

NAME _____ EXPRESSION _____

AP Physics 1 Summer Assignment

PRINT AND COMPLETE THE FOLLOWING QUESTIONS.

THIS ASSIGNMENT IS DUE THE FIRST DAY OF SCHOOL.

PLEASE GIVE TO YOUR AP PHYSICS TEACHER ON THE FIRST DAY OF SCHOOL REGARDLESS IF YOUR CLASS MEETS ON THE FIRST DAY OF SCHOOL. MUST BE SUBMITTED ON PAPER. **Please show all work and staple. No work shown = no credit!**

This packet is designed to make sure you have the necessary skills expected when starting AP Physics. Please make sure to go through each section carefully, and do not leave this for the last minute.

Part 1: Note Taking - Keep this in your notebook - do not turn notes in

Read and take notes on “Giancoli: Physics for Scientists & Engineers” chapter 1.

A scanned textbook copy of the chapter is attached.

Part 2: From Textbook - Measurement, Sig Figs and Scientific Notation

Answer the following 12 questions which are from the end of chapter 1 on a separate sheet of paper.

1. What are the merits and drawbacks of using a person's foot as a standard? Consider both (a) a particular person's foot and (b) any person's foot. Keep in mind that it is advantageous that fundamental standards be accessible (easy to compare to), invariable (do not change), indestructible, and reproducible.
2. What is wrong with this road sign:
Memphis 7 mi (11.263 km)
3. Why is it incorrect to think that the more digits you include in your answer, the more accurate it is?
4. For an answer to be complete, the units need to be specified. Why?
5. You measure the radius of a wheel to be 4.16 cm. If you multiply by 2 to get the diameter, should you write the result as 8 cm or 8.32 cm? Justify your answer.
6. Express the sine of 30.0° with the correct number of significant figures.
7. How many significant figures do each of the following numbers have:
(a) 214 (b) 81.60 (c) 7.03 (d) 0.03 (e) 0.0086 (f) 3236 (g) 8700
8. Write the following numbers in powers of 10 notation:
(a) 1.156 (b) 21.8 (c) 0.0068 (d) 328.65 (e) 0.219 (f) 444
9. Write out the following numbers in full with the correct number of zeros:
(a) 8.69×10^4 (b) 9.1×10^3 (c) 8.8×10^{-1} (d) 4.76×10^2 (e) 3.62×10^{-5}
10. The age of the universe is thought to be about 14 billion years. Assuming two significant figures, write this in powers of 10 in (a) years and (b) seconds. Show your work.
11. Add $(9.2 \times 10^3 \text{ s}) + (8.3 \times 10^4 \text{ s}) + (0.008 \times 10^6 \text{ s})$
12. Multiply $3.079 \times 10^2 \text{ m}$ by $0.068 \times 10^{-1} \text{ m}$, taking into account significant figures and units.

Part 3: Variable Isolation

A large part of the curriculum and the AP Test involves solving problems for one variable in terms of another variable. You will need to practice rearranging equations. The subscripts are assigned to specific variables...be careful to keep them together.

Manipulate the following equations algebraically to solve for the specified variable.

- | | |
|--|--|
| a. $v^2 = v_o^2 + 2a(x-x_o)$; $x=$ | b. $U_s = \frac{1}{2} kx^2$; $x=$ |
| c. $F = Gm_1m_2/r^2$; $r=$ | d. $mgh = \frac{1}{2} mv^2$; $v=$ |
| e. $x = x_o + v_o t + \frac{1}{2} at^2$; $a=$ | f. $1/f = 1/d_o + 1/d_i$; $d_i=$ |
| g. $f' = f(v+v_o)/(v-v_s)$; $v_s=$ | h. $n_i \sin \theta_i = n_r \sin \theta_r$; $\theta_i=$ |
| i. $P_1V_1/T_1 = P_2V_2/T_2$; $P_2=$ | j. $Gm_1m_2/r^2 = m_2v^2/r$; $v=$ |

Part 4: Relationships

Let's say that a value A is proportional to x and y such that $A = x^2/y^3$. If the values of x and y will be changed as follows, what will happen to the value of A? All changes start off as the regular equation (2 does not use the values from 1, etc.)

1. x is unchanged, y is doubled
2. x is tripled, y is unchanged
3. x is doubled, y is doubled
4. x is unchanged, y is halved
5. x is doubled, y is halved

Part 5: Units and Dimensional Analysis

Many of the problems that we will be solving can be solved more easily if you consider the units being used. This section is to help you practice using units.

This exercise is to reinforce the concept that problems are set up based in UNITS. Nonsense words taken from the poem Jabberwocky (from Lewis Carroll's Through the Looking Glass).

