Name: _____

AP Physics 1 - Summer 2017 Assignment **Due on the SECOND day of school!**

Congratulations! You are taking AP Physics 1 — the course that attempts to help you understand how the universe works! Physics on any level can be a challenging course. That's why colleges look for any form of Physics on a high school transcript.

You have chosen to take AP Physics 1—the second highest level we offer. Many students find it to be a challenging, time-consuming course that will require them to think harder than they ever have before. AP Physics 1 is a course for serious students. To be successful requires dedication, commitment to hard work, and a willingness to be challenged and pushed. The pace of the course will most likely be more rapid than most courses you have taken and may seem overwhelming at times. Remember, your teacher is there to help you and guide you through this process of learning!

Physics, and AP Physics 1 in particular, requires proficiency in algebra, trigonometry, and geometry. In addition to the science concepts, Physics often seems like a course in applied mathematics. (The higher the level of Physics you attempt, the higher the level of mathematics you will need to have mastered!) The following assignment includes mathematical problems that are considered *routine* in AP Physics 1. This includes knowing several key metric system conversion factors and how to employ them (i.e. the factor-label method).

The AP Exam is scheduled for the *beginning* of May. We need to be able to jump into the material right away when school begins. This summer homework will allow us to do this. This packet is predominantly a **math review** to brush up on valuable skills that are essential if you are to have a chance to succeed in this level of a Physics course.

Let's be clear: you are not expected to teach yourself these math skills, nor should you have to hire a tutor to teach you. These are math skills you should have already learned. You may have forgotten them, or gotten rusty on them. That's possible. That's exactly why I am giving you this assignment. Over the summer you have a chance to "dust off" those skills, or "scrape off the rust" and get everything in prime working order. Come August, we need to hit the ground running, and you want to be ready!

If you have questions you can contact the teacher at jgifford@taylorisd.org .

Warning: Physics is a subject where *each* student must learn from his/her *own* mistakes. In order to make those mistakes, everyone must do their *own* work, **all** of the time! If, in the midst of your struggle with a particular problem or question, you try and take an easy shortcut, you are **un-preparing** yourself for the next intellectual challenge. Do NOT copy or plagiarize! Work it out yourself. (If you *really* hit a wall, come to your teacher for help. That's what we're here for!)

For extra help, if you aren't sure how to work a section of the assignment, you can find a lot of useful tutorials and demonstrations at the websites http://www.aplusphysics.com/courses/ap-1/AP1_Physics.html#ap1 and www.physicsclassroom.com/mmedia/index.cfm.

Once again, welcome to AP Physics. It's going to be a great year!

Mrs, Gifford

Class supply list on the back of this page!

I recommend the following supplies for AP Physics 1:

Scientific calculator. It does not need to be a graphing calculator, though you are welcome to use a graphing calculator if you already have one. Adequate scientific calculators can be found at HEB or Wal-Mart for about $10.

A LARGE 3-ring binder (minimum 2 inches). This binder will stay at home, and be used to store notes and problem sets as they are accumulated over the year. This binder will be your main tool for review at the end of the year.

A SMALL 3-ring binder (1/2 inch). This will be given to you on the first day of school, and will be used to store notes and problem sets for a unit of study. This small binder should travel back and forth with you each day.

A composition notebook. This will be used as a lab journal. Composition notebooks will be available for purchase from the teacher for $1.00.

Sharpened pencils with good erasers.

Black or blue pens.

Loose-leaf notebook paper.

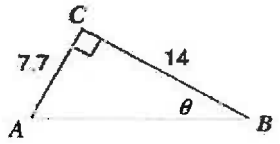
A protractor. Protractors will be available for purchase from the teacher for $1.00

AP Physics 1
Summer Assignment

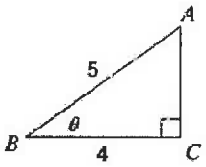
Part I: Right Triangles

Directions: Find the measure of the angle or side indicated. Please show all of your work.

