

DUE on Google Classroom 8/17/2020 Class Code **yutthoy**  
AP Physics 1 Basic Algebra Review Summer Assignment

The exercises below are a review of the prerequisite math skills that you need to succeed in AP Physics C. Make sure to read all directions throughout the packet. Final answers must be in decimal units but those with mathematical constants ( $\pi$ ,  $e$ ,  $i$ , etc.) may be in fractions. Use a math book or internet for reference. No physics is needed for this review.

In 2015, the head grader for the AP physics test stated that “Basic algebra was often weak”. These problems are examples of what College Board considers basic algebra, and can be solved with only the knowledge of Algebra 1, Geometry and Chemistry. Very little time will be devoted to reteaching these concepts, so any gaps will have to be covered outside of class during your own time.

Your work must be legible and linear, and I must be able to follow it easily. Please no incoherent jumping around the page. Mark your final answers by boxing them.

Your completed summer work is due on August 17<sup>th</sup> 2021. You will be taking a 50 point quiz on similar concepts on the first day of school. We will then go over your summer work and the quiz as a review of all of the prior math knowledge required for mastery of this course. A 5point bonus will be awarded on this 50 point quiz if all of the summer work is turned in on or before July 30, 2021 on google classroom. Late Assignments will be assessed a late penalty of -10 for every calendar day it is late. Absence does not excuse any student from the late penalty. No assignment will be accepted more than 5 days late.

Do not copy work from another student for your own integrity and for you own benefit because all AP Physics students will take a quiz with problems similar to (if not exactly like) those found on this review the first week of school. No calculators will be allowed on this math quiz.

**Significant Figures and Scientific Notation Review**

1.) How many significant figures do the following numbers have?

- a.) 6.001      Answer: \_\_\_\_\_      d.) 27.00      Answer: \_\_\_\_\_  
 b.) 0.0080      Answer: \_\_\_\_\_      e.)  $\pi$       Answer: \_\_\_\_\_  
 c.) 206,000      Answer: \_\_\_\_\_

Directions: Find the following. Final answers should be in scientific notation with the correct number of significant figures.

- 2.)  $(5.0 \times 10^{-8})(2.9 \times 10^2)$       3.)  $(3.25 \times 10^4 + 7.4 \times 10^3)$

- 4.)  $6.000 \times 10^{-11} \frac{1.00 \times 10^{26}}{2.00 \times 10^7}$       5.)  $\frac{8400}{1.2 \times 10^7}$

**Unit Conversions Review ( basic stoichiometry)**

6.) Finish the SI prefix table below. Follow the example of the centi- prefix. You will need to memorize these.

Symbol	Name	Numerical Equivalent
n		
$\mu$		
m		
c	centi	$10^{-2}$
k		
M		
G		

7.) 16.7 kilograms is how many grams?

8.) 560 nm is how many meters?

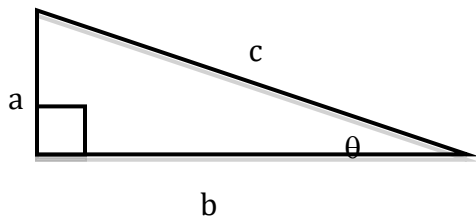
9.) 15 years is how many seconds?

10.)  $8.99 \times 10^9$  seconds is how many years?

11.)  $2.998 \times 10^8$  m/s is how many kilometers per hour?

### Trigonometry Review

Directions: Use the figure below to answer problems 15-25. Simplify as much as you can.



12.) Find  $c$  if given  $a$  and  $b$ .

13.) Find  $a$  if given  $b$  and  $c$ .

14.) Find  $a$  if given  $c$  and  $\theta$ .

15.) Find  $b$  if given  $a$  and  $\theta$ .

16.) Find  $c$  if given  $b$  and  $\theta$ .

17.) Find  $\theta$  if given  $b$  and  $c$ .

18.) Find  $\theta$  if given  $a$  and  $b$ .

19.) If  $a = 2.0$  and  $c = 7.0$ , what is  $b$ ?

20.) If  $c = 10.0$  and  $\theta = 60^\circ$ , what is  $b$ ?

21.) If  $a = 12.0$  and  $\theta = 30^\circ$ , what is  $b$ ?

### Algebra Review

Directions: Solve the following equations for the given variable and conditions. Simplify if needed.

Example:  $2x + xy = z$ . Solve for  $x$ .

$$x(2 + y) = z$$

$$x = \frac{z}{2 + y}$$

22.)  $v_1 + v_2 = 0$ . Solve for  $v_1$ .

23.)  $a = \frac{v}{t}$ . Solve for  $t$ .

24.)  $v_f^2 = v_i^2 + 2ad$

A.) Solve for  $v_i$ .

B.) Solve for  $d$ .

25.)  $d_f = d_i + v_o t + \frac{1}{2} a t^2$

A.) Solve for  $v_o$ .

B.) Solve for  $t$ , if  $v_o = 0$ .

C.) Solve for  $t$ , if  $d_i = d_f$ .

$$26.) \quad F = m \frac{v_f - v_i}{t_f - t_i}$$

A.) Solve for  $v_f$ , if  $t_i = 0$ .

B.) Solve for  $t_f$ , if  $v_f = 0$  and  $t_i = 0$ .

$$27.) \quad a_c = \frac{v^2}{r} \quad \text{Solve for } v.$$

$$35.) \quad mg \sin q = mmg \cos q. \quad \text{Solve for } \theta.$$

$$28.) \quad \frac{1}{2}mv_f^2 + mgh_f = \frac{1}{2}mv_i^2 + mgh_i$$

A.) Solve for  $h_f$ , if  $h_i = 0$  and  $v_f = 0$ .

B.) Solve for  $v_f$ , if  $h_f = 0$ .

$$29.) \quad Ft = mv_f - mv_i \quad \text{Solve for } v_f.$$

$$38.) \quad m_1v_{i,1} + m_2v_{i,2} = (m_1 + m_2)v_f \quad \text{Solve for } v_{i,2}.$$

DUE on Google Classroom 8/17/2020 Class Code **yutthoy**

30.)  $m_1 v_{i,1} + m_2 v_{i,2} = m_1 v_{f,1} + m_2 v_{f,2}$ . Solve for  $v_{f,2}$  if  $v_{i,1} = 0$ .

31.)  $(F_1 \sin \theta) r_1 + (-F_2 \sin \theta) r_2 = 0$ . Solve for  $r_2$ .

32.)  $-kx + m(-g) = 0$ . Solve for  $m$ .

33.)  $F_g = G \frac{m_1 m_2}{r^2}$ . Solve for  $r$ .

34.)  $L - L \cos \theta = \frac{v^2}{2}$  Solve for  $L$ .

35.)  $\frac{mv^2}{R} = G \frac{Mm}{R^2}$ . Solve for  $v$ .

36.)  $T = 2\pi \sqrt{\frac{L}{g}}$ . Solve for  $g$ .

37.)  $\frac{1}{2} m v_f^2 + \frac{1}{2} k x^2 = \frac{1}{2} m v_i^2 + m g h_i$ . Solve for  $x$  if  $v_f = 0$ .

38.)  $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ . Solve for  $R_T$ .

### Miscellaneous

Directions: Simplify without using a calculator. Remember to show all of your work.

39.)  $\frac{1}{4} + \frac{1}{6}$

40.)  $\frac{1}{3} + \frac{1}{18}$

41.) Consider  $z = \frac{x}{y}$ ,  $c = ab$ ,  $l = m - n$ , or  $r = \frac{s^2}{t^2}$ .

a.) As  $x$  increases and  $y$  stays constant,  $z$  \_\_\_\_\_.

b.) As  $y$  increases and  $x$  stays constant,  $z$  \_\_\_\_\_.

c.) As  $x$  increases and  $z$  stays constant,  $y$  \_\_\_\_\_.

d.) As  $a$  increases and  $c$  stays constant,  $b$  \_\_\_\_\_.

e.) As  $c$  increases and  $b$  stays constant,  $a$  \_\_\_\_\_.

f.) As  $b$  increases and  $a$  stays constant,  $c$  \_\_\_\_\_.

g.) As  $n$  increases and  $m$  stays constant,  $l$  \_\_\_\_\_.

h.) As  $l$  increases and  $n$  stays constant,  $m$  \_\_\_\_\_.

i.) If  $s$  is tripled and  $t$  stays constant,  $r$  is multiplied by \_\_\_\_\_.

j.) If  $t$  is doubled and  $s$  stays constant,  $r$  is multiplied by \_\_\_\_\_.

**Systems of equations**

Conceptual Question:

42.) How many equations are needed to solve...

a.) for 1 unknown variable? \_\_\_\_\_

b.) for 2 unknown variables? \_\_\_\_\_

c.) for 3 unknown variables? \_\_\_\_\_

Use the equations in each problem to solve for the specified variable in the given terms. Simplify.

43.)  $F_f = \mu F_N$  and  $F_N = mg \cos \theta$ . Solve for  $\mu$  in terms of  $F_f$ ,  $m$ ,  $g$ , and  $\theta$ .

44.)  $F_1 + F_2 = F_T$  and  $F_1 \times d_1 = F_2 \times d_2$ . Solve for  $F_1$  in terms of  $F_T$ ,  $d_1$ , and  $d_2$ .

45.)  $F_c = ma_c$  and  $a_c = \frac{v^2}{r}$ . Solve for  $r$  in terms of  $F_c$ ,  $m$ , and  $v$ .

46.)  $T = 2\pi \sqrt{\frac{L}{g}}$  and  $T = \frac{1}{f}$ . Solve for  $L$  in terms of  $\pi$ ,  $g$ , and  $f$ .



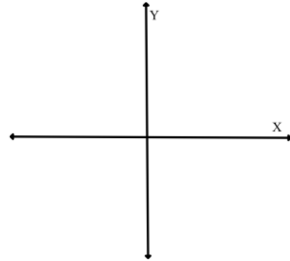
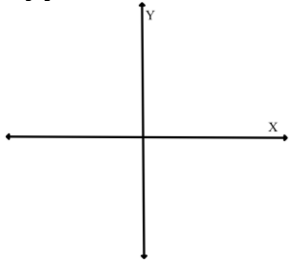
**Graphing Equations**

47.) If  $r = c - x*t$  was graphed on an  $r$  vs.  $t$  graph, what would the following be?

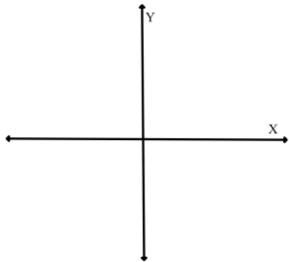
Slope: \_\_\_\_\_ y-intercept: \_\_\_\_\_

48.) On the  $y$  vs.  $x$  graphs below, sketch the relationships given.

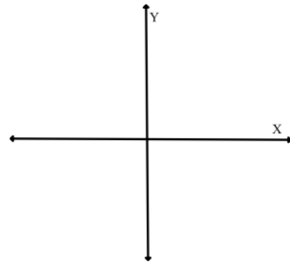
a.)  $y = mx + b$ , if  $m > 0$  and  $b = 0$ .      b.)  $y = mx + b$ , if  $m < 0$  and  $b > 0$ .



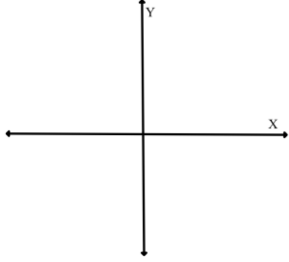
c.)  $y = x^2$



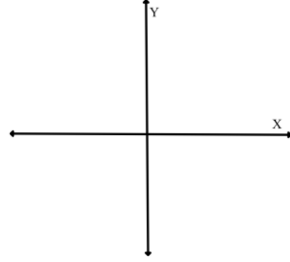
d.)  $y = \sqrt{x}$



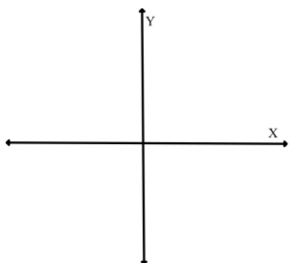
e.)  $y = 1/x$



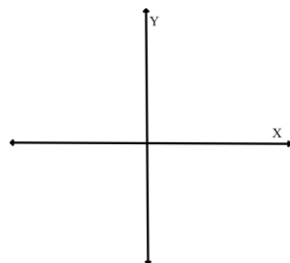
f.)  $y = 1/x^2$



g.)  $y = \sqrt{\frac{1}{x}}$



h.)  $y = \sin(x)$



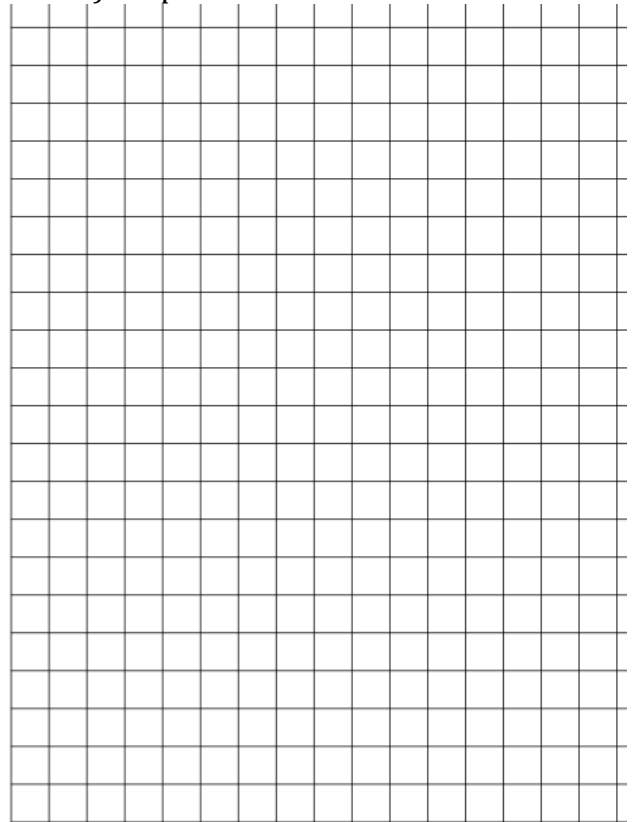
**Marbles in Cylinder Lab**

You received a graduated cylinder with three identical marbles and an unknown amount of water already in it. You placed extra identical marbles in the cylinder and obtained the data below. Use the data to graph a best-fit line showing the relationship between the water level and the number of marbles. The y-intercept should be visible on the graph. Label your axes and include units.

From the graph, determine a mathematical formula for the water level for any number of marbles. Lastly, give an explanation of your formula in words. Make sure to give an explanation of the slope and y-intercept of your formula.

Number of Marbles in Water	Water level (mL)
3	58
4	61
5	63
6	65
7	68

49.) Graph below



50.) Formula: \_\_\_\_\_

51.) Explanation of the formula in words: (Include the meaning of the slope and y-intercept.)