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# Lesson 1 MULTIPLY WHOLE NUMBERS BY FRACTIONS

## LESSON OBJECTIVES

Students will:

- Use repeated addition to find the product of a whole number and a fraction.
- Multiply a whole number by a fraction using a standard algorithm.

## RELATED AUSTRALIAN CURRICULUM CONTENT DESCRIPTIONS

See page 26 to cross-reference this lesson with aligned Australian Curriculum content descriptions.

## PREREQUISITES

Students should be able to:

- Add like fractions.
- Simplify fractions.
- Rewrite improper fractions as whole numbers and mixed numbers.

## RELATED STAMS® PLUS LESSONS

- **Book D – Lesson 9**

*Simplify fractions* introduces simplifying fractions by dividing by a common factor.

- **Book E – Lesson 7**

*Understand mixed numbers* introduces renaming improper fractions.

- **Book E – Lesson 8**

*Add and subtract like fractions* introduces adding and subtracting fractions with common denominators.

## VOCABULARY

### PAGE 4

- **multiplication:** an operation used to find the total number of items in equal-sized groups
- **repeated addition:** addition of the same number a particular number of times
- **factor:** a number multiplied by another number
- **product:** the answer to a multiplication problem

### PAGE 5

- **numerator:** the top number in a fraction that tells the number of equal parts described by the fraction.
- **denominator:** the bottom number in a fraction that tells the total number of equal parts in a whole.
- **improper fraction:** a fraction whose numerator is greater than or equal to its denominator

## MATHS BACKGROUND

Rectangle models can be used to multiply a whole number and a fraction. For example, when you multiply 3 and  $\frac{2}{5}$ , the whole number 3 tells how many whole rectangles there are. The denominator of the fraction tells how many parts are in each rectangle. The numerator tells how many sections of each rectangle to shade. Shade 2 fifths of each of the 3 rectangles. To multiply, count the number of shaded rectangles. There are 6 fifths shaded, so the product is  $\frac{6}{5} = 1\frac{1}{5}$ .

When you shade 2 fifths of each rectangle, you are displaying how multiplying  $3 \times \frac{2}{5}$  is the same as adding  $\frac{2}{5} + \frac{2}{5} + \frac{2}{5}$ . Students learn about this method in part one. In part two, students learn a standard algorithm.



### Interactive Whiteboard

Visualise multiplying whole numbers by fractions

Go to the *IWB lessons* to bring parts one and two to life. Use features such as interactive fraction models to deepen students' understanding of multiplying whole numbers by fractions.



### Download

<http://iwb.camsandstams.com.au>

## Modelled Instruction

**Lesson 1** MULTIPLY WHOLE NUMBERS BY FRACTIONS  
PART ONE: Learn about multiplying whole numbers by fractions

How can you multiply a whole number by a fraction using repeated addition?

**Explore**  
You can use **multiplication** to find the total amount of equal groups. One way to multiply whole numbers is to use **repeated addition**.  
 $5 \times 3 = ?$  5 groups of 3  
 $3 + 3 + 3 + 3 + 3 = 15$   
How can you multiply if one factor is a fraction?  $3 \times \frac{3}{10}$

**Think**  
Make a model of the problem  $3 \times \frac{3}{10}$ .  
  
There are 3 groups. How much is in each group?  $\frac{3}{10}$

**Connect**  
To multiply  $3 \times \frac{3}{10}$ , you can use repeated addition to find the product.  
  
Add:  $\frac{3}{10} + \frac{3}{10} + \frac{3}{10} = \frac{9}{10}$  3 groups of  $\frac{3}{10}$  is  $\frac{9}{10}$

**Let's Talk**  
Does the order of the factors in a fraction multiplication problem matter? Why or why not?

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## Guided Instruction

Multiply whole numbers by fractions

**Think It Through**

**Fill in the blanks as you solve the problem.**

Gabriella and her friends are making 6 fruit smoothies. One serving of smoothie needs  $\frac{2}{3}$  of a cup of yoghurt.

How much yoghurt do they need in all?

■ How many smoothies are the friends making? 6  
How much yoghurt is in each smoothie?  $\frac{2}{3}$  of a cup

■ You can find  $6 \times \frac{2}{3}$  using repeated addition.  
Think:  $6 \times \frac{2}{3}$  means 6 groups of  $\frac{2}{3}$ .  
Add  $\frac{2}{3}$  six times.  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{12}{3}$

■ You can simplify the answer  $\frac{12}{3}$  by dividing.  
The numerator 12 divided by the denominator 3 equals 4.

**Solution:** Gabriella and her friends need 4 cups of yoghurt.

**Your Turn** ▶ **Now, use what you know to solve this problem.**

1. Use repeated addition to find the product of  $4 \times \frac{1}{8}$ .  
Show your work. Simplify your answer.  
 $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{4}{8}$   
 $\frac{4}{8} \div 4 = \frac{1}{2}$   
 $\frac{4}{8} \div 4 = \frac{1}{2}$   
 $4 \times \frac{1}{8} = \frac{1}{2}$

When the numerator (top) of a fraction is greater than or equal to the denominator (bottom), you have an **improper fraction**. This means the fraction is greater than or equal to one.

