# ALL AP PHYSICS SUMMER WORK IS DUE ON JULY 31st by 11:59 pm!

## AP Physics 1 Summer Assignment

Welcome to AP Physics 1! I am extremely pleased that you are interested in taking another year of physics during your high school career. Throughout the year we will investigate all different principles and concepts that are physics related through research and experimentation. We will spend a lot of time investigating the relationships between various properties of objects and how everything relates to the real world. This course will focus on both the conceptual and mathematical aspect of physics. Although AP Physics is usually calculus based, we will only be focusing on the algebra and geometry portions of this course as AP Physics 1 is an algebra based course.

In the pages that follow, you will be tested on some fundamentals of algebra and geometry to review/practice to ensure you are prepared for to upcoming school year. You must complete the entire packet prior to the beginning of the school year.

At the end of this summer work packet, there will be several experimental design problems you will be required to complete to prepare you for how the course will be run this year. Most of the labs this year will only consist of a prompt which a problem you are being asked to investigate. You will be required to list all materials necessary to complete the lab along with how the materials will be used, summarize a procedure to carry out your experiment, how/what you would collect the data during the experiment, and how you would analyze the data collected during the experiment.

The last page of the summer packet is the AP Physics 1 equation sheet. This is the equation sheet you will be given on the AP Exam in May. Familiarize yourself with the material on the equation sheet, but do not memorize any of the equations.

**ALL OF THE AP PHYSICS SUMMER WORK IS DUE ON JULY 31st by 11:59 pm either in the front office or via email (zachary.schiffman2@sccpss.com). Any work not submitted on time will result in two automatic zeros, one for the math based problems and one for the experimental design problems, as an assessment grade to begin the year.**

Below I have listed a few resources for you to familiarize yourself with if you are struggling with the material throughout the summer or throughout the year.

http://aplusphysics.com/courses/ap-1/AP1_Physics.html
http://www.physicsclassroom.com/class
http://www.physicsphenomena.com/PhysicsMathReview.htm

If you have any questions throughout the summer, please do not hesitate to contact me via email (zachary.schiffman2@sccpss.com).

I look forward to teaching you AP Physics next year.

Mr. Schiffman

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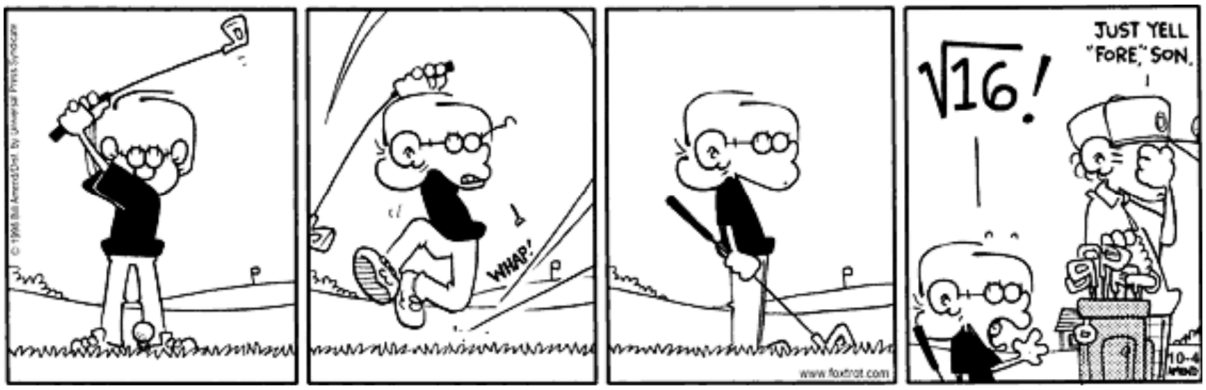


**PART I. SOLVING EQUATIONS**
**Solve the following equations for the quantity indicated. SHOW ALL OF YOUR WORK FOR CREDIT!**

Often problems on the AP exam are done with variables only. Below are various physics formulas we will use throughout the year. Don't worry about what the variables mean, just solve for the variable indicated. Don't let the different letters confuse you. Manipulate the equations algebraically as though they were numbers.

1. $v_f^2 = v_i^2 + 2a(\Delta x)$, solve for a

2. $K = \frac{1}{2}kx^2$, solve for x

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

4. $F = G\frac{m_1 m_2}{r^2}$, solve for r

5. $mgh = \frac{1}{2}mv^2$, solve for v

6. $B = \frac{\mu_o I}{2\pi r}$, solve for r

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7. $W = Fd\cos\theta$ , solve for θ

8. $F\Delta t = m\Delta v$ , $solve\ for\ F$

9. $K = \frac{1}{2}I\omega^2$ , $where\ I = \frac{2}{5}MR^2$ , solve for ω

10. $F_f = \mu F_N$ , $where\ F_N = mg$ , solve for g

11. $F = k\ \frac{q_1 q_2}{r^2}$ , solve for $q_2$

12. $\tau = Fr\sin\theta$ , solve for r

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**Part II: Factor Label Method for converting units (Dimensional Analysis)**
A very useful method of converting one unit to an equivalent unit is called the factor label method of unit conversion. To do this conversion, you want to cancel out the units you do not want, and leave the units you do want. Sometimes you will have to perform multiple steps to get the right answer.

