

Use Multiplication to Convert Measurements



Dear Family,

This week your child is learning to use multiplication to convert measurements.

When you **convert** from a larger unit, such as a pound, to a smaller unit, such as an ounce, you use multiplication.

Knowing that there are 16 ounces in 1 pound, you can find the number of ounces in a number of pounds by multiplying the number of pounds by 16. For example, to find how many ounces are in 10 pounds, you multiply 10 by 16.

When your child is converting larger units to smaller units, he or she is not only becoming more familiar with the relative sizes of units, but is also getting practice with multiplication!

Sometimes it is convenient to use a table to convert measurements. The diagram below shows that each pound is the same as 16 ounces.

10 pounds (lb)

1 lb	1 lb	1 lb	1 lb	1 lb	1 lb	1 lb	1 lb	1 lb	1 lb
16 oz	16 oz	16 oz	16 oz	16 oz	16 oz	16 oz	16 oz	16 oz	16 oz

160 ounces (oz)

The table below shows how many ounces are in a number of pounds.

Pounds (lb)	1	2	3	4	5	6	7	8	9	10
Ounces (oz)	16	32	48	64	80	96	112	128	144	160

When your child writes $p \times 16$ to tell how many ounces are in p pounds, he or she is applying the skill of writing an expression. The expression gives the formula for converting any number of pounds to ounces.

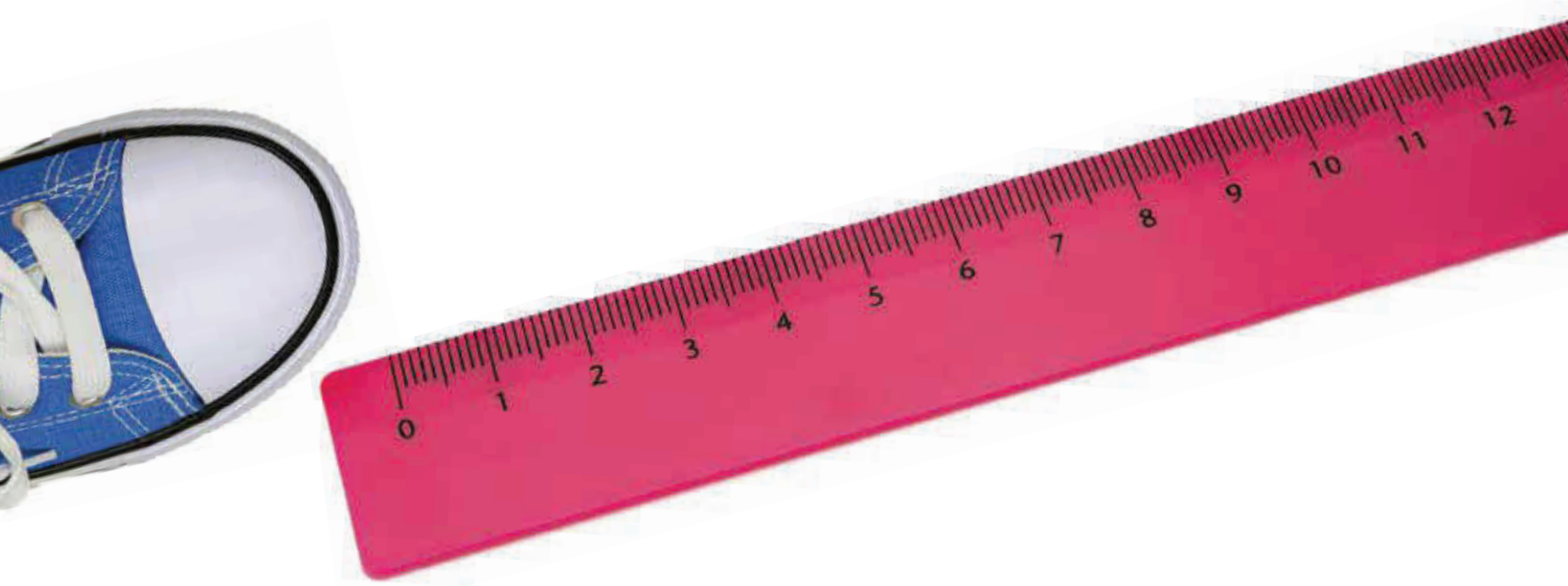
Invite your child to share what he or she knows about converting measurements by doing the following activity together.

