How Big or How Little?

This activity is designed to have students think about what it means to "keep it in proportion" – a very common phrase, but what does it mean?

Give each team (pairs? Groups of 3 or 4? Whatever works in your situation) a different object to work with. I like to use the following:

- A hula-hoop – How big is the giant who wears this wedding ring?
- A giant crayon bank – How big is the kid who uses this crayon?
- A giant coke bottle bank – How big is the vending machine that would dispense this bottle?
- A Hot Wheels car – How tall is the driver of this car?
- A small, collectible football helmet – How tall is the football player who wears this helmet?
- A small basketball – How far off the ground is the basketball hoop for this ball?

The idea is for each group to reason proportionally! The goal is not for students to remember how to set up a proportion, cross multiply, and find the right answer! After each group finishes working on their object, they each present their work to the class. The following ideas should emerge with the help of the skilled teacher.

- The scale factor for the large items is greater than 1.
- The scale factor for the small items is between 0 and 1.
- Assumptions need to be made and must be stated. For example, for the hula hoop, students might use the average height of a person or might measure one of the members of the group. They might measure the diameter of someone's ring. Then, if the proportional relationship between the height of the person and the diameter of the ring is known, that same proportional relationship must exist between the hula hoop ring and the giant person. For example:
  - I am 72 inches tall and my wedding ring has a diameter of about 7/8 inch. Therefore, I need to know, how many 7/8 inch are in 72 inches? That is a division problem! 72 inches divided by 7/8 inch is approximately 82.3. That is, my height is about 82.3 times greater than the diameter of my ring. Using this proportion, we can say that the giant person is 82.3 times taller than the diameter of their ring. My hula hoop has a diameter of 28 inches. Therefore, the giant is 82.3 times taller than 28 inches or about 2304 inches tall. This is 192 feet tall!
- If you want to make a connection between this proportional reasoning and the standard algorithm, great! In the hula hoop/ring case, it might look like this:

$$\frac{7/8}{72} = \frac{28}{x}$$

$$x = \frac{72 \cdot 28}{7/8}$$

- Note that we might see this as $\frac{72}{7/8} \cdot 28$ where $\frac{72}{7/8}$ gives us the scale factor and multiplying this by 28 gives the height of the giant!
- This is the kind of thinking we want each group to articulate.
- At the end, challenge students to answer the question, "what does it mean to be "in proportion" in the context of this activity?