There are 20 tumtum trees in the tulgey wood.
In each tulgey wood is one frumious Bandersnatch.
There are 5 slithy toves in 2 borogroves.
There are 2 mome raths per Jabberwock.
There are 2 Jubjub birds in 200 tumtum trees.
There are 200 mome raths in each borogrove.
There are 5 Jubjub birds per slithy tove.

1. **The question is: If there are 5 frumious Bandersnatches, how many Jabberwocks are there?**
Use dimensional analysis setup to show your work!

Dimensional analysis even works with nonsense units. In this case, it is the **procedure** you are practicing - - see if you REALLY know how to do this!

$$28 \text{ yipyaps} = 1 \text{ foop}$$

$$12 \text{ foops} = 1 \text{ zark}$$

$$1 \text{ zark} = 20 \text{ neeks}$$

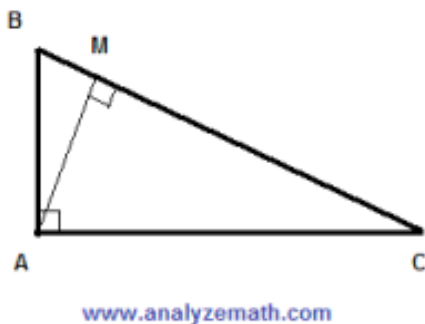
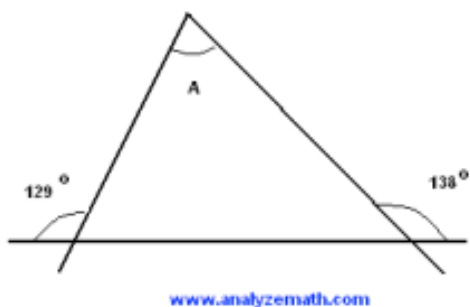
$$1 \text{ neek} = 50 \text{ blips}$$

2. How many blips are in one yipyap? 3. How many foops are in 3 neeks? 4. How many neeks are in 5 foops?

5. Use what you already know about time to convert 45 mph to (a) km/h and (b) m/s. There are 1609 meters in 1 mile, and 1000 m in 1 km.
6. Use dimensional analysis to estimate how long it would take one person to mow a football field using an ordinary home lawn mower. (State your assumptions, such as the mower moves with a 1-km/h speed, and has a 0.5 m width)
7. A certain compact disc (CD) contains 783.216 megabytes of digital information. Each byte consists of exactly 8 bits. When played, a CD player reads the CD's information at a constant rate of 1.4 megabits per second. How many minutes does it take the player to read the entire CD?
8. Estimate how many days it would take to walk around the Earth, assuming 12 hours walking per day at 4 km/h.

Part 6: Geometry

Solve the following geometric problems.



- a. solve for angle A on the figure at top left.
- b. ABC is a right triangle. AM is perpendicular to BC . The size of angle ABC is equal to 55 degrees. Find the size of the angle MAC . This is the figure at top right.

Part 7: Trigonometry

Solve each problem and draw the triangle.

- a. A right triangle has a hypotenuse of 19 units and is elevated at an angle of 41 degrees above the horizontal. Find the other angle and both legs.
- b. A right triangle has a vertical leg of 17 units and a hypotenuse that is 33 degrees from vertical. Find the other angle, the other leg and the hypotenuse.
- c. A right triangle has a hypotenuse of 7 units and a vertical leg of 12 units. Find the horizontal leg and each angle.
- d. A right triangle has a horizontal leg of 21 units and a vertical leg of 17 units. Find the hypotenuse and each of the angles.

Part 8: Algebra

Simplify the polynomials in 1-6. Solve #7.

1. $4x^5(9x^3)$
2. $-7x^5(3x^2)$
3. $65x^{19}y^{17} / 13x^5y^5$
4. $(4x^2y^5)^3$
5. $[(3x^6y^{11})/(10x^2y^5)] \times [(20x^5y^8)/(12x^4y^3)]$
6. $(3a^2 + 6a)/(3a)$
7. Solve the System: $XY = 28$, $Y = 3X - 5$. $X =$, $Y =$