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### AT A GLANCE

Students activate their background knowledge about repeated addition and its connection to multiplication. Then they use models and repeated addition to find equal groups of a fractional amount.

### STEP BY STEP

#### PAGE 4

- Introduce the **Question** at the top of the page.
- Have students study the groups shown in **Explore** and connect the picture to the equation.
- Read **Think** with students. Emphasise that the groups all show the same fractional amount.

**EAL/D Support:** Emphasise the correct way to read a fraction. The numerator is read as a counting number. The denominator is read as an ordinal number, with the exception of 2 (halves) and 1 (wholes). So the fraction in this example is read “three-tenths”.

- Discuss **Connect** with students. Make sure they understand why the numerators are added and the denominator remains the same in the sum.

- Organise students in pairs or groups for **Let's Talk** and monitor their discussions.
- Be sure students understand that changing the order of the factors in any multiplication problem does not change the product. (Commutative Property)

#### PAGE 5

- Read the **Think It Through** problem with students.
- Make sure students see the connection between the factors in the multiplication equation and the addends in the repeated addition equation. Review rewriting improper fractions as mixed numbers.

**Tip:** Draw a model of the answer, showing 4 full measuring cups, each divided into thirds.

- Monitor students as they complete **Your Turn**. Then discuss the correct answer. If necessary, review simplifying fractions.

**Error Alert:** Students who got  $\frac{4}{32}$  (before simplifying) are also adding the denominators.



### ADDITIONAL ACTIVITY

See **Hands-on Activity** (page 38).

## Modelled Instruction

**PART TWO:** Learn more about multiplying whole numbers by fractions

**Explore** How can you multiply a whole number by a fraction without using repeated addition?

To multiply  $8 \times \frac{1}{2}$ , you could find the sum shown below.

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$$

Is there a quicker way to find the product?

**Think** Any whole number can be written as a fraction with a denominator of 1.

$$3 = \frac{3}{1} \quad 7 = \frac{7}{1} \quad 42 = \frac{42}{1}$$

How can you write the whole number 8 as a fraction?  $\frac{8}{1}$

Rewrite the multiplication problem  $8 \times \frac{1}{2}$  using only fractions.  $\frac{8}{1} \times \frac{1}{2}$

**Connect** To multiply two fractions, follow the steps.

Process	Equation
Step 1: Multiply the numerators.	$\frac{8}{1} \times \frac{1}{2} = \frac{8}{2}$
Step 2: Multiply the denominators.	$\frac{8}{1} \times \frac{1}{2} = \frac{8}{2}$
Step 3: If possible, simplify your answer.	$\frac{8}{2} = 4$

The product of  $8 \times \frac{1}{2} = 4$ .

**Let's Talk** If you multiply a whole number by 2, the number increases. What happens when you multiply a whole number by  $\frac{1}{2}$ ?

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## Guided Instruction

Multiply whole numbers by fractions

**Think It Through**

Fill in the blanks as you solve the problem.

Corine had 11 packets of icing sugar. She used  $\frac{2}{3}$  of the icing sugar to decorate cupcakes. How many packets of icing sugar did she use?

- You need to find  $\frac{2}{3}$  of 11, so multiply  $\frac{2}{3} \times 11$ .

How can you write the whole number 11 as a fraction?  $\frac{11}{1}$

Rewrite the multiplication problem  $\frac{2}{3} \times 11$  using only fractions.

$$\frac{2}{3} \times \frac{11}{1}$$

- Multiply the numerators.

$$\frac{2}{3} \times \frac{11}{1} = \frac{22}{3}$$

Multiply the denominators.

$$\frac{2}{3} \times \frac{11}{1} = \frac{22}{3}$$

- Simplify the answer by dividing the numerator by the denominator.

$$\frac{22}{3} = 7\frac{1}{3}$$

**Solution:** Corine used  $7\frac{1}{3}$  packets of icing sugar.

**Your Turn** Now, use what you know to solve this problem.

2. Rewrite  $2 \times \frac{3}{4}$  using only fractions.

Then multiply using the steps. Simplify your answer.

$$2 \times \frac{3}{4} = \frac{2}{1} \times \frac{3}{4} = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$

$$2 \times \frac{3}{4} = \frac{1}{2}$$

A fraction bar means division. The number 11 equals  $\frac{11}{1}$  because 11 is the same as  $11 \div 1$ .

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### AT A GLANCE

Students learn to multiply a whole number by a fraction using standard fraction multiplication steps.

### STEP BY STEP

#### PAGE 6

- Introduce the **Question** at the top of the page.
- Read **Explore** with students. Have students find the sum of the repeated addition problem ( $\frac{8}{2} = 4$ ).

