KMHS AP Physics 1 Summer Assignment

Welcome to AP Physics 1! This is a college level physics course that is fun, interesting and challenging on a level you may not have experienced yet. This summer assignment will review all of the prerequisite knowledge expected of you. There are 5 parts to this assignment. It might seem like a lot, but it should not take you any longer than a summer reading book assignment. By taking the time to review and understand all parts of this assignment, you will help yourself acclimate to the rigor and pacing of AP Physics 1. Use any resources available to you for help, but really this is all stuff you already know how to do (basic math skills). It is VERY important that this assignment be completed *individually.* It will be a total waste of your time to copy the assignment from a friend. Please keep the completed assignment with you for the first few days of class as we will take a quick assessment for which you will be allowed to use the assignment as a reference.

Part 1: Scientific Notation and Dimensional Analysis

Many numbers in physics will be provided in scientific notation. You need to be able to read and simplify scientific notation. **(This section is to be completed without calculators...all work should be done by hand.)**

Express the following the numbers in scientific notation. Keep the same unit as provided. ALL answers in physics need their appropriate unit to be correct.

1. 7,640,000 kg =
2. 2.83272 s =
3. 0.000000003 m =
4. 4.00093 km/s =

Often multiple numbers in a problem contain scientific notation and will need to be reduced by hand. Before you practice, remember the rules for exponents (circle or highlight the appropriate operation).

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

Using the three rules from above, simplify the following numbers in proper scientific notation:

5. $(3x10^6)(2x10^4)$ =

6. $(1.2x10^{4})/(6x10^{2})$ =
7. $(4x10^{8})(5x10^{-3})$ =
8. $(7x10^{3})^{2}$ =
9. $(8x10^{3})/(2x10^{5})$ =
10. $(2x10^{-3})^{3}$ =

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

Prefix	**Power**	**Symbol**
Giga		
Mega		
Kilo		
Centi	**10^{-2}**	
Milli		
Micro		
Nano		

Not only is it important to know what the prefixes mean, it is also vital that you can convert between metric units. If there is no prefix in front of a unit, it is the base unit which has 10^{1} for its power, or just simply "1", Remember if there is an exponent on the unit, the conversion should be raised to the same exponent as well.

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

11. 24 g = kg
12. 94.1 MHz = Hz
13. 6 Gb = kb
14. 640 nm = m
15. 3.2 m^2 = cm^2
16. 40 mm = m
17. 1 g/cm = kg/m
18. 20 m/s = km/hr

For the remaining scientific notation problems you may use your calculator. It is important that you know how to use your calculator for scientific notation. The easiest method is to use the "EE" button. An example is included below to show you how to use the “E” button.

Ex: 7.8×10^{-6} would be entered as 7.8“E "-6

19. $(3.67 \times 10^{3})(8.91 \times 10^{-6})$ =

20. $(5.32 \times 10^{-2})(4.87 \times 10^{-4})$ =

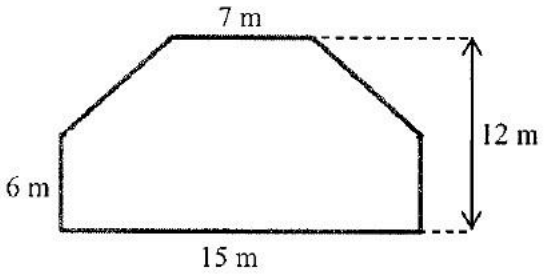
21. $(9.2 \times 10^{6})/(3.6 \times 10^{12})$ =

22. $(6.12 \times 10^{-3})^{3}$ =

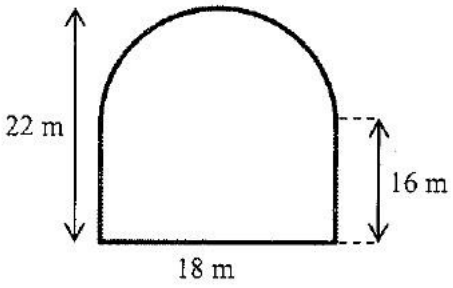
Part 2: Geometry

Calculate the area of the following shapes. It may be necessary to break up the figure into common shapes.

1. Area =

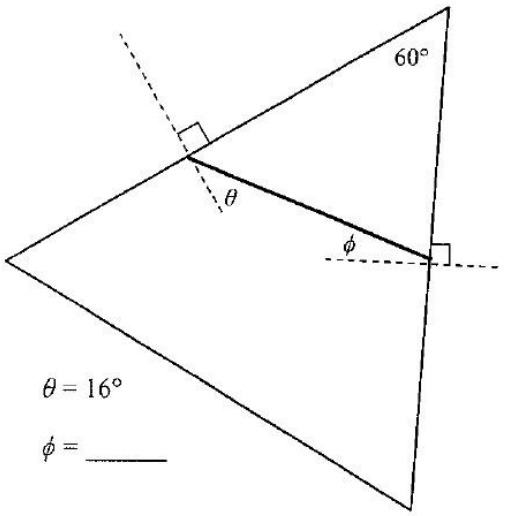


2. Area =



Calculate the unknown angle values for questions 3-6.

