Multiply Fractions

🅖 Use What You Know

In Lesson 18, you learned about multiplying fractions by whole numbers. In this lesson, you will multiply fractions by whole numbers to solve word problems.

One serving of crackers is $\frac{3}{10}$ of the whole box of crackers. Bella ate 3 servings last week. What fraction of the box of crackers did she eat?

3 parts = 1 serving

a. What fraction of the box is one serving? _____

b. How many servings did Bella eat? _____

c. Did Bella eat more or less than $\frac{3}{10}$ of the box of crackers? _____

d. What operation can you use to solve the problem? _____

e. If Bella ate 2 servings, you could multiply $\frac{3}{10}$ by 2 to find the fraction of the box of crackers she ate.

What is $2 \times \frac{3}{10}$? _____

f. Explain how you could find the fraction of the box of crackers Bella did eat.

_____

_____

_____

▶▶ Find Out More

To solve some word problems, you can multiply a fraction by a whole number. These problems include combining equal-size parts. In the cracker problem, the serving size $\left(\frac{3}{10} \text{ of the box}\right)$ is the equal-size part. You can add $\frac{3}{10}$ each time Bella eats a serving. Or, you can use multiplication.

Eating $\frac{3}{10}$ of the box **3 times** can be written as **3** $\times$ $\frac{3}{10}$, or $\frac{3 \times 3}{10}$.
Since $3 \times 3 = 9$, $\frac{3 \times 3}{10} = \frac{9}{10}$.

CRACKERS

9 parts = 3 servings

The answer to a problem like the one above may be a fraction. You may be asked to tell between which two whole numbers the answer lies.

For example:

$\frac{9}{10}$ is less than 1 whole. $\frac{9}{10}$ is between 0 and 1.

$\frac{12}{10}$ is more than 1 whole, but less than 2 wholes. $\frac{12}{10}$ is between 1 and 2.

Situations for multiplying a fraction by a whole number are similar to ones you have seen for multiplying whole numbers. Some problems are about multiple groups of equal-size parts. Others are about comparing, such as "2 times as many."

▶ Reflect

1 Describe a real situation when you might want to multiply a fraction by a whole number.

_____

_____

_____

Learn About ▶ **Multiplying Fractions in Word Problems**

Read the problem below. Then explore different ways to solve the word problem.

> James is baking cookies. One batch of cookies needs $\frac{2}{4}$ of a teaspoon of vanilla. James wants 3 times the number of cookies in 1 batch. How much vanilla does James need?
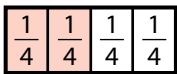
▶ **Picture It** **You can use a drawing to help solve the word problem.**

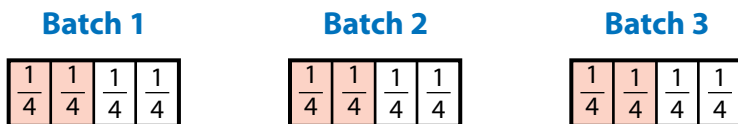Three times as many means 3 batches. The picture shows six $\frac{1}{4}$ teaspoons for 3 batches.

Batch 1　　Batch 2　　Batch 3
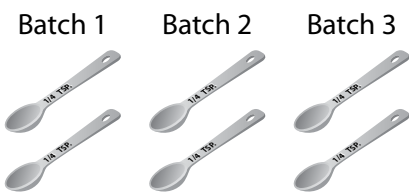
▶ **Model It** **You can also use fraction strips to solve the word problem.**

The fraction strip below is divided into fourths and shows $\frac{2}{4}$, the amount of vanilla in each batch.

