

## *AP Physics 1 Summer Assignment*

Welcome to AP Physics 1! It is a college level physics course that is fun, interesting and challenging on a level you've not yet experienced. This summer assignment will review all the prerequisite knowledge expected of you. There are 7 parts to this assignment. It is quantity not the difficulty of the problems that has the potential to overwhelm, so do it over an extended period of time. By taking the time to review and understand all parts of this assignment, you will help yourself acclimatize to the rigor and pacing of AP Physics 1. Use a book or the internet if you need to, but really this is all stuff you already know how to do (basic math skills), or you can email me at [tcolizzi@behs.com](mailto:tcolizzi@behs.com) or TEAMS chat me, if you are stuck or have a question. I'll get back to you as quickly as I can. 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 since you will not be prepared for the first day of class. The summer assignment will be due the first day of class. If it is not turned in on the first day of class it will be a zero that cannot be recovered.

Good luck!

**READ ALL DIRECTIONS CAREFULLY. YOUR GRADE DEPENDS ON HOW WELL DIRECTIONS ARE FOLLOWED. MOST ANSWERS MUST BE WRITTEN ON THE ANSWER SHEET (SEE SEPARATE ATTACHMENT). ANSWER 1-144 WILL GO IN THE TABLE. THE LAST SECTIONS' ANSWERS WILL BE WRITTEN ON THE APPROPRIATE PAGES.**

**Note: Each section has a link to a video and on-line practice that can help you to review each topic**

### **Part 1: Scientific Notation and Dimensional Analysis**

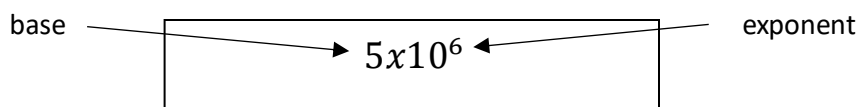
Scientific Notation Review: <http://bit.ly/2HzJLnU>

Scientific Notation Practice: <http://bit.ly/yayphys2>

Many numbers in physics will be provided in scientific notation. You need to be able read and simplify scientific notation. (This section is to be completed without calculators...all work should be done by hand.) Directions: Express the following the numbers in scientific notation. Make sure you round correctly (0-2 Decimals).

1. 45,440,000
2. 25,682.2
3. 0.00000006
4. 0.00045
5. 205
6. 0.589
7. 15.3
8. 6

Often times multiple numbers in a problem contain scientific notation and will need to be reduced by hand. Before you practice, remember the rules for exponents. base exponent  $5 \times 10^6$



**Multiplying and Dividing with Scientific Notation Review:** <http://bit.ly/2r4LwDo>

Give the correct answers for the following statements.

You will write two answers for problems 9 and 10. (feel free to look these rules up!)

9. When numbers in scientific notation are multiplied together, you (*a. add or b. subtract*) the exponents and (*c. multiply or d. divide*) the bases.
10. When numbers in scientific notation are divided, you (*a. add or b. subtract*) the exponents and (*c. multiply or d. divide*) the bases.
11. When an exponent is raised to another exponent, you (*a. add, b. subtract, c. multiply, or d. divide*) the exponent.

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

12.  $(5 \times 10^6) \cdot (3 \times 10^3) =$

13.  $(4 \times 10^9) \cdot (5 \times 10^{-4}) =$

14.  $(6 \times 10^2) \cdot (2 \times 10^4) =$

15.  $(7 \times 10^{-1}) \cdot (9 \times 10^6) =$

16.  $(2 \times 10^5)^2 =$

17.  $(2 \times 10^{-4})^4 =$

18.  $(6 \times 10^3)^2 =$

19.  $(2 \times 10^5)^{-2} =$

20.  $\frac{(2 \times 10^3)}{(6 \times 10^6)} =$

21.  $\frac{(1.2 \times 10^5)}{(6 \times 10^{-3})} =$

22.  $\frac{(10 \times 10^{-5})}{(5 \times 10^4)} =$

23.  $\frac{(8 \times 10^{-2})}{(2 \times 10^{-4})} =$

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. (The numbers in each box are the numbers on the answer sheet where you should enter your answer).

| PREFIX | POWER | SYMBOL |
|--------|-------|--------|
|--------|-------|--------|

|        |        |     |
|--------|--------|-----|
| Giga-  | 24.    | 25. |
| Mega-  | 26.    | 27. |
| Kilo-  | $10^3$ | k   |
| Centi- | 28.    | 29. |
| Milli- | 30.    | 31. |
| Micro- | 32.    | 33. |
| Nano-  | 34.    | 35. |
| Pico-  | 36.    | 37. |

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 100 for its power ( $100 = 1$ ). Remember if there is an exponent on the unit, the conversion should be raised to the same exponent as well.

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

Converting Units Review: <http://bit.ly/2HXEOBW>

Converting Units Practice: <http://bit.ly/2HwKCtr>

- 38. 564g to kilograms
- 39. 101.3 MHz to Hertz
- 40. 1.7 Gb to kilobytes
- 41. 64nm to meters
- 42. 4.5 L to milliliters
- 43. 200 kg to grams
- 44. 0.1 mm to meters
- 45. 5 kb to megabytes

Directions: 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 “EE” button.