ACTIVITY USING MULTIPLICATION TO CONVERT MEASUREMENTS

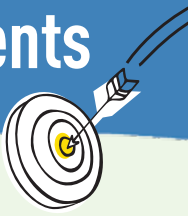
Do this activity with your child to use multiplication to convert measurements.

Materials ruler or yardstick

- Measure the stride of your child. Put a mark at your child's toe to identify a "starting point."
- Ask your child to take a long step and put another mark at the toe of the foot taking the step.
- Measure the distance in *feet* between the marks. Round the measurement to the nearest foot.
- Now, find the measure of your child's stride in inches by converting feet to inches. There are 12 inches in one foot.
- Talk with your child about different ways you could convert the measurement, such as using a diagram or a table, drawing a picture, or writing an expression. Ask: *How could you use a different way to convert the measurement?*
- Now, measure the stride of another family member. First, find the measure in feet and then convert it to inches. Compare the length of this stride to the length of your child's stride. Who has a longer stride? Who has a shorter stride?



Explore Using Multiplication to Convert Measurements



Learning Target

- 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.

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

You have used basic units of measure such as hours and minutes. Now you will learn how to express the same measurement using different units in order to solve problems. Use what you know to try to solve the problem below.

Lidia hears the announcer on a TV show say, “We will return in 240 seconds.” It takes Lidia 5 minutes to wash the dishes. Does Lidia have enough time to wash the dishes before the TV show returns?


Change the number of minutes it takes Lidia to wash the dishes to a number of seconds to find out.

Units of Time
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 365 days
1 year = about 52 weeks

TRY IT



Math Toolkit

- clocks
- clock faces
- math reference sheet
- index cards
- sticky notes
- multiplication models 



DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I agree with you about . . . because . . .

CONNECT IT

1 LOOK BACK

Explain how you found out if Lidia has enough time to wash the dishes.

2 LOOK AHEAD

You already solved a problem about converting units of time from a larger unit to a smaller unit. You can **convert** from larger to smaller units in other systems of measurement, such as length, mass, weight, and liquid volume. Look at the table that shows customary units of weight.

Customary Units of Weight
1 pound = 16 ounces
1 ton = 2,000 pounds

- a. Name an object that is about 1 pound.
- b. About how many ounces is that object?
- c. Suppose you had 5 pounds of the object you wrote in problem 2a. How could you convert 5 pounds to a number of ounces?
- d. Think about the problem with Lidia and the dishes. Do you use the same operation to convert from minutes to seconds as you use to convert from pounds to ounces in problem 2c? Explain.

3 REFLECT

When you convert from a larger unit, such as pounds or minutes, to a smaller unit, such as ounces or seconds, why do you use multiplication?

.....

.....

.....



Prepare for Using Multiplication to Convert Measurements

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

In My Own Words	My Illustrations
Examples	Non-Examples

convert measurements

- 2 How does the table at the right show converting from larger to smaller units of measurement?

Customary Units of Weight

1 pound = 16 ounces

1 ton = 2,000 pounds

- 3 Solve the problem. Show your work.

Jayne misses an exercise class. She wants to know if she has enough time to do her errands before the next exercise class. The next class starts in 195 minutes. It takes Jayne 3 hours to do her errands. Does Jayne have enough time to do her errands before the next class starts?

Change the number of hours it takes Jayne to do her errands to a number of minutes to find out.

Units of Time
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 365 days
1 year = about 52 weeks

Solution

- 4 Check your answer. Show your work.



Develop Converting Units of Weight and Mass

Read and try to solve the problem below.

