AP Physics 1 – Summer 2017 Assignment

Welcome to AP Physics 1. This course and the AP exam will be challenging. AP classes are taught as college courses—not just college-level courses, but actual college courses. This means that if you're having trouble with something, you need to be proactive about learning it, either by coming in for help after school or consulting with your classmates. If you have trouble with any of it, feel free to do some independent research on solving these sorts of problems. Remember—your job is to succeed; my job is to help you be successful.

The summer assignment is a review of the math necessary for the AP Physics 1 course. These topics should have been part of your experiences in the prerequisite math and science courses. We will use these skills throughout the AP Physics 1 course. Try to answer all of the questions and bring them to the first class of the school year. There will be a short quiz on this material during the first full week of school. There are some links on the last page that might help.

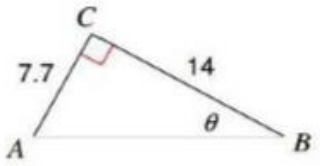
Please contact me through Remind.com if you need any additional help. To sign up for Remind just text **@ga6a7** to the number **81010**. You'll receive a welcome text from Remind. If you have trouble with **81010**, you can try texting **@ga6a7** to **(229) 471-4203**. I am looking forward to our time together and I hope you have a wonderful summer!
See you July 31st!

Recommended Supplies for AP Physics 1:

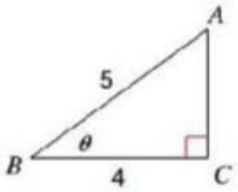
- Scientific calculator. *It does not need to be a graphing calculator, though you are welcome to use a graphing calculator if you already have one.*
- 3-ring binder
- 1, one subject notebook
- Notebook paper
- Pens and pencils

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

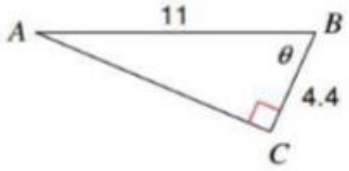
1) Find θ



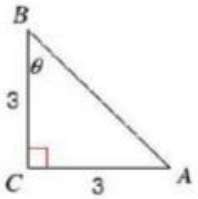
2) Find θ



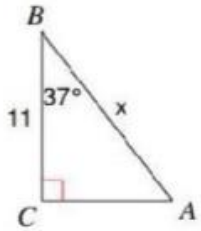
3) Find θ



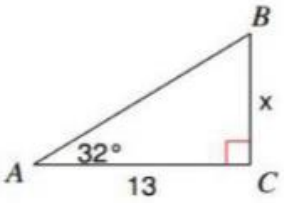
4) Find θ



5) Find x



6) Find x



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? (1ft = 0.3048m)

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

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?

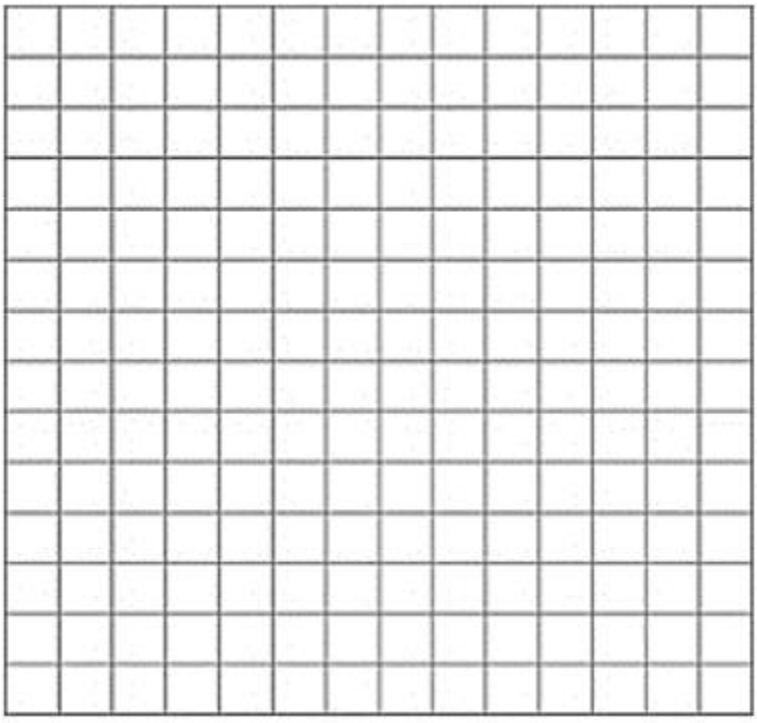
12. I want to know how far I just traveled on my super sweet 21-speed bike. I know the speed I went (2.5 m/s) and I know that my bike ride was 45 minutes long.