Ex:  $7.8 \times 10^{-6}$  would be entered as 7.8“EE”-6, which would read as 7.8E-6 on your calculator screen. Using this “E” notation in your calculator will help you prevent many common errors in your calculations. Also note: “E” notation is for calculators and computers only. When writing answers you should never use “E” notation.

Scientific Notation Using Graphing Calculators Review: <http://bit.ly/2Jy63ai>

- 46.  $(8.72 \times 10^4)(4.36 \times 10^{-4})$
- 47.  $(10.54 \times 10^{-3})(2.11 \times 10^{-5})$
- 48.  $\frac{(8 \times 10^5)}{(2.1 \times 10^{10})}$
- 49.  $(4.77 \times 10^{-4})^7$

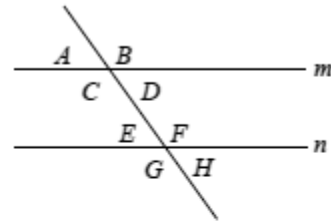
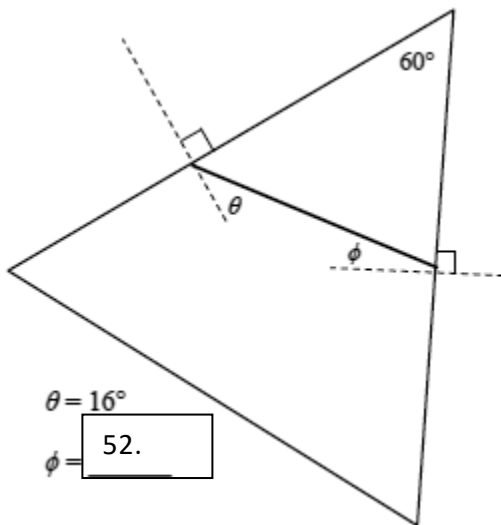
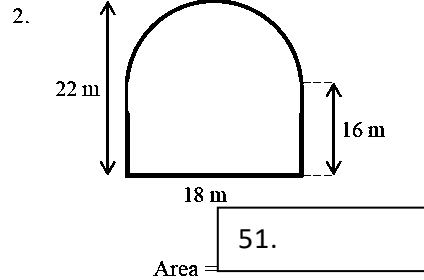
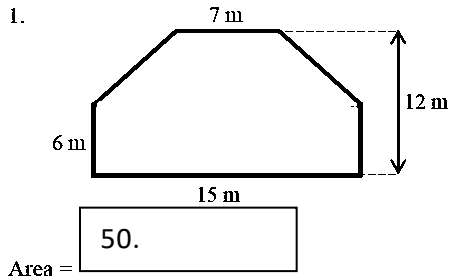
## ***Part 2: Geometry***

Calculate the area of the following shapes. It may be necessary to break up the figure into common shapes. (The numbers in each box are the numbers on the answer sheet where you should enter your answer).

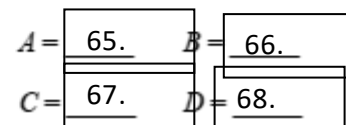
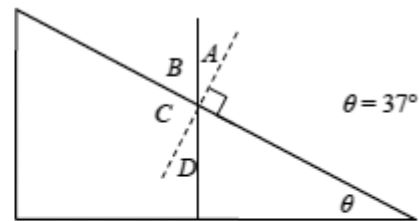
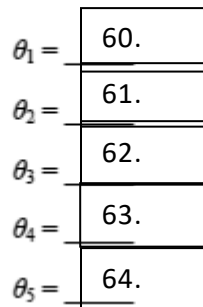
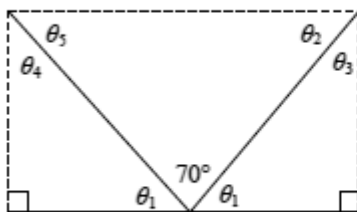
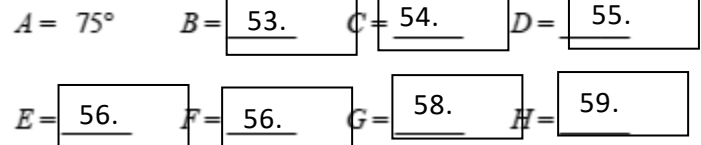
Calculating Area Review: <http://bit.ly/2HEo9qg>

Angles in Geometry Review: <http://bit.ly/2vRHvHj>

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



Lines  $m$  and  $n$  are parallel.