Example: Convert 25 km/hr to m/s

$$\left(\frac{25\ km}{1\ hr}\right)\left(\frac{1000\ m}{1\ km}\right)\left(\frac{1\ hr}{3600\ sec}\right) =$$

Complete the following conversions using the factor label method: **SHOW ALL OF YOUR WORK!**

13. How many seconds are in one year?

14. Convert 28 km to cm.

15. Convert 45 kg to mg.

16. Convert 85 cm/min to m/s.

17. Convert 8.5 $cm^3$ to $m^3$.

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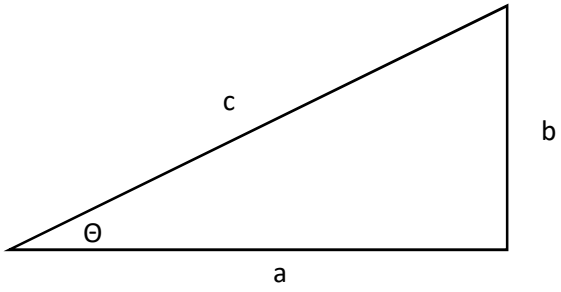
**Part III: Trigonometry and Basic Geometry**
Solve for all sides and all angles for the following triangles. **SHOW ALL OF YOUR WORK!**

$$\text{SOH} \quad \sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{CAH} \quad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{TOA} \quad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$




**Your calculator must be in degree mode!**

18. If Θ = 55° and c = 32 m, solve for a and b.

19. If Θ = 45° and a = 15 m/s, solve for b and c.

20. If Θ = 65° and b = 17.8 m, solve for a and c.

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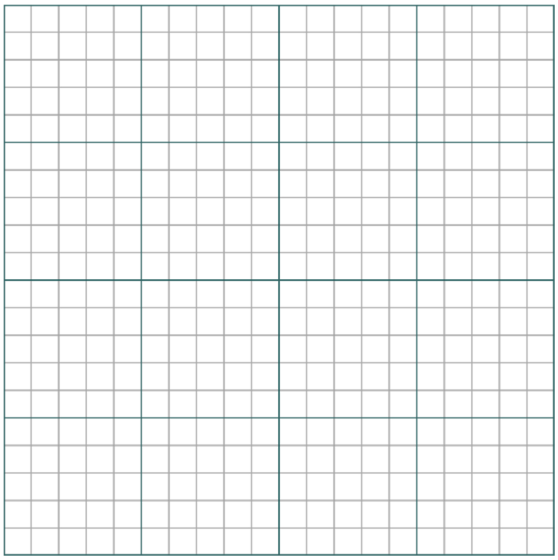
**Part IV: Graphing and Data Analysis**
Make sure you include all of the components of a graph.

Graph TALKS - rules for drawing graphs
TALKS = **T**itle, **A**xes, **L**abels, **K**ey, **S**cale

21. Plot a graph for the following data recorded for an object falling from rest.

| Velocity (ft/s) | Time (s) |
|---|---|
| 32 | 1 |
| 63 | 2 |
| 97 | 3 |
| 129 | 4 |
| 159 | 5 |
| 192 | 6 |
| 225 | 7 |



22. What kind of curve did you obtain?

23. What is the relationship between the variables?

24. What do you expect the velocity to be after 4.5 sec?

25. How much time is required for the object to attain a speed of 100 ft/s?

26. Derive an equation that satisfies the graph you created.

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**Part V: Experimental Design**

Most of the labs this year will only consist of a prompt which a problem you are being asked to investigate. Use the following to help you answer all questions:

1. What materials will be necessary to complete the experiment? How will each piece of equipment be used?
2. Summarize a procedure to conduct an experiment using only the equipment listed above.
3. What data will be collected during the experiment? How will the data be displayed?
4. How will the data be analyzed at the conclusion of the experiment?
5. How can the experimental uncertainty be reduced?

Complete the following four experimental design problems. After you have completed all four experimental design problems, choose two of them to carry out and conduct your experiment. Make sure you attach any additional pages of work to the end of the summer packet (clearly label each additional page).

**Experimental Design Problem #1**
How can you find the density of irregularly shaped objects?

**Experimental Design Problem #2**
How does the length of an inclined plane affect the acceleration of an object?

**Experimental Design Problem #3**
What factors affect the period of a pendulum?

**Experimental Design Problem #4**
Determine the speed of a projectile shot from a launcher.