

# Convert Measurement Units



Dear Family,

This week your child is learning to convert from one measurement unit to another.

Your child is learning to make measurement conversions, such as:

- from one unit of length to another, using kilometers, meters, and centimeters.
- from one unit of weight to another, using pounds and ounces.
- from one unit of capacity to another, using gallons, quarts, and cups.

You can describe the same measurement using different units. For example, 1 kilometer describes the same distance as 1,000 meters. The length is the same. The units used to measure the length are different, so the number of units in the measurement is different, too.

Kilometers are a larger unit of measurement than meters. Since there are 1,000 meters in each kilometer, you can multiply the length, or distance, in kilometers by 1,000 to convert the measurement to meters.

$$\begin{aligned} 4.5 \text{ kilometers} &= ? \text{ meters} \\ 4.5 \times 1,000 &= 4,500 \\ 4.5 \text{ kilometers} &= 4,500 \text{ meters} \end{aligned}$$

Meters are a smaller unit of measurement than kilometers. Since 1 kilometer is equivalent to 1,000 meters, you can divide the length, or distance, in meters by 1,000 to convert the measurement to kilometers.

$$\begin{aligned} 6,700 \text{ meters} &= ? \text{ kilometers} \\ 6,700 \div 1,000 &= 6.7 \\ 6,700 \text{ meters} &= 6.7 \text{ kilometers} \end{aligned}$$

Your child is becoming familiar with the relative sizes of units by identifying which units are larger and which units are smaller. Also, as your child practices converting units, he or she is applying multiplication and division skills.

Invite your child to share what he or she knows about converting measurement units by doing the following activity together.

## ACTIVITY CONVERTING MEASUREMENT UNITS

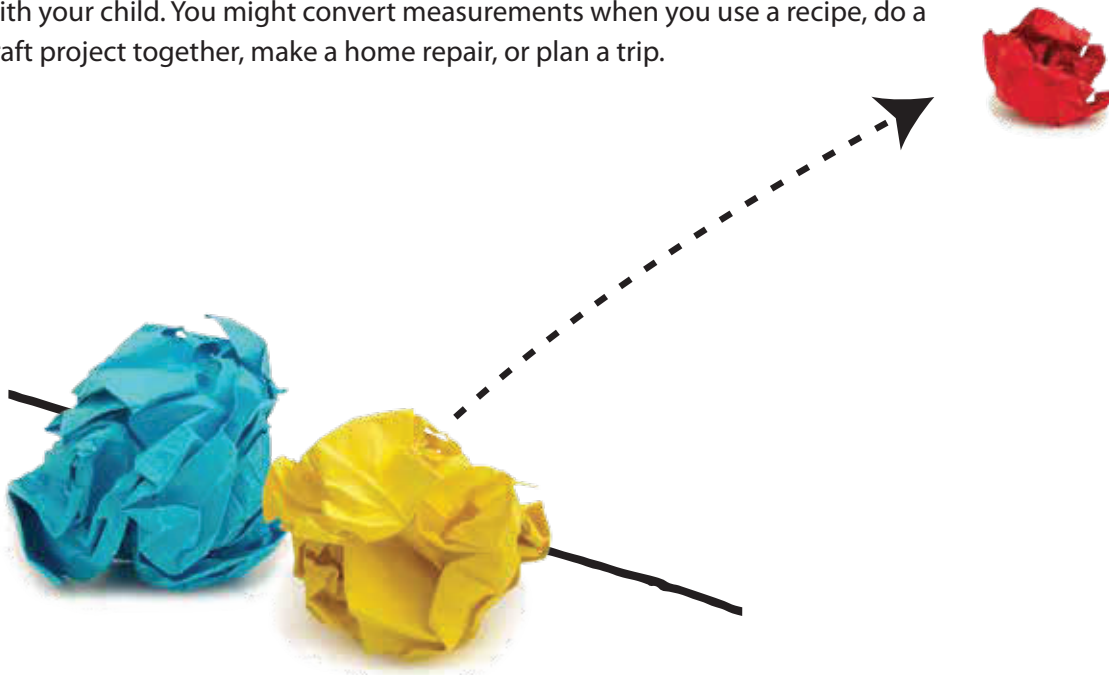
Do this activity with your child to convert measurement units.