#### 4: Trigonometry

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

Trigonometry Functions Review: <http://bit.ly/2jfc6k6>

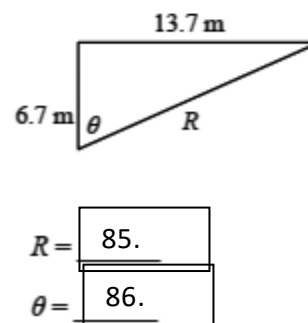
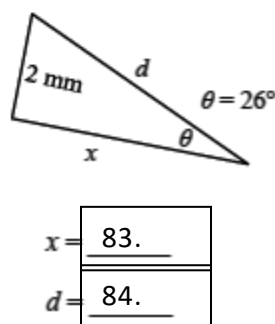
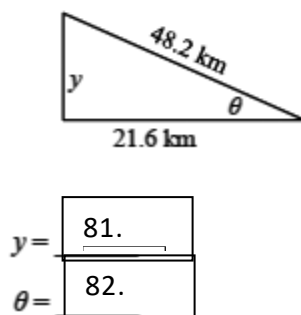
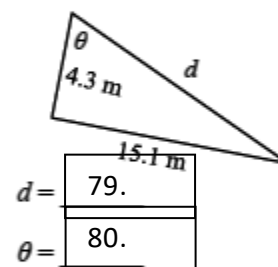
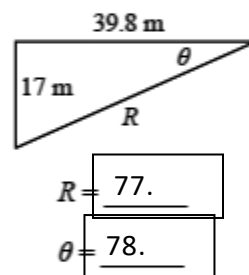
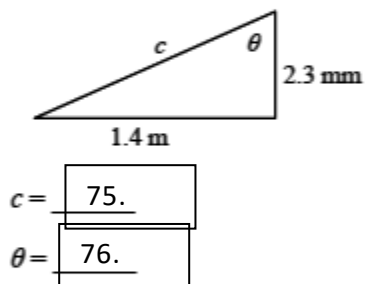
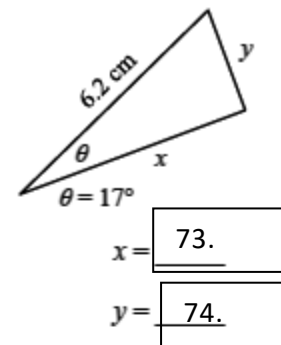
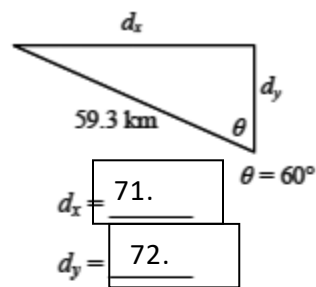
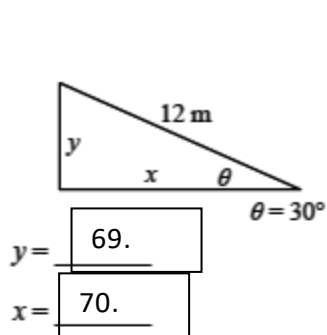
Trigonometric Functions Practice: <http://bit.ly/2HUlyfD>

$\sin\theta =$

$\cos\theta =$

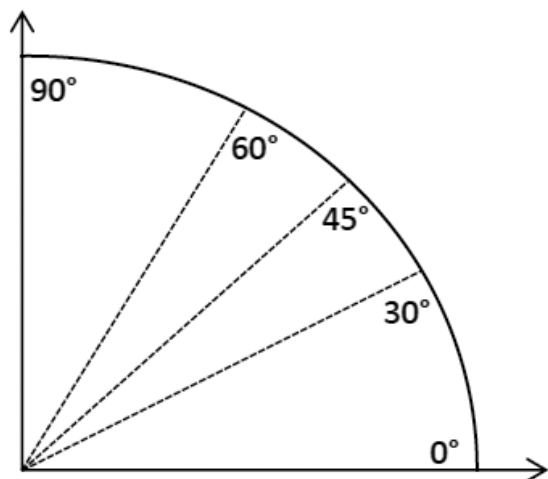
$\tan\theta =$

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!)



You will need to be familiar with trigonometric values for a few common angles. Memorizing this unit circle diagram in degrees or the chart below will be very beneficial for next year in both physics and pre-calculus. How the diagram works is the cosine of the angle is the x-coordinate and the sine of the angle is the y-coordinate for the ordered pair. Write the ordered pair (in fraction form) for each of the angles shown in the table below

Refer



| $\theta$   | $\cos\theta$ | $\sin\theta$ |
|------------|--------------|--------------|
| $0^\circ$  | 87.          | 88.          |
| $30^\circ$ | 89.          | 90.          |
| $45^\circ$ | 91.          | 92.          |
| $60^\circ$ | 93.          | 94.          |
| $90^\circ$ | 95.          | 96.          |

Refer to your completed chart to answer the following questions.

97) At what angle is sine at a maximum?

98) At what angle is sine at a minimum?

99) At what angle is cosine at a maximum?

100) At what angle is cosine at a minimum?

101) At what angle are the sine and cosine equivalent?

