

Name: \_\_\_\_\_

Per: \_\_\_\_\_ Date: \_\_\_\_\_

# AP Physics 1: Summer Homework

Join the **Google Classroom code: o4wb435**

Dear AP Physics 1 Student,

Hello! This packet is meant to be a review of the **prerequisite** math skills that you need to succeed in AP Physics 1. Please make sure to read all directions throughout the packet. Here are just a few overarching instructions:

- ALL work must be completed on the pages and in the area provided.
- Calculators may be used **ONLY** when specified. Otherwise, **DO NOT** use calculators.
- Make sure that your work is **LEGIBLE**. It has to be followed easily, or it will be marked off .

You should already know this, but **do not copy work** from another student for your own integrity and for your own benefit, however, do feel free to verify your work with others. All AP Physics 1 students should have the work ethic and the responsibility to carry their own weight--especially with regard to these math skills. There will most likely be a quiz on the first day of class to determine if you are prepared for this course.

If you have questions or concerns, you may e-mail me ([mai.alan@tusd.org](mailto:mai.alan@tusd.org)) or use the REMIND app on your phone (A. Mai) to message me or your fellow classmates. In addition, I will be uploading the syllabus for this class for you to look over during the summer.

Have a lovely summer (and don't spend all of it studying-- maybe just some of it :P)

Sincerely,

**Mr. Mai**

## SIGNIFICANT FIGURES AND SCIENTIFIC NOTATION REVIEW

DIRECTIONS: Fill in the "answers" to the table.

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 correct scientific notation with the correct number of significant figures

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

4. Complete the SI prefix table below. Follow the example of the centi- prefix. *\*you need these memorized!*

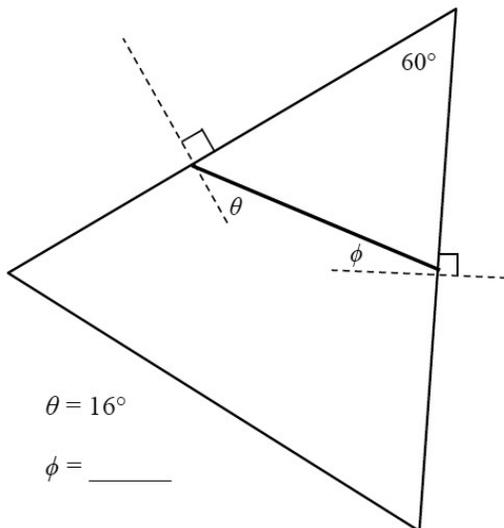
SYMBOL	NAME	NUMERICAL EQUIVALENT
c	centi-	$10^{-2}$
$\mu$		
M		
m		
G		
n		
k		
p		

DIRECTIONS: Set up the conversion correctly (part of dimensional analysis). You MAY use a calculator just for the final calculation. \*\*sig figs are NOT required here, but you should be rounding "appropriately." If you are unsure of what that means, use sig figs.

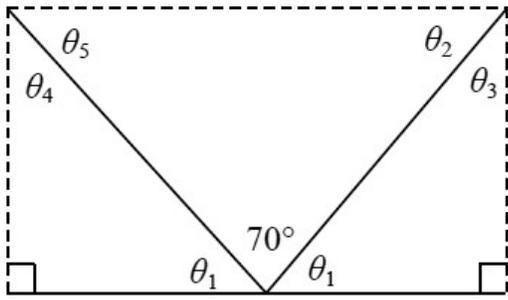
5. 15 years is how many nanoseconds?
6.  $2.998 \times 10^8$  m/s is how many kilometers per hour?
7.  $4.50 \text{ kg/m}^2$  is how many  $\text{mg mm}^2/\mu\text{s}^2$ ?

**GEOMETRY / TRIGONOMETRY REVIEW**

8. a



9.