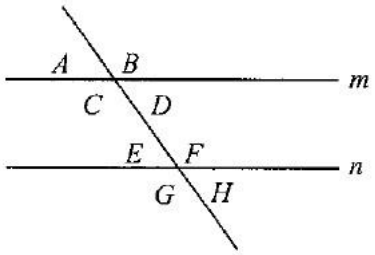
3.



$\theta = 16°$

$\phi =$ _____

4.

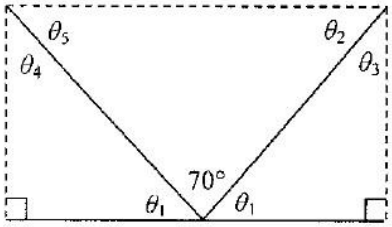


Lines m and n are parallel.

$A = 75°$ $B =$ _____ $C =$ _____ $D =$ _____

$E =$ _____ $F =$ _____ $G =$ _____ $H =$ _____

5.



$\theta_1 =$ _____

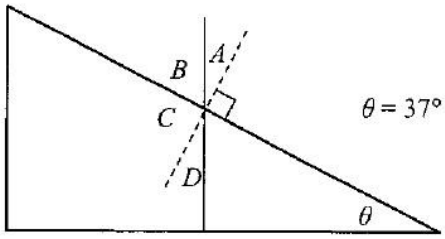
$\theta_2 =$ _____

$\theta_3 =$ _____

$\theta_4 =$ _____

$\theta_5 =$ _____

6.



$A =$ _____ $B =$ _____

$C =$ _____ $D =$ _____

Part 3: Trigonometry

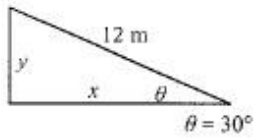
Write the formulas for each one of the following trigonometric functions. Remember SOHCAHTOA!

sin□ =

cos□ =

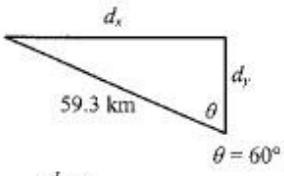
tan□ =

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. 

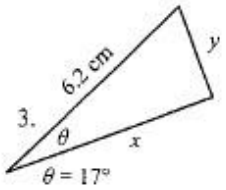
$y =$ _____

$x =$ _____

2. 

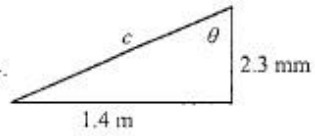
$d_x =$ _____

$d_y =$ _____

3. 

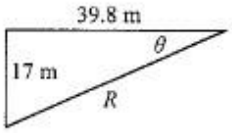
$x =$ _____

$y =$ _____

4. 

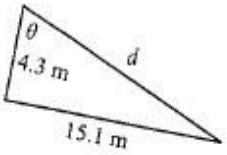
$c =$ _____

$\theta =$ _____

5. 

$R =$ _____

$\theta =$ _____

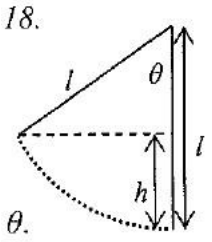
6. 

$d =$ _____

$\theta =$ _____

7. Find an expression for h in terms of l and θ.

8. What is the value of h if l = 6 m and θ = 40°?

18. 

Part 4: Algebra

Basic manipulation of variables is an important skill for finding numerical answers in physics. It is important to be able to recall algebraic rules and be able to solve equations for unknown variables BEFORE plugging it into your calculator. You cannot always rely on the calculator to solve equations you do not input correctly and it cannot take into account that some variables that you do not have numbers for will cancel out.

Solve these to refresh your algebra skills.

1. $X + 47 = 95$

2. $55 + a = -78$

3. $1/r = 1/5 + 1/15$

4. $1/32 = 1/f + 1/-8$

5. $37 = \dfrac{314.5}{x}$

6. $5 = \dfrac{3x - 4}{x}$

7. $2x = \dfrac{3x^2 - 16}{x}$

Solve for the given letter

1. $A = p + prt$ for t

2. $A = \dfrac{1}{2} d_1 d_2$ for d_1

3. $f_o = f_s \dfrac{(v + v_o)}{(v - v_s)}$ for v_o

4. $y = mx + b$ for m

5. $v = \sqrt{\dfrac{GM}{r}}$ for r

6. $F = k \dfrac{Q_1 Q_2}{r^2}$ for r

7. $F = \dfrac{m v^2}{r^2}$ for v

Systems of equations – solve the following for the decimal value of x:

1. $5x + y = -13$ and $x + 2y = 1$

2. $6x - 9y = -30$ and $-x + 18y = 5$

3. $4y = Ax$ and $y = A2$

Part 5: Graphing

A greater emphasis has been placed on conceptual questions and graphing on the AP exam. Below you will find a few example concept questions that review foundational knowledge of graphs. Ideally you won't need to review, but you may need to review some math to complete these tasks.

