

AP Physics 1: Summer Assignment

Welcome to AP Physics!

Hello! Welcome to AP Physics 1. This course will delve deep into the study of motion, everything from tennis balls to planets to electrons to waves. AP Physics is a fascinating and challenging course that requires a solid foundation in mathematics to be able to study how the world moves. To make sure you have the proper mathematics background please complete the following packet and submit it as you walk into class on the first day of school. On the second day of school you will take the AP Physics 1 entrance exam to make sure that AP Physics 1 is a good fit. The entrance exam will cover the material on this summer assignment and you will need to score higher than an 80% on that to remain in AP Physics 1. Students who score less than an 80% might be better suited in another class. I'm looking forward to meeting you on the first day of school and be sure to check out the helpful links throughout this assignment to get refreshers with the math skills and watch the necessary video for the graphing portion of the assignment.

Sincerely,



Mr. Templin

Parts 1 and 2: Goals for AP Physics and Measurement Skills

Fill out the following [Google Form](#)¹ to explain your goals for AP Physics and refresh your measurement skills.

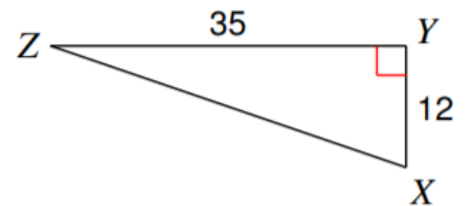
Part 3: Trigonometry

Trigonometry needs to be a foundational skill in AP Physics 1.

- 1) Answer the following regarding the triangle to the right, with angles X, Y, and Z.

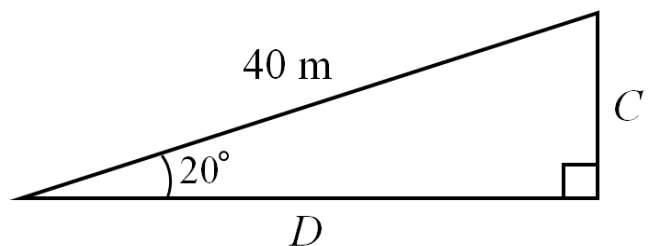
$$\tan(X) = \text{-----} \quad \cos(X) = \text{-----} \quad \sin(X) = \text{-----}$$

$$\tan(Z) = \text{-----} \quad \cos(Z) = \text{-----} \quad \sin(Z) = \text{-----}$$



- 2) Determine the values of sides C and D on the triangle to the right.

$$C = \text{-----} \quad D = \text{-----}$$



¹ <https://forms.gle/Wf1a8FaMgyaRUt339>

Part 4: Algebraic Skills

Section I

The equation relating the variables T_s , m , and k is shown below.

$$T_s = 2\pi\sqrt{\frac{m}{k}}$$

- 1) As k approaches infinity, what happens to T_s ? Explain.

Example of a Superior Answer: As k gets larger and larger and approaches infinity, T_s gets smaller and smaller and approaches zero. T_s and k have an inverse square relationship, and the square root of $1/\infty$ is zero.

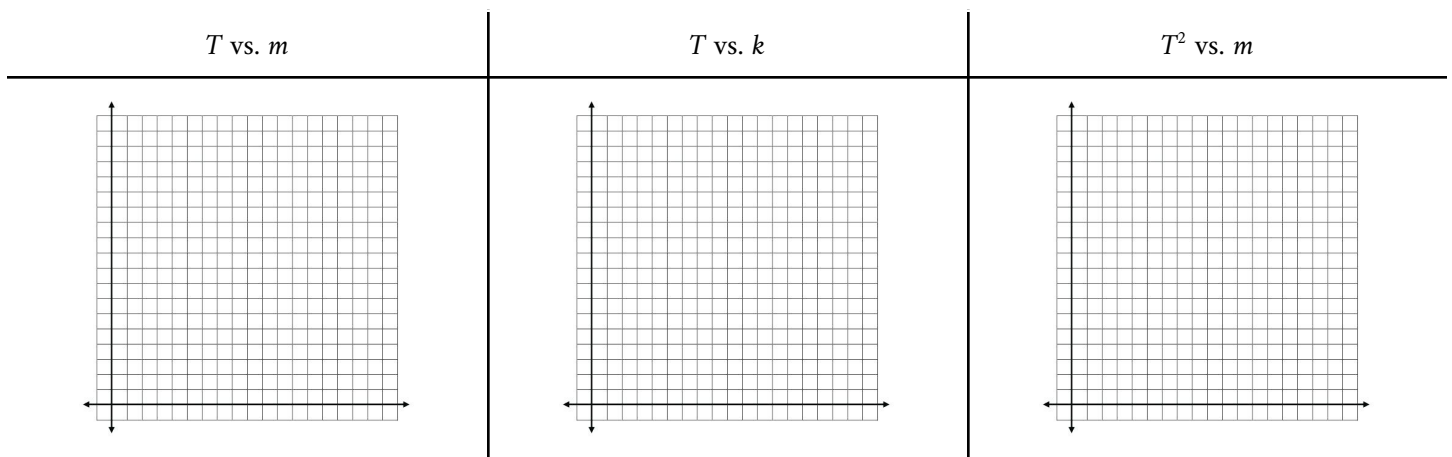
- 2) As m approaches infinity, what happens to T_s ? Explain.