102) As the angle increases in the first quadrant, what happens to the cosine of the angle? a) increases b) decreases c) stays the same

103) As the angle increases in the first quadrant, what happens to the sine of the angle? a) increases b) decreases c) stays the same

### Part 5: Algebra

**Please complete this part on separate sheets of paper**, there is not enough room on this sheet to show all of your work. Solve the following (it is *important* for you to work *independently*). Units on the numbers are included because they are essential to the concepts, however they do not have any *effect* on the actual numbers you are putting into the equations. In other words, the units do not change how you do the algebra. Show every step for every problem, including writing the original equation, all algebraic manipulations, and substitution! You should practice doing all algebra *before* substituting numbers in for variables. Don't let the subscripts on the variables confuse you.  $v_f$ , for example is just a single variable.

Rearranging Equations Review: <http://bit.ly/2KiOXhE>

Rearranging Equations Practice: <http://bit.ly/2I3GFMi>

Using Substitution to Solve Systems of Equations Review: <http://bit.ly/2ifgi8s>

**Section I:** For problems 104-109, use the three equations below:

1.  $v_f = v_0 + at$
2.  $x_f = x_0 + v_0t + \frac{1}{2}at^2$
3.  $v_f^2 = v_0^2 + 2a(x_f - x_0)$

104) Using equation (1) solve for  $t$  given that  $v_0 = 5$  m/s,  $v_f = 25$  m/s, and  $a = 10$  m/s<sup>2</sup>.

105)  $a = 10$  m/s<sup>2</sup>,  $x_0 = 0$  m,  $x_f = 120$  m, and  $v_0 = 20$  m/s. Use the second equation to find  $t$ .

106)  $v_f = -v_0$  and  $a = 2$  m/s<sup>2</sup>. Use the first equation to find  $t/2$ .

- a)  $-v_0$       b)  $-2v_0$       c)  $-v_0^2$       d)  $-4v_0$

How does each equation simplify when  $a = 0$  m/s<sup>2</sup> and  $x_0 = 0$  m?

107) Equation (1): a)  $v_f = v_0$     b)  $v_f = at$     c)  $v_f = 0$     d)  $v_f = v_0 + at$

108) Equation (2):

- a)  $x_f = x_0 + 1/2at^2$     b)  $x_f = v_0t + 1/2at^2$     c)  $x_f = v_0t$     d)  $x_f = x_0 + v_0t$

109) Equation (3):

- a)  $v_f^2 = 2a(x_f - x_0)$     b)  $v_f = v_0$     c)  $v_f^2 = 2a$     d)  $v_f^2 = v_0^2 + 2a$

**Section II:** For problems 110–115, use the four equations below. Don't let the Greek letters confuse you, they're just like any other letter used for variables.

$$\Sigma F = ma$$

$$f_s \leq \mu_s N$$

$$f_k = \mu_k N$$

$$F_s = -kx$$

110) If  $\Sigma F = 10 \text{ N}$  and  $a = 1 \text{ m/s}^2$ , find  $m$  using the first equation.

111) Given  $\Sigma F = f_k$ ,  $m = 250 \text{ kg}$ ,  $\mu_k = 0.2$ , and  $N = 10m$ , find  $a$ . Use the 1<sup>st</sup> and 3<sup>rd</sup> equations

112)  $\Sigma F = T - 10m$ , but  $a = 0 \text{ m/s}^2$ . Use the first equation to find  $m$  in terms of  $T$ .

a)  $m = 2T$       b)  $m = T/10$       c)  $m = 0$       d)  $m = 10T$

113) Given the following values, determine if the third equation is valid.  $\Sigma F = f_s$ ,  $m = 90 \text{ kg}$ , and  $a = 2 \text{ m/s}^2$ . Also,  $\mu_s = 0.1$ , and  $N = 5 \text{ N}$ .

a) valid      b) not valid      c) impossible to determine without more information

114) Use the first equation in Section I, the first equation in Section II and the givens below, find  $\Sigma F$ .  
 $m = 12 \text{ kg}$ ,  $v_o = 15 \text{ m/s}$ ,  $v_f = 5 \text{ m/s}$ , and  $t = 12 \text{ s}$ .

115) Use the last equation to solve for  $F_s$  if  $k = 900 \text{ N/m}$  and  $x = 0.15 \text{ m}$ .

**Section III:** For problems 116–118 use the two equations below.

$$a = \frac{v^2}{r} \quad \tau = rF \sin \theta$$

116) Given that  $v$  is  $5 \text{ m/s}$  and  $r$  is  $2 \text{ meters}$ , find  $a$ .

117) Originally,  $a = 12 \text{ m/s}^2$ , then  $r$  is doubled. Find the new value for  $a$ .

118) Use the second equation to find  $\theta$  when  $\tau = 4 \text{ Nm}$ ,  $r = 2 \text{ m}$ , and  $F = 10 \text{ N}$ .

**Section IV:** For problems 119–124, use the equations below.

$$K = \frac{1}{2}mv^2 \quad \Delta U_g = mgh \quad W = F(\Delta x) \cos \theta \quad \mu_s = \frac{1}{2}kx^2$$

$$P = \frac{W}{t} \quad P = Fv_{avg} \cos \theta$$

119) Use the first equation to solve for  $K$  if  $m = 12 \text{ kg}$  and  $v = 2 \text{ m/s}$ .

