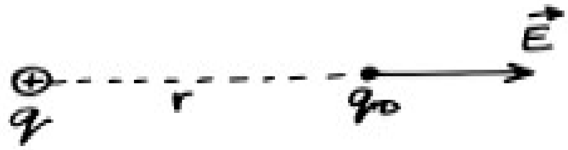
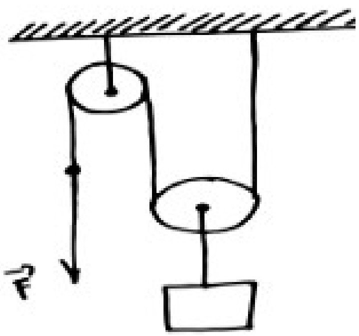
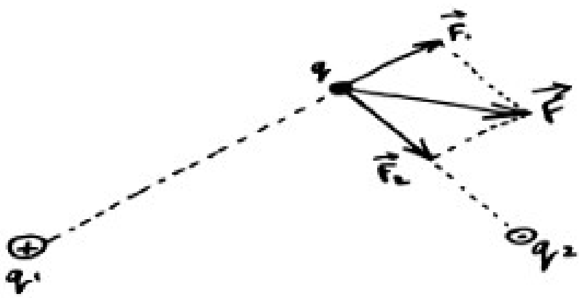
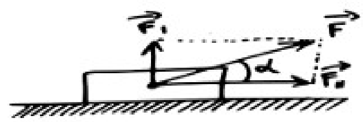


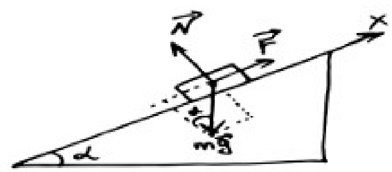


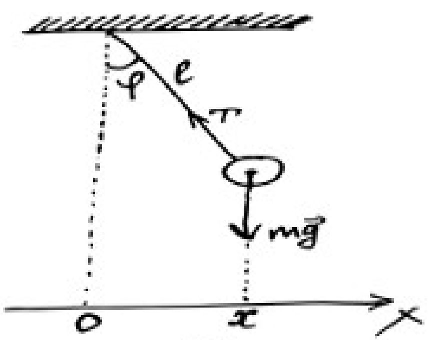
AP Physics 1

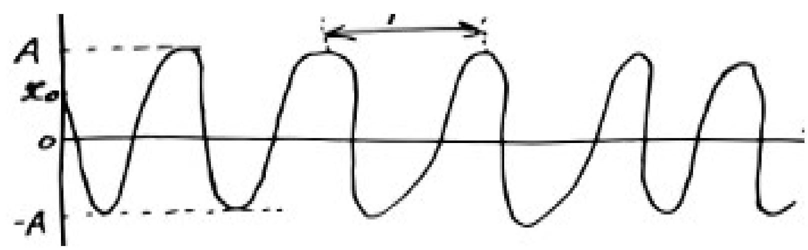
Summer Assignment

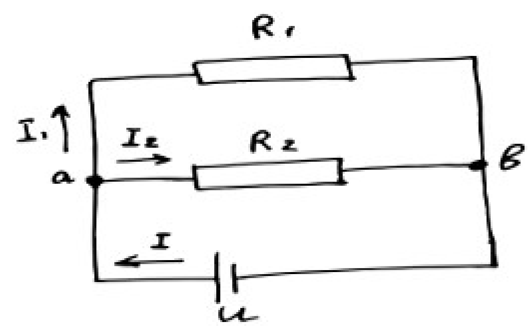


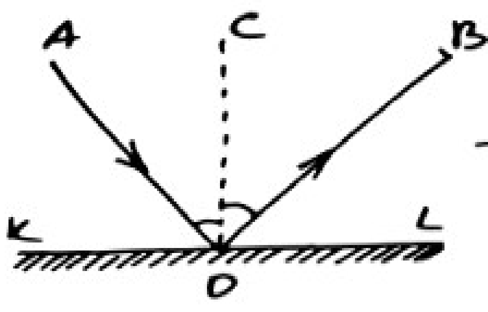


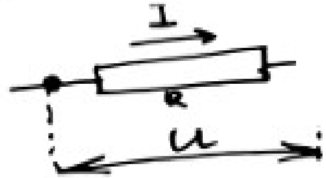












Dear Student,

Welcome to AP Physics 1! This is a college level Physics course that is fun, interesting and academically challenging on a level you might not have experienced yet. To complete the material and the labs, we must pass quickly through dimensional analysis and other basic topics.

This summer assignment will review all of the prerequisite knowledge expected of you. It is very important that this assignment be completed **individually**. Your summer work will be due at the beginning of class on the first day of school. It will count as your first test grade.