Part 9: Writing a procedure

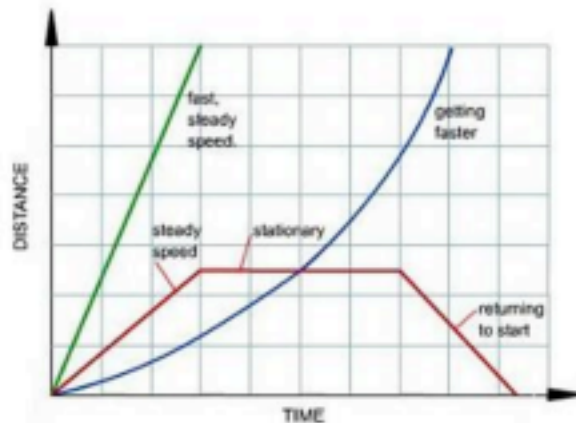
Write a procedure (in steps) for a simple task or your choosing. It needs to be detailed enough so that it can be followed. Possible examples are tying a shoe, building an Ikea bookshelf, etc

Part 10: Graphs

GRAPHING SPEED

INTERPRETING GRAPHS-

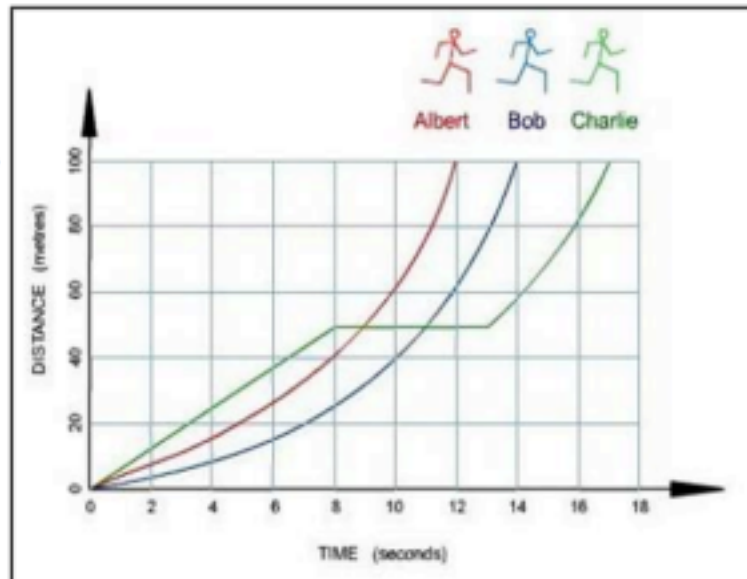
In physics, a graph is "worth a thousand numbers". A great deal of information can be obtained by looking and interpreting graphs describing motion (displacement, speed, velocity, and acceleration).



Distance vs. Time Graphs- To the right is a typical graph displaying Distance vs. Time. One or more objects may be graphed at one time, so you can compare the relative positions, speeds and displacement as they relate to each other.

Directions: Answer the following questions as they apply to the Motions graphs and diagrams.

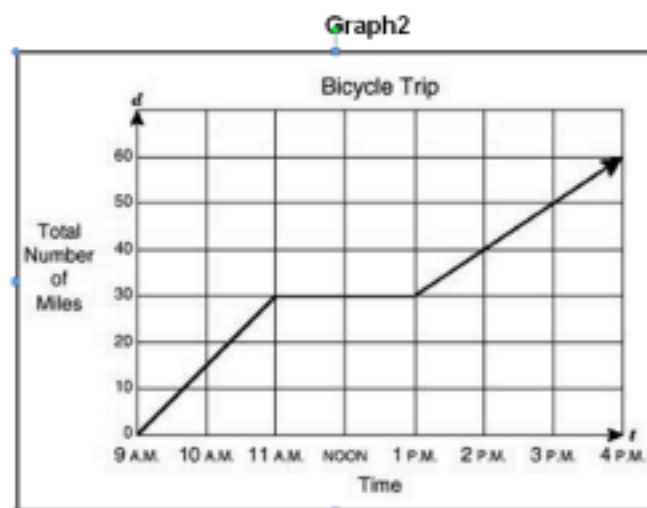
Graph1: Questions 1-7



1. What does the slope of each line on the graph tell you?
2. Which runner completed the 100m race in the least amount of time? What was his time?
3. Which runner started out the fastest?
4. What was Charlie doing between 8 seconds and 10.5 seconds?
5. What does a straight line on this graph tell you? A curved line?
6. At what distance and time did Albert overtake Bob?

Graph2:Questions8-13

7. What is happening between 9AM and 11AM?
8. What do you think bicyclist is doing between 11 AM and 1PM?
9. What was the total distance covered by 11AM, 1PM, and 4PM?