120) If  $\Delta U_g = 10 \text{ J}$ ,  $m = 10 \text{ kg}$ , and  $g = 9.8 \text{ m/s}^2$ , find  $h$  using the second equation.

121)  $K = \Delta U_g$ ,  $g = 9.8 \text{ m/s}^2$ , and  $h = 10 \text{ m}$ . Find  $v$ .

122) Use the third equation to find  $W$  if you know that  $F$  is  $10 \text{ N}$ ,  $\Delta x$  is  $12 \text{ m}$ , and  $\theta$  is  $180^\circ$ .

123) Given  $U_s = 12$  joules, and  $x = 0.5$  m, find  $k$  using the fourth equation.

124) For  $P = 2100$  W,  $F = 30$  N, and  $\theta = 0^\circ$ , find  $v_{avg}$  using the last equation in this section.

**Section V:** For problems 125 – 127, use the equations below.

$$p = mv \quad F\Delta t = \Delta p \quad \Delta p = m\Delta v$$

125)  $p$  is 12 kgm/s and  $m$  is 25 kg. Find  $v$  using the first equation.

126) “ $\Delta$ ” means “final state minus initial state”. So,  $\Delta v$  means  $v_f - v_i$  and  $\Delta p$  means  $p_f - p_i$ . Find  $v_f$  using the third equation if  $p_f = 50$  kgm/s,  $m = 12$  kg, and  $v_i$  and  $p_i$  are both zero.

127) Use the second and third equation together to find  $v_i$  if  $v_f = 0$  m/s,  $m = 95$  kg,  $F = 6000$  N, and  $\Delta t = 0.2$  s.

**Section VI:** For problems 128 – 130 use the three equations below.

$$T_s = 2\pi\sqrt{\frac{m}{k}} \quad T_p = 2\pi\sqrt{\frac{l}{g}} \quad T = \frac{1}{f}$$

128)  $T_p$  is 1 second and  $g$  is  $9.8$  m/s<sup>2</sup>. Find  $l$  using the second equation.

129)  $m = 8$  kg and  $T_s = 0.75$  s. Solve for  $k$ .

130) Given that  $T_p = T$ ,  $g = 9.8$  m/s<sup>2</sup>, and that  $l = 2$  m, find  $f$  (the units for  $f$  are Hertz).

**Section VII:** For problems 131-134, use the equations below.

$$F_g = -\frac{GMm}{r^2} \quad \mu_g = -\frac{GMm}{r}$$

131) Find  $F_g$  if  $G = 6.67 \times 10^{-11}$  m<sup>3</sup>/kgs<sup>2</sup>,  $M = 2.6 \times 10^{23}$  kg,  $m = 1200$  kg, and  $r = 2 \times 10^7$  m.

132) What is  $r$  if  $U_g = -7.2 \times 10^{15}$  J,  $G = 6.67 \times 10^{-11}$  m<sup>3</sup>/kgs<sup>2</sup>,  $M = 2.6 \times 10^{23}$  kg, and  $m = 1200$  kg?

133) Use the first equation in Section IV for this problem.  $K = -U_g$ ,  $G = 6.67 \times 10^{-11}$  m<sup>3</sup>/kgs<sup>2</sup>,  $M = 3.2 \times 10^{23}$  kg. Find  $v$  in terms of  $r$

$$\text{a) } v = (4.25 \times 10^8)(r) \quad \text{b) } v = \sqrt{\frac{r}{6.45 \times 10^6}} \quad \text{c) } v = (8.52 \times 10^{-5})(r^2) \quad \text{d) } v = \frac{6.53 \times 10^6}{\sqrt{r}}$$

134) Using the first equation above, describe how  $F_g$  changes if  $r$  doubles.

- a) it decreases by a factor of 2
- b) it decreases by a factor of 4
- c) it increases by a factor of 2
- d) it increases by a factor of 4

**Section VIII:** For problems 135 – 140 use the equations below.

$$V = IR \qquad I = \frac{\Delta Q}{t} \qquad P = IV \qquad R = \frac{\rho l}{A}$$

$$R_s = (R_1 + R_2 + R_3 + \dots R_i) = \sum R_i \qquad \frac{1}{R_p} = \left( \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \dots \frac{1}{r_i} \right) = \sum_i \frac{1}{R_i}$$

135) Given  $V = 220$  volts, and  $I = 0.2$  amps, find  $R$  (the units are ohms,  $\Omega$ ).

136) If  $\Delta Q = 0.2$  C,  $t = 1$  s, and  $R = 100 \Omega$ , find  $V$  using the first two equations.

137)  $R = 60 \Omega$  and  $I = 0.1$  A. Use these values to find  $P$  using the first and third equations.

138) Let  $R_s = R$ . If  $R_1 = 50 \Omega$  and  $R_2 = 25 \Omega$  and  $I = 0.15$  A, find  $V$ .

139) Let  $R_p = R$ . If  $R_1 = 50 \Omega$  and  $R_2 = 25 \Omega$  and  $I = 0.15$  A, find  $V$ .

