1. Find the ticker tape on which you recorded a freely-falling motion. It should have your name on it. Starting at the beginning of the tape, where the dots are close together, label the even-numbered dots 0, 2, 4, and so on. Discard the dots made after impact. The dots show that the speed __creased.

2. Suppose dot no. 9 is 12.0 ± 0.03 cm. from dot 6. Show how that information is used to calculate the MLV of the object's average speed during that part of the trip, as on pages 0 & 8. Don't forget the units. Show how the distributive law is used to calculate the uncertainty of that speed as on p. 4 & 4R.

3. On the back of this paper set up a data table with three columns.
   a. At the top of the first column write **"TIME (in ticks)".** Fill in this column with time values written in "range form", like this: "0 - 2", "2 - 4", "4 - 6", and so on.
   b. At the top of the second column write **"ΔD (in cm.)".** The first entry in this column will be the distance from dot 0 to dot 2. The second will be from dot 2 to dot 4, and so on. Measure those distances with a ruler and write them into the data table. *Don't bother to repeat the units*.
   c. Record the uncertainties (SDC's) of those ΔD measurements. If they all have the same SDC then write it once in parentheses with a "plus-or-minus" sign at the end of the column, as we did on page 7.

4. The third column heading in your data table will be labeled **"SPEED".** Write a preposition and appropriate units in parentheses under that heading, as in the first two columns. Use the method in #2 to fill in that column. Remember to give the estimated uncertainty of the speed, as in #2 and 3c.

5. Use the entire data table to make a graph of **Speed vs Time** on graph paper. Write a *title* at the top of the graph and *label the axes with both names and units*, as explained on page 7. Because the times are in range form, each data point must be an "error bar" with a width of __ ticks. (See page 9R.)

6. The **"slope"** of a graph is a measure of its steepness. For example, suppose A, B, and C are consecutive points on some graph. The graph may or may not be straight, but B is between A and C.
   a. Sketch a graph on which diagonal segment BC is slightly steeper than AB.
   b. Sketch another graph with segment BC slightly *less* steep than diagonal segment AB. (See p. 0.)
   c. Sketch another graph on which the slope of BC is *equal* to the slope of AB.

7. Please copy these definitions onto RS I: To **accelerate** an object means *to change its speed or velocity*. An object's "**acceleration**" is the *rate* at which that speed or velocity is changing. If the object is moving along a straight path then its acceleration is the *slope of its speed vs time graph*.
   a. Circle two short sections of the speed-time graph in #5: one near the beginning of the motion and one near the end: Is one section steeper than the other, as in 6a or 6b? ____ If so, label it.
   b. Do the two sections have equal slopes, as in 6c? ____ Does 7b contradict 7a? ___
   c. Apparently a freely-falling object near the surface of the earth has _________ speed but ________ acceleration. (increasing, decreasing, or constant*) Does 7c contradict 7a or 7b?* ____

8. Use symbols (not numbers, not words) to write an equation describing your speed-time graph, just as you did on pages 6 & 7. Write it *on the graph*. Remember to use #7. *Define your symbols clearly*.

9. To calculate the slope of a graph you divide the _______ of a triangle by its _______. (saved on RS _)
   a. What must you do with the units when divide those numbers? _______ (See #7 on page 7.)
   b. The algebraic rule for dividing with fractions says you must invert the _________ and then _______.
   c. For example, 4/5 divided by 2 is equal to _____. (Answer with a fraction.)
   d. If you divide half a six-pack among three people, each person gets ____ of a six-pack. (fraction)
   e. By that same rule "A/B divided by C" is equal to ______. *Does 9d contradict 9e?* ____
   f. What strange units are necessary for the slope of your speed-time graph? (Use 9a, 9b & 9e.) _____

* 10. If the pattern is a curve then draw the curve freehand. If the pattern seems to be linear, then use a ruler to draw two intersecting straight lines which fit the data reasonably well, as on pages 5 & 7. Use the two diagonal intersecting lines on your speed-time graph to determine the acceleration of your freely-falling object in *RANGE* form, as on page 4. Write that result *in decimal form, with units, on the graph. Remember to write it as a sentence with a subject, a predicate, and the word, "between".* Save copies of the falling time and change in speed (in range form) for use on pages 12, 15, and 17.

11. If you repeated the experiment on the moon your graph would have a different _______. (shape, slope, intercept) *Illustrate that difference* by sketching and labeling two graphs below.