**Materials** ruler or measuring tape, sheet of paper

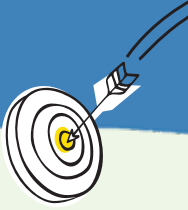
Play a game with your child to convert measurements in real-life situations.

- Choose a place to mark a starting line. It can be inside your home or outside. Make sure there is enough open space if you choose to play inside.
- Make a paper ball by crumpling a sheet of paper.
- Have your child stand at the starting line and toss the paper ball.
- Together, measure the length of the toss to the nearest foot. Then convert the length of the toss from feet to inches. [1 foot = 12 inches] So, multiply the number of feet by 12 to find the number of inches.
- Take turns tossing the ball, measuring, and converting measurements.

Look out for other real-life opportunities to practice converting measurements with your child. You might convert measurements when you use a recipe, do a craft project together, make a home repair, or plan a trip.



# Explore Converting Measurement Units



## Learning Target

- Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

**SMP** 1, 2, 3, 4, 5, 6, 7

You have worked with measurement units in earlier grades. Now you will convert between different units in the same measurement system. Use what you know to try to solve the problem below.

**Lira finds an antique dresser that is 4 feet wide. She wants to know if it will fit in her room. She measures the space in inches. How many inches wide is the dresser?**

**(1 foot = 12 inches)**

## TRY IT



## Math Toolkit

- ruler
- yardstick
- number lines
- grid paper
- math reference sheet



## DISCUSS IT

**Ask your partner:** Why did you choose that strategy?

**Tell your partner:**  
I knew ... So I ...

## CONNECT IT

### 1 LOOK BACK

Look at the problem on the previous page. Is the number of inches in 4 feet greater than or less than the number of feet? Explain.

### 2 LOOK AHEAD

You solved a problem using the relationship between units to find the equivalent measure. You can use what you know about unit sizes and operations to convert other measurement units.

The table shows equivalent measurements of weight.

a. Is an ounce a smaller unit or larger unit than a pound?

.....

A melon weighs about 2 pounds.

How many ounces is 2 pounds? .....

b. Suppose a basket of melons weighs 64 ounces.

Is the weight in pounds greater than or less than 64 pounds? How do you know?

.....

.....

Complete the table to convert from ounces to pounds.