140) Given  $R = 110 \Omega$ ,  $l = 1.0$  m, and  $A = 22 \times 10^{-6} \text{ m}^2$  find  $\rho$ .

### **Part 6: Graphing and Functions**

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. At the end of this part is a section covering graphical analysis that you probably have not seen before: *linear transformation*. This analysis involves converting any non-linear graph into a linear graph by adjusting the axes plotted. We want a linear graph because we can easily find the slope of the line of best fit of the graph to help justify a mathematical model or equation.

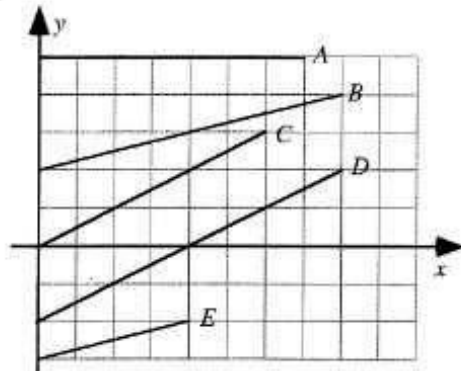
#### **Key Graphing Skills to remember:**

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 or curve of best fit.
3. Provide a clear legend if multiple data sets are used to make your graph understandable.
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
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.

Slope Review: <http://bit.ly/2Ko8P3e>.

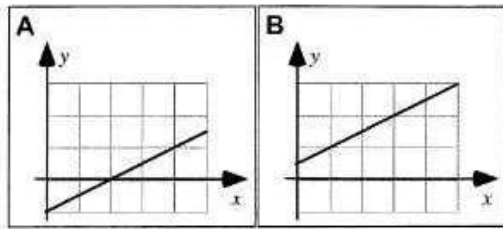
## Conceptual Review of Graphs

Shown are several lines on a graph.



141) Rank the slopes of the lines in the graph above.

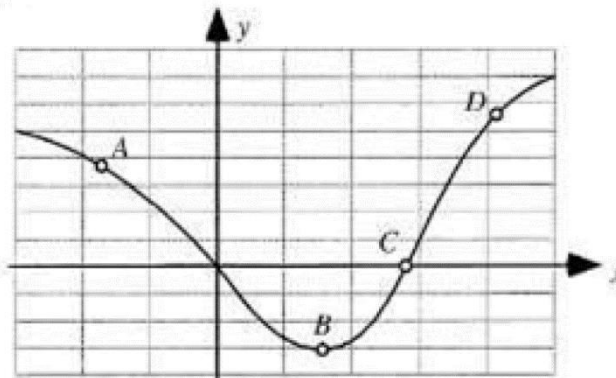
- a)  $A > B = E > C = D$       b)  $B = D > C = E > A$       c)  $C = D > B = E > A$       d) cannot be determined



142) Is the slope of the graph greater in Case A, greater in Case B or the same in both?

- a) Greater in A      b) Greater in B      c) Same in both

Four points are labeled on the graph below.

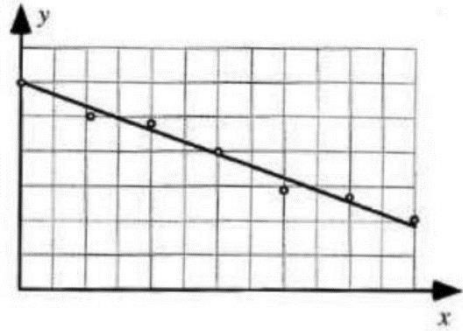


143) Rank the slopes of the graph at the labeled points.

- a)  $C > D > B > A$       b)  $C > D > A > B$       c)  $A > C > D > B$       d) cannot be determined

A student makes the following claim about some data that they have collected.

“My data shows that the value of  $y$  decreases as  $x$  increases. I found that  $y$  is inversely proportional to  $x$ ”



144) What, if anything, is wrong with this statement?

- a) The statement is correct.
- b) The statement is wrong because “inversely proportional” means they should both increase.
- c) The statement is wrong because the graph does not show that  $y$  decreases as  $x$  increases.
- d) The statement is wrong because the data points are not directly on the line that was drawn.

***For the rest of the assignment you will NOT answer in the table, you will write you answers on the sheets after the table. (SEE ANSWER SHEET)***

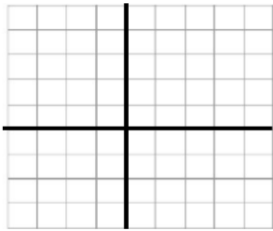
### ***Linear and Non-Linear Functions***

**Recommended video** Graphing Review: <http://bit.ly/2r7ShDM>

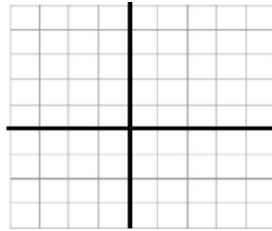
**Recommended video:** Linearization: <http://bit.ly/2HBjQMA>

You must understand functions to be able linearize. First let's review what graphs of certain functions looks like. Sketch the shape of each type of  $y$  vs.  $x$  function below.  $k$  is listed as a generic constant.

