

## Arlington Tech Summer Assignment DE Physics (PHY201 & PHY202)

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**Due Date: Sunday 09/10/2024 on Canvas**

### **Instructor Note:**

Welcome to Arlington Tech and DE Physics!

Over the summer, you will read an assigned summer packet and complete a preliminary assignment for your DE Physics course. You will also review resources to assist in your transition to college, especially in remote learning conditions. Please read the following material carefully and complete the assignments according to the instructions below.

## Physics Summer Packet

The exercises below are a review of the prerequisite math skills that you need to succeed in AP Physics 1. Make sure to read all directions throughout the packet. Final answers can be in fractions and in terms of mathematical constants ( $\pi$ ,  $e$ ,  $i$ , etc.).

Your work must be legible and linear, and I must be able to follow it easily. Show all steps used when solving the problem. Physics emphasizes the process and not just the end result. Please no incoherent jumping around the page. Mark your final answers by either circling or boxing them.

Do not copy work from another student for your own integrity and for your own benefit. Use a math book or internet for reference. No physics is needed for this packet.

### Unit Conversions Review

1.) Finish the SI prefix table below. Follow the example of the centi- prefix.

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

2.) 16.7 kilograms is how many grams?

3.) 560 nm is how many meters?

4.)  $2.998 \times 10^8$  m/s is how many kilometers per hour?

### Trigonometry Review

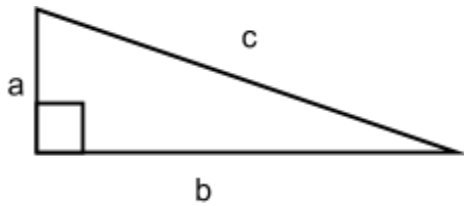
5.) Complete the table below.

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

6.) 360 degrees = \_\_\_\_\_ radians.

7.) 4.5 revolutions = \_\_\_\_\_ radians.

Directions: Use the figure below to answer problems 8-13. Simplify as much as you can.



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

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

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

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

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

13.) 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  $x$ .

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

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

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

A.) Solve for  $v_f$ .

B.) Solve for  $d$ .

15.)  $mgsin\theta = \mu mgcos\theta$ . Solve for  $\theta$ .

$$16.) \frac{1}{2}mv_f^2 + mgh_f = \frac{1}{2}mv_i^2 + mgh_i$$

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

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

$$17.) F_g = G \frac{m_1 m_2}{r^2} . \text{ Solve for } r.$$

$$18.) \frac{mv^2}{R} = G \frac{Mm}{R^2} . \text{ Solve for } v.$$

$$19.) T = 2\pi \sqrt{\frac{L}{g}} . \text{ Solve for } g.$$

$$20.) \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} . \text{ Solve for } R_T.$$

### Miscellaneous

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

$$21.) \frac{1}{4} + \frac{1}{6}$$

$$22.) \frac{1}{3} + \frac{1}{18}$$

$$23.) \text{ Consider } z = \frac{x}{y}, c = ah, l = m - n, \text{ or } r = \frac{s^2}{t^2}.$$

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

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

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

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

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

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

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

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

## Systems of equations

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

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

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

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

### 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

Formula: \_\_\_\_\_

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

27.) Graph below