- 3) If m is doubled and T_s remains constant, what happens to k ? Explain.

If m is doubled and T_s remains constant, then k must have doubled as well. In algebra, whatever you do to one side you must do to the other. If T_s is remaining constant, then it is essentially being multiplied by 1. In order to have one on the other side, the 2 in front of the m must be canceled out by a 2 in front of the k . In the equation below, you can see that if m is doubled and k is doubled then T_s remains unchanged.

- 4) If m is tripled and k remains constant, what happens to T_s ? Explain.

- 5) On the graphs below, sketch² the following graphs to show the relationships. Label each axis with the correct variable and units. When a graph is written in the form y vs. x , the first term should go on the y -axis.



² A sketch means that you should not plot exact values, but rather just a line or curve to show the relationship between two variables.

6) Rearrange the equation above to solve for k .

7) Rearrange the equation above to solve for m .

Section II

The equation relating the variables R , ρ , l , and A is shown below.

$$R = \frac{\rho l}{A}$$

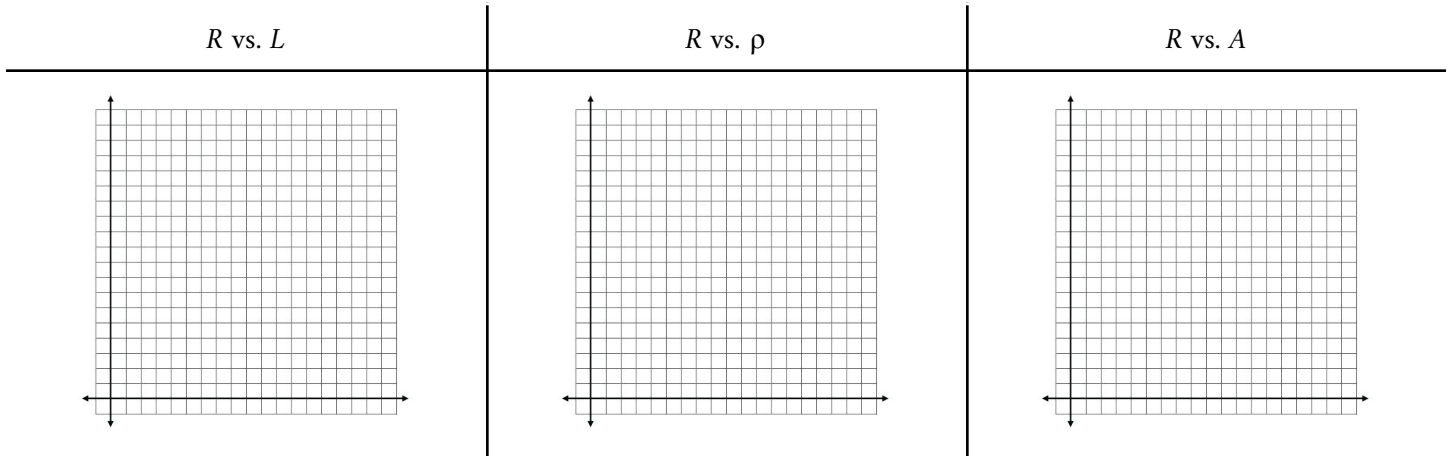
1) As A gets larger, what happens to R ? Explain.

