

# MASS AND LIQUID VOLUME

## Across-Grades Progression

Looking Back	Looking Here	Looking Ahead
<b>Grade 2 Chapter 5</b> Section 5A Measure and Estimate Length in Metric Units <ul style="list-style-type: none"> <li>• Measure and Estimate Length in Meters</li> <li>• Measure and Estimate Length in Centimeters</li> </ul> Section 5D Word Problems <ul style="list-style-type: none"> <li>• One-Step Word Problems</li> <li>• Two-Part and Two-Step Word Problems</li> </ul>	<b>Grade 3 Chapter 8</b> Section 8A Measure Mass in Kilograms Section 8B Measure Mass in Grams Section 8C Measure Volume in Liters Section 8D Word Problems	<b>Grade 4 Chapter 10</b> Section 10A Metric Units of Measurement and Conversion <ul style="list-style-type: none"> <li>• Metric Length in Kilometers, Meters, and Centimeters</li> <li>• Metric Mass in Kilograms and Grams</li> <li>• Metric Capacity in Liters and Milliliters</li> </ul> Section 10D Word Problems

## Across-Chapters STEAM Project Work

This project spans **Chapters 8** and **9**. Students are given an opportunity to make connections between science and mathematics as they carry out experiments and write a report to convince first graders about big ideas related to mass and size (volume). This task requires students to apply their understanding of mass to create a list of materials needed to carry out experiments, write a report to summarize their procedures, and present their results in a graph. Students can also include further questions regarding mass and size of objects in their reports. Invite each group to share their plan with the class at the end of **Chapter 9**.

In **Section 8C**, students learn to read, measure, estimate, and compare capacities of containers to the benchmark of 1 liter. The use of 1-liter measuring pitchers and containers of different capacities develop students' understanding of liquid volume and capacity of containers. They also learn the metric unit of liquid volume, the liter. Students learn that capacity refers to the amount of liquid a container can hold, while volume refers to the amount of liquid in a container.



The milk carton contains 1 liter of milk.  
The volume of milk in the carton is 1 liter.



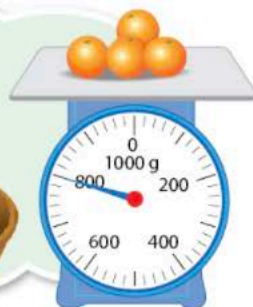
The can holds less than 1 liter of liquid.  
The capacity of the can is less than 1 liter.  
The bottle holds more than 1 liter of milk.  
The carton holds 1 liter of orange juice.



In **Section 8D**, students apply what they have learned about mass and liquid volume to solve one-step word problems involving the four operations. They continue to apply the three steps: Understand, Solve, and Check, to solve word problems.



A basket with four oranges has a total mass of 970 grams.  
The mass of the four oranges is 800 grams.  
What is the mass of the empty basket?



$970 - 800 = 170$   
The mass of the empty basket is 170 grams.

Lesson 1

# Chapter Opener (page 115)

20 minutes

The picture provides a familiar context for students to explore measuring mass and liquid volume.

- You may use the Interactive Class Presentation to facilitate discussions and promote interactions.
- Display the picture. Invite students to share what they see.  
I see children baking; measuring spoons; measuring pitcher; weighing scale; ingredients for baking.
- Group students in pairs or small groups. Provide students with measuring pitchers.
- Encourage students to talk about experiences where they had to help someone measure the amount of ingredients needed to bake or cook something.
- You may facilitate discussions with these questions. Observe student discussions and pay attention to the language they use.

- What are some ingredients that you need to measure to bake a cake?** I use flour; sugar; milk; water; butter to bake a cake. **How are they measured?** using scales, spoons, or cups **Do you think it is important to measure the amount exactly? Why or why not? How could a scale help you measure the ingredients?** The scale tells me the exact amount of ingredients. **What are some things you might need to measure with measuring cups or spoons?** water; milk
- Invite students to take turns in groups to observe a weighing scale and compare it to the measuring pitchers.
- What do you notice about these measuring tools?** They have large and small marks. The scale has a pointer. **Which one would you use if you needed to measure an exact mass?** scale **Which would you use if you needed to measure an exact amount of a liquid?** cups; spoons **Why do you think it is important to learn to measure things?** to ensure that the correct amount of each ingredient is used in a recipe; to determine whether a shelf can hold the weight of an object **Why do you think learning about mass and volume is important to your everyday life?**

## English Language Support

Help students understand mass and volume using these sentence frames.

I need to measure the mass and volume when I \_\_\_\_\_ (activity).

I use a scale to measure the \_\_\_\_\_ of something. **mass**

I use a measuring cup to measure the \_\_\_\_\_ of liquid. **volume**



How would you measure the mass of flour needed?  
How would you measure the amount of milk needed?

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## Promoting Growth

Throughout the chapter, encourage students to use concrete materials to connect what they already know about comparing masses. Have students physically compare the masses of objects using a balance and practice using comparative language such as "as heavy as 1 kilogram," "heavier than 1 kilogram," and "lighter than 1 kilogram." Provide students with opportunities to compare and describe masses of objects in multiple ways.

# Recall (pages 116 to 118)

30 minutes

Have students complete the **Recall** questions to check their readiness for the chapter. After students have answered all the questions, go through each of them by facilitating the following class activities and/or discussions. You may refer to the **Transition Guide** for additional resources. As an option, you may refer students to the online **Recall** questions. These online questions will be auto-graded. For questions that require students to show their work, have them do so in the Student Book.