<b>Ounces</b>	16	32		64
<b>Pounds</b>	1		3	

64 ounces = ..... pounds

<b>Units of Weight</b>
1 pound = 16 ounces
1 ton = 2,000 pounds



### 3 REFLECT

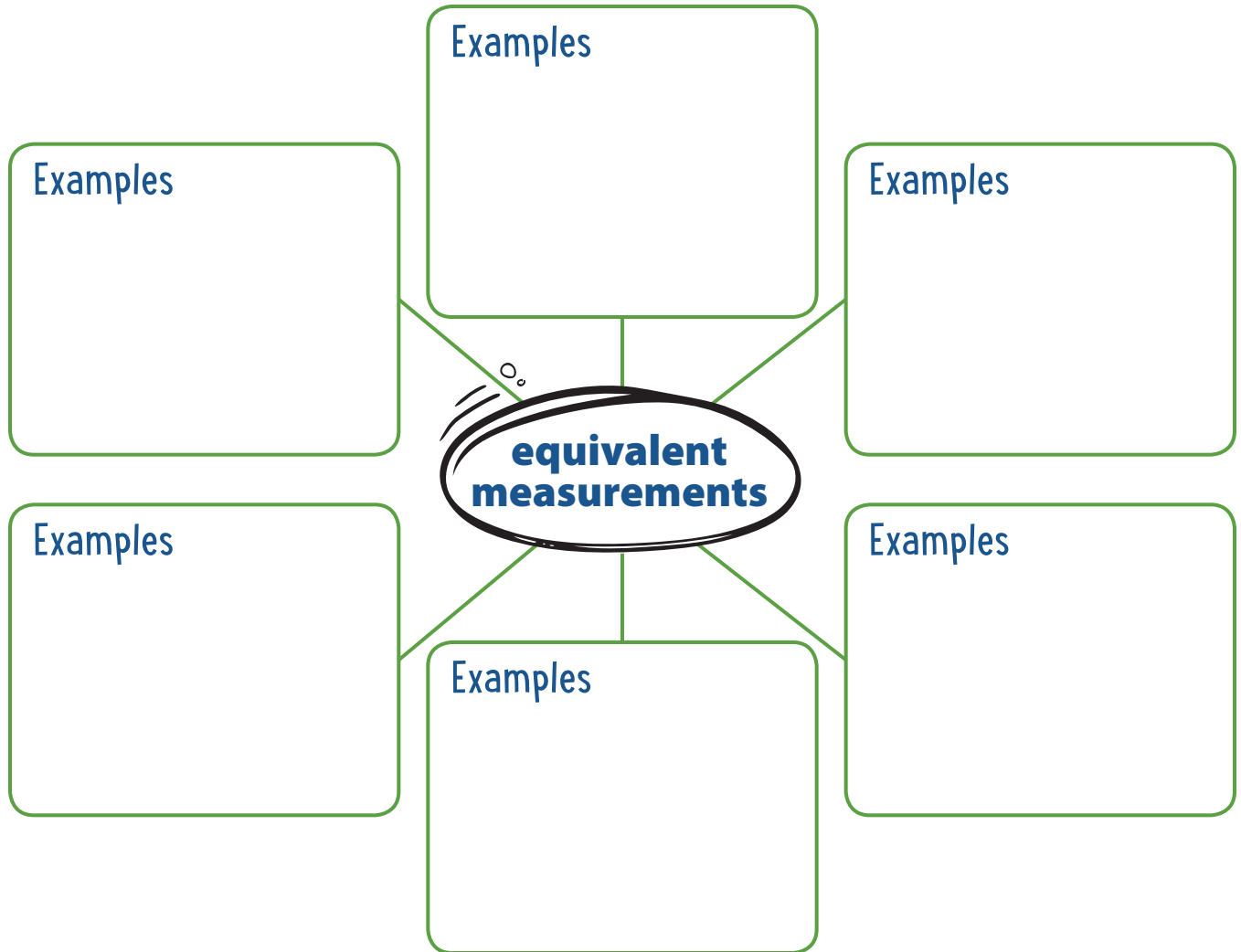
Describe a real-world object that can be measured using two different units and tell which two units you could use. Which unit would you need more of to measure the object?

.....

.....

# Prepare for Converting Measurement Units

- 1 Think about what you know about equivalent measurements. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.



- 2 The picture shows a container with 1 gallon of liquid. The measurements written on the container tell how much liquid there is in cups and in quarts.

Use the picture to write the equivalent measurement units.

$$2 \text{ quarts} = \dots\dots\dots \text{ cups} \quad 12 \text{ cups} = \dots\dots\dots \text{ quarts}$$

$$1 \text{ gallon} = \dots\dots\dots \text{ cups} \quad 8 \text{ quarts} = \dots\dots\dots \text{ gallons}$$



- 3 Solve the problem. Show your work.

**Marc is filling 1-cup containers with juice. He has 5 gallons of juice. How many 1-cup containers can he fill? (1 gallon = 16 cups)**



**Solution** .....

- 4 Check your answer. Show your work.

# Develop Converting Larger Units to Smaller Units

Read and try to solve the problem below.

