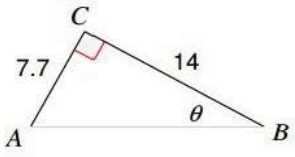
AP Physics 1
Summer Assignment

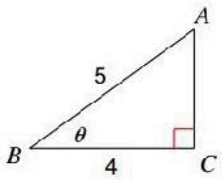
Part I: Right Triangles

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

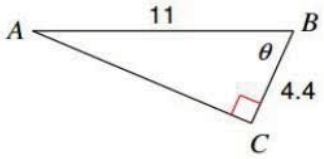
1) Find θ



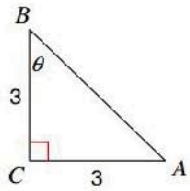
2) Find θ



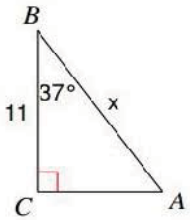
3) Find θ



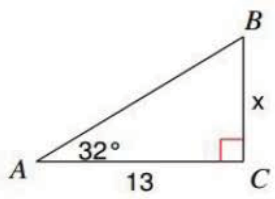
4) Find θ



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.

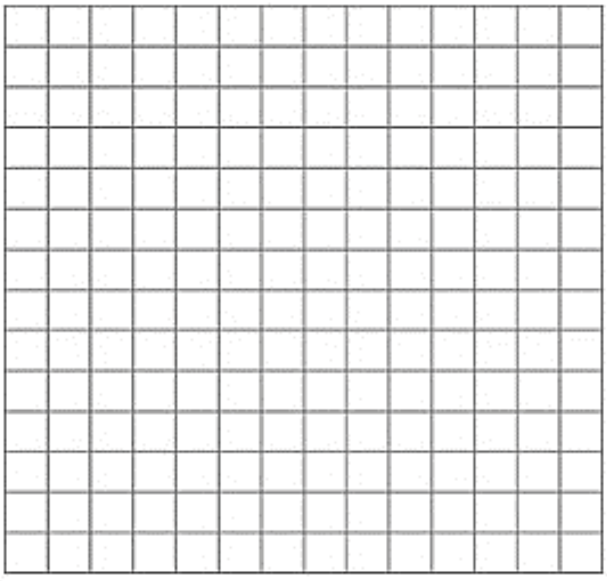
Part III: Graphing

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 = 2×10^5 0.00000123 = 1.23×10^{-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