$\theta_1 = \underline{\hspace{2cm}}$

$\theta_2 = \underline{\hspace{2cm}}$

$\theta_3 = \underline{\hspace{2cm}}$

$\theta_4 = \underline{\hspace{2cm}}$

$\theta_5 = \underline{\hspace{2cm}}$

DIRECTIONS: Use the figure below to answer problems 9-16. Simplify as much as you can:

10. Find  $c$  given  $a$  and  $b$ :

11. Find  $a$  given  $b$  and  $c$ :

12. Find  $a$  if given  $c$  and  $\theta$ .

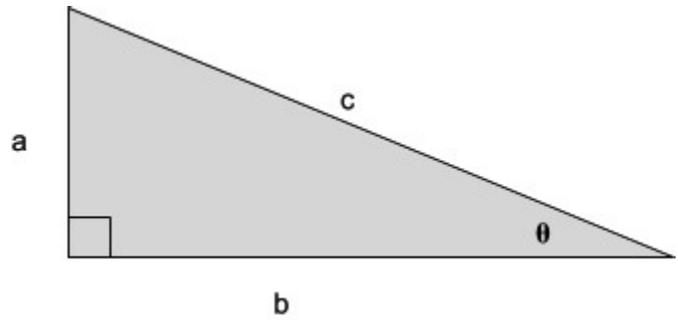
13. Find  $b$  if given  $a$  and  $\theta$ .

14. Find  $\theta$  if given  $a$  and  $b$ .

15. If  $a=2.0\text{cm}$  and  $c=7.0\text{ cm}$ , what is  $b$ ?

16. If  $c=10.0\text{cm}$  and  $\theta=60^\circ$ , what is  $b$ ?

17. If  $a=12.0\text{cm}$  and  $\theta=30^\circ$ , what is  $b$ ?



18. Complete the table below without using a calculator:

$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
$\sin\theta$					
$\cos\theta$					
$\tan\theta$					

19. 360 degrees = \_\_\_\_\_ radians

20. 4.5 revolutions = \_\_\_\_\_ radians

21. Find the length of an arc with a radius of 6.0m swept across 2.5 radians.

22. Find the length of an arc with a radius of 10.0m swept across 100 degrees.

**ALGEBRA REVIEW**DIRECTIONS: Solve the following equations for the given variable and the conditions. Simplify as needed.23.  $v_1 + v_2 = 0$ . Solve for  $v_1$  :

24.

$$a = \frac{v_f - v_o}{t} \quad \text{Solve for } t :$$

25.

$$v_f^2 = v_o^2 + 2a(x_f - x_o) \quad \text{Solve for } v_o :$$

26.

$$v_f^2 = v_o^2 + 2a(x_f - x_o) \quad \text{Solve for } x_f \text{ when } x_o = 3 \text{ units}$$

<p>27.</p> $F_c = m \frac{v^2}{r}$ <p>Solve for v :</p>	<p>28.</p> $mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2$ <p>Solve for <math>h_2</math> if <math>h_1 = 0</math> units and <math>v_2 = 0</math> units</p>
<p>29.</p> $m_1v_1 + m_2v_2 = (m_1 + m_2)V$ <p>Solve for <math>v_2</math> :</p>	<p>30.</p> $F = G \frac{m_1m_2}{r^2}$ <p>Solve for r :</p>
<p>31.</p> $T = 2\pi \sqrt{\frac{L}{g}}$ <p>Solve for g:</p>	<p>32.</p> $mg\sin\theta = \mu mg\cos\theta$ <p>Solve for <math>\theta</math>: *here <math>\mu</math> is a variable!</p>

**MISCELLANEOUS MATH!**

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

<p>33. <math>\frac{1}{4} + \frac{1}{6} =</math></p>	<p>34. <math>\frac{1}{x} + \frac{1}{y} = \frac{1}{z}</math> Solve for z.</p>
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35. Consider the following:

$z = \frac{x}{y}$	$c = ab$	$l = m - n$	$z = \frac{s^2}{t^2}$
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- 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 tripled and t stays constant, z is multiplied by \_\_\_\_\_.
- j. If t is doubled and s stays constant, z is multiplied by \_\_\_\_\_.

### SYSTEMS of equations

DIRECTIONS: Use the equations in each problem to solve for the specified variable in the given terms. Of course, simplify your answer.