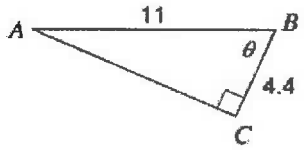
1) Find θ



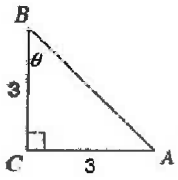
2) Find θ



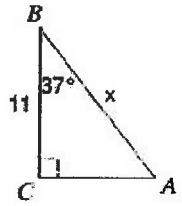
3) Find θ



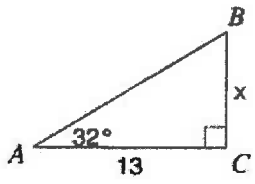
4) Find θ



5) Find x



6) Find x



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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. You may be given the speed of an object as 25 **km/h** and wish to express it in **m/s**. To make this conversion, you must change **km** to **m** and **h** to **s** by multiplying by a series of factors so that the units you do not want will cancel out and the units you want will remain. Conversion factors: 1000 **m** = 1 **km** and 3600 **seconds** = 1 **hour**

Do the following conversions using the factor-label method. Include units in each step and box in your answer. Show all of your work!

7. How many meters are in 100 feet? (1 ft = 0.3048 m)

8. How many square feet are in 100 m^2 ?

9. How many kilograms are in 2000 grams?

10. If there are 745 Watts for every horsepower how many horses would it take to power a single hundred-watt light bulb?

11. If a woodchuck can chuck 2 cubic meters of wood per minute, how many cubic centimeters per second is that equivalent to?

12. I want to know how far I just traveled on my super sweet 21-speed bike. I know the speed I went (2.5 m/s) and I know that my bike ride was 45 minutes long.

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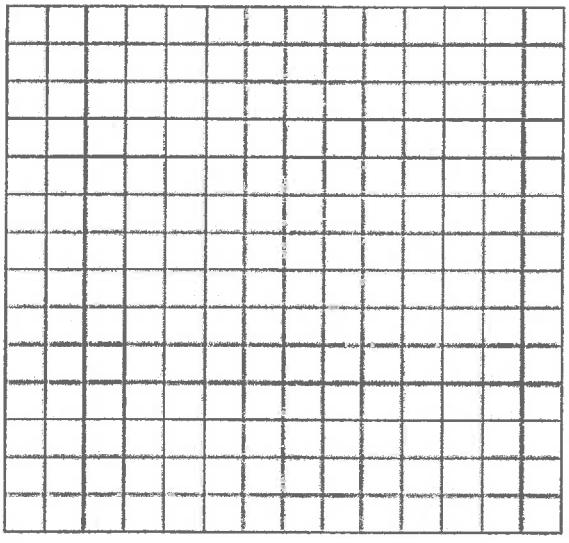
Part III: Graphing

You have been asked by your teacher to measure the diameter, radius and circumference of some round objects, such as tin cans, lids, CD's, coins, etc. You have collected the measurements and recorded them in the table below:

Radius (cm)	Circumference (cm)
1.1	3.5
3.2	10.0
4.8	15.1
8.8	27.5
9.6	29.9
12	37.6

13. You are to graph the data in the graph below. The radius is the independent variable here and the circumference is the dependent variable. What does this mean for how you graph the data?

14. Label the axis and with the name of the quantity, appropriate scaling of numbers and units. Then plot the points and draw the best straight line through as many points as possible, known as best-fit-curve (DO NOT JUST CONNECT THE DOTS!)



15. Find the slope of the graph. Does it have a name or a physical meaning?

16. Is the slope constant? How do you know this?

17. Does your graph have a y-intercept, if it does, what is it and does it have any significance?

18. Using the fact that the equation for a straight line is $y = mx + b$ write the specific equation for this graph using the appropriate symbols for radius and circumference in place of the and symbols.