Wanda is shopping for a pet carrier for her cat. One small carrier can hold 240 ounces. Her cat weighs 12 pounds. Can the carrier hold her cat?

Customary Units of Weight

1 pound = 16 ounces


1 ton = 2,000 pounds



TRY IT



Math Toolkit

- math reference sheet
- grid paper
- index cards
- sticky notes
- multiplication models 



DISCUSS IT

Ask your partner: How did you get started?

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

Explore different ways to understand converting from a larger unit of measurement to a smaller unit of measurement.

Wanda is shopping for a pet carrier for her cat. One small carrier can hold 240 ounces. Her cat weighs 12 pounds. Can the carrier hold her cat?

Customary Units of Weight

1 pound = 16 ounces

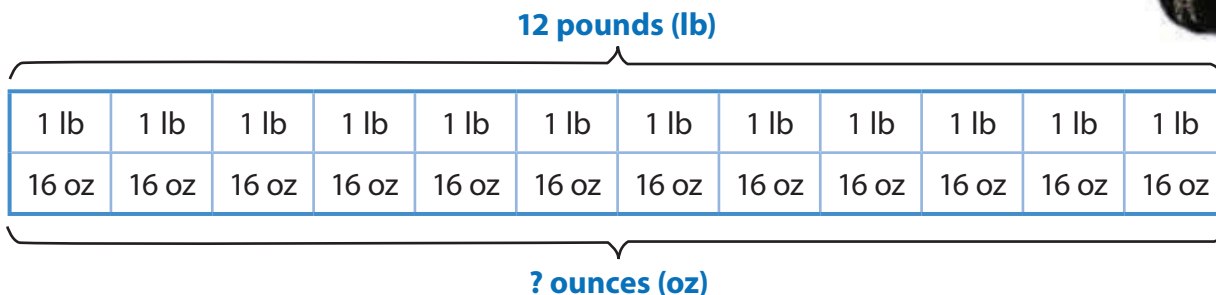
1 ton = 2,000 pounds



MODEL IT

You can use a diagram to convert from a larger unit to a smaller unit.

The diagram shows that there are 16 ounces in 1 pound.



Find the number of ounces in 12 pounds: $12 \times 16 = ?$

MODEL IT

You can use a table to convert from a larger unit to a smaller unit.

This table shows how many ounces are in different numbers of pounds.

Pounds (lb)	1	2	3	4	5	6	7	8	9	10	11	12
Ounces (oz)	16	32	48	64	80	96	112	128	144	?	?	?

The number of ounces in each column is equal to the number of pounds multiplied by 16.

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 The diagram in the first **Model It** shows that 1 pound is equal to how many ounces?
- 2 What do you multiply the number of pounds by to find the number of ounces?
- 3 Write an expression that shows how to convert any number of pounds to ounces. Use p to stand for the number of pounds.
- 4 Use the expression to solve the problem from the previous page. Can the carrier hold the cat? Show your work.
- 5 Describe how to convert from a larger unit to a smaller unit.

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for converting from a larger unit of measurement to a smaller unit of measurement? Explain.

.....

.....

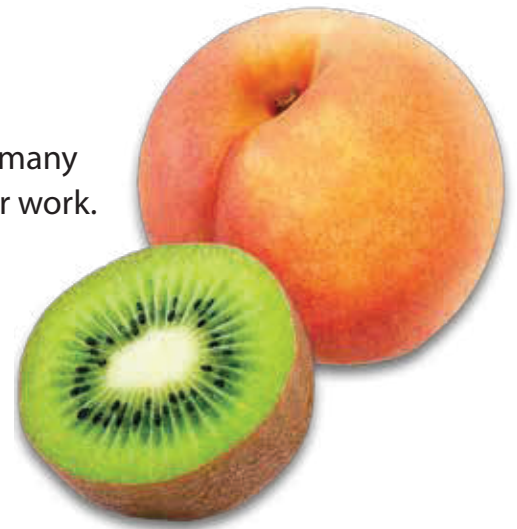
.....

.....

APPLY IT

Use what you just learned to solve these problems.