36.  $F_f = \mu F_N$  and  $F_N = mg \cos \theta$ . Solve for  $\mu$  (it's a variable again!) in terms of  $F_f$ ,  $m$ ,  $g$ , and  $\theta$ .

37.  $F_1 + F_2 = F_T$  and  $(F_1)(d_1) = (F_2)(d_2)$ . Solve for  $F_1$  in terms of  $F_T$ ,  $d_1$ , and  $d_2$ .

**PRE-CALC REVIEW OF VECTORS!**

38. Given the following VECTORS, DRAW the vector on a Cartesian coordinate system, then break down the vectors into x- and y- components:

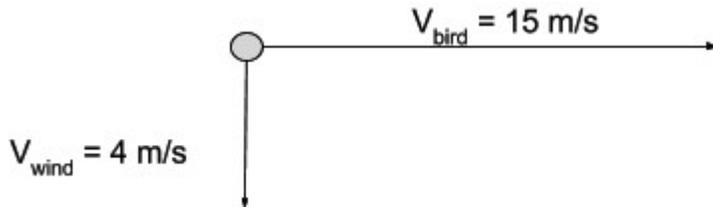
<p>a. 30 m/s velocity vector that is <math>40^\circ</math> above the positive x-axis.</p>	<p>b. 300N force vector that is directed <math>25^\circ</math> below the negative x-axis.</p>
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39. Given the following vector quantities, find the RESULTANT/NET vector quantity. You may use a calculator for this part. (the situation may help you)

- a. A bird is flying at 15 m/s horizontally, to the EAST. A gust of wind blowing at 4 m/s to the SOUTH pushes it so that it has a new RESULTANT velocity. FIND the MAGNITUDE and DIRECTION of the resultant velocity.

\*\*here's a drawing to help you on this first one:

\*\*\*hint: do vector addition!



- b. Jake is pushing Kyle to the RIGHT at 100N. Joseph is pulling Kyle's arm UP and to the LEFT (at an angle of  $50^\circ$  from the horizontal) at 140N. What the magnitude and direction of the RESULTANT force on Kyle (assuming he's safe)?

Draw the situation, then calculate!

**GRAPHING EQUATIONS**

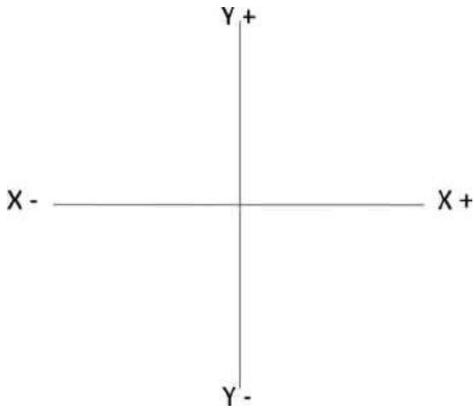
40. If  $r = c - xt$  was graphed on an  $r$  vs  $t$  graph, what would the following be?

a) SLOPE: \_\_\_\_\_

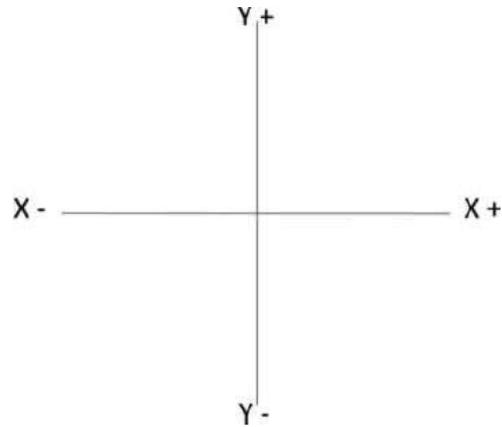
b) Y-INTERCEPT: \_\_\_\_\_

DIRECTIONS: Roughly but CLEARLY sketch the shape of the graph for each given condition and equation:

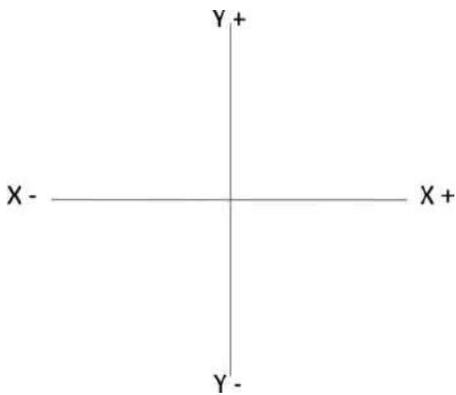
41.  $y = mx + b$ , when  $m > 0$  and  $b = 0$



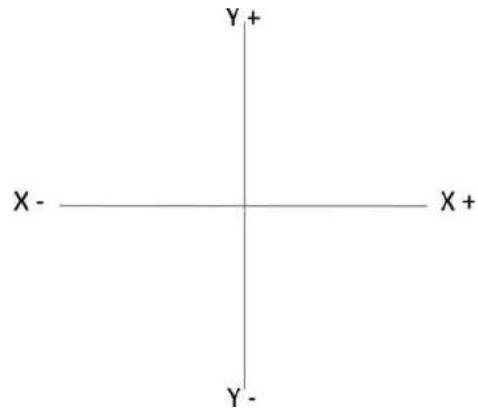
42.  $y = mx + b$ , when  $m < 0$  and  $b > 0$