In some parts of the world, travel distances on road signs and maps are given in kilometers. How many meters are there in 3.5 kilometers?  
(1 kilometer = 1,000 meters)



## TRY IT



### Math Toolkit

- base-ten blocks
- number lines
- grid paper
- thousandths decimal place-value charts
- math reference sheet



## DISCUSS IT

**Ask your partner:** Can you explain that again?

**Tell your partner:** I started by ...

Explore one way to understand converting larger measurement units to smaller measurement units.



**In some parts of the world, travel distances on road signs and maps are given in kilometers. How many meters are there in 3.5 kilometers? (1 kilometer = 1,000 meters)**

**MODEL IT**

You can use a table to help understand the problem.

The table below shows the relationship between meters and kilometers.

<b>kilometers</b>	1	2	3	4	5	6
<b>meters</b>	1,000	2,000	3,000	4,000	5,000	6,000

**SOLVE IT**

Use the information from the table to understand how to solve the problem.

The pattern in the table shows that the number of meters is always 1,000 times the number of kilometers.



<b>kilometers</b>	1	2	3	3.5	4	5	6
<b>meters</b>	1,000	2,000	3,000		4,000	5,000	6,000

To find the number of meters in 3.5 kilometers, multiply 3.5 by 1,000. Write the answer in the table.



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to convert larger measurement units to smaller measurement units.

- 1 Which is the smaller unit, *meters* or *kilometers*? .....
- How do you know?

- 2 What operation do you use to convert from a larger measurement unit to a smaller measurement unit? .....

- 3 3.5 kilometers = ..... meters

- 4 Use what you learned about the relationship between meters and kilometers to complete the table below.

<b>kilometers</b>	0.8	1	1.85	2	2.03	3
<b>meters</b>		1,000		2,000		3,000

- 5 How many meters are in  $k$  kilometers?

- 6 There are 3 feet in 1 yard. Explain how you decide whether to multiply or divide by 3 if you need to convert yards to feet.

## 7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model It** and **Solve It**. Which models or strategies do you like best for converting larger units to smaller units? Explain.

.....

.....

.....

**APPLY IT**

Use what you just learned to solve these problems.

- 8 How many ounces are there in  $4\frac{1}{2}$  pounds? Show your work.  
(16 ounces = 1 pound)

**Solution** .....

- 9 How many millimeters are in 9.25 centimeters? Show your work.  
(1 centimeter = 10 millimeters)

**Solution** .....

- 10 Ravi's fish tank can hold 65 liters of water. How many milliliters of water can the fish tank hold? (1 liter = 1,000 milliliters)
- (A) 0.065 milliliters  
(B) 6.5 milliliters  
(C) 6,500 milliliters  
(D) 65,000 milliliters



# Practice Converting Larger Units to Smaller Units

Study the Example showing how to convert between meters and millimeters. Then solve problems 1–10.

## EXAMPLE

How many millimeters are in 2.52 meters?

The table below shows the relationship between meters and millimeters.

<b>meters (m)</b>	1	2	3	4	5
<b>millimeters (mm)</b>	1,000	2,000	3,000	4,000	5,000

To find the number of millimeters in 2.52 meters, multiply 2.52 by 1,000.

$$2.52 \times 1,000 = 2,520$$

There are 2,520 millimeters in 2.52 meters.

- Which is the larger unit, *meters* or *millimeters*? .....
- How can you find how many millimeters are in 4.06 meters?
- How many millimeters are in 4.06 meters? .....
- Fill in the missing information in the table.

<b>meters (m)</b>	0.34	1	1.5	2	2.09	3	3.77	4
<b>millimeters (mm)</b>		1,000		2,000		3,000		4,000

- What operation do you use to convert from a larger measurement unit to a smaller measurement unit? Explain why.

- 6 The pattern in the table shows that the number of centimeters is always 100 times the number of meters. Fill in the missing number of centimeters.

<b>meters (m)</b>	1	1.5	2	2.07	3	3.26	4
<b>centimeters (cm)</b>	100	150	200				

- 7 A football player runs for  $13\frac{1}{2}$  yards. How many feet does he run? Show your work. (1 yard = 3 feet)

**Solution** .....

- 8 There are 24 hours in a day. If you want to convert days to hours, should you multiply or divide by 24? Explain.
- 9 Look at problem 8. How many hours are in  $2\frac{1}{2}$  days? Show your work.