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? (hint: which goes on which axis?)

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 values for radius and circumference.

Part IV: Scientific Notation: *Examples:* 200,000 = 2×10^5, 0.00000123 = 1.23×10^{-6}

Express the following numbers in scientific notation:

13. 86,400s =
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.

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 _____

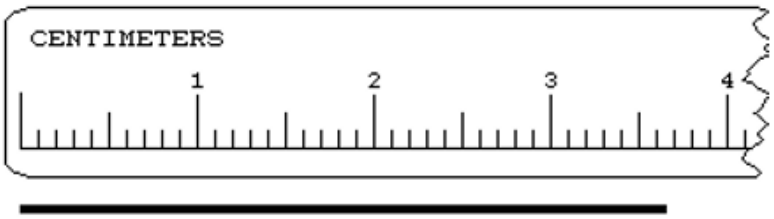
56. 5.0 _____

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:

Directions: Solve each problem. Show all steps of your process and circle your answer. Be sure your answer has the correct amount of significant figures.

62. 1.3 m x 71.5 m =

63. 4.2 ft + 8.15 ft =

64. 38.520 L – 11.4 L =

65. $\frac{8.00\ ml}{4.00\ m.} =$

66. $\frac{0.82\ g\ x\ 25.4\ g}{0.116\ g\ x\ 3.4\ g} =$

67. Test Yourself….An engineering student is trying to calculate the permeation rate of water across a polymer membrane of a fuel cell. The student's measurements are provided in the table below. Determine how many significant figures each measurement has.

Student's Data	Student's Measurements	# of Significant Figures
the mass of water that crossed the membrane	3.7520g	
the area of the membrane used	$1.00cm^2$	
elapsed time	3600 seconds	

68. Explain why all of the measurements are given in different numbers of significant figures.

69. In order to calculate the permeation rate of water across the polymer membrane, she must divide the mass of the water collected by the area of the membrane and then divide that by the elapsed time. So in other words:

Permeation rate = the mass of the collected methanol/ area of the membrane /elapsed time

a) How many significant digits should her answer be?_____
b) Explain how you figured out the answer to part a.

70. What is the connection between the number of significant digits provided in a problem and the way in which these quantities were initially measured?

AP Physics 1: LaVigne **Summer 2017 Assignment**

The textbook used for this class is Wilson, Buffa, Lou: Physics 6th edition by Pearson/Prentice Hall. I'd recommend purchasing a study guide such as 5 Steps to a 5 for AP Physics 1: Algebra Based by Greg Jacobs. Jacobs was one of the developers of test questions for the AP course. The new edition comes out in August. The last two editions (2016 and 2017) were the same by my understanding, so a used copy should work as well as a new one. There are others available as well.

To review the trigonometry used to calculate angles using sine, cosine and tangent:
http://mathworld.wolfram.com/SOHCAHTOA.html

We will be using some of the resources found at http://www.physicsclassroom.com/class

The units cover material in the following sections of that resource, if you want to start looking over them. We will cover these roughly in this order:

- 1-D Kinematics
- Newton's Laws
- Vectors
- Momentum and Its Conservation
- Work, Energy, and Power
- Circular Motion and Satellite Motion
- Waves
- Sound Waves and Music
- Static Electricity
- Current Electricity