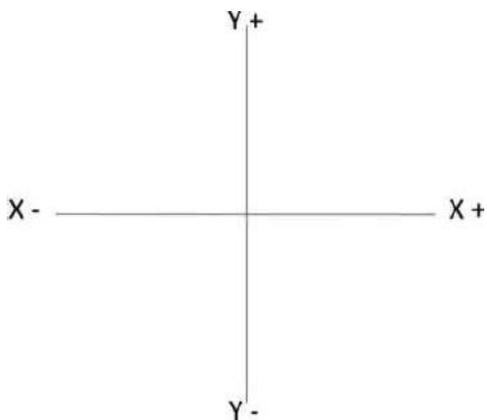
43.  $y = x^2$



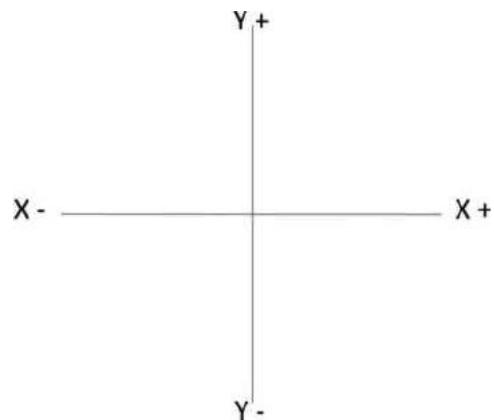
44.  $y = \sqrt{x}$



45.  $y = 1/x$



46.  $y = 1/x^2$

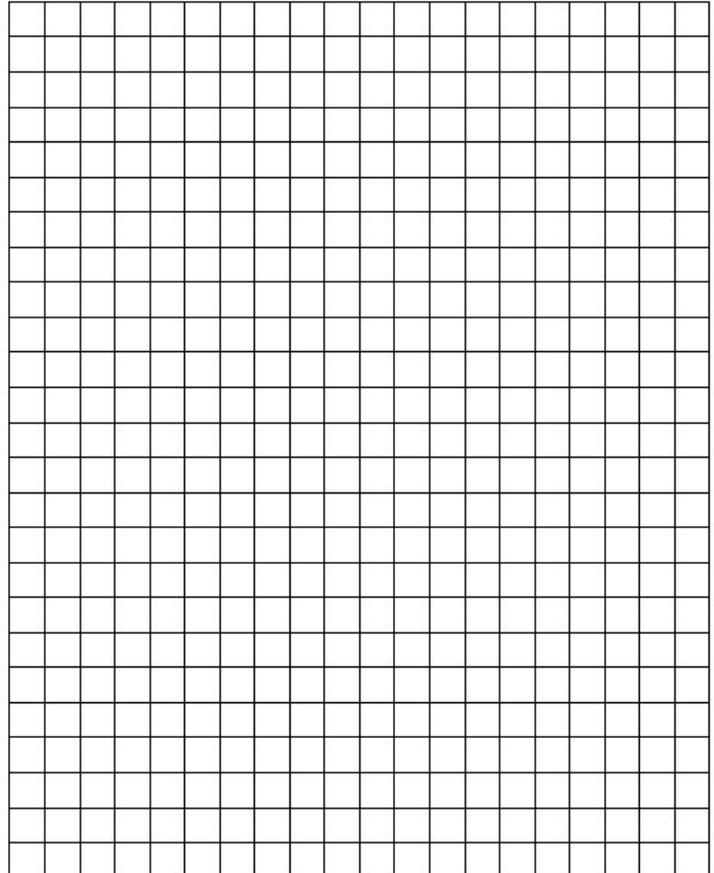


**EXPERIMENT SET-UP / DATA ANALYSIS:**

PROMPT: *Mubashir received a graduated cylinder with 3 identical marbles and an unknown initial amount of water already inside the graduated cylinder. He 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, and give a verbal explanation of what that formula means. Make sure to include slope and y-intercept values for your formula, and be able to explain what those values mean as well.*

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



47. Graph in the grid to the right →

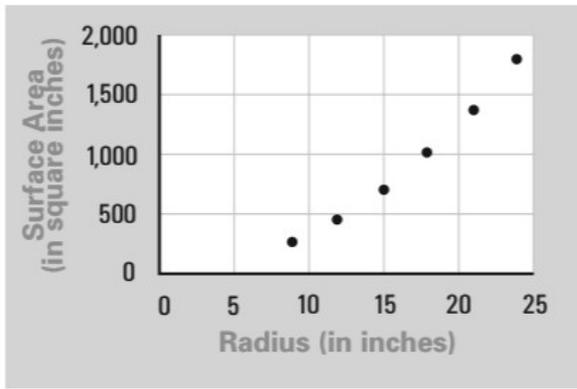
48. Find the FORMULA for the line of best fit:

49. How would Mubashir explain the formula and make sense of it?

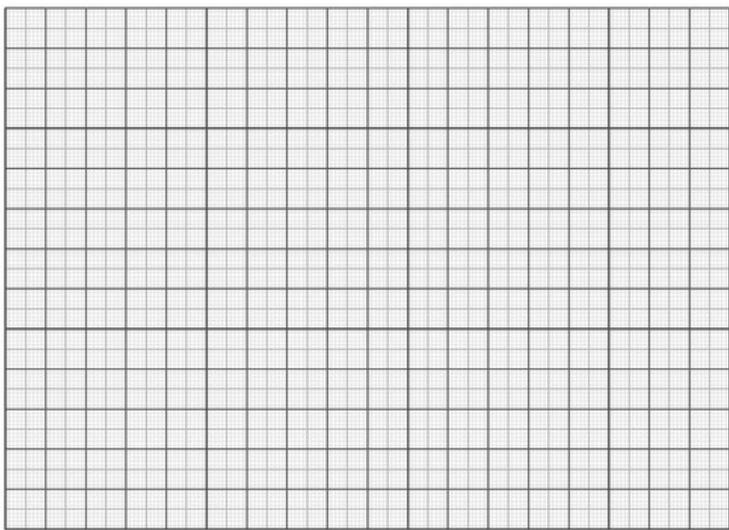
**LINEARIZATION and GRAPH ANALYSIS:**

50. Given the data below of the radii in inches of some circular tables and the surface areas in square inches of a tabletop.

Radius (in inches)	Surface Area (in square inches)
9	254.47
12	452.39
15	
18	1,017.88
21	1,385.44
24	1,809.56



- Find the surface area of a table with a 15-inch radius, and write it in the table given.
- Write an equation that expresses the relationship between radius  $x$  and surface area  $y$  of a circular tabletop. Describe the shape of its graph.
- LINEARIZE this graph, and LABEL axes correctly to show how this graph was linearized! (ie, what was graphed on the “ $y$ ” and what was graphed on the “ $x$ ”)



- Find the line of best fit, and describe what the slope of the line should be and why (briefly).