AP PHYSICS 1 – Introductory Math Review Name:

Problem Set DUE Tuesday September 3, 2024

While AP Physics 1 is a science course and predominantly focuses on conceptual learning, algebra skills are a necessity and you will often be asked to both qualitatively and quantitatively describe something. You will need the following math skills time and time again throughout the course, so we want to build a solid foundation from the very beginning.

You MUST show work to earn full credit! (This is an AP policy)

PART 1: Units and Conversions

Fill out the following table of the base units for the SI system:

Physical Quantity	SI Unit	Abbreviation
Length		
Temperature		
Time		
Mass		

Make a list of common SI prefixes and what they mean. Be sure to include both large and small units.

Perform the following conversion. If you don't know the conversion factor, look it up. You need to be comfortable with these types of conversions: between different metric prefixes and between metric and standard units. It may be helpful to keep a list of prefixes.

1. $0.77\ m =$ $\quad cm$
2. $298\ K =$ $\quad$ ℃
3. $6.23 \times 10^{-7}\ m =$ $\quad nm$
4. $1.5 \times 10^{11}\ g =$ $\quad kg$
5. $25.0\ \mu s =$ $\quad s$
6. $823\ mL =$ $\quad m^3$

PART 2: Dimensional Analysis

Perform the following conversions by using dimensional analysis. Show your conversions.

1. How many seconds are in 2 years?

2. The volume of a wooden block is 6.30 in^3. This is equivalent to how many cubic centimeters?

3. If a car is traveling 60 miles per hour, how many inches per second is it traveling?

PART 3 Scientific Notation

Convert each of the following into scientific notation.

1. 123,000

2. 0.000984

3. 0.0114×10^4

4. 20.4×10^5

Convert each to standard form

1. 1.27×10^{-3}

2. 78.4×10^4

PART 4 Algebraic Manipulation

Often in physics, solving for one variable is necessary. For each of the following, solve for the indicated variable. Just follow order of operations!

1. $F = \frac{mv^2}{r}$ solve for v

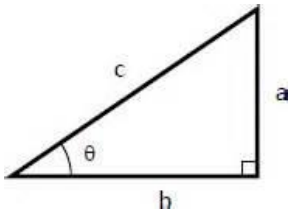
2. $a = mg(sin\theta - \mu cos\theta)$ for μ

3. $T = 2\pi\sqrt{\frac{l}{g}}$ solve for g

4. $\Delta x = \frac{1}{2}(v + v_o)t$ solve for v_o

PART 5 Trigonometry

In order to deal with the angles that are ever present in physics, we use Right Angle Trigonometry and the Pythagorean Theorem frequently. Use these principles to solve the following problems. If using a calculator, be sure that your calculator is in ***degree mode****.*



1. $\theta = 55°, c = 32\ m$ solve for a and b.

2. $\theta = 45°, a = 15\ m/s$ solve for b and c.

3. $\theta = 65°, b = 17.8\ m$ solve for a and c.

4. $a = 250\ m, b = 180\ m$ solve for θ and c.

5. $a = 25\ cm,\ c = 32\ cm$solve for θ and b.

6. $b = 140\ cm, a = 650\ cm$ solve for θ and c.

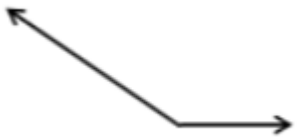
PART 6 Vectors

Using the parallelogram rule for vector addition, draw the resultant vector.

1.



2.



3.

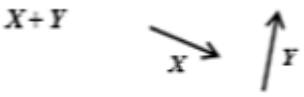


4.

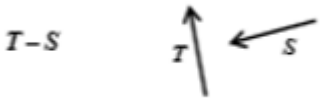


Using the tip-to-tail method for vector addition and subtraction, draw the resultant vector. Label the resultant vector clearly as such.

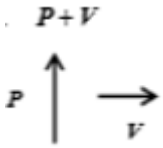
1.



2.

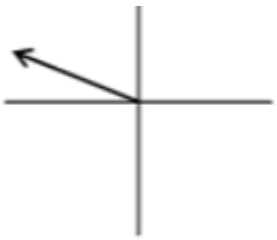


3.



For the following vectors, draw the component vectors along the x and y axes.

1.



2.



3.



4.



Part 7 Proportionality

In the equation below, F equals the electric force between two charges placed at a distance apart. Q1 is the magnitude of the first charge, Q2 is the magnitude of the second charge, and k is Coulomb's constant. Answer the following questions.

$$F = k\frac{q_1 q_2}{r^2}$$

1. What is the relationship between the electric force and Coulomb's constant?

2. What is the relationship between the electric force and the magnitude of the first charge?

3. If the magnitude of charge 2 is doubled, what happens to the electric force?

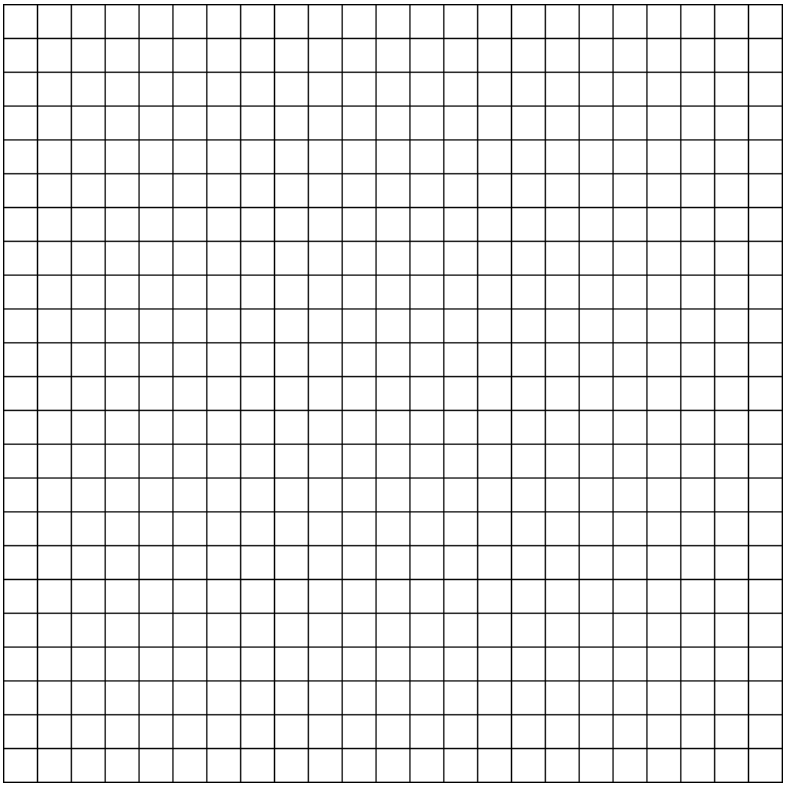
4. If the distance is doubled, what happens to the electric force?

5. If the radius and electric force are held constant and charge 1 is doubled, what must happen to charge 2?

Part 8 Graphing

The following data set was collected during an experiment to find the density for an unknown pure metal. Five different volumes of the same unknown pure metal were massed and the data was recorded below. Create a graph for the data and answer the analysis questions.

Volume (cm^3)	Mass (g)
0.18	2.00
0.44	5.00
0.66	7.50
1.41	16.00
2.11	24.00



1. What is the relationship between volume and mass in this experiment? How can you tell?

2. What does a data point on this graph actually represent?

3. The **slope** of the best fit line of this graph is equal to the **density** of the unknown pure metal. Explain why this is true using the definition of slope, the definition (or formula) for density, and your graph.

4. What volume would a 10.00 gram sample of this substance occupy? How did you determine this?