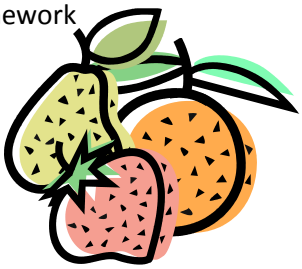

Scaffolding Task: Setting the Standard

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.MD.1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36)

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.

BACKGROUND KNOWLEDGE

Students should know how to measure mass using a balance.

Students should have had experience measuring and comparing weight using a balance scale and understand the difference between standard and non-standard units in measurement.

The Metric prefixes are as follows:

Kilo	Hecto	Deka	Gram	Deci	Centi	Milli
1,000	100	10	1	1/10	1/100	1/1,000

Based on the chart above, 10 grams is 1 dekagram, 100 grams is 1 hectogram, and 1,000 grams is a kilogram. Also, one tenth of a gram is a decigram, one hundredth of a gram is a centigram, and one thousandth of a gram is a milligram. **Remember, in fourth grade students are only responsible to know and understand the relationship between kilogram and gram**. However, it is appropriate to use the correct label when creating 10 gram bags and 100 gram bags.

ESSENTIAL QUESTIONS

- What is the difference between a gram and a kilogram?
- What is weight (mass when using a balance)?

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- Why do we measure weight?
- What units are appropriate to measure weight?
- What around us weighs about a gram?
- How are units in the same system of measurement related?
- What happens to a measurement when we change units?

MATERIALS

For each group
- Balance scale
- Set of small items
- Set of gram weights (1g, 5g, 10g, and 20g)

For each student
- "Setting the Standard" student recording sheet
- Snack-size zippered plastic bag

For the class
- 5 lbs aquarium gravel
- Several pieces of fruit (apple, orange, banana)
- One 2-gallon zippered plastic bag (to create a 1 kilogram bag)

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students transition from non-standard to a standard unit of measure (grams). Then students use grams to measure the weight of fruit.

The distinction between mass and weight is not made until middle school, when students begin their study of gravity. Therefore, the emphasis of this unit should be placed on measurement. In the classroom, teachers should use the correct name (mass or weight) depending of the instrument used to make the measurement. ("Mass" is used when measuring with a balance scale; "weight" is used when measuring with a spring scale, which includes scales like a bathroom scale.) The correct term for this task is mass because students are using a balance scale.

Comments

To introduce this task, show a gram weight. Introduce its name and symbol and describe it as a standard unit of weight. Ask students to use the balance scale to compare 1 gram (1g) to the paper clips. Show the other gram weights (5g, 10g, and 20g) and have students estimate and then measure how many paper clips would equal each weight. Ask students to share their findings.

When discussing the weight of the fruit, guide students to suggest making new units (100 g weights). These can be created using a zippered plastic bag and aquarium gravel. Let students

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show how these can be created. Students should determine that they will have to combine their weight sets to get a total of 100 grams on one side of the balance scale and then measure an equivalent amount of gravel to balance the scale. Provide the fruit and have students measure the fruit using the new and old weights. (A medium apple weighs about 200g.)

Some students may try to name this new unit 100 grams (100g). If so, encourage the use of metric roots and prefixes from prior knowledge to do so (see "Background Knowledge" above.) Finally, collect 10 of the 100g bags and place them in a large zippered plastic bag. Ask students to figure out how much this new unit weighs (1000 g). Guide students to the term kilogram meaning 1000 grams.

Task Directions

Students will follow the directions below from the "Setting the Standard" student recording sheet.

1. Find the weight of each object using 1 gram (1 g) weights.
2. Record the weights in the chart below.
3. Place a piece of fruit in your balance scale. Talk with your group about how you would measure the fruit using metric units. Record your thoughts below.
4. Create a three-column chart similar to the one above. Label the first column **Fruit Name**, the second column **Measurement in Grams (g)**, and the third column **Measurement in Kilograms (kg)**. Find the weight of each piece of fruit and record it in your chart. Students may weigh more than one piece of fruit to have at least one kilogram.

FORMATIVE ASSESSMENT QUESTIONS

- What is the difference between a standard and non-standard unit of measurement?
- How can you use gram weights and a balance scale to measure the weight of an object?
- What happens when the unit is too small to measure an object?
- What is the difference between units in the same system of measurement?

DIFFERENTIATION

Extension

- Ask students to find the weight of the objects using different units, such as hectograms and dekagrams.
- Ask students to estimate how many apples would be needed to make one kilogram? How many bananas? How many oranges?

Intervention

- Make the relationship between kilogram and gram (1kg = 1,000g) explicit.
- Add the second chart to the student recording sheet, allowing the student to focus on measurement, not creating a chart.

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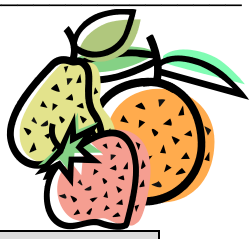
Name _____ Date _____

Setting the Standard



1. Measure each item using gram weights in the balance scale. Record the measures in the chart below.

Item Name	Measurement in Grams (g)	Measurement in Kilograms (kg)

2. Place a piece of fruit in your balance scale. Talk with your group about how you would measure the fruit using metric units. Record your thoughts below.

_____

_____

_____

_____

3. Create a three-column chart similar to the one above. Label the first column **Fruit Name**, the second column **Measurement in Grams (g)**, and the third column **Measurement in Kilograms (kg)**. Find the weight of each piece of fruit and record it in your chart. You may weigh more than one piece of fruit at a time.

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