

AP Physics 1: Summer Review/Preparation Assignment

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Part I: Units, Precision, and Accuracy

In AP Physics 1, significant time will be spent in the laboratory measuring quantities and establishing mathematical relationships between variables. Quantities will be measured and reported using SI units.

Please view the [presentation on units, precision, and accuracy](#) in order to get background information before doing the practice questions below.

Two videos targeting precision and accuracy are also available for your viewing.

[Precision and Accuracy 1](#)

[Precision and Accuracy 2](#)

Units, Precision, and Accuracy Practice

- Express the following quantities in scientific notation.
 - 75 000 000 *m*
 - 0.00048 *s*
- Convert the following quantities as specified.
 - 0.045 *g* to *mg*
 - 82 000 *m* to *km*
 - 340 *m/s* to *km/h*
- State the number of significant digits in the following measurements.
 - 903 *kg*
 - 600.00 *m*
 - 0.0030 *s*
 - 8.030×10^{-4} *kg*
 - 0.6 *km*
- A student measures the surface dimensions of a rectangular floor using two different measuring tapes. The data collected is shown in the table below.

Tape Measure A	Tape Measure B
Length (<i>L</i>) = 4.24 <i>m</i>	Width (<i>w</i>) = 1.103 <i>m</i>

- Do the measuring tapes have the same measurement precision? Explain.
 - Calculate the perimeter of the floor. Report your answer to the appropriate number of significant digits and/or decimal places, and include appropriate units.
 - Calculate the surface area of the floor. Report your answer to the appropriate number of significant digits and/or decimal places, and include appropriate units.
- A student measures the mass of a standard set of calibration weights on a triple-beam balance and on an electronic balance. The data obtained is recorded in the table below.

Triple-Beam Balance (g)	Electronic Balance (g)	Standard (Accepted) Value (g)
1.001	1.1033	1.000
2.002	2.1033	2.000
3.001	3.1034	3.000
5.000	5.1033	5.000

- Does the triple-beam balance have a greater precision than the electronic balance? Explain.
- The student claims that the data set collected by the triple-beam balance is more accurate than the set collected by the electronic balance. Do you agree with this claim? Explain.

Part II: Mathematical Variation

In physics and other sciences, many experiments are performed to obtain or test a relationship between two variables, the independent or manipulated variable, and the dependent or responding). Once the evidence is collected and analyzed, the relationship is expressed clearly and concisely using the concepts and language of mathematics. The mathematics topic of variation is a powerful tool not only to summarize a relationship but also to predict values believed to satisfy a known variation; i.e., to solve problems.

Please [view the presentation on Mathematical Variation](#) in order to get background information before doing the practice questions below.

Mathematical Variation Practice

1. A student has a large graduated cylinder that is resting on a mass scale. The student adds water to the cylinder and measures the reading in the mass scale for various volumes of water. The student correctly determines that the mass of the water varies directly with the volume of the water added to the cylinder. If the mass of 1.50 L of water is 1.50 kg, what is the mass of 2.40 L of water?
2. The attraction between a magnet and a bar of iron varies inversely as the square of the distance between them. The attraction is 2.0 units when the distance is 3.0 cm. What is the attraction when the distance is 1.0 cm?
3. The volume (V) of a mass of gas varies directly as its absolute temperature (T) and inversely as the pressure (P) applied to it. A gas occupies a volume of 100 mL when the temperature is 300 K and the pressure is 4000 units. Calculate the volume of the same gas when the temperature is 600 K and the pressure is 16000 units.

4. On a horizontal surface, the distance a cart travels is a function of time.

position (m)	5.0	9.9	15.1	20.1	25.0
time (s)	0	1.0	2.0	3.0	4.0

- (a) Plot a graph with time on the horizontal axis and position on the vertical axis.
 - (i) Describe the relationship between position and time?
 - (ii) Determine the constant of variation *graphically* using the slope formula. What does this constant (slope) physically represent?
 - (b) Predict the position of the cart at the following times:
 - (i) $t = 6.0$ s
 - (ii) $t = 2.5$ s
5. A triathlete marks out a course for their daily training that includes cycling and running. Each day they complete the course using a different combination of cycling and running, which varies the average speed for the course. The time to complete the course for each day is shown in the table below.

Day	1	2	3	4	5
Average speed (km/h)	16	8	4	2	1
Time (h)	1	2	4	8	16

- (a) Draw a graph of speed versus time.
- (b) What is the simplest form of the variation suggested by this data?
- (c) Using your answer to (b) and a new table of values, draw another graph to obtain a straight-line relation. Draw the best-fit straight line.
- (d) Determine the slope of this line and write the equation of the line.

Answers

1. 2.40 kg 2. 18 units 3. 50 mL 4. linear, 5.0 m/s, slope represents average speed of cart, 35.0 m, 17.6 m 5. $\text{slope} = 16$ km, equation: $vt = 16$ km

Part III: Introduction to Mechanics

Provide a definition or explanation of the quantities listed below. Include an example to bolster your explanation.

1. Scalar Quantity

2. Vector quantity

3. Position

4. Distance

5. Displacement

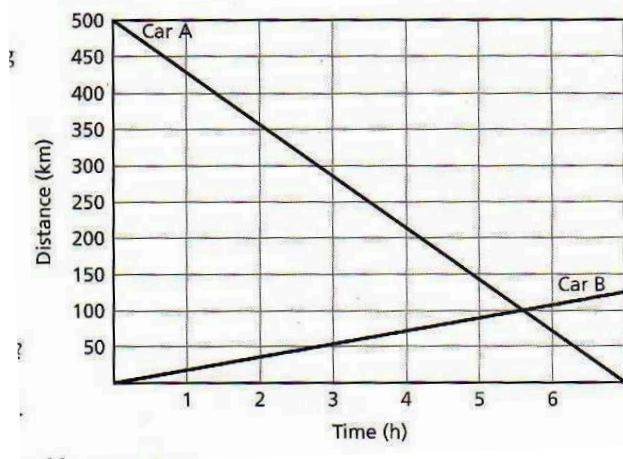
6. Speed

7. Velocity

8. Uniform Motion

9. Acceleration

10. Analyzing Graphs



The graph above shows the position of two cars over time as they travel on a straight highway.

- A student claims that Car A travels in the opposite direction to Car B. Do you agree with the student's claim? Explain.
- At what approximate time and position do the two cars pass one another?
- Determine the slope of the line describing the motion of Car A.
- Which car is traveling faster? Explain.
- What is the value of the "y-intercept" for the graph describing car A? What does this value physically represent?

Part IV: Contextual Experience

Much of the content presented in AP Physics 1 has real-life connections. So, get out there this summer and experience things, get a job, be active! Pay attention to how objects move (i.e., cars, bicycles), how you feel as you speed up, slow down, turn a corner, or fall through the air. Pay attention to how forces are involved to change motion, and the different forces that you experience (weight, tension, support force, friction, buoyancy, etc.). Pay attention while playing a sport or doing an activity; focus on the ball's path, the effort required, and the factors you must work against (or with). There is physics everywhere, whether it is while you are swimming, raking leaves, riding a skateboard, building a deck, or even cooking!

Due: Start of course

Important Study Guide and Reading

This may be "old-school," but a copy of an AP Physics 1 Review/Study Guide (Princeton Review, 5 Steps to a 5, Barron's etc.) is useful. This resource can be used for the entire course, not just in preparation for the AP Physics 1 Exam in May.

Questions, comments, concerns? I can be reached via email at ksage3434@gmail.com. However, my access to email will be limited during the summer break, so I cannot promise quick or consistent communication.