1. Suppose I measure the height of a certain triangle and call it "h". The width of that same triangle in the same units is called "w". The triangle's "height-to-width ratio" (h/w) is the *quotient* that I get when I divide "h" by "w". **If h = 9 inches and w = 6 inches, then h/w = ___**. (Use #1 on RS I.)

2. Suppose a new triangle is similar to the one in #1, but bigger. The height and width of the original one are "h" and "w". The height and width of the new one are "H" and "W".
   a. Because the triangles are similar the two height-to-width ratios must be _______. (One word)
   b. Use the letters defined above to write equation 2a in algebra languange: ___ = _____ *Does 2a agree?*
   c. Use the rules of algebra to solve that equation for "H", as on p. 0: H = ____
   d. Solve the same equation for "w". w = ____

3. A certain spring has a linear graph of tension vs. length. When it is not stretched, its length is "L". When its tension is 12 pounds, we find that it is stretched to an overall length of L + 15 cm.
   a. How much tension will it have if we stretch it another five centimeters? ______ ____
   b. Sketch the graph of tension vs length. Clearly label the unstretched length, the two new lengths, and the two tensions (old and new) on the axes of the graph. Did you need the original length value? ____
   c. On that same graph shade in the two similar triangles which were used in 3a. *See page 7R.*

4. A spring lying on a table top is 18 cm. long. Mr. A and Miss B pull on its ends, stretching it to a length of 26 cm. Mr. A pulls on it with a 12-newton force. How hard is Miss B pulling? (Use #2 on p.7.)

5. Miss B ties one end of the same spring to a tree and pulls on the other end with a force of 9 N. How long is the spring now, and how much force is the tree exerting on the spring? *Illustrate with a graph.*

6. A round water tank is to be replaced with a new one with a diameter "5% greater" than the old one:
   a. Let "D_o" represent the old diameter. Use that symbol to write a formula showing how the new diameter can be calculated: $\mathbf{D_n}$ **=** _____ **+** _____
   b. If you remember "factoring" from algebra then you can write this same formula in simplified form so that the "Ro" appears only once: $\mathbf{D_n}$ **= (___ + ___)**$\mathbf{D_o}$
   c. If you remember any "arithmetic" from elementary school, then you can simplify still more by combining the two terms in the parentheses: $\mathbf{D_n}$ **= (____)**$\mathbf{D_o}$
   d. According to #10 on RS I, **circumference is directly proportional to _________**.
   e. In 7e on page 5 you showed that whenever two variables are directly proportional then multiplying one variable by "N" causes the other variable to be _________ed by __. (Recorded in #__ on RS I.)
   f. In 6c we found that numerical value of "N" was ____. We conclude that the new cylinder's circumference is ___ times the old one. In other words, it is ___ percent greater than the old one.

7. Imagine recording the motions of two different freely-falling objects. One of them falls a smaller distance, so its tape has 5% fewer dots than the other one. Use the hints below to form a conclusion.
   a. We already know that the speed-time graph for a freely-falling object is a _______ line through the _______. Therefore the falling speed is _________ly ___________ to falling time. (See 9b on RS I.)
   b. The phrase "5% fewer dots" tells us that the new falling time is _____ times the old one. (See #6.) In ratio language we say T_2/T_1 = ____. (Insert a number in decimal form, as in #1 & 6f.)
   c. Using 6e, the second (smaller) impact speed is ___ times the first one, so $\mathbf{S_2/S_1}$ **=** ____.
   d. We conclude (as in 6f) that the new impact speed is ____ percent ________ than the old one.

8. In 6 & 7 we discovered that ___creasing one variable in a direct proportion by X% causes the other to ___crease by ___%. -Does 7d agree? __ This discovery has been saved in part __ of #___ on RS I.

9. We know that one kilometer is a thousand times longer than a meter. Thus 1.0 km = $(10^3)\cdot$(1.0 m.) That statement is certainly an equation, and the "10^3" is certainly a constant. Why is it *absurd* to say that a kilometer is proportional to a meter? *Clue: The answer is in part __ of #___ on RS I.* -Does it make any sense to say that "inches are proportional to centimeters", or that "2 is proportional to 6"?

* 10. Is it better to say that the ratios in 2a are "proportional", or to say that they are "equal"? Remember that the star means you must *explain* this answer on the back of this paper, using sentences which are so simple and clear that even a physics teacher can understand them. Don't contradict 2ab.