

AP Physics 1 Summer Work 2018

The exercises below are a review of the math skills we will be using regularly 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 (π , e , i , etc.). Your work must be written out clearly so that all steps are easy to follow. Attach extra pages if you need more space. Mark your final answers by either circling or boxing them.

Your completed summer work is due the first week of class. During the first two weeks of class there will be a quiz with problems similar to those found in this review. Please do not hesitate to email me with any questions at knewton@cpsd.us.

Join the following Google classroom pages for links to videos and/or websites that you might find helpful or interesting.

Fall Semester Class (S504A-001) – Google Classroom Code: wxa907k

Spring Semester Class (S504A-002) – Google Classroom Code: 1zylul

Significant Figures and Scientific Notation Review

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

a.) 6.001 Answer: _____

c.) 206,000 Answer: _____

b.) 0.0080 Answer: _____

d.) 27.00 Answer: _____

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.

Symbol	Name	Numerical Equivalent
n		
μ		
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.) 8.99×10^9 seconds is how many years?

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

12.) Complete the table below. (Do as much as you can without using a calculator.)

θ	0°	30°	45°	60°	90°
$\sin \theta$					
$\cos \theta$					
$\tan \theta$					

13.) 360 degrees = _____ radians.

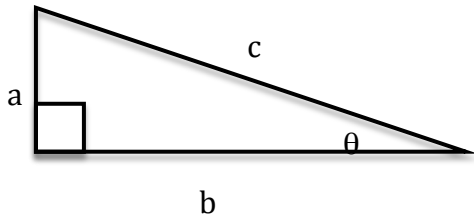
14.) 4.5 revolutions = _____ radians.

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

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

Trigonometry Review

Use the figure below to answer problems 17-24. Simplify as much as you can.



17.) Solve for c if given a and b .

18.) Solve for a if given b and c .

19.) Solve for a if given c and θ .

20.) Solve for b if given a and θ .

21.) Solve for θ if given b and c .

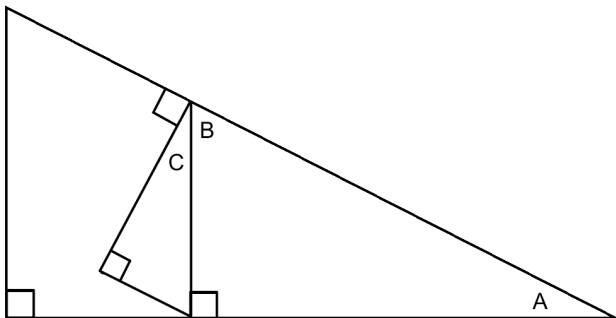
22.) Solve for θ if given a and b .

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

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

25.) Using the properties of triangles, prove that $\angle A \cong \angle C$ in the drawing below.

Answer:



Algebra Review

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

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

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

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

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

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

28.) $v^2 = v_0^2 + 2a(x - x_0)$

A.) Solve for v_0 .

B.) Solve for x .

29.) $x = x_0 + v_0t + \frac{1}{2}at^2$

A.) Solve for v_0 .

B.) Solve for t , if $v_0 = 0$.

C.) Solve for t , if $x = x_0$.

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

31.) $mg \sin \theta = \mu mg \cos \theta$. Solve for θ .

$$32.) \frac{1}{2}mv_f^2 + mgh_f = \frac{1}{2}mv_i^2 + mgh_i$$

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

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

$$33.) \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}. \text{ Solve for } R_T.$$

$$34.) F_g = G \frac{m_1 m_2}{r^2}. \text{ Solve for } r.$$

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

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

$$37.) \frac{1}{2}mv_f^2 + \frac{1}{2}kx^2 = \frac{1}{2}mv_i^2 + mgh_i. \text{ Solve for } x \text{ if } v_f = 0.$$

Miscellaneous

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

$$38.) \frac{1}{4} + \frac{1}{6}$$

$$39.) \frac{1}{3} + \frac{1}{18}$$

40.) Consider $z = \frac{x}{y}$, $c = ab$, 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.) 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

Conceptual Question:

41.) 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.

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

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

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

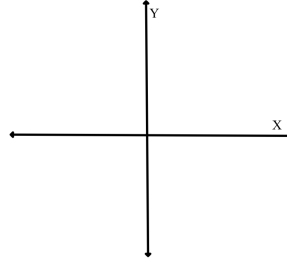
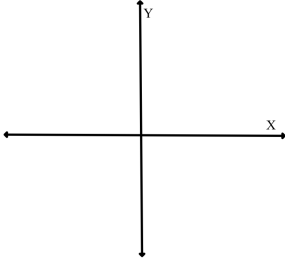
Graphing Equations

45.) If $r = c - b \cdot t$ was graphed on an r vs. t graph, what would the following be?