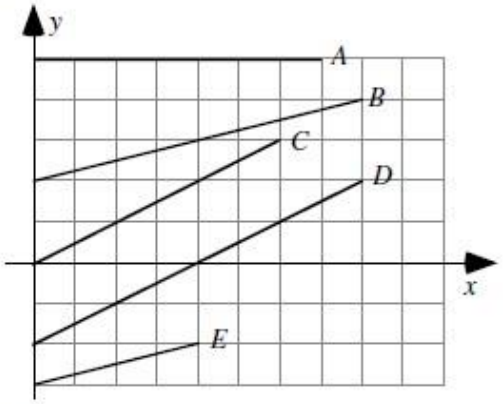
Key Graphing Skills to remember:

1. Always label your axes with appropriate units.
2. Sketching a graph calls for an *estimated* line or curve while plotting a graph requires individual data points AND a 'line of best fit'.
3. Provide a clear legend if multiple data sets are used
4. Never include the origin as a data point unless it is provided as a data point.
5. **Never** connect the data points individually, but draw a single smooth line or curve of best fit (no "connecting the dots")
6. When calculating the slope of the best fit line you must use points from your line. You may only use given data points IF your line of best fit goes directly through them.

Conceptual Review of Graphs - consider the following tasks and always include the "explain your reasoning" part as it is most important that you be able to explain why you answered the way you did.

A1-RT02: Y-X Graph Lines—Slope

Shown are several lines on a graph.



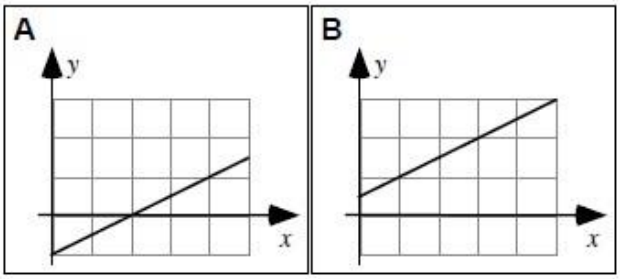
Rank the slopes of the lines in this graph.

					OR			
1 Greatest	2	3	4	5 Least		All the same	All zero	Cannot determine

Explain your reasoning.

A1-CT07: Line Graph II—Slope

Shown are two graphs.



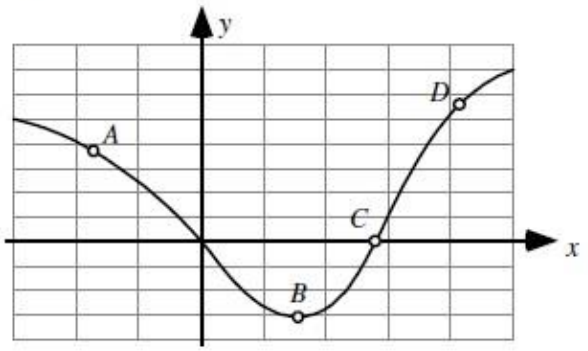
Is the slope of the graph (i) *greater in Case A*, (ii) *greater in Case B*, or (iii) *the same in both cases?* _____

Explain your reasoning.

For the next exercise rank any positive slopes as “greater than” and any negative slopes as “less than”

A1-RT08: CURVED LINE GRAPH—SLOPE

Four points are labeled on a graph.



Rank the slopes of the graph at the labeled points.

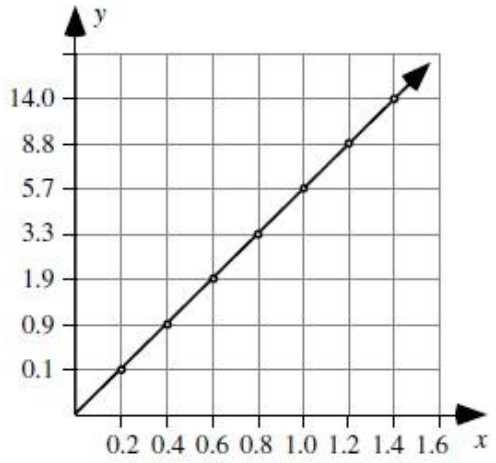
				OR			
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

A1-WWT09: Two Columns of Data—Data Graph

A student uses data from a table to make a graph as shown.

x	y
0.2	0.1
0.4	0.9
0.6	1.9
0.8	3.3
1.0	5.7
1.2	8.8
1.4	14.0



What, if anything, is wrong with this graph? If something is wrong, identify and explain how to correct all errors. If this statement is correct, explain why.