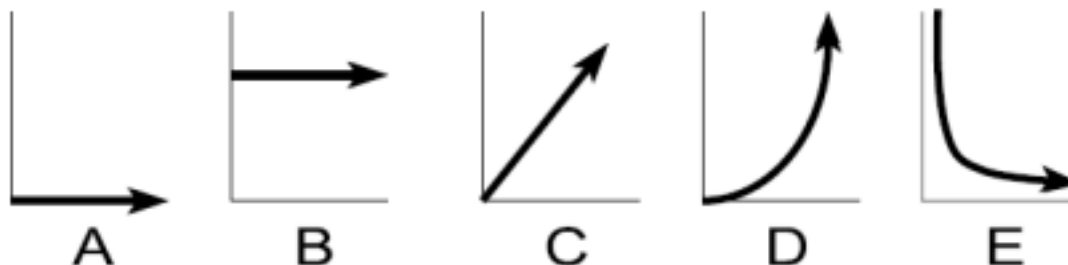
10. What was the average speed of the bicyclist between 9AM and 11AM?
11. Is the speed a positive or negative number? Could speed ever be a negative number?

ANSWER QUESTIONS 1 AND 2 IN COMPLETE SENTENCES

1. What does the slope of a distance vs. time graph indicate about an object's motion?

2. What does the slope of a speed vs. time graph indicate about an object's motion?

Questions 3 - 8 refer to the following generic graph shapes. Write the letter corresponding to the appropriate graph in the blank at the left of each question.

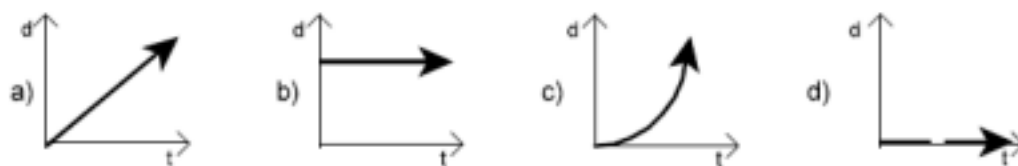


- _____ 3. Which shape fits a **distance** vs. time graph of an object moving at constant (non-zero) speed?
- _____ 4. Which shape fits a **speed** vs. time graph of an object moving at constant (non-zero) speed?
- _____ 5. Which *two* shapes fit a **distance** vs. time graph of a motionless object?
- _____ 6. Which shape fits a **speed** vs. time graph of a motionless object?
- _____ 7. Which shape fits a **distance** vs. time graph of an object that is speeding up at a steady rate?
- _____ 8. Which shape fits a **speed** vs. time graph of an object that is speeding up at a steady rate?
- _____ 9. Which of the following units is equivalent to (meters per second) per second?
 a) m b) m/s c) m/s^2 d) m/s^3
- _____ 10. Which of the following units correspond to the slope of a distance vs. time graph?
 a) m b) s c) m/s d) m/s^2
- _____ 11. Which of the following units correspond to the slope of a speed vs. time graph?
 a) m/s b) $\text{m}\cdot\text{s}$ c) m/s^2 d) m^2/s^2

The table below gives distance and time data for a moving object. Pay attention to how the **time intervals** are changing as the distance rises in 20 m increments.

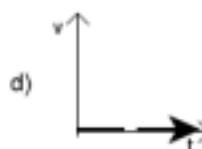
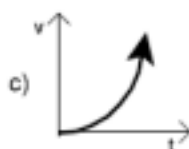
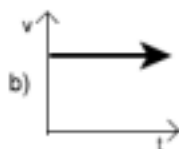
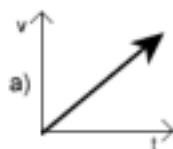
Distance (m)	Time (s)
0	0
20	4.5
40	6.3
60	7.7
80	8.9
100	10

- _____ 12. Which of the following **distance** vs. time graphs corresponds to the table data?



- _____ 13. Which of the following descriptions matches the graph you selected in question 12?
- a) A motionless object.
- b) An object moving at a constant speed.
- c) An object undergoing constant, positive acceleration.
- d) An object undergoing constant, negative acceleration.

14. Which of the following speed vs. time graphs corresponds to the table data?



15. Which of the following descriptions matches the graph you selected in question 14?

- a) A motionless object.
- b) An object moving at a constant speed.
- c) An object undergoing constant, positive acceleration.
- d) An object undergoing constant, negative acceleration.

BEWARE: If your answers to questions 13 and 15 are different from each other, you are claiming that the same object can have two distinct motions simultaneously. Ask yourself, "Is that reasonable?"

16. A woman walks away from a starting point in a straight line.

A distance vs. time graph for her motion is shown at right.

a. Describe the woman's motion between 0 and 2 seconds.

b. Fill out the table below. You do not have to show your work.

<u>Time Interval</u>	<u>Woman's Speed (m/s)</u>
2 to 4 seconds	_____
4 to 6 seconds	_____
6 to 8 seconds	_____

