AP Physics 1 Summer Assignment

Ms. Carter

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Introduction

AP Physics 1 is an algebra-based, introductory college-level physics course. You will cultivate your understanding of physics through inquiry-based investigations as you explore these topics: kinematics, dynamics, circular motion and gravitation, energy, momentum, simple harmonic motion, torque and rotational motion, and fluids. This assignment is designed to refresh some material that we will immediately start using in class and possibly help you learn some new techniques for solving problems.

1 Scientific Notation and Dimensional Analysis

In Physics, we may work with extremely large or small numbers. To more easily write and understand these numbers, we use scientific notation. You should try and work on this section without a calculator to get used to quick conversions.

Rewrite the following numbers in proper scientific notation. Keep the unit that is provided and remember to ALWAYS WRITE YOUR UNITS!

1. 7,000 m

2. .00065 m/s

Frequently when we work with scientific notation we will be solving problems that include equations involving these numbers. For the next problem set, solve the mathematical operations involving numbers already in scientific notation.

Using scientific notation rules, simplify the numbers in the following problem set.

3. $(4 \times 10^6) \times (2 \times 10^4) =$

4. $(3.2 \times 10^2) \ / \ (4 \times 10^{-3}) =$

5. $(3 \times 10^9) \times (1.5 \times 10^{-10}) =$

6. $(6 \times 10^4)^2 =$

It is also extremely important to be able to convert across metric units. If a unit has no prefix, then it is a base unit with a 10^0 for its power, which is also equal to 1.

Convert the numbers given in the following problem set. Remember to keep appropriate units and use scientific notation if there are more than 4 digits.

7. 31 kg = _____ g

9. 5.7 m^2 = _____ mm^2

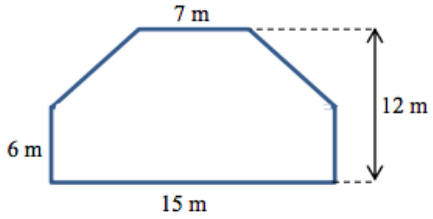
8. 70 Hz = _____ GHz

10. 4.96 km/s = _____ m/s

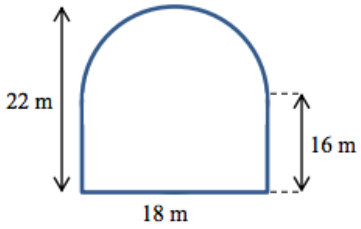
2 Geometry

Find the area of the following shapes, breaking them up into common shapes if needed.

1. Area = _____

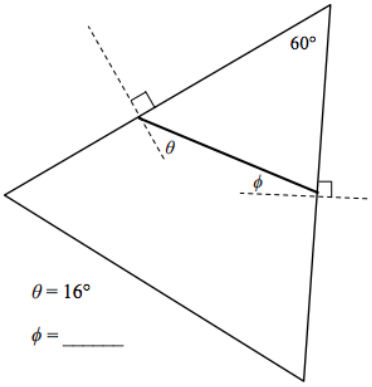


2. Area = _____

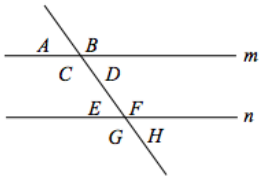


Calculate the unknown angles for the following problems.

3.



4.



Lines m and n are parallel.

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

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

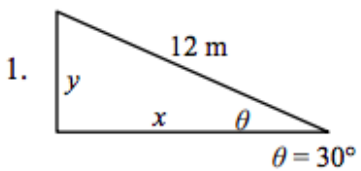
3 Trigonometry

Write the proper simple trig ratios for each of the following functions.

Sin $\theta =$ Cos $\theta =$ Tan $\theta =$

Solve for the following unknowns using your trig functions.

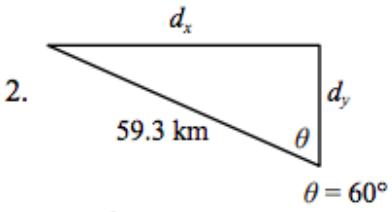
1.



$y =$ _____

$x =$ _____

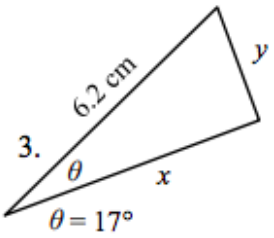
2.



$d_x =$ _____

$d_y =$ _____

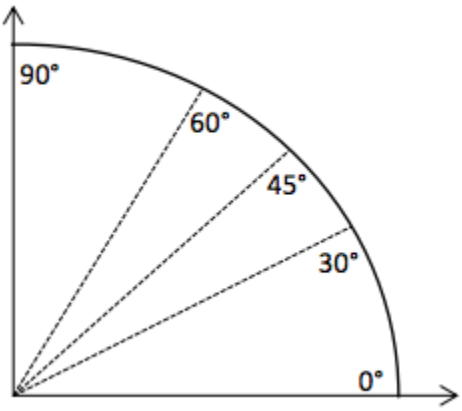
3.