- 7 Steve buys 14 ounces of kiwis and 2 pounds of peaches. How many more ounces do the peaches weigh than the kiwis? Show your work. (1 pound = 16 ounces)



Solution

- 8 An empty suitcase has a mass of 2 kilograms. Draw a diagram to find its mass in grams. Show your work.

Metric Units of Mass	
1 gram =	1,000 milligrams
1 kilogram =	1,000 grams

Solution

- 9 The table shows the mass of two boxes of raisins, in grams. Complete the table to show the mass of each box, in milligrams. Show your work.

	Mass in Grams	Mass in Milligrams
Box 1	9	
Box 2	7	

Practice Converting Units of Weight and Mass

Study the Example showing how to convert from a larger unit to a smaller unit of weight. Then solve problems 1–7.

EXAMPLE

Eleanor buys a 3-pound watermelon and 32 ounces of strawberries. How much more does the watermelon weigh than the strawberries? (1 pound = 16 ounces)

Write an expression to convert pounds to ounces. Let p stand for the number of pounds. $p \times 16$

Find the weight of the watermelon in ounces. The watermelon weighs 48 ounces. Substitute 3 for p .
 $3 \times 16 = 48$

Find the difference between the weight of the watermelon and strawberries. $48 - 32 = 16$

The watermelon weighs 16 ounces more than the strawberries.

- 1 Isayah has a watermelon with a mass of 3 kilograms. Complete the diagram. Then write the mass of the watermelon in grams.

3 kilograms (kg)

1 kg	1 kg	
1,000 g	1,000 g	

..... grams (g)

- 2 Write an expression that shows how to convert kilograms to grams. Use k to stand for the number of kilograms.

- 3 Convert the units of mass.

$2 \text{ kg} = \dots\dots\dots \text{ g}$ $4 \text{ kg} = \dots\dots\dots \text{ g}$

Vocabulary

convert to write an equivalent measurement using a different unit.

1 kilogram = 1,000 grams



unit



unit

- 4 Complete the table to convert from a larger unit to a smaller unit of weight.

Pounds (lb)	1	2	3	4	5	6	7
Ounces (oz)	16		48				112



- 5 Neil has 2 pounds of grapes. He uses some to make a fruit salad. Now Neil has 8 ounces of grapes. How many ounces of grapes does Neil use for the fruit salad? Look at the table in problem 4 to help you answer the question. Show your work.

Solution

- 6 Select all the objects that weigh about 1 pound.

- Ⓐ a flat-screen TV
- Ⓑ three bananas
- Ⓒ a house key
- Ⓓ a can of soup
- Ⓔ a bicycle helmet

- 7 An adult bottlenose dolphin has a mass of 200 kilograms. What is the mass of an adult bottlenose dolphin in grams? Show your work. (1 kilogram = 1,000 grams)

Solution

Develop Converting Units of Liquid Volume

Read and try to solve the problem below.

**Julie makes 4 liters of orange juice.
How many milliliters of orange juice
does Julie make?**


Metric Units of Liquid Volume

1 liter = 1,000 milliliters

TRY IT



Math Toolkit

- math reference sheet
- grid paper
- index cards
- sticky notes
- multiplication models 



DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I am not sure how to find the answer because . . .

Explore different ways to understand converting from a larger unit to a smaller unit of liquid volume.

Julie makes 4 liters of orange juice. How many milliliters of orange juice does Julie make?

Metric Units of Liquid Volume

1 liter = 1,000 milliliters

PICTURE IT

You can use a picture to help convert from a larger unit to a smaller unit of liquid volume.

Each beaker shows that 1 liter (L) is equal to 1,000 milliliters (mL).



MODEL IT

You can use a table to help convert from a larger unit to a smaller unit of liquid volume.

The table below shows that there are 1,000 milliliters in one liter. It also shows how many milliliters are in 2, 3, 4, and 5 liters.