Part IV: Scientific Notation:

Examples: $200{,}000 = 2 \times 10^{5}$ $0.00000123 = 1.23 \times 10^{-6}$

Express the following numbers in scientific notation:

13. 86,400 s =

14. 0.000564 m =

15. 300,000,000 m/s =

16. 0.0000000000667 =

Convert from scientific notation to normal notation:

17. 9×10^{9} =

18. 1×10^{-3} m =

19. 1.93×10^{4} kg/m^3 =

20. 4.5×10^{-7} m =

Multiplying Numbers in Scientific Notation

21. In your own words, explain how you multiply numbers in scientific notation.

22. $(2.5 \times 10^{8}) \times (1.2 \times 10^{1})$

23. $(1.8 \times 10^{3})(7.3 \times 10^{-8})$

24. $(6.0 \times 10^{-2})(6.1 \times 10^{-2})$

25. $(5.5 \times 10^{9}) \times (4.0 \times 10^{11})$

Adding Numbers in Scientific Notation

26. In your own words, explain how you add numbers in scientific notation.

27. $(2.5 \times 10^{8}) + (1.2 \times 10^{8})$

28. $(1.8 \times 10^{3}) + (7.3 \times 10^{2})$

29. $(6.0 \times 10^{-2}) + (6.1 \times 10^{-2})$

30. $(5.5 \times 10^{9}) + (4.0 \times 10^{11})$

31. Why do scientists use scientific notation?

32. Which of the following is written in proper scientific notation?

(A) 0.25×10^{3} (B) 2.5×10^{2} (C) 25×10^{1} (D) 250

PART V: Algebraic Relationships

Consider the following: $z = x/y$ $c = ab$ $l = m\sqrt{n}$ $r = s^2/t^2$

33. As *x* increases and *y* stays constant, *z* _____.
34. As *y* increases and *x* stays constant, *z* _____.
35. As *x* increases and *z* stays constant, *y* _____.
36. As *a* increases and *c* stays constant, *b* _____.
37. As *c* increases and *b* stays constant, *a* _____.
38. As *b* increases and *a* stays constant, *c* _____.
39. As *n* increases and *m* stays constant, *l* _____.
40. As *l* increases and *n* stays constant, *m* _____.
41. If *s* is tripled and *t* stays constant, *r* is multiplied by _____.
42. If *t* is doubled and *s* stays constant, *r* is multiplied by _____.

PART VI: SOLVING EQUATIONS

Often problems on the AP exam are done with variables only. Below are various physics formulas. Don't worry about what the variables mean for now; we will learn that later. Just solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers. Remember, there is a video tutorial on the website if you need some help.

Directions: Use algebra to solve for the indicated variable. Please show all work.

43. $\Delta V = IR$, solve for I

44. $v_f = v_o + at$, solve for a

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

46. $\Delta x = v_o t$, solve for t

47. $v_f^2 = v_o^2 + 2a(x_f - x_0)$, solve for a

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

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

PART VII: Significant Figures

For each number given below, identify how many significant digits are in the number.

50. 0.56 _____

51. 5,984 _____

52. 5.9873 _____

53. 100,000 _____

54. 0.098 _____

55. 5 _____

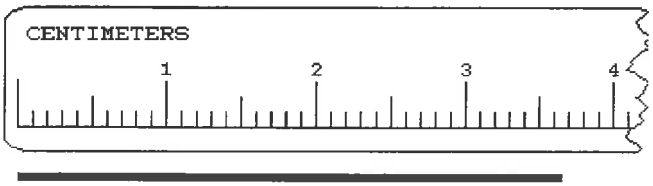
56. 5.0 _____

57. 5.08 _____

58. 1870 _____

59. 1.400 _____

60. Measure the line with the ruler shown below



a) Your Measurement:_____

b) How many significant digits are there? _____

c) How do you know how many significant digits are necessary here?

61. In math operations involving significant figures, the answer is reported in such a way that it reflects the reliability of the least precise operation. In your own words, what are the "rules" for:

a) multiplication & division of significant figures:

b) addition & subtraction of significant figures: