

AP Physics 1 Summer Assignment

TVHS: Murphy

Welcome to AP Physics 1! This course is challenging and it is a lot of fun. Please use this assignment to review most of the math skills that you will need to use in this course. You will need a scientific calculator and a ruler for AP physics. If you have these items already, great! If not please try to get them before school starts. Graphing calculators are allowed, but not necessary. You have likely seen most, if not all, of the things in this assignment at some point during the last few years in school, but you may not remember all of it. If there is math here that you are unfamiliar with or that you felt unsure of in the past please do not panic! There are many resources available on the internet, such as Organic Chemistry Tutor and Khan Academy, to help you. I will provide tutoring on this material during the first couple of weeks of school to help students who need it. Please allow yourself time to complete this assignment. It is not meant for you to complete this in one sitting. **This assignment is due Friday, August 19, 2022.**

Part 1: Scientific Notation and Units

Express the following in scientific notation:

1. 7,605,000

2. 0.00423

3. 5345

4. 0.000000009

Complete the following questions **without a calculator**. Using the rules of exponents and the rules of multiplication and division, simplify the following and express your answer in scientific notation:

5. $(4 \times 10^5)(2 \times 10^3)$

7. $(4 \times 10^5) / (2 \times 10^3)$

6. $(3 \times 10^8)(6 \times 10^{-3})$

8. $(5 \times 10^{-3})^2$

Fill in the power and the symbol for the following unit prefixes.

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

AP Physics 1 Summer Assignment

TVHS: Murphy

Unit conversions are often necessary in physics as in all science classes. Convert the following numbers to the specified unit. Use scientific notation where appropriate.

9. $52 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

10. $52 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

11. $1,320 \text{ m} = \underline{\hspace{2cm}} \text{ km}$

12. $654 \text{ nm} = \underline{\hspace{2cm}} \text{ m}$

13. $25 \text{ m/s} = \underline{\hspace{2cm}} \text{ km/s}$

14. $74 \text{ GHz} = \underline{\hspace{2cm}} \text{ MHz}$

Sometimes we will need to convert from imperial units (inches, feet, pounds, etc.) to metric units. Convert the following units from imperial to metric. Some of the questions below require you to convert to seconds. Express your answers in scientific notation where appropriate. (use this information: $2.2 \text{ lbs} = 1 \text{ kg}$, $1 \text{ mi} = 1.6 \text{ k}$)

15. $12 \text{ miles} = \underline{\hspace{2cm}} \text{ km}$

16. $4,320 \text{ m} = \underline{\hspace{2cm}} \text{ mi}$

17. $32 \text{ lbs} = \underline{\hspace{2cm}} \text{ kg}$

18. $0.7 \text{ kg} = \underline{\hspace{2cm}} \text{ lbs}$

19. $30 \text{ mi/hr} = \underline{\hspace{2cm}} \text{ m/s}$

20. $30 \text{ m/s} = \underline{\hspace{2cm}} \text{ mi/hr}$

Use a calculator for the next few problems. Your calculator most likely has a special button for scientific notation. This button says "EE" or "Exp" Use the "EE" or "Exp" button like this: 6.2×10^7 is entered as $6.2\text{EE}7$

You also have a special calculator button to enter negative numbers in. This button has the symbol "+/-" To enter in a number in scientific notation with a negative exponent, use both your special scientific notation button and your negative/positive button like this:

3.4×10^{-5} is entered as $3.4\text{EE}+/-5$

If you are struggling with your particular calculator, bring it to class with you the first week of school and I'll show you how to use it.

21. $(3.67 \times 10^4)(4.26 \times 10^{-2}) =$

22. $(6.36 \times 10^{-2})(3.47 \times 10^{-7}) =$

23. $(5.2 \times 10^6) / (9.6 \times 10^{11}) =$

24. $(8.24 \times 10^{-2})^3 =$

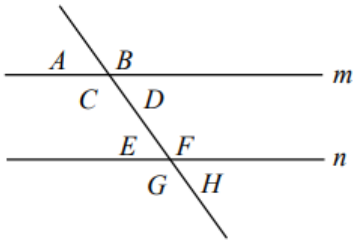
AP Physics 1 Summer Assignment

TVHS: Murphy

Part 2: Geometry

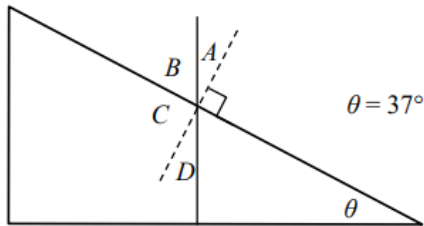
Find the unknown angles:

1. m and n are parallel



$A = 75^\circ$ $B = \underline{\hspace{2cm}}$ $C = \underline{\hspace{2cm}}$ $D = \underline{\hspace{2cm}}$
 $E = \underline{\hspace{2cm}}$ $F = \underline{\hspace{2cm}}$ $G = \underline{\hspace{2cm}}$ $H = \underline{\hspace{2cm}}$

2.



$A = \underline{\hspace{2cm}}$ $B = \underline{\hspace{2cm}}$
 $C = \underline{\hspace{2cm}}$ $D = \underline{\hspace{2cm}}$

Part 3: Trigonometry

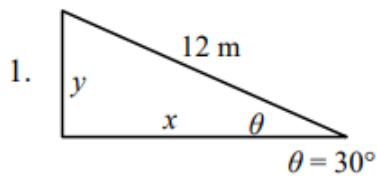
Write down the formulas for the following:

$\sin \theta =$

$\cos \theta =$

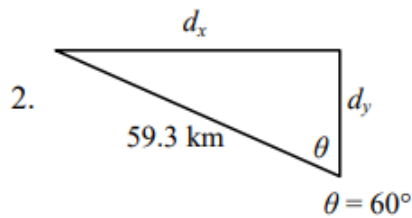
$\tan \theta =$

Calculate the unknowns:



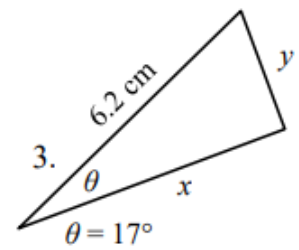
$y = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$



$d_x = \underline{\hspace{2cm}}$

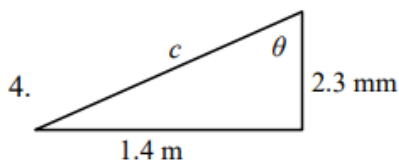
$d_y = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$

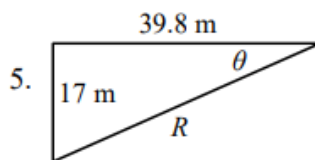
$y = \underline{\hspace{2cm}}$

AP Physics 1 Summer Assignment
TVHS: Murphy



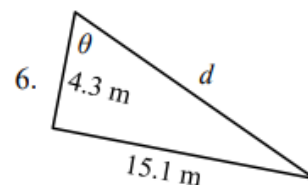
$c = \underline{\hspace{2cm}}$

$\theta = \underline{\hspace{2cm}}$



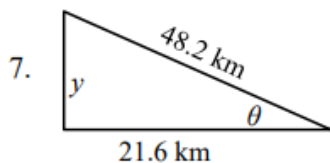
$R = \underline{\hspace{2cm}}$

$\theta = \underline{\hspace{2cm}}$



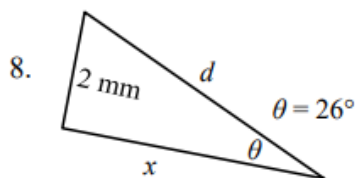
$d = \underline{\hspace{2cm}}$

$\theta = \underline{\hspace{2cm}}$



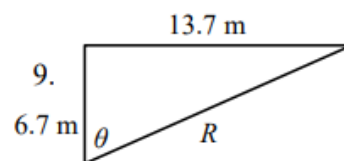
$y = \underline{\hspace{2cm}}$

$\theta = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$

$d = \underline{\hspace{2cm}}$



$R = \underline{\hspace{2cm}}$

$\theta = \underline{\hspace{2cm}}$

Part 4: Variables and Graphing

Graphing skills are critical for success in AP physics. You will need to be able to read graphs and you will need to be able to make them. We will go over this together as a class, however here are the basic rules of graphing:

1. All graphs require a title and accurately labeled axes with quantities measured and units (units go in parentheses).
2. Always provide data along with your graph for lab assignments and make sure your data columns are clearly labeled.
3. Never use "x" and "y" to label your graph axes. Always use the quantity you are actually plotting.
4. Never "connect the dots" on your graph. We use a line of best fit for data analysis.
5. When calculating the slope of the best fit line you always must use points ON the line of best fit. Do not use a data point to calculate the slope unless the line of best fit passes directly through it.

Independent and dependent variables:

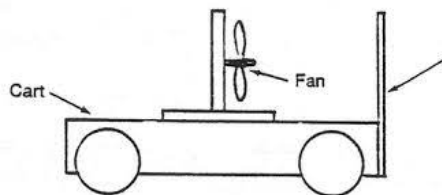
In math, you learned that the variable that is graphed on the horizontal axis (usually "x") is the independent variable and that the variable that is graphed on the vertical axis (usually "y") is the

AP Physics 1 Summer Assignment

TVHS: Murphy

dependent variable. In science we use this same convention. In science the independent variable in an experiment is the thing that you change and the dependent variable is the thing that changes as a result.

1. Students conduct a survey to determine if the number of hours spent studying each week has an effect on average test scores in a math class. The independent variable is _____ and the dependent variable is _____.
2. A student conducts an investigation to determine if different types of fertilizer affect the growth rate of a particular plant. The independent variable is _____ and the dependent variable is _____.
3. Students conduct an experiment using a fan cart like the one here:

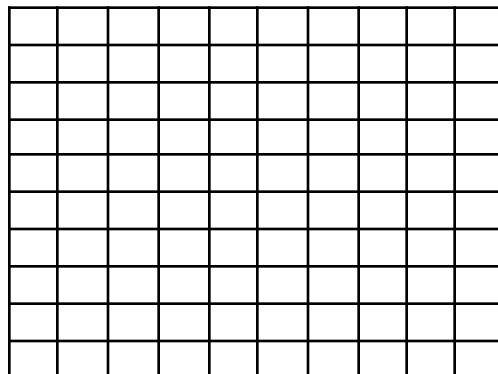


The students are able to add mass to the cart. The students add mass to the cart and measure the time it takes for the cart to move a distance of 1 meter. The independent variable is _____. The dependent variable is _____.

4. The students obtain the following data:

| Mass (kg) | Time (s) |
|-----------|----------|
| 2 | 6 |
| 4 | 8 |
| 6 | 12 |
| 8 | 15 |
| 10 | 18 |

Graph the data on the grid below. Be sure to label the graph using the rules for graphing!



AP Physics 1 Summer Assignment

TVHS: Murphy

5. Draw a line of best fit on your graph. This data is pretty linear so it should be easy, you can probably “connect the dots” this time.
6. What is the slope of your line?
7. What is the intercept of your line?
8. Using the slope and intercept, write the mathematical relationship that describes the graph (the equation of the line in slope-intercept form).
9. Write a complete sentence that describes the relationship between mass and time for this experiment.

Part 5: Algebra

AP Physics 1 is an algebra-based, college level course in physics. You will need to apply basic algebra throughout the course.

1. Use the equation $y = at + c$ to complete the following:
 - a. Rearrange the equation and solve for t . Do not plug in any numbers!
 - b. $c = 3$, $a = 5$, $y = 1$, solve for t .
2. Use the equation $g = 3t^2 + 4t$ to complete the following:
 - a. Simplify the equation
 - b. Find all solutions for t if $g = 0$

AP Physics 1 Summer Assignment

TVHS: Murphy

3. Use the equation $g = 1/x^2$ to complete the following. Express all answers as fractions.

a. Solve for g when $x = 1$

b. Solve for g when $x = 2$

c. Complete the following statement:

2 is _____ times greater than 1.

d. Complete the following statement:

When x is doubled, g becomes _____ times smaller/bigger.

Once you have successfully completed this assignment, congratulations! You are ready for success in AP Physics! If you struggled a little, that's okay. **I will run study sessions at the start of the school year to help with the little things that students get stuck on.** When you are done you may email me for the answer key if you want to check your work. I will check my work email periodically throughout the summer, please be patient when awaiting a response!

This class is challenging, but it is also extremely rewarding. If you are willing to work hard during class, and you complete the homework assignments, you will learn what you need to know and be very successful. By the end of the school year you will find that your classmates have become like family, and you will be amazed at what you are able to accomplish. Enjoy your summer and I look forward to getting to know you this school year!

Ms. Murphy

djaeggi-murphy@tvusd.us