For help on these topics, please go to http://aplusphysics.com/community/index.php?/videos/category/29-general/. This website has wonderful videos for review that cover all of AP Physics. Should you have a question that you cannot figure out, please feel free to email me at lcarson@ccslancers.com. Please be patient as I may not have access to email every day.

I will be praying for each and every one of you this summer as I prepare for your arrival this fall. May God keep you safe and I hope you have a wonderful (and productive) summer.

Mrs. Carson

Part I - Significant Figures and Scientific Notation

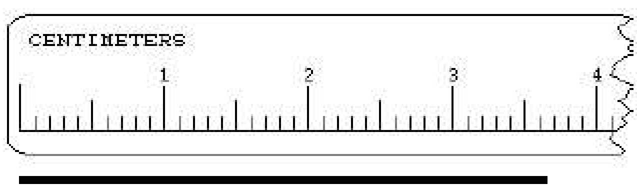
For each number given below, identify how many significant figures are in the number.

Significant Figures:

- All non-zero digits are significant.
- Never count the zeros at the beginning.
- Always count zeros between two other non-zero digits.
- Maybe count the zeros at the end. They must be designated as significant by having a decimal point in the number or a line over the last significant zero.

1. 0.56 ______
2. 5,984 ______
3. 5.9873 ______
4. 100,000 ______
5. 0.098 ______
6. 5 ______
7. 5.0 ______
8. 5.08 ______
9. 1870 ______
10. 1.400 ______

11. Measure the line with the ruler shown below to the correct number of significant figures. **Be sure to research how to properly read a ruler to the correct number of significant figures.**



a) Your Measurement:______________________
b) How many significant digits are there? _____

c) How do you know how many significant digits are necessary here?

12. In math operations involving significant figures, the answer is reported in such a way that it reflects the reliability of the least precise operation. In your own words, what are the rules for :

    a) multiplication and division of significant figures

    b) addition and subtraction of significant figures

Solve each problem. Be sure your answer has the ***correct number of significant figures*** *and the correct unit.*

13. (1.3 m)(71.5 m) =

14. 4.2 kg + 8.15 kg =

15. 38.520 L – 11.4 L =

16. $\frac{8.00\ m}{4.00\ s} =$

17. $\frac{0.82\ kg\ x\ 25.4\ m}{(0.116\ s)^2} =$

Express the following numbers in scientific notation. Keep the same units and ***significant figures*** *as provided. ALL answers in Physics need an appropriate unit to be correct.*

Examples: 200,000 = 2 x 10^5 0.00000123 = 1.23 x 10^{-6}

18. 7,620,000 kg =

19. 8327.2 s

20. 864,000 s =

21. 300,000,000 m/s

22. 0.000564 m =

23. 0.00000000000667 m

Express the following numbers without using scientific notation. Keep the same units and the same ***significant figures****.*

24. 9 x 10^9 s =

25. 1.93 x 10^4 kg/m^3

26. 1.00 x 10^3 m =

27. 4.50 x 10^{-7} m

Calculations with scientific notation (exponents):

- When numbers are multiplied together, you *multiply* the bases and *add* the exponents.
- When numbers are divided, you *divide* the bases and *subtract* the exponents.
- When an exponent is raised to another exponent, you *multiply* the exponents.

Using these rules, simplify the following numbers using proper scientific notation and significant figures.

28. $(3 \text{ x } 10^6)\cdot(2 \text{ x } 10^4) =$

29. $(1.2 \text{ x } 10^4) / (6 \text{ x } 10^{-2}) =$

30. $(7.0 \text{ x } 10^3)^2 =$

The following are ordinary Physics problems. Write the answer in scientific notation, with the proper significant figures and simplify the units.

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

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

33. $F = 9x10^{-9}\dfrac{\text{N}\cdot\text{m}^2}{\text{C}^2}\left(\dfrac{(3.2x10^{-9}\text{C})(9.6x10^{-9}\text{C})}{(0.32\text{ m})^2}\right) =$

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

35. $e = \dfrac{\left(1.7\times10^{3}\text{ J}\right)-\left(3.3\times10^{2}\text{ J}\right)}{\left(1.7\times10^{3}\text{ J}\right)} =$

Part II - Dimensional Analysis

A useful method of converting one unit to an equivalent unit is called dimensional analysis. You may be given the speed of an object as 25 **km/hr** and wish to express it in **m/s**. To make this conversion, you must change **km** to **m** and **hr** to **s** by multiplying by a series of factors so that the units you do not want cancel out and the units that you do want remain.

Example: $$\frac{25\ km}{hr} x \frac{1000\ m}{1\ km} x \frac{1\ hr}{3600\ s} = 6.9\ m/s$$

Fill in the power and the symbol for the following unit prefixes. Look them up as necessary. These should be memorized for next year. Kilo- has been completed as an example.