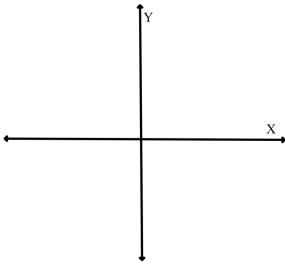
Slope: _____ y-intercept: _____

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

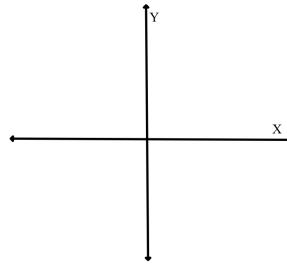
a.) $y = mx + b$, if $m > 0$ and $b = 0$. b.) $y = mx + b$, if $m < 0$ and $b > 0$.



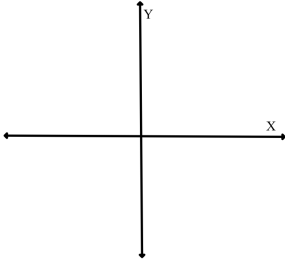
c.) $y = x^2$



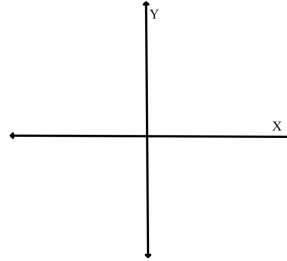
d.) $y = \sqrt{x}$



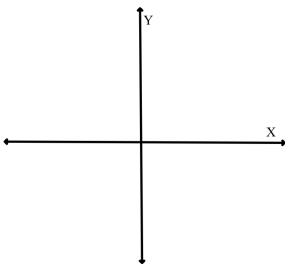
e.) $y = 1/x$



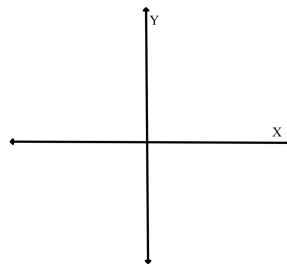
f.) $y = 1/x^2$



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



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

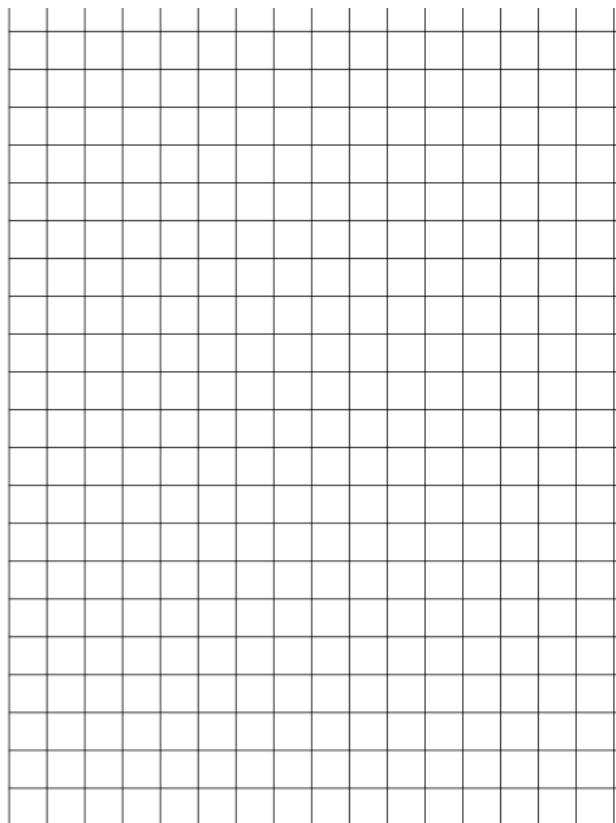


Marbles in Cylinder Lab

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. Find the slope of the line. Remember that you need to use the best fit line – not the data points – to find the slope. 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.)

Pendulum Lab

You are doing an experiment to find out how the length of a pendulum affects its period. (Period is the time it takes for one back and forth swing). You collect the data below. Use Google Sheets to do the following:

- Copy the data into a Google Sheet file (or you can start with the Google Sheet file that is shared on Google Classroom).
- Set up a formula to calculate the average period for each length
- Make a scatter plot of the data with length on the x-axis and period on the y-axis
- Add a trendline using a power series
- Set the label to show the equation on the graph
- Attach the Google Sheet file to the Summer Assignment post on Google Classroom.

	Period (s)		
length (m)	trial 1	trial 2	trial 3
0.10	0.64	0.63	0.65
0.20	0.91	0.90	0.89
0.30	1.10	1.11	1.09
0.40	1.27	1.25	1.28
0.50	1.42	1.45	1.41
0.60	1.55	1.53	1.56
0.70	1.68	1.67	1.65
0.80	1.79	1.81	1.78
0.90	1.90	1.92	1.89
1.00	2.01	2.02	1.99