**QUESTION 1** assesses students' ability to compare the masses of two animals using "lighter" or "heavier."

**How can you decide which animal is heavier or lighter?**  
by looking at the size of the animal. **Can you always tell by comparing the sizes?** no **How can you be sure?** use a scale

**QUESTION 2** assesses students' ability to compare the masses of two objects using a balance.

**How can you tell which object is heavier?** The heavier object is on the lower side of the balance; the toy car is heavier than the teddy bear.

## English Language Support

Remind students that when comparing the masses of two objects, we say an object is heavier or lighter. Use these sentence frames to facilitate discussions.

\_\_\_\_\_ is heavier than \_\_\_\_\_.

\_\_\_\_\_ is lighter than \_\_\_\_\_.

## Recall

1. Write **heavier** or **lighter**.

(a)



The cow is **heavier** than the duck.

(b)



The cat is **lighter** than the goat.

2. Look at the picture.



(a) The **toy car** is heavier than the **teddy bear**.


(b) The **teddy bear** is lighter than the **toy car**.




Name: \_\_\_\_\_ Date: \_\_\_\_\_

3. Circle the item that is heavier.


(a) An apple or a pumpkin?




(b) An orange or a feather?



(c) A jar full of beans or a jar full of cotton?



4. Which glass has more water?



Glass A      Glass B

(A) Glass A      (B) Glass B


(C) Glasses A and B have the same amount of water.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

5. Which jug has more juice?




Jug C      Jug D

(A) Jug C      (B) Jug D

(C) Jugs C and D have the same amount of juice.

6. Which bottle has less water?



Bottle E      Bottle F

Bottle F has less water than Bottle E.

**I can...**

☐ compare the masses of two objects.

☐ compare to tell which container has more liquid.

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**QUESTION 3** assesses students' understanding that mass is not related to size.

- For (b), encourage students to explain that although the orange is smaller than the feather, it is heavier than the feather.
- For (c), have students conclude that even though the jar of beans and the jar of cotton are of the same size, beans are heavier than cotton.

**What do you notice about the size and the mass of objects in this question?** The size and mass of objects are not related. An object can be smaller than another object, but heavier. An object can be of the same size as another object, but heavier. How do you know the jar of cotton would be lighter than the jar of beans? beans are heavier than cotton

**QUESTION 4** assesses students' ability to reason about containers that are of the same size with the same amount of water.

**What do you notice about the two glasses?** They are of the same size. What do you notice about the amount of water in each glass? Both glasses are fully filled with water. How can you compare them? They are the same.

**QUESTION 5** assesses students' ability to reason about containers that are of the same size but have different amounts of juice.

**What do you notice about the two jugs of juice?** The jugs are of the same size, but Jug C contains more juice than Jug D.

**QUESTION 6** assesses students' ability to reason about containers that are of different sizes with different amounts of water.

**What do you notice about the two bottles?** Their sizes are different. Which bottle has more water? the larger bottle; Bottle E Why do you think so? It can hold more water. Do you think the size of a container is a good way to determine the amount of liquid it contains? Why or why not? Does the size of the container always tell you which one has more? No, only if they are completely filled.

## Lesson 2

# 8A Measure Mass in Kilograms

## Focus Question

How can you use a balance and a scale to measure and estimate the mass of objects in kilograms?

## I CAN

- I can measure and estimate the mass of objects to the nearest kilogram.

## Mathematical Practice(s)

- 2 Reason
- 5 Use Tools

## Vocabulary

- kilogram (kg)
- mass

## Material(s)

- 1 bottle with 1 liter of water for the teacher
- 1 tennis ball for the teacher
- objects of different masses (less than, about, and more than 1 kg) for the teacher
- 1 balance for the teacher
- 1 kilogram scale for the teacher
- a 1-kilogram weight for the teacher

## MEASURE MASS IN KILOGRAMS (pages 119 to 124)



### Lesson Opener

Task (page 119)

10 minutes

- You may use the appropriate digital manipulatives to support teaching and learning throughout the lesson(s) in Section 8A.
- Group students in pairs or small groups.
- Have students work on the task. Observe student discussions.
- After students have attempted the task, use the following prompts to facilitate a class discussion. Pay attention to the language students use.
- Show students a bottle with 1 liter of water and a tennis ball. Invite students to consider the mass of each object and determine which one is lighter.
- How can you tell how heavy an object is? I can hold the object and estimate its mass; I can use a scale. How heavy might the bottle of water be? How could you compare objects to find which is lighter? compare the objects using a balance; use a scale Which object is lighter? tennis ball**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## 8A Measure Mass in Kilograms



## Learn

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The mass of the water bottle is 1 kilogram.

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## Lesson Development

### Learn (page 119)

10 minutes

- Group students in pairs or small groups.
- Invite each pair or group to take turns to come to the front of the class to measure the mass of a bottle filled with 1 liter of water using a balance and a 1-kilogram weight.
- Explain to students that the "kilogram" is used to describe how heavy an object is. It is a metric unit of mass and is denoted by "kg."
- Point out to students that they can use a balance to compare the mass of an object to the mass of a 1-kilogram weight and determine if the object has a mass of less than 1 kilogram, more than 1 kilogram, or about 1 kilogram.
- What can you determine when the balance does not tilt? The objects have about the same mass. What can you determine when the balance tilt? One of the objects is heavier than the other; one of the objects is lighter than the other. How do you know if an object has a mass more than 1 kilogram? The object is on the lower side of the balance. How do you know if an object has a mass less than 1 kilogram? The object is on the higher side of the balance.**
- Encourage students to explore the balance and scale as they weigh other objects, then share what they see.