Prefix	Power	Symbol
Giga-		
Mega-		
Kilo-	10^3	k
Centi-		
Milli-		
Micro-		
Nano-		
Pico-		

To convert between prefixes, use a conversion factor by replacing the prefix symbol with the power. If there is no prefix, it is considered the base unit. For example, 1 km = 10^3 m.

To convert between two different prefixes, go through the base unit. This will require two conversions. For example, to convert from km to cm, convert km to m then m to cm.

Remember, if there is an exponent on the unit, the conversion must be done multiple times.

Convert the following numbers into the specified unit. Use scientific notation when appropriate.

1. 24 g = _______ kg
2. 94.1 MHz = _______ Hz
3. 6 Gb = ________ kb
4. 640 nm = ________ m
5. 3.2 m^2 = ________ cm^2
6. 40 mm^3 = _______ m^3
7. 1 g/cm^3 = _______ kg/m^3
8. 20 m/s = _______ km/hr

Complete the following conversions ***using dimensional analysis****. Use scientific notation as appropriate and follow significant figures.* ***Show all work to receive credit.***

9. How many seconds are in a year?

10. Convert 28 km to cm.

11. Convert 45 kg to mg.

12. Convert the speed of light, 3.00×10^8 m/s into km/day.

13. Convert 823 nm to m.

14. Convert 3.03×10^{-8} m into mm.

15. Convert 7.6 m^2 into cm^2.

16. Convert 8.5 cm^3 into m^3.

17. If a wood chuck can chuck 2 cubic meters of wood per minute, how many cubic centimeters per second is that equivalent to?

Part III – Algebra Review

Manipulating formulas algebraically is very important. Below are various Physics formulas. Don't worry about what the variables mean for now; we will learn that later. Just solve for the variable indicated. Don't let the different letters confuse you. Manipulate them as if they were numbers.

Solve for each of the indicated variables. Show all work for each step to receive credit.

1. $\Delta V = IR$, solve for I

2. $v_f = v_o + at$, solve for a

3. $mgh = ½ mv^2$, solve for v

4. $\Delta x = v_o t$, solve for t

5. $v_f^2 = v_o^2 + 2a(x_f - x_o)$, solve for a

6. $T = 2\pi\sqrt{\frac{l}{g}}$ solve for g

7. $U_s = ½ kx^2$, solve for x

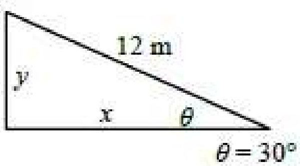
Part IV – Trigonometry Review

Write the formulas for each one of the following trigonometric functions. Remember SOHCAHTOA!

$\sin\theta =$ $\qquad$ $\cos\theta =$ $\qquad$ $\tan\theta =$

Calculate the following unknowns using trigonometry. Use a calculator, but show all of your work. Please include appropriate units with all answers. (Watch the unit prefixes!)

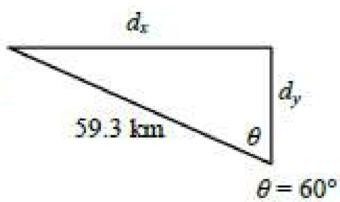
1.



$y =$ ________

$x =$ ________

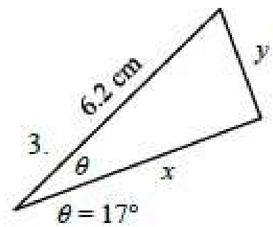
2.



$d_x =$ ______

$d_y =$ ______

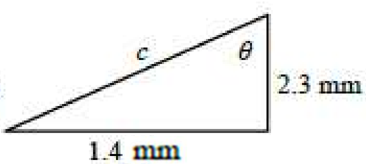
3.



$x =$ _____

$y =$ _____

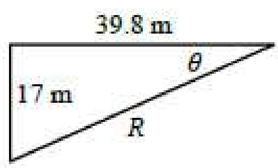
4.



$c =$ ______

$\theta =$ ______

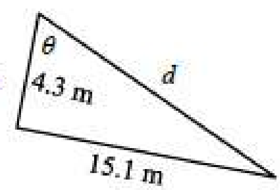
5.



$R =$ ______

$\theta =$ ______

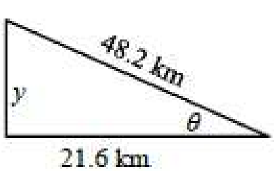
6.



$d =$ ______

$\theta =$ ______

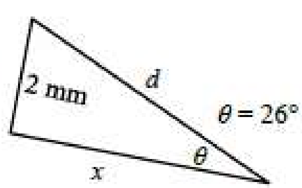
7.



$y =$ ______

$\theta =$ ______

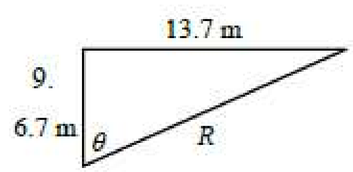
8.