**Solution** .....

- 10 16 ounces is equivalent to 1 pound. A lion cub born at the zoo weighs  $2\frac{1}{2}$  pounds. How many ounces does the lion cub weigh? Show your work.



**Solution** .....

# Develop Converting Smaller Units to Larger Units

Read and try to solve the problem below.

**How many quarts are equivalent to 6 cups? (1 quart = 4 cups)**



## TRY IT



### Math Toolkit

- fraction tiles
- fraction circles
- number lines
- grid paper
- math reference sheet



## DISCUSS IT

**Ask your partner:** How did you get started?

**Tell your partner:** A model I used was . . . It helped me . . .

Explore one way to understand converting smaller measurement units to larger measurement units.

**How many quarts are equivalent to 6 cups?**  
 (1 quart = 4 cups)

### MODEL IT

You can use a table to help understand the problem.

The table below shows the relationship between cups and quarts.

<b>quarts</b>	1	2	3	4	5	6
<b>cups</b>	4	8	12	16	20	24

### SOLVE IT

Use the information from the table to understand how to solve the problem.

The pattern in the table shows that there are 4 cups in every quart.



<b>quarts</b>	1		2	3	4	5	6
<b>cups</b>	4	6	8	12	16	20	24

To find the number of quarts equivalent to 6 cups, divide by 4.



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to convert smaller measurement units to larger measurement units.

- 1 Which is a smaller unit, quarts or cups? .....
- How do you know?

- 2 What operation do you use to convert from a smaller measurement unit to a larger measurement unit? .....

- 3  $6 \text{ cups} = \dots\dots\dots \text{quarts}$

Write your answer in the table on the previous page. Explain your reasoning.

- 4 Use what you learned about the relationship between cups and quarts to complete the table below.

<b>quarts</b>		1		2		3		4
<b>cups</b>	2	4	5	8	9	12	15	16

- 5 One gallon is equivalent to 8 pints. Describe how to convert from pints to gallons. Explain your reasoning.

## 6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model It** and **Solve It**. Which models or strategies do you like best for converting smaller units to larger units? Explain.

.....

.....

.....

**APPLY IT**

Use what you just learned to solve these problems. Use the Math Reference Sheet as necessary.

- 7 How many kilometers is equal to 800 meters? Show your work.

*Solution* .....

- 8 How many yards are equal to 25 feet? Show your work.

*Solution* .....

- 9 Which of the following measures is equivalent to 3,300 grams?
- Ⓐ 330 kilograms
  - Ⓑ 33 kilograms
  - Ⓒ 3.3 kilograms
  - Ⓓ 0.33 kilograms



# Practice Converting Smaller Units to Larger Units

Study the Example showing how to convert between ounces and pounds.  
Then solve problems 1–8.

## EXAMPLE

How many pounds are equivalent to 56 ounces?

The table below shows the relationship between pounds and ounces.

<b>pounds (lb)</b>	1	2	3	4
<b>ounces (oz)</b>	16	32	48	64

To find the number of pounds equivalent to 56 ounces, divide by 16.

$$56 \div 16 = 3\frac{1}{2}$$

$3\frac{1}{2}$  pounds is equivalent to 56 ounces.

- Which is the smaller unit, pounds or ounces? .....
- What operation do you use to convert from a smaller measurement unit to a larger measurement unit? .....
- Look at the Example. Explain how you can use multiplication to check the answer.
- Use the relationship between pounds and ounces complete the table.

<b>pounds (lb)</b>		1		2	
<b>ounces (oz)</b>	8	16	20	32	40

- 5 How many yards are equivalent to 38 feet? Show your work.  
(1 yard = 3 feet)

**Solution** .....

- 6 How many meters are equivalent to 247 centimeters? Show your work.  
(1 meter = 100 centimeters)

**Solution** .....

- 7 When converting between two measurement units, how can you tell which operation to use?