$x =$ _____

$y =$ _____

For this class, you will need to know some of the common angles from the unit circle. Fill out the following chart by calculating the different angles of the unit circle. Be sure the write the answers in fraction form.



θ	$\cos\theta$	$\sin\theta$
0°		
30°		
45°		
60°		
90°		

Use your completed chart to answer the following questions.

10. At what angle is sine at a maximum?

11. At what angle is sine at a minimum?

12. At what angle is cosine at a maximum?

13. At what angle is cosine at a minimum?

14. At what angle are sine and cosine the same?

15. As the angle increases in the first quadrant, what happens to the cosine of the angle?

16. As the angle increases in the first quadrant, what happens to the sine of the angle?

4 Algebra

The following problems should give you some practice with the types of equations and necessary algebra that we will use in class. Make sure to show every step for every problem and use proper units!

Section I: Use the following 3 equations for the following problems.

$$v_f = v_0 + at \qquad x_f = x_0 + v_0 t + \tfrac{1}{2}at^2 \qquad v_f^2 = v_0^2 + 2a(x_f - x_0)$$

1. Using the first equation, solve for a, given $v_0 = 2$ m/s, $v_f = 10$ m/s, and $t = 1$ s.

2. Using the second equation, solve for t given $x_f = 40$ m, $x_0 = 0$, $v_0 = 6$ m/s, and $a = 2$ m/s^2.

3. Using the third equation, solve for v_0, given $v_f = 10$ m/s, $a = 3$ m/s, $x_f = 8$ m, and $x_0 = 2$ m.

4. How does each equation simplify when $a = 0$ m/s^2 and $x_0 = 0$ m?

Section II: Use the following 4 equations for the following problems.

$$\Sigma F = ma \qquad f_s \leq \mu_s N \qquad f_k = \mu_k N \qquad F_s = -kx$$

5. Using the first equation, solve for m, given $\Sigma F = 15$ N and $a = 2$ m/s^2.

6. Given $\Sigma F = f_k$, $m = 115$ Kg, $\mu_k = .1$, and $N = 10m$, find a.

7. If $\Sigma F = T - 10m$, and $a = 0$ m/s^2, use the first equation to find m in terms of T.

8. Using the last equation, solve for k, given $F_s = 850$ N and $x = 2$ m.

Section III: Use the following 2 equations for the following problems.

$$a = \frac{v^2}{r} \qquad\qquad \tau = rFsin\theta$$

9. If $a = 8$ m/s^2 and $r = 2$, what is v?

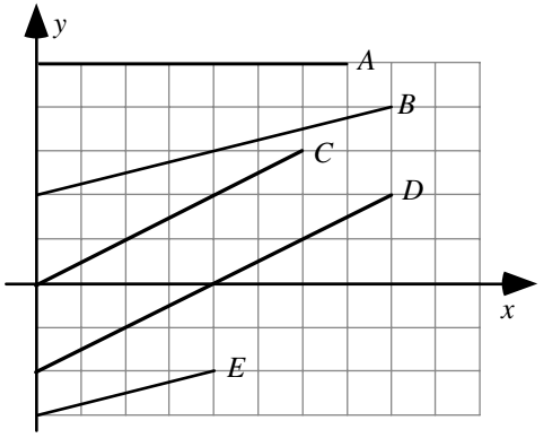
10. In one instance, $a = 25$ m/s^2. In the next instance, r is tripled, what is a now?

11. Using the second equation solve for θ, given $\tau = 3$ Nm, $r = 5$ m, and $F = .6$ N.

5 Graphs

Interpreting and drawing graphs are a large part of Physics. The following problems will give you examples of what you may see in class. Answer them to the best of your ability.

Shown are several lines on a graph.



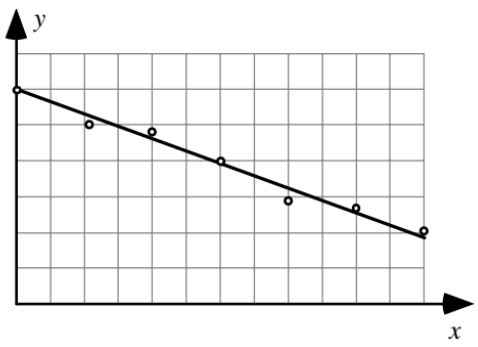
Rank the slopes of the lines in this graph.

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

A student makes the following claim about some data that he and his lab partners have collected:

"Our data show that the value of y *decreases as* x *increases. We found that* y *is inversely proportional to* x*."*

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



6 Scalars and Vectors

Scalars and Vectors are similar but very distinct types of quantities. For this section, you will be reviewing the general idea of them. I hope this will help you start understanding a complicated topic.

1. Read the following web page and summarize in YOUR OWN WORDS what each of the types of quantities are, scalars and vectors. Give 1 example of each, which can be found on the same web page. (Feel free to use separate lined paper for this)

https://www.physicsclassroom.com/class/1DKin/Lesson-1/Scalars-and-Vectors

*Adapted from Rich Township High School AP Physics Summer Assignment