Liters (L)	1	2	3	4	5
Milliliters (mL)	1,000	2,000	3,000	4,000	5,000

CONNECT IT

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

- 1 Look at the beakers in **Picture It**. How many milliliters are in 1 liter?
- 2 Look at the number pairs in each column of the table in **Model It**. Each number of milliliters is how many times the number of liters?

Write an equation to describe the relationship between each pair of numbers in the table.

- 3 Use the equation to find the number of milliliters in 4 liters.

How many milliliters of orange juice does Julie make?

- 4 Explain why the number of milliliters is always greater than the number of liters for each number pair in the table.

5 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for converting from a larger unit to a smaller unit of liquid volume? Explain.

.....

.....

.....

.....

.....

APPLY IT

Use what you just learned to solve these problems.

- 6 Awan buys 3 liters of apple juice. He drinks 2,500 milliliters of the apple juice over a few days. How many milliliters of apple juice does Awan have left? Show your work. (1 liter = 1,000 milliliters)

**Solution**

- 7 Aliya makes 8 quarts of punch for a party. Make a table or write an equation to find the number of cups of punch she makes. Show your work.

Customary Units of Liquid Volume
1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 quart = 4 cups
1 gallon = 4 quarts

Solution

- 8 How many quarts are in 6 gallons? Use the table above.
- (A) 64
- (B) 24
- (C) 16
- (D) 10

Practice Converting Units of Liquid Volume

Study the Example showing how to convert from a larger unit to a smaller unit of liquid volume. Then solve problems 1–7.

EXAMPLE

Josie makes 4 quarts of iced tea for a family picnic. Her sister makes 14 cups of punch for the picnic. Who makes a greater amount of beverage?

Use a table to convert quarts to cups.

Quarts	1	2	3	4	5
Cups	4	8	12	16	20

Josie makes 4 quarts, or 16 cups of iced tea.

$$16 > 14$$

Josie makes a greater amount of beverage.

- 1 The soccer coach has a container that holds 5 liters of water. How many milliliters of water does the container hold? Fill in the table to answer the question.

Liters (L)	1	2	3	4	5
Milliliters (mL)	1,000		3,000		

The container holds of water.

- 2 Write an expression that shows how to convert liters to milliliters. Use L to stand for the number of liters.

- 3 Convert the units of liquid volume.

$$6 \text{ L} = \dots\dots\dots \text{ mL} \quad 9 \text{ L} = \dots\dots\dots \text{ mL}$$

- 4 Carla has 2 liters of juice. She pours the juice into another container that has 500 milliliters of juice in it. How many milliliters of juice does the container have in all? Show your work. (1 liter = 1,000 milliliters)

Solution

- 5 Select all the objects that can hold about 1 gallon of liquid when filled.
- Ⓐ a paint can
 - Ⓑ a paper cup
 - Ⓒ a bathtub
 - Ⓓ a large jug of milk
 - Ⓔ a swimming pool
- 6 A small bottle contains 2 cups of juice. Do 5 small bottles of juice have a greater amount of juice than a 1-quart bottle of juice? Explain. (1 quart = 4 cups)
- 7 Rachel has a 4-liter jug of water. She uses it to fill 3 small vases each with 900 mL of water. How much water does Rachel use to fill the vases? How much water is left in the jug? Show your work. (1 liter = 1,000 milliliters)

**Solution**

Refine Using Multiplication to Convert Measurements

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

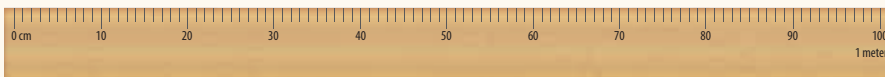
EXAMPLE

A shed is 5 meters long. How many centimeters long is the shed?

Look at how you could show your work using a picture and an expression.

Think: 5 meters = ? centimeters

The drawing of a meter stick shows that 1 meter is equal to 100 centimeters.



$100 \times m$ $100 \times 5 = 500$

Solution

The student substituted 5 for m : $100 \times 5 = 500$.



PAIR/SHARE

How else could you solve this problem?