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

The model below shows the amount of vanilla needed for **3 batches.**

Batch 1

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Batch 2

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Batch 3

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

▶ **Connect It** **Now you will solve the problem from the previous page using equations.**

2 How much vanilla does James need for each batch? _____

3 How many batches does James want to make? _____

4 Write an equation to find how many teaspoons of vanilla James needs.

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

number of   teaspoon   teaspoons
batches   for 1 batch   needed

5 Explain how you can check your answer using repeated addition.

_____

_____

_____

_____

▶ **Try It** **Use what you just learned to solve these problems. Show your work on a separate sheet of paper.**

6 Micah jogged $\frac{8}{10}$ of a mile. Sarah jogged 3 times this distance. How far did

Sarah jog? _____

7 On Monday, Sylvia spent $\frac{5}{12}$ of a day driving to her cousin's house. On Friday, she

spent the same amount of time driving home. What fraction of a day did Sylvia
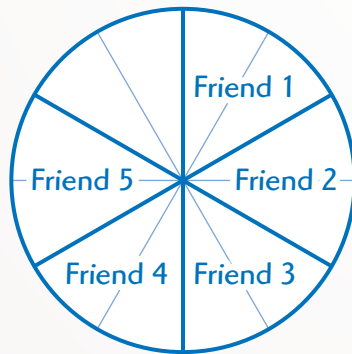
spend driving to her cousin's house and back? _____

Practice **Multiplying Fractions**

Study the example below. Then solve problems 8–10.

Example

Five friends shared a pizza. Each friend ate $\frac{2}{12}$ of the pizza.
How much pizza did they eat altogether?

Look at how you could show your work using a model.

$$5 \times \frac{2}{12} = \frac{10}{12}$$

Solution _The 5 friends ate $\frac{10}{12}$ of a pizza._

> The student labeled the model to show each of the 5 friends!

> **Pair/Share**
> How could you write the equation a different way?

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8 A partially eaten bag of grapes weighs $\frac{5}{8}$ of a pound.
The bag of grapes weighed 4 times this amount before any were eaten. What was the original weight of the bag of grapes?

Show your work.

> Was the original weight more or less than $\frac{5}{8}$ of a pound?

> **Pair/Share**
> Check your answer using repeated addition.

Solution _____

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9 Leo painted for $\frac{2}{3}$ of an hour each day on Monday, Tuesday, Thursday, and Friday. How long did Leo paint this week?

Show your work.

Did Leo paint for the same amount of time each day?

Solution _____

10 Karime biked $\frac{3}{4}$ of a mile on Monday. On Tuesday he biked 5 times this distance. The number of miles Karime biked on Tuesday is between which two whole numbers? Circle the letter of the correct answer.

Make sure your answer is reasonable!

A 0 and 1

B 1 and 2

C 3 and 4

D 4 and 5

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

_____

_____

_____

_____

Practice ▶ **Multiplying Fractions**

Solve the problems.

1 A choir concert lasts for $\frac{5}{6}$ of an hour. The choir performed 3 concerts over the weekend. Find the number of hours the choir spent performing over the weekend. The answer is between which two whole numbers?

A 0 and 1

B 1 and 2

C 2 and 3

D 3 and 4

2 Tell whether each equation is *True* or *False*.

a. $3 \times \frac{4}{6} = 2$ ☐ True ☐ False

b. $2 \times \frac{4}{5} = \frac{8}{10}$ ☐ True ☐ False

c. $5 \times \frac{2}{9} = 5\frac{2}{9}$ ☐ True ☐ False

d. $2 \times \frac{3}{7} = 6 \times \frac{1}{7}$ ☐ True ☐ False

3 Melanie wrote an expression that has a value of $\frac{15}{4}$.

Choose *Yes* or *No* to tell whether each expression has a value of $\frac{15}{4}$.

a. $5 \times \frac{3}{4}$ ☐ Yes ☐ No

b. $1 \times \frac{5}{4}$ ☐ Yes ☐ No

c. $15 \times \frac{1}{4}$ ☐ Yes ☐ No

4 Morgan bought 6 tomatoes that each weigh $\frac{1}{4}$ of a pound. Russ bought 14 tomatoes that each weigh $\frac{1}{8}$ pound. Whose tomatoes weigh more?

Show your work.

Answer   The tomatoes that _____ bought weigh more.

5 Mr. Nelson bought paint brushes for the art club. He gave each of the 6 club members $\frac{4}{12}$ of a box of paint brushes. What is the total number of boxes of paint brushes he gave to the club?

Show your work.

Answer   Mr. Nelson gave the club _____ boxes of paint brushes.

✔ **Self Check**   **Go back and see what you can check off on the Self Check on page 147.**