

Name \_\_\_\_\_

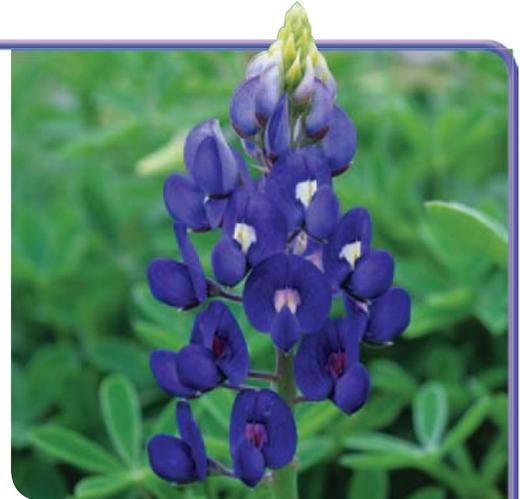
**Metric Units of Mass and Liquid Volume****Essential Question** How can you compare metric units of mass and liquid volume?Measurement and Data—4.MD.A.1  
Also 4.MD.A.2**MATHEMATICAL PRACTICES**  
MP2, MP7 **Unlock the Problem**

Mass is the amount of matter in an object. Metric units of mass include kilograms (kg) and grams (g). Liters (L) and **milliliters** (mL) are metric units of liquid volume.

The charts show the relationship between these units.

Metric Units of Mass
1 kilogram (kg) = 1,000 grams (g)

Metric Units of Liquid Volume
1 liter (L) = 1,000 milliliters (mL)

 **Example 1** Compare kilograms and grams.

Becky planted a flower garden full of bluebonnets. She used 9 kilograms of soil. How many grams of soil is that?

number of kilograms		grams in 1 kilogram		total grams
9	×	1,000	=	_____

So, Becky used \_\_\_\_\_ grams of soil to plant her bluebonnets.

**Example 2** Compare liters and milliliters.

Becky used 5 liters of water to water her bluebonnet garden. How many milliliters of water is that?

number of liters		milliliters in 1 liter		total milliliters
5	×	1,000	=	_____

So, Becky used \_\_\_\_\_ milliliters of water.

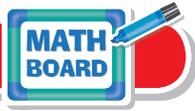
- Are kilograms heavier or lighter than grams?

- Will the number of grams be greater than or less than the number of kilograms?

- What operation will you use to solve the problem?

**Math Talk****MATHEMATICAL PRACTICES 7****Identify Relationships**

Compare the size of a kilogram to the size of a gram. Then compare the size of a liter to the size of a milliliter.



1. There are 3 liters of water in a pitcher. How many milliliters of water are in the pitcher?

There are \_\_\_\_\_ milliliters in 1 liter. Since I am changing from a larger unit to a smaller unit, I can \_\_\_\_\_ 3 by 1,000 to find the number of milliliters in 3 liters.

So, there are \_\_\_\_\_ milliliters of water in the pitcher.



**Complete.**

2. 4 liters = \_\_\_\_\_ milliliters

3. 6 kilograms = \_\_\_\_\_ grams

## On Your Own

**Complete.**

4. 8 kilograms = \_\_\_\_\_ grams

5. 7 liters = \_\_\_\_\_ milliliters

**MATHEMATICAL PRACTICE 4 Use Symbols Algebra** Compare using  $<$ ,  $>$ , or  $=$ .

6. 1 kilogram  900 grams

7. 2 liters  2,000 milliliters

**MATHEMATICAL PRACTICE 7 Look for a Pattern Algebra** Complete.

8.

Liters	Milliliters
1	1,000
2	
3	
	4,000
5	
6	
	7,000
8	
9	
10	

9.

Kilograms	Grams
1	1,000
2	
	3,000
4	
5	
6	
7	
	8,000
9	
10	



### MATHEMATICAL PRACTICES 7

**Look for Structure** Explain how you can find the number of grams in 8 kilograms.

Name \_\_\_\_\_

## Problem Solving • Applications



10. Frank wants to fill a fish tank with 8 liters of water. How many milliliters is that?

\_\_\_\_\_

11. **GO DEEPER** Kim has 3 water bottles. She fills each bottle with 1 liter of water. How many milliliters of water does she have?

\_\_\_\_\_

12. **GO DEEPER** Jared's empty backpack has a mass of 3 kilograms. He doesn't want to carry more than 7 kilograms on a trip. How many grams of equipment can Jared pack?

\_\_\_\_\_

13. **GO DEEPER** A large cooler contains 20 liters of iced tea and a small cooler contains 5 liters of iced tea. How many more milliliters of iced tea does the large cooler contain than the small cooler?

\_\_\_\_\_

14. **THINK SMARTER** A 500-gram bag of granola costs \$4, and a 2-kilogram bag of granola costs \$15. What is the least expensive way to buy 2,000 grams of granola? Explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

15. **MATHEMATICAL PRACTICE 3** **Verify the Reasoning of Others** The world's largest apple had a mass of 1,849 grams. Sue said the mass was greater than 2 kilograms. Does Sue's statement make sense? Explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**WRITE** *Math*  
**Show Your Work**

# Unlock the Problem Real World

16. **THINK SMARTER** Lori bought 600 grams of cayenne pepper and 2 kilograms of black pepper. How many grams of pepper did she buy in all?



black pepper



cayenne pepper

- a. What are you asked to find?

\_\_\_\_\_

- b. What information will you use?

\_\_\_\_\_

- c. Tell how you might solve the problem.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- d. Show how you solved the problem.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- e. Complete the sentences.

Lori bought \_\_\_\_\_ grams of cayenne pepper.

She bought \_\_\_\_\_ grams of black pepper.

\_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_ grams

So, Lori bought \_\_\_\_\_ grams of pepper in all.

17. **WRITE** *Math* Jill has two rocks. One has a mass of 20 grams and the other has a mass of 20 kilograms. Which rock has the greater mass? Explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

18. **THINK SMARTER** For numbers 18a–18c, choose Yes or No to tell whether the measurements are equivalent.

18a. 5,000 grams and 5 kilograms  Yes  No

18b. 300 milliliters and 3 liters  Yes  No

18c. 8 grams and 8,000 kilograms  Yes  No

Name \_\_\_\_\_

## Metric Units of Mass and Liquid Volume



**COMMON CORE STANDARDS—4.MD.A.1**  
**4.MD.A.2** Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

### Complete.

1. 5 liters = 5,000 milliliters

Think: 1 liter = 1,000 milliliters,  
so 5 liters =  $5 \times 1,000$  milliliters, or 5,000 milliliters

2. 3 kilograms = \_\_\_\_\_ grams

3. 8 liters = \_\_\_\_\_ milliliters

4. 7 kilograms = \_\_\_\_\_ grams

5. 9 liters = \_\_\_\_\_ milliliters

### Compare using $<$ , $>$ , or $=$ .

6. 8 kilograms  $\bigcirc$  850 grams

7. 3 liters  $\bigcirc$  3,500 milliliters

## Problem Solving



8. Kenny buys four 1-liter bottles of water. How many milliliters of water does Kenny buy?

\_\_\_\_\_

9. Mrs. Jones bought three 2-kilogram packages of flour. How many grams of flour did she buy?

\_\_\_\_\_

10. Colleen bought 8 kilograms of apples and 2.5 kilograms of pears. How many more grams of apples than pears did she buy?

\_\_\_\_\_

11. Dave uses 500 milliliters of juice for a punch recipe. He mixes it with 2 liters of ginger ale. How many milliliters of punch does he make?

\_\_\_\_\_

12. **WRITE** *Math* Write a problem that involves changing kilograms to grams. Explain how to find the solution.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Lesson Check (4.MD.A.1, 4.MD.A.2)

1. During his hike, Milt drank 1 liter of water and 1 liter of sports drink. How many milliliters of liquid did he drink?
2. Larinda cooked a 4-kilogram roast. The roast left over after the meal weighed 3 kilograms. How many grams of roast were eaten during that meal?

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## Spiral Review (4.MD.A.1, 4.MD.C.6, 4.G.A.1)

3. Use a protractor to find the angle measure.
4. Draw a pair of parallel lines.



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5. Carly bought 3 pounds of birdseed. How many ounces of birdseed did she buy?
6. A door is 8 decimeters wide. How wide is the door in centimeters?

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