APPLY IT

- 1 a.** A bag of potatoes weighs 5 pounds. The bag is placed on a scale. The unit on the scale is ounces. What weight does the scale show? Show your work.

Solution

- b.** Two pounds of potatoes are taken out of the bag. What weight does the scale show now? Show your work.

Solution

There are 16 ounces in 1 pound.

PAIR/SHARE

How could you use a table to solve this problem?

- 2 The amount of liquid in three containers is shown below. Order the liquid measurements from least to greatest. Show your work.

2 gallons 3 quarts 15 cups

Solution

- 3 Aaron is 63 inches tall. In order to ride a roller coaster at an amusement park, a person must be 5 feet tall. Is Aaron tall enough to ride a roller coaster? How many inches shorter or taller is he than 5 feet?

- A Yes. He is 3 inches taller than 5 feet.
- B Yes. He is 13 inches taller than 5 feet.
- C No. He is 7 inches shorter than 5 feet.
- D No. He is 17 inches shorter than 5 feet.

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

There are 4 quarts in 1 gallon. There are 4 cups in 1 quart.



PAIR/SHARE

How did you solve the problem?

There are 12 inches in a foot.

PAIR/SHARE

How can you check your answer?



- 4 Ming buys a watermelon with a mass of 6 kilograms. She cuts off the rind. The remaining watermelon has a mass of 2,500 grams. What is the mass of the rind?

(A) 15,000 grams
 (B) 4,500 grams
 (C) 3,500 grams
 (D) 500 grams

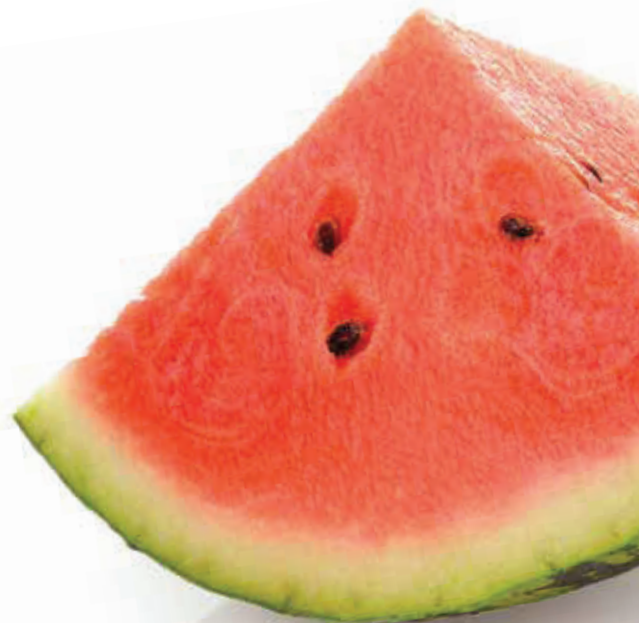
- 5 Tell whether each measurement is equal to 2 yards, 1 foot.

	Yes	No
4 feet	(A)	(B)
84 inches	(C)	(D)
7 feet	(E)	(F)
1 yard, 2 feet, 24 inches	(G)	(H)

- 6 Suzie is measuring furniture for her bedroom. She does not have a tape measure or a ruler. Instead, she uses her book. She knows that the length of her book is 8 inches.

The table below shows the total number of book lengths that Suzie uses to measure each object. Complete the table.

Object	Number of Book Lengths	Number of Inches
Bed	11	
Dresser	6	
Bookcase	4	



- 7 Ramon has an 8-liter jug filled with water. He uses it to fill nine 750-milliliter pitchers with water. How much water does Ramon have left in the jug?
- Ⓐ 250 mL
- Ⓑ 500 mL
- Ⓒ 1,000 mL
- Ⓓ 1,250 mL
- 8 Simone jogs 5 kilometers. How many meters does she jog?
Show your work.

Simone jogs meters.

9 MATH JOURNAL

Name an object that is about 3 feet long. Explain how to find the length of the object in inches.



SELF CHECK Go back to the Unit 3 Opener and see what you can check off.