2) As l gets larger, what happens to R ? Explain.

3) If ρ is doubled while l and A remain constant, what happens to R ? Explain.

4) If ρ is tripled, l is tripled, and A is tripled, what happens to R ? Explain.

- 5) On the graphs below, sketch the following graphs to show the relationships. Label each axis with the correct variable and units. When a graph is written in the form y vs. x , the first term should go on the y -axis.



- 6) Rearrange the equation above to solve for A .

- 7) Rearrange the equation above to solve for l .

Section III

The equation relating the variables a_c , v , and r is shown below.

$$a_c = \frac{v^2}{r}$$

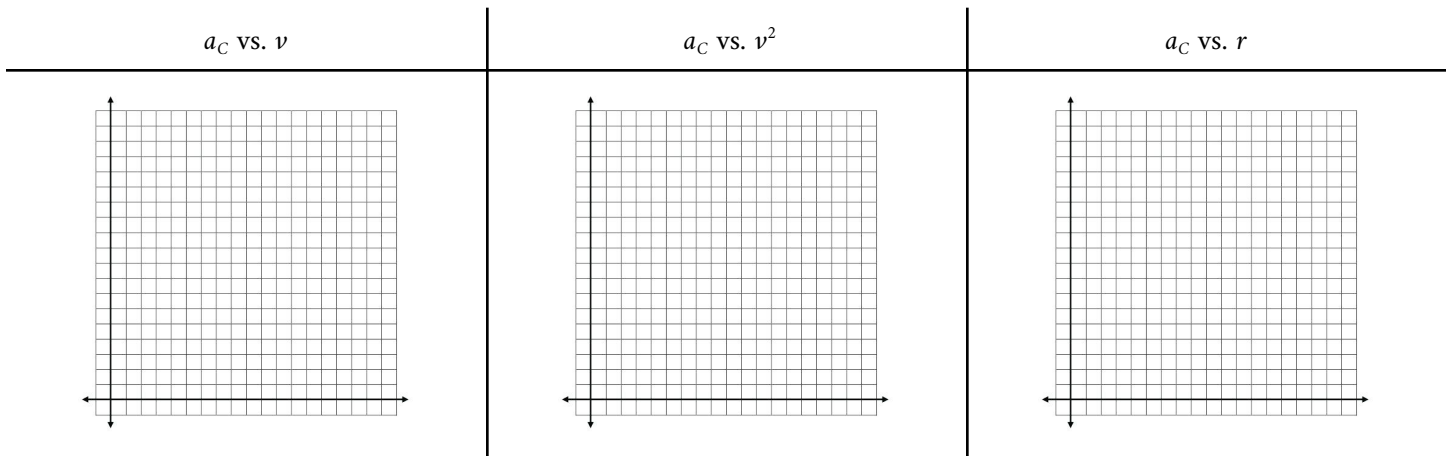
- 1) As r gets larger, what happens to a_c ? Explain.

2) As v gets larger, what happens to a_c ? Explain.

3) If v is doubled while r remains constant, what happens to a_c ? Explain.

4) If r is tripled, while v remains constant, what happens to a_c ? Explain.

5) On the graphs below, sketch the following graphs to show the relationships. Label each axis with the correct variable and units. When a graph is written in the form y vs. x , the first term should go on the y -axis.



6) Rearrange the equation above to solve for r .

7) Rearrange the equation above to solve for v .

- 1) On the following page, create a hand-drawn graph that shows the student's **Position vs. Time**. When a graph is written as y vs. x the first term should be plotted on the y -axis and the second term on the x -axis.
- 2) Each axis needs to be correctly labeled with units.
- 3) Your graph needs to be scaled correctly, with each grid representing the same value.
- 4) Your graph should include a trendline that does not connect the points, but shows the trend in the data. If the data shows a linear trend, draw a linear trendline. If the data shows an exponential trend, draw a parabolic trendline.
- 5) Making college level graphs is a skill that an AP Physics 1 student should find easy and is a required skill to enter this course.