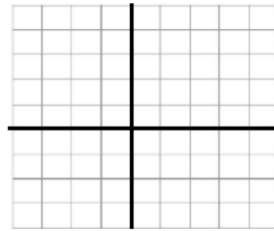
Linear  $y = kx$



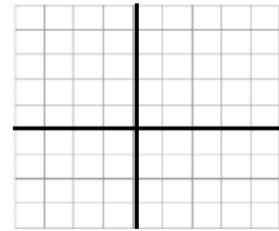
Inverse  $y = k/x$



Inverse Square  $y = k/x^2$



Power  $y = kx^2$



You will notice that only the linear function is a straight line. We can easily find the slope of our line by measuring the rise and dividing it by the run of the graph or calculating it using two points. The value of the slope should equal the constant  $k$  from the equation.

Finding  $k$  is a bit more challenging in the last three graphs because the slope isn't constant. This should make sense since your graphs aren't linear. So how do we calculate our constant,  $k$ ?

We need to transform the non-linear graph into a linear graph in order to calculate a constant slope. We can accomplish this by transforming one or both of the axes for the graph. The hardest part is figuring out which axes to change and how to change them. The easiest way to accomplish this task is to solve your equation for the constant. (Note in the examples from the last page there is only one constant, but this process could be done for other equations with multiple constants. Instead of solving for a single constant, put all of the constants on one side of the equation.)

When you solve for the constant, the other side of the equation should be in fraction form. This fraction gives the rise and run of the linear graph (the numerator is the rise, the denominator is the run). Whatever is in the numerator is the vertical axis and the denominator is the horizontal axis. If the equation is not in fraction form, you will need to inverse one or more of the variables to make a fraction, so  $k=xy$  would be written as  $k = \frac{x}{\frac{1}{y}}$  which is mathematically the same but show us we need to make the vertical axis  $x$  and

the horizontal axis  $\frac{1}{y}$  since  $x$  is in the numerator and  $\frac{1}{y}$  is in the denominator.

First let's solve each equation to figure out what we should graph. Then look below at the example and complete the last one, a sample AP question, on your own.

State what should be graphed in order to produce a linear graph to solve for  $k$ .

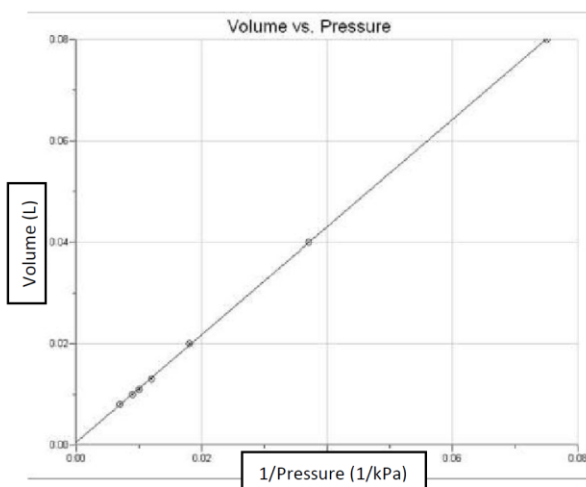
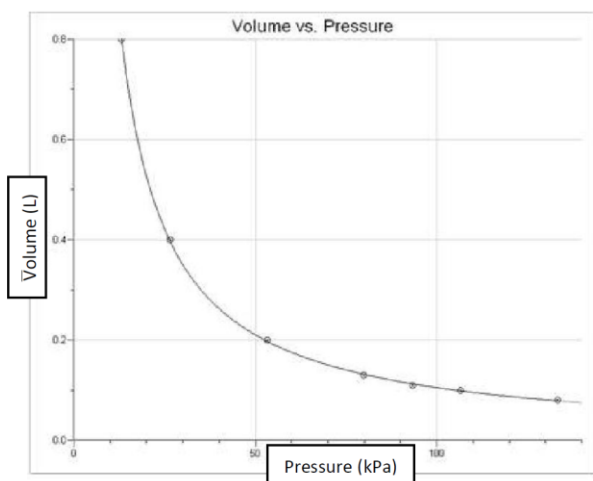
**Inverse Graph** Vertical Axis Variable: \_\_\_\_\_ Horizontal Axis Variable: \_\_\_\_\_

**Inverse Square Graph** Vertical Axis Variable: \_\_\_\_\_ Horizontal Axis Variable: \_\_\_\_\_

**Power (Square) Graph** Vertical Axis Variable: \_\_\_\_\_ Horizontal Axis Variable: \_\_\_\_\_

### Chemistry Example

Let's look at an equation you should remember from chemistry. According to Boyle's law, an ideal gas obeys the following equation  $P_1V_1=P_2V_2=k$ . This states that pressure and volume are inversely related (as one goes up the other goes down), and the graph on the left shows an inverse shape. Although the equation is equal to a constant, the variables are not in fraction form. One of the variables, pressure in this case, is inverted. This means every pressure data point is divided into one to get the inverse. The graph on the right shows the linear relationship between volume  $V$  and the inverse of pressure  $1/P$ . We could now calculate the slope of this linear graph to find  $k$ .