$x =$ ______

$d =$ ______

9.



$R =$ ______

$\theta =$ ______

Part V – Graphing

You have been asked by your teacher to measure the radius and circumference of some round objects, such as cans, lids, CD's, coins, etc. You have collected the measurements and recorded them in the table below. Calculate the diameter and complete the table.

Radius (cm)	Circumference (cm)	Diameter (cm)
1.1	7.0	
3.2	20.0	
4.8	30.2	
8.8	55.0	
9.6	59.8	
12	75.2	

Graph the data below. The **diameter** is the independent variable and the circumference is the dependent variable. What does this mean for how you graph the data?

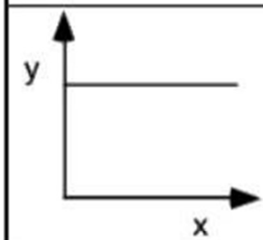
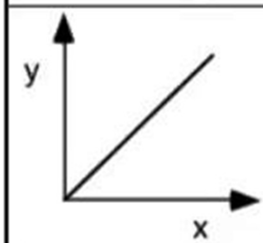
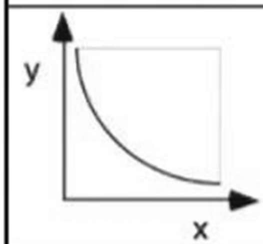
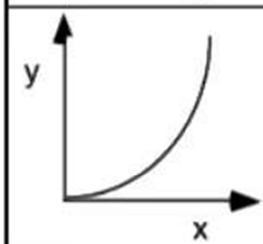
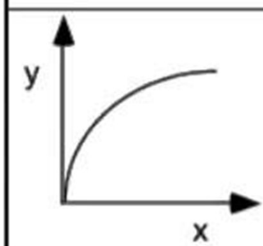
Be sure that your graph includes the following:

- Points for each data set.
- Title both axes (including units).
- Scale both axes appropriately. Label the axes with the scale.
- Title the graph.
- Draw a best fit line through the data points. **Do NOT just connect the dots.**

Give the equation for best-fit line:

Calculate the slope of the best-fit line. Is the slope constant? How do you know?

Many times in Physics it is necessary to "linearize" your data in order to better interpret the slope of the line. Use the following table to answer the questions on the next two pages.

Graph shape	Written relationship	Modification required to linearize graph	Algebraic representation
	As x increases, y remains the same. There is no relationship between the variables.	None	$y = b$, or y is constant
	As x increases, y increases proportionally. Y is directly proportional to x.	None	$y = mx + b$
	As x increases, y decreases. Y is inversely proportional to x.	Graph y vs $\frac{1}{x}$, or y vs x^{-1}	$y = m\left(\frac{1}{x}\right) + b$
	Y is proportional to the square of x.	Graph y vs x^2	$y = mx^2 + b$
	The square of y is proportional to x.	Graph y^2 vs x	$y^2 = mx + b$

Graph the following data. Use all proper graphing conventions. Plot B vs. A. This means to put A on the horizontal axis and B on the vertical axis.

A	**B**	
0	0	
1	2	
2	8	
3	18	
4	32	
5	50	

Using the table on the previous page, what is the **written relationship** between A and B? Be sure to use the variables A and B (not x and y).

Given this relationship, what should be graphed on the x and y axes in order to linearize the graph? State your answer in terms of A and B.

Fill in the empty column above with the appropriate modification that will be needed to graph a linearized version of the data. Then, graph your new data. Follow all graphing conventions.

What is the slope of this new graph and the equation of the line in terms of A and B?

Part VI – Relationships in Equations

1. Consider the following: $z = x/y$ $c = ab$ $l = m\sqrt{n}$ $r = s^2/t^2$

   As *x* increases and *y* stays constant, *z* ______________________.

   As *y* increases and *x* stays constant, *z* ______________________.

   As *x* increases and *z* stays constant, *y* ______________________.

   As *a* increases and *c* stays constant, *b* ______________________.

   As *c* increases and *b* stays constant, *a* ______________________.

   As *b* increases and *a* stays constant, *c* ______________________.

   As *n* increases and *m* stays constant, *l* ______________________.

   As *l* increases and *n* stays constant, *m* ______________________.

   If *s* is tripled and *t* stays constant, *r* is multiplied by ______________________.

   If *t* is doubled and *s* stays constant, *r* is multiplied by ______________________.

2. To solve for one variable in terms of other variables, you must pay attention to the variables that you are allowed to use in the final answer. In the following equation, solve for F_1 in terms of F_T, d_1, and d_2. This means that F_2 cannot be in your final answer. SHOW ALL WORK. Hint: Use substitution or elimination.

$$F_1 + F_2 = F_T \text{ and } F_1 \cdot d_1 = F_2 \cdot d_2$$