**EAL/D Support:** Clear up any confusion about the word *sum* and its homonym *some*.

- Read **Think** with students. Remind students that a denominator of 1 indicates a whole, so for example  $\frac{3}{1}$  means 3 wholes. Pause so students can read aloud the shaded numbers.
- Read and discuss the multiplication steps in **Connect**.

**Tip:** Compare the answer here to the one found in **Explore**. Help students understand that they are the same because with the repeated addition, the numerator 1 was added 8 times, and the denominator 2 was added 0 times (kept the same).

- Organise students in pairs or groups for **Let's Talk** and monitor their discussions.
- Be sure students realise that the product of a whole number and  $\frac{1}{2}$  will be less than the whole number. This is because it takes two halves to equal one whole.

#### PAGE 7

- Read the **Think It Through** problem with students.
- Guide students as they solve the problem. Pause for students to fill in missing information. Then discuss each response. Show how to rewrite the improper fraction as a mixed number on the board.
- Monitor students as they complete **Your Turn**. Then discuss the correct answer.

**Error Alert:** Students who got the incorrect answer of  $\frac{3}{4}$  may have multiplied the numerator by 2 and the denominator by 2, and then simplified  $\frac{6}{8}$  to  $\frac{3}{4}$ .



### ADDITIONAL ACTIVITY


See **Reteaching Activity** (page 38).

### Modelled Practice

**PART THREE: Choose the right answer**

Solve the problem. Then read why each answer choice is correct or not correct.

Jeff and his three friends are all having a glass of apple juice. Each glass is  $\frac{3}{5}$  full.



How much apple juice is there all together?

Ⓐ  $\frac{3}{20}$  of a glass    Ⓒ  $1\frac{2}{5}$  of a glass  
 Ⓑ  $\frac{12}{20}$  of a glass    Ⓓ  $2\frac{2}{5}$  of a glass


Check whether you chose the correct answer.  
 Multiply  $4 \times \frac{3}{5}$  to find the total amount.  
 $4 \times \frac{3}{5} = \frac{4}{1} \times \frac{3}{5} = \frac{12}{5}$   
 Simplify the answer.  
 $\frac{12}{5} = 2\frac{2}{5}$   
 So, the correct answer is Ⓓ.  
 Why are the other answer choices not correct?

Ⓐ $\frac{3}{20}$ of a glass	The whole number 4 written as a fraction is $\frac{4}{1}$ , not $\frac{1}{4}$ .
Ⓑ $\frac{12}{20}$ of a glass	Multiply 4 by 3 to get the numerator. Multiply 1 by 5, not 4 by 5, to get the denominator.
Ⓒ $1\frac{2}{5}$ of a glass	There are two groups of 5 in 12, not 1.

### Guided Practice

Multiply whole numbers by fractions

**Your Turn** Solve each problem. Use the hints to avoid mistakes.



- Identify the number of groups and the amount in each group, and then write the problem.
- Solve the problem using repeated addition or multiplication.
- Simplify your answer.

3. Manuel's family ordered 4 different pizzas for dinner. Manuel ate  $\frac{1}{6}$  of each pizza. Which equation could **not** be used to find the total amount of the pizza order that Manuel ate?

Ⓐ  $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \square$   
 Ⓑ  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \square$   
 Ⓒ  $4 \times \frac{1}{6} = \square$   
 Ⓓ  $\frac{1}{6} \times 4 = \square$


4. Which two expressions have the same result?

Ⓐ  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ ;  $2 \times \frac{2}{3}$   
 Ⓑ  $2 \times \frac{3}{2}$ ;  $2 \times \frac{2}{3}$   
 Ⓒ  $2 \times \frac{2}{3}$ ;  $\frac{2}{3} \times 3$   
 Ⓓ  $\frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ ;  $\frac{2}{3} \times 3$

5. Jin is watering her tomato plants. Each plant needs  $\frac{5}{8}$  of a bucket of water. If there are 10 plants all together, how many buckets of water will she need?

Ⓐ  $\frac{5}{80}$  of a bucket    Ⓑ  $6\frac{1}{4}$  buckets  
 Ⓒ  $\frac{1}{16}$  of a bucket    Ⓓ  $10\frac{5}{8}$  buckets

6. Jane bought 5 kg of flour. She used  $\frac{11}{15}$  of the flour for muffins.



How many kgs of flour did Jane use to make the muffins?

Ⓐ  $1\frac{1}{15}$  kg    Ⓑ  $4\frac{2}{3}$  kg  
 Ⓒ  $3\frac{2}{3}$  kg    Ⓓ  $5\frac{11}{15}$  kg

### AT A GLANCE

Students reinforce their understanding of fraction multiplication through solving a multiple-choice problem and analysing correct and incorrect answer choices.

### STEP BY STEP

#### PAGE 8

- Tell students that this page models finding the correct answer to a multiple