### Sample AP Graphing Exercise

A steel sphere is dropped from rest and the distance of the fall is given by the equation  $D = \frac{1}{2}gt^2$ .  $D$  is the distance fallen and  $t$  is the time of the fall. The acceleration due to gravity is the constant known as  $g$ . Below is a table showing information on the first two meters of the sphere's descent.

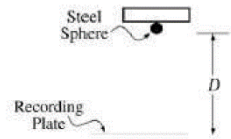
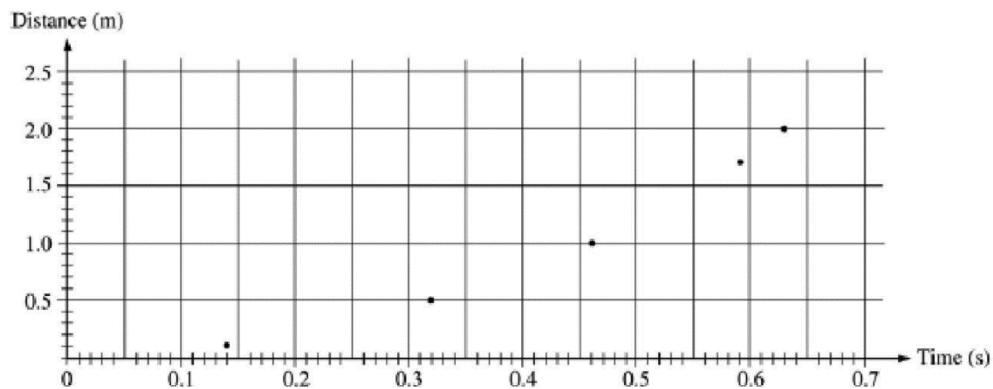


Table: Decent of sphere

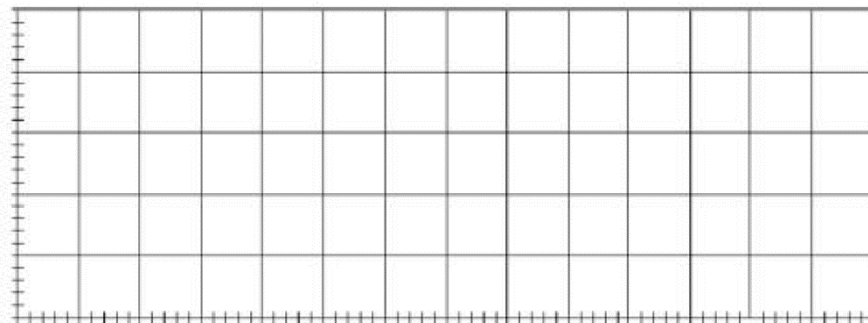
|                      |      |      |      |      |      |
|----------------------|------|------|------|------|------|
| Distance of Fall (m) | 0.10 | 0.50 | 1.00 | 1.70 | 2.00 |
| Time of Fall (s)     | 0.14 | 0.32 | 0.46 | 0.59 | 0.63 |



- Draw a line of best fit for the distance vs. time graph above (it should be a curve that goes through the dots)
- If only the variables  $D$  and  $t$  are used, what quantities should you graph in order to produce a linear relationship between the two quantities (remember: first solve the equation for  $g$ , then look at what's on the numerator and what's on the denominator)?
- On the grid below, plot the data points for the quantities you have identified in part (b), and sketch the straight-line fit to the points. **Label your axes and show the scale that you have chosen for the graph.**

Title \_\_\_\_\_

Scale: \_\_\_\_\_



- Calculate the value of  $g$  by finding the slope of the graph.

***Part 7: Scalars and Vectors Preview***

Watch the following two videos. For each video, summarize the content Mr. Khan is presenting in three sentences. Then, write at least one question per video on something you didn't understand or on a possible extension of the elementary concepts he presents here.

<http://bit.ly/2FrbXaL>

***Summary 1***

<http://bit.ly/2r6ZvYo>

***Summary 2***

**Congratulations! You're finished!**

**Make sure you have save all your answers on the answer sheets and have uploaded your answers to the TEAMS assignment.**

That wasn't so bad was it? *Trust me...* the blood, sweat, and tears it took to get through all of those problems will make everything later on a lot easier. Think about it as an investment with a guaranteed return.

*This course is a wonderful opportunity to grow as a critical thinker, problem solver and great communicator. Don't believe the rumors — it is not impossibly hard. It **does** require hard work, but so does anything that is worthwhile. You would never expect to win a race if you didn't train. Similarly, you can't expect to do well if you don't train academically. AP Physics is immensely rewarding and exciting, but you do have to take notes, study, and read the book (gasp!). I guarantee that if you do what is asked of you that you will look back to this class with huge sense of satisfaction! I know I can't wait to get started...*

*Let's learn some **SCIENCE!!!***