- 8 How many gallons are equivalent to 24 cups? Show your work.  
(1 gallon = 4 quarts and 1 quart = 4 cups)

**Solution** .....

# Refine Converting Measurement Units

Complete the Example below. Then solve problems 1–9 using the Math Reference Sheet as necessary.

## EXAMPLE

**How many liters are equivalent to 100 milliliters?**

Look at how you could explain your work using conversions.

$$1 \text{ liter} = 1,000 \text{ milliliters}$$

Liters are larger than milliliters, so the number of liters will be less than the number of milliliters. Divide the number of milliliters by 1,000 or  $10^3$ .

$100 \div 1,000 = 0.1$  because dividing by  $10^3$  changes the placement of the decimal point. The digit 1 from the hundreds place has a value of 0.1 in the quotient because it has moved three place values to the right.

**Solution** .....

Use division, because milliliters are smaller than liters.



## PAIR/SHARE

How can you check your answer?

## APPLY IT

- 1 Jillian makes  $10\frac{1}{2}$  gallons of lemonade to sell in 1-quart bottles. How many quarts of lemonade can she make? Show your work.

How many quarts are in  $\frac{1}{2}$  gallon?

**Solution** .....

## PAIR/SHARE

Draw a picture or make a table to support your answer.

2 How many kilograms are equivalent to 450 grams? Show your work.

Will the number of kilograms be greater or less than 450?



**Solution** .....

3 How many millimeters are in 180 meters?

- Ⓐ 0.18 millimeter
- Ⓑ 1.80 millimeter
- Ⓒ 180,000 millimeters
- Ⓓ 1,800,000 millimeters

Emily chose Ⓐ as the correct answer. How did she get that answer?

**PAIR/SHARE**

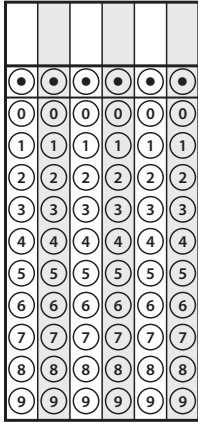
Did you and your partner solve the problem the same way?

Which is a larger unit, millimeters or meters?

**PAIR/SHARE**

Does Emily's answer make sense?

- 4 A mining company digs 75 kilograms of silver. They plan to use 1 gram of silver in each special coin they make. How many grams are equivalent to 75 kilograms?



- 5 Five measurements are shown below. Write one of the measurements on each of the lines to create two true equations.

300 millimeters    30 meters    3,000 meters    3 kilometers    3,000 centimeters

..... = .....

..... = .....

- 6 Complete each conversion below. Show your work.

- a. 3 feet + 7 inches = ..... inches
- b. 2 gallons – 5 quarts = ..... quarts
- c. 5 pounds – 38 ounces = ..... ounces
- d. 60 centimeters + 4 meters = ..... centimeters
- e. 2,000 meters + 5,000 meters = ..... kilometers
- f. 1 liter – 150 milliliters = ..... milliliters

7 How many yards are equivalent to 1,000 feet?

- Ⓐ  $333\frac{1}{3}$  yards
- Ⓑ  $333\frac{1}{12}$  yards
- Ⓒ  $83\frac{4}{12}$  yards
- Ⓓ 3,000 yards

8 Write each measurement below in the table under an equivalent measure, if possible. Some of the measurements may not have an equivalent measure.

$\frac{1}{2}$  quart      4 pints      16 cups       $\frac{1}{4}$  gallon      8 pints

1 gallon	1 quart	1 pint

9 MATH JOURNAL

Rafael uses a ruler to measure his desk. It is 85 centimeters wide. If he measures the width of his desk in meters, will the number of meters be less than or greater than 85? What will the measure in meters be? Explain how you know.

 **SELF CHECK** Go back to the Unit 4 Opener and see what you can check off.