

# AP Physics 1 Summer Work 2021

Name \_\_\_\_\_ Period \_\_\_\_\_

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. All work must be completed on the pages below in the area provide. Final answers can be 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. Please no incoherent jumping around the page. Mark your final answers by either circling or boxing them.

Your completed summer work is due the first day of class.

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. If you have difficulty, please do not hesitate to email me at [jrhody@lcscmail.com](mailto:jrhody@lcscmail.com)

## 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

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?

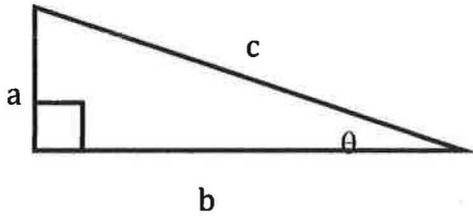
9.) 15 years is how many seconds?

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  $b$ ?

22.) 360 degrees = \_\_\_\_\_ radians.

23.) 4.5 revolutions = \_\_\_\_\_ radians.

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

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

### Algebra Review

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

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

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

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

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

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

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

A.) Solve for  $v_i$ .

B.) Solve for  $d$ .

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

A.) Solve for  $v_o$ .

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

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

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

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

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

31.)  $a_c = \frac{v^2}{r}$ . Solve for  $v$ .

32.)  $m g \sin \theta = \mu m g \cos \theta$ . Solve for  $\theta$ .

$$33.) \frac{1}{2}mv_f^2 + mgh_f = \frac{1}{2}mv_i^2 + mgh_i$$

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

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

$$34.) Ft = mv_f - mv_i. \text{ Solve for } v_f.$$

$$35.) m_1v_{i,1} + m_2v_{i,2} = (m_1 + m_2)v_f. \text{ Solve for } v_{i,2}.$$

$$36.) m_1v_{i,1} + m_2v_{i,2} = m_1v_{f,1} + m_2v_{f,2}. \text{ Solve for } v_{f,2} \text{ if } v_{i,1} = 0.$$

$$37.) (F_1 \sin \theta)r_1 + (-F_2 \sin \phi)r_2 = 0. \text{ Solve for } r_2.$$

$$38.) -kx + m(-g) = 0. \text{ Solve for } m.$$

$$39.) F_g = G \frac{m_1 m_2}{r^2}. \text{ Solve for } r.$$

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

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

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

43.)  $\frac{1}{2}mv_f^2 + \frac{1}{2}kx^2 = \frac{1}{2}mv_i^2 + mgh_i$ . Solve for  $x$  if  $v_f = 0$ .

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

**Miscellaneous**

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

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

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

47.) 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:

48.) 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.

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

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

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

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