1. Here's a familiar fact: "**The area of a circle is proportional to the square of its radius.**"
 There are several ways to interpret that simple statement:
 a. In picture language, it says that the graph of _______ **vs radius** is parabolic.
 b. The graph of **area vs.** _______ ________ is a straight line through the origin.
 c. In equation language, it says that **area** = a **constant times** _________ _________.
 d. An especially useful interpretation is the one in *ratio* language: Let R_1 and A_1 represent the radius and area of circle number 1, and let R_2 and A_2 represent the radius and area of circle number 2. Use 1c to figure out how the area ratio can be calculated from the two radii. Simplify your formula as much as you can and record the final result here: **A_2/A_1 =** ______.

2. As an example, imagine a pair of circles with a radius ratio equal to 3.00.
 a. Use 1d to calculate the ratio of their areas: A_2/A_1 = ______ -Does 2a contradict 1c or 1d? ___
 b. Did you need the value of "π" to answer the question? ____
 c. Did you need to know the numerical value of either radius? ___
 d. Was either radius given? ____ If so, please copy its numerical value and units here: ____ ____

3. Let's generalize 1d: Let A_1 and A_2 represent two possible values of the variable called "A". Let B_1 and B_2 represent the corresponding values of "B". If A is proportional to B^n, then the ratio A_2/A_1 can be calculated from the ratio B_2/B_1 in a very simple way: **(A_2/A_1) =** ______
 -Do 1d and 2a agree with that theorem? ___ -Where have you saved a copy? #___ on _____

4. Example: A 9-inch bowling ball weighs 14 pounds. How much will a 10-inch ball weigh if the finger holes have not yet been drilled and the densities of the two balls are equal?
 a. The weight ratio is equal to the ratio of their ________. (areas, volumes, densities, diameters)
 b. The circumference of a circle is directly proportional to its diameter, and the area of a circle is proportional to the *square* of its diameter. In both cases the proportionality constant is "dimensionless", which means it has no units. The constant in the formula for sphere volume is also dimensionless. Since volume is measured in cubic units and diameter is measured in linear units, volume must be proportional to diameter to the ______ power. *Use* that exponent in 4d - 4f:
 c. Let W = weight and let D = diameter: From 4a and 4b we know that W is proportional to ____.
 d. Using #3, we conclude that **W_2/W_1 =** ______. (Use the *given* symbols with subscripts.)
 e. Solving for the unknown, **W_2 =** (______) **W_1**. (Again, use the *given* symbols.)
 f. Inserting the given values with their units, **W_2 =** (________) (14 ___) = **19.2 pounds.**
 (In physics we always give numerical answers in *decimal* form, with appropriate units.)

* 5. If the exponent in a proportion is **negative one** (-1) we call the relation an **"inverse"** proportion. For example, you saw on page 18 that the volume of an ideal gas sample is "inversely" proportional to its pressure if its temperature is not allowed to change. Doubling either variable in such a relation causes the other to be *halved*. How much pressure (in atmospheres) is needed to compress three cubic feet of air from this room into a one-cubic-foot container if it behaves like an ideal gas? Please write four-step solutions ***like the one given in 4c-4f*** for this and all of the problems below.

* 6. An olympic diver leaping from a high platform on Mars has about 2.28 seconds to complete her act before hitting the water. How much time will the diver have if the platform height is reduced to 3/4 of its former value? Write a four-step solution like the ones above, *beginning with #6 on RS II.*

* 7. A pendulum on the moon would not have the same period that it has here on the earth because the moon's gravity is much weaker. But its period would still be ***related*** to its length in the same way as it is on earth, because the same laws of physics still apply. (That relation is recorded in #___ on RS II.) Suppose a pendulum on the moon has a period of 5.0 seconds. Using #3, predict the period of a pendulum which is exactly twice as long, placed at that same location.

8. How many fictional or bogus digits did you keep in answer #6, just to avoid roundoff error? __
 -How about #7? __ (See #6c on page 14, or the back of RS I.)