Scaffolding Task: My Big Feet

Approximately 1 Day (This task was adapted from "How Big is a Foot?", http://illuminations.nctm.org)

STANDARDS FOR MATHEMATICAL CONTENT

MCCMD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MCC.2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

MCC2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

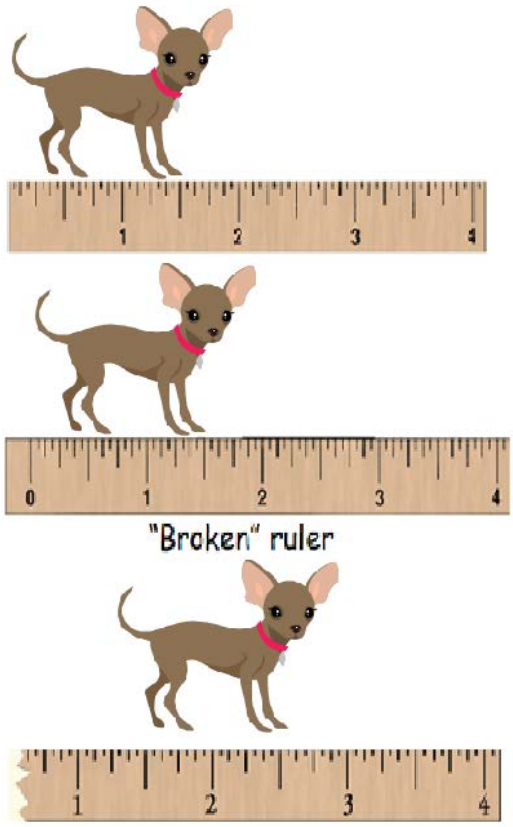
BACKGROUND KNOWLEDGE

It is important to recognize this is the first time students are using standard units of measure; therefore the first few tasks address non-standard and standard units of measure. We are building the understanding that measurement is a consistent distance or duration. **It is highly recommended that you follow these tasks in the order presented, so that students recognize the need for a consistent unit of measure and the importance of using standard units of measure.**

***For additional background, see Measuring Pets task.**

Students are first introduced to standard linear measurement in second grade; therefore they will need many experiences to learn how to use the ruler correctly. It is important to show students how to accurately use the ruler when it begins at 0, as well as when it begins at the end of the ruler. It is important to expose students to both types and give them practice with both types of rulers. Research tells us that students see rulers with hash marks as counting numbers instead of

the units (or spaces) between the marks. This is what will be helpful as they are exposed to experiences like the "broken" ruler. It is important for students to develop an understanding of length (measure) even when the starting point varies. Students should begin to understand that a ruler is a representation of a consistent row of units.



ESSENTIAL QUESTIONS

- Why do we need to be able to estimate a measurement or value?
- Why is it important for us to know how to measure different units of measurement?

MATERIALS

- *How Big Is a Foot?* by Rolf Myller or similar book
- Butcher paper: about 6' x 3' piece for each group
- Pencils or markers
- Rulers
- Making Beds activity sheet (one per student)

GROUPING

Small Groups

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Tell students the story of the king who wants his carpenter to make a bed for his queen, but it's a challenge to make sure the bed is the right size and to figure what to measure it with.

Create a list of questions the apprentice would have to answer in order to be able to make the bed. Discuss the things that have to happen in order to measure a bed.

For example:

- Is it for an adult or a child?
- Is it for 1 person or 2 people?
- Is the person big or small?
- Do they sleep diagonally or vertically? (The bed has to be longer than the person is tall and wider the person is, etc.).
- What would you estimate is the length and the width of your bed at home, what would you use to find this out? How did you come up with your estimate?
- What other questions would you want to ask?

Read the book, *How Big Is a Foot?* or similar book to the students. Tell students that they will have the chance to explore some of the things that happened in the story with their classmates. Ask students to explain why the bed created by the apprentice was not what the King expected.

Part II

To begin, divide students into groups of 4. (If this is not possible, groups of 3-5 will work). Within the group, roles should be assigned for the following tasks. Roles can be combined based on the number of group members.

- The Foot (the person whose foot will be traced)
- Tracer (this person will trace The Foot's foot).
- Recorder
- Speaker (will report results to the class).
- Measurer (this person will measure the finished bed in both The Foot's feet and with a ruler).
- Checker (checks the group's work to make sure that there is agreement with the results found).

After assigning roles, the groups should:

- Trace the Foot's foot end-to-end on the butcher paper to make two sides of a bed that is 6 footprints long and 3 footprints wide. Modeling this for the students may be helpful, or have a pre-made sample of what you would like the finished product to look like.
- After all groups finish tracing their "beds" hang them up in the front of the room so that a comparison discussion can take place.

Discuss individual students' responses to the tasks. In particular, ask the students:

- "Why do you think a standard unit of measure was invented?" Student responses might include the idea that a standard unit of measurement is more reliable than everyone using their own footprint to measure length. "What problems do you think measuring with a nonstandard unit would cause?"

Part III

After the class has had a discussion using the nonstandard units, have students work in pairs to create a bed using a 12 inch ruler. This is a good time to demonstrate how to appropriately measure. Expose students to rulers that begin at zero and rulers that leave a small space before zero. This is not to mislead students, but rather to keep them from creating misconceptions that all rulers begin at the edge. See the Background Knowledge portion for further explanation.

Each group will create a bed that is 6 feet long and 3 feet wide. Once each has created their bed, hang all the beds at the front of the room to compare.

FORMATIVE ASSESSMENT QUESTIONS

- How do we line up our rulers to measure correctly?
- Why is it important for us to know how to measure different objects using different tools of measurement?
- How can we tell if an estimate is reasonable?
- Why do we need to be able to estimate a measurement or value?
- Why is it important for us to know how to measure different units of measurement?
- Is there a time when you could use a nonstandard unit of measure?

DIFFERENTIATION

Extension

- Students could create a bed using yardsticks to measure without given dimensions. How many yards long should the bed be? How many yards wide?
- Students could calculate the number of inches long a bed with a length of six feet would be? How many inches wide would a bed be that is 3 feet wide?

Intervention

- Have students use multiple copies of a foot to measure. Some students struggle with keeping the ending point while they move their unit of measurement. This causes inaccurate measuring. If students have multiple copies, or multiple rulers, they would be able to hold one in place while they moved the other.