The MATH LEARNING CENTER

ENGLISH LEARNERS SUCCESS FORUM

Measuring Mass

GRADE 3

Today's Learning

Students hear a story about a child named Erika baking bread with her dad as an introduction to measuring mass in grams. They learn about metric units of mass and how to use a digital scale. Then they practice estimating and finding the mass of classroom objects to develop a class list of referents.

Content Target: I can measure mass using grams and kilograms. (3.MD.2)

Practice Target: I can notice and describe patterns in related problems. (3.MP.8)

Attention to Context

Math Guideline 10

The teacher guidance for using a story moved from general information to specific and strategic word selection to help students make connections between mathematics and their lived experiences.

Materials

- plastic gram cubes (more than 1,000)
- Bread for Our Friends book
- digital scale (at least 1)
- Digital Scale Instructions (1 copy)
- student whiteboards (with markers and erasers, class set)
- penny
- transparent container
- three objects of different masses to demonstrate measuring mass (suggestion: heavy textbook, kickball or soccer ball, stapler)
- bowl or container to place on scale for measuring larger objects (1 per scale)
- sticky notes
- "How Many Grams?" Anchor Chart (see Preparation)
- Math Language Cards (pages 9–11)

Language Objective

Math Specification 2a

This objective combines mathematical goals (understanding patterns across units of measurement) with language goals (being able to describe those patterns).

Multiple Sensory Modalities

Math Guideline 4

Students have access to manipulatives, whiteboards, and other tools to help amplify the language they use to communicate in this lesson.

Preparation

If you can borrow **digital scales** from families or other staff members, students will have more opportunities to measure mass. Look for digital platform scales that measure in whole grams and have a capacity of 5 kilograms. Many kitchen scales work well.

There are many fine books about baking bread. Try to locate some and bring them to school. Books with international recipes, photographs of each kind of bread, and photographs of the techniques will be especially engaging for students. Many bread cookbooks will specify ingredient amounts in metric units.

Consider showing students an instructional online video about how to bake some different kinds of breads. Many engaging and brief videos are available online for home cooks.

Prepare a How Many Grams? anchor chart (below).

Guidance for Visual Aides

Math Specification 8c

These instructions prompt teachers to make visual reference materials available to students.

How many grams?

1 gram

2 – 10 grams

11 – 100 grams

101 – 200 grams

201 – 500 grams

501 – 1,000 grams

Over 1,000 grams (1 kilogram)

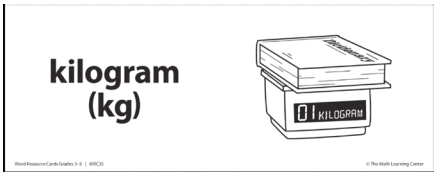
Expanded Word Wall

Math Specification 8c

The word wall cards have been revised to include more context for students to use as reference. See the revised cards on pages 9–11.

Language Focus

Word Wall



Some students might understand *mass* to mean a religious service, so you will need to clarify the word's mathematical meaning today. Students might also think of *Grandma* when they hear the word *gram*. Be sure to clarify these terms with the math language cards (see pages 9–11 below).

You will read the book *Bread for Our Friends* aloud today. The book features language in a baking context to introduce mass, grams, kilograms, time, and liquid volume. Today, focus on the language related to telling time and discussing elapsed time, as well as language about using a scale to measure mass in grams.

Quick Context Notes

Math Specification 6a

These brief notes help teachers anticipate possible pitfalls and opportunities related to language and context.

Language Functions and Math Practices

Math Specification 7a

This table guides teachers to listen for how students are developing language for specific mathematical purposes like making comparisons and descriptions.

Language Patterns in This Lesson (Activity)

Warm-Up		
Function	**Addition Example**	**Subtraction Example**
Express a comparison (3.NBT.2)	*446 is 100* ***greater/more than*** *346.*	*246 is 100* ***less than*** *346.*
Describe the operation (+/–) (3.NBT.2)	*346* ***plus*** *100 is 446.*	*346* ***minus/take away*** *100 is 246.*
Name the result of adding or subtracting (3.NBT.2)	*The* ***sum of*** *346 and 100 is 446.*	*The* ***difference between*** *346 and 246 is 100.*

Work Time	
Function	**Examples**
Express the mass of an object (3.MD.2)	*The stapler* ***has a mass*** *of 347* ***grams****.* *The stapler* ***weighs*** *347* ***grams****.*
Compare the masses of two objects (3.MD.2)	*The stapler* ***has a bigger mass*** *than the scissors.* *The stapler* ***is heavier than*** *the scissors.* *The stapler* ***is bigger than*** *the scissors.*

Assessment Opportunities

What does success look like in this session?

Use the scale to measure mass in grams	Students demonstrate progress toward proficiency when they: • Follow your verbal and/or gestural guidance to use the scale • Follow pictorial instructions to use the scale • Point to and/or say the number of grams displayed • Use language like "The stapler has a mass of 347 grams" or "The stapler weighs 347 grams." (Students aren't expected to understand the difference between mass and weight at this time, and connecting mass and to their experiences with weight is an indication of emerging understanding.)

Examples of Success

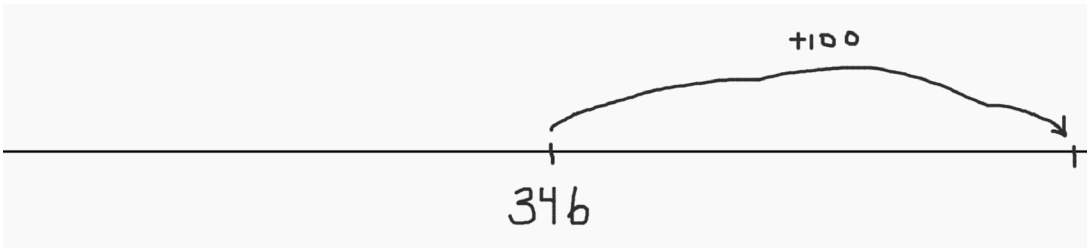
Math Guideline 13

This table helps guide teachers towards look-fors and listen-fors that will help them recognize student success with measuring mass, sense-making, and comparing numbers.

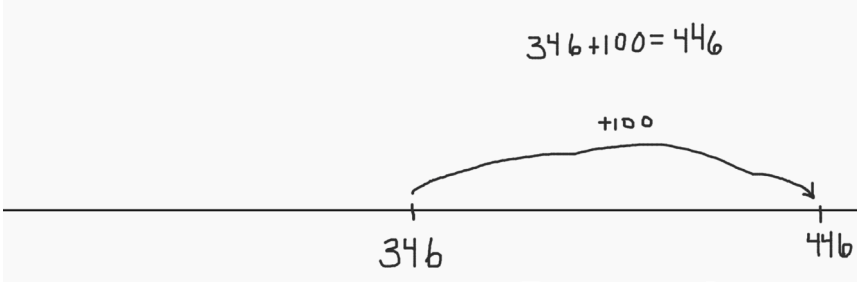
Record the mass with the correct number and unit	Students demonstrate progress toward proficiency when they: • Copy the number from the scale • Attend to the units by writing *g* or *grams* beside the number
Make sense of numbers	Students demonstrate proficiency when they: • Place their sticky notes in the correct range on the anchor chart • Adjust the placement of sticky notes to show the different masses in order from least to greatest • Use language that expresses an accurate comparison of objects based on their masses. For example: "The stapler has a bigger mass than the scissors," "The stapler is heavier than the scissors," or "The stapler is bigger than the scissors."

Warm-Up: Adding & Subtracting 100

1. Draw an open number line on the board and label a point in the middle 346. Have students do the same on their **whiteboards**.
2. Draw a jump of 100. Pair-share: *What number is this? What number do we get when we add 100 to 346, and how can we show it on the number line?* (446)



3. Invite students to show their thinking on their whiteboards, and work with the class to establish that 346 + 100 = 446.

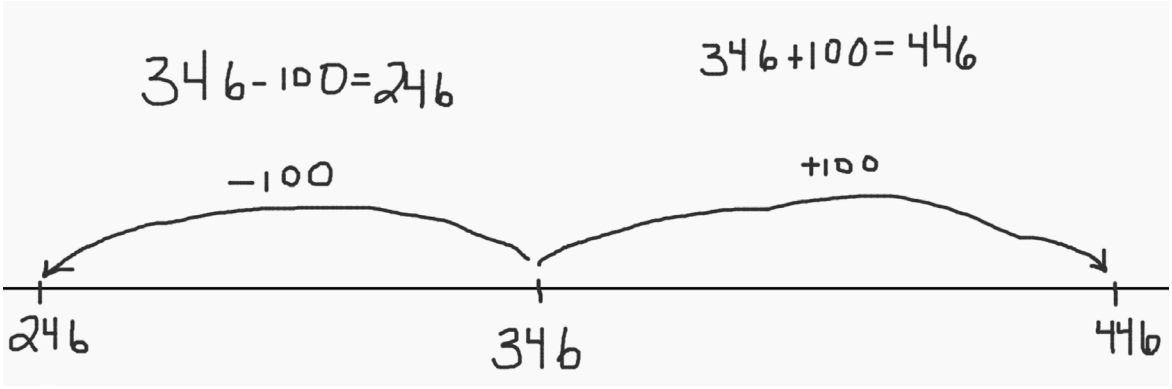


Deepening through Varied Modes

Math Specification 3a

This activity structure guides students to use written representations of addition on a number line while seamlessly incorporating multiple opportunities for students to speak and listen about those representations in pairs.

4. Repeat steps 2 and 3 to establish that 346 – 100 = 246.



5. Repeat with 142 (42, 242) and 508 (408, 608).
6. Pair-share: *What patterns did you notice when adding 100 to a number and when subtracting 100 from a number. What changed? What stayed the same?* (When adding or subtracting 100 from a number, only the digit in the hundreds place changed.)

Work Time: Introduction to Measuring Mass

1. Introduce today's lesson by briefly reviewing the content learning target.
2. Read ***Bread for Our Friends*** to connect today's learning to baking.
   a. Before reading, preview the pictures with students. Invite them to share what they notice.
   b. While reading, use the prompts in the book to invite students to think about elapsed time, mass, and liquid volume.
   c. After reading once, have students ask and answer clarifying questions about the book.
   d. Read the book a second time.
3. Pair-share: *Have you ever baked bread? How was it similar to or different from Erika and her dad's baking?* (Responses will reflect personal experiences. Students with little personal experience with baking may need assistance understanding the process.)

   Students from other countries might have experience using grams and milliliters to cook. Invite them to share those experiences now. This is a wonderful opportunity for them to be the expert on a topic that is probably new to most students in the U.S.
4. Focus the class discussion to introduce the terms ***mass***, ***grams***, and ***kilograms***, using the **penny** and **plastic centimeter cube** as referents for 1 gram and the **math language cards** to clarify all three terms.
   a. Let students know that serious bakers measure ingredients in grams with a scale because it is the best way to make sure they are using *exactly* the right amount.
   b. Ask: *How much is a gram? Do you know of anything that has a mass of 1 gram?*

Connecting to Students' Lived Experiences

Math Guideline 10

This book was written specifically for this lesson and others that would go with it. It incorporates real-life experiences with relevance to different cultures and to students' experiences baking and eating bread.

Inviting Expertise

Math Specification 10b

These suggestions invite students to make connections between the curriculum and their lives while positioning them as experts.

c. If students don't have any suggestions, let them know that a penny, large metal paper clip, artificial sweetener packet, and plastic cube each have a mass of 1 gram.

5. Set out the **three objects** where all can see. Pair-share: *Which object do you think has the largest mass and which has the smallest mass? Explain why.* (Responses will vary based on selection of objects.)

"I think the _____ will have the greatest mass because _____."

"I think the _____ is heaviest because _____. "

6. Show students the **digital scale** and if they don't notice, explain it is the same as the one Erika and her dad used in the book.

7. Demonstrate how to use the digital scale, and the **bowl or container** when necessary, to measure the mass of one object and record it on a **sticky note**. Connect your use of the scale to the **Digital Scale Instructions teacher master**, which students will use as a reference.

   a. Turn on the power.

   b. Use the Mode button to set units to grams (g) if needed.

   c. Tare the scale if you put a container on it.

   d. Explain that *tare* does not mean *rip* here. It comes from a word that means *the part that is thrown away.* Pushing the Tare button after placing the container on the scale is a way to tell the scale to throw away the mass of the bowl so that we measure only the mass of the object inside the bowl.

8. Invite students to revise their ideas about the masses of the other two objects. Then measure their masses and record them on sticky notes.

9. With students' help, place the three sticky notes on the "**How Many Grams?" anchor chart** (see page 7, below).

Sentence Frames

Math Specification 8c

These examples show how sentence frames can be used to extend (rather than constrain) students' language.

Tare vs. Tear

Math Specification 6a

This brief note guides teachers to consider unintended confusion that may arise from language and suggests a quick and simple way to address it.

How many grams?

1 gram	2 - 10 grams
1g plastic cube *1g penny* *1g plastic cube*	*4g six-sided die*
11 - 100 grams	101 - 200 grams
74g teacher scissors	
201 - 500 grams	501 - 1,000 grams
347g stapler	

Over 1,000 grams (1 kilogram)

10. Explain that students will have math choice time now, and you will invite one group or pair at a time to locate and find the mass of two objects in the classroom to record on sticky notes and add to the chart.

Choice Time: Stations & Creating the "How Many Grams?" Anchor Chart

1. Invite students to spend time at math stations while groups are using the scale with your guidance. Groups should stay together at stations so that calling them to the scale does not disrupt other students.

2. Invite groups to the scale one at a time to measure their objects, using the Digital Scale Instructions teacher master to reinforce how to use the scale. Pace students' time at the scale so that all groups get a chance to work with the scale under your guidance today.
    a. Invite students to use the scale without your help.
    b. Remind them they can use the instructions to help if needed.
    c. Help students if they cannot remember how to use the scale or need help interpreting the instructions. You can read them aloud together. You can also have them repeat a very pared-down version of the instructions are few times with you as they go through the steps: *Power on. Grams. (Tare.) Place object. How many grams?*

3. Have students write their objects and masses on sticky notes and add them to the anchor chart. Ask them to move the other sticky notes around to keep the objects in order by mass on the chart.

Closing: Using the Anchor Chart

1. When students have cleaned up after choice time, gather them where they can see the "How Many Grams?" anchor chart. Pair-share: *What do you notice about the chart we made together?* (responses will vary based on objects selected)
2. Remind students that Erika and her dad used 12 grams of yeast to make their bread. *Pair-share: Which objects have a mass close to 12 grams?* (responses will vary based on objects selected)
3. Repeat step 2 with 500 grams of flour, 40 grams of butter, and 10 grams of salt.
4. Let students know when they will have more opportunities to use the scale.

Digital Scale Instructions

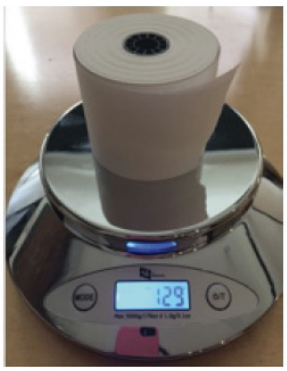
Math Specification 6a

These pictures and directions help remove some of the cognitive demand around how to use the scale so that students can use their energy to focus on larger mathematical questions.

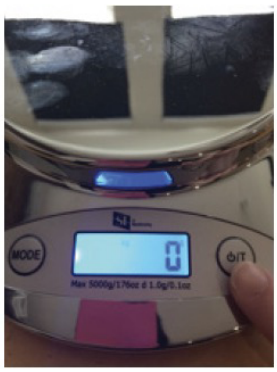
Digital Scale Instructions

1. Press the power button to turn on the scale.

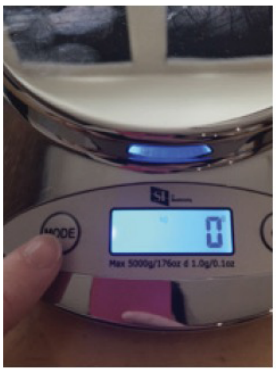
2. Choose grams (g) if needed.



3. Put the object on the scale. Read the mass.



1. Press the power button to turn on the scale.



2. Choose grams (g) if needed.

3. Put the bowl on the scale. Press the tare (T) button.

4. When you see 0, put the object in the bowl. Read the mass.

Carry the scale carefully.

Put only small objects on the scale.

Hold the bottom of the scale. Don't push on the top of the scale.

Math Language Cards

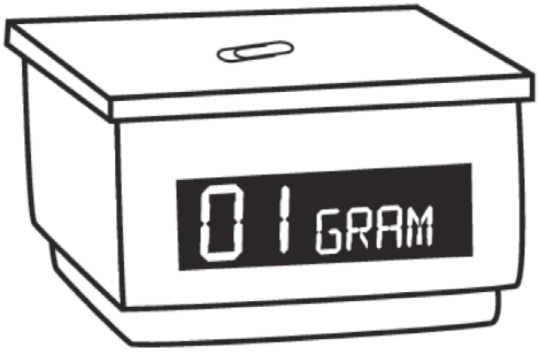
Front of Card:

mass	
We use a scale to measure the mass of objects in grams and kilograms.	

Back of Card:

Formal Definition	Informal Definition
A measure of the amount of matter in an object measured in grams, kilograms, etc.	Mass is very similar to weight. How much an object weighs. How heavy something is.

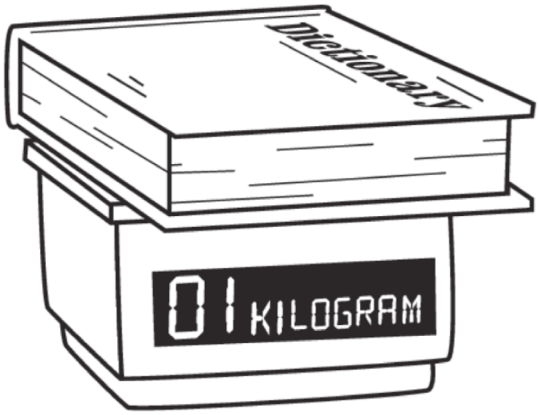
Front of Card:

gram (g)	
We can measure mass in grams. The mass of a paperclip is about 1 gram.	

Back of Card:

Formal Definition	**Informal Definition**
A metric unit of mass equal to one-thousandth of a kilogram or about the weight of a standard paperclip.	A gram is very small. A packet of artificial sweetener is about 1 gram. We measure the mass of small things with grams.

Front of Card:

kilogram (kg)	
We can measure mass in kilograms. The mass of a large book is about 1 kilogram.	

Back of Card:

Formal Definition	**Informal Definition**
A metric unit of mass equal to 1,000 grams or about 2.2 pounds.	We measure the mass of bigger things with kilograms. A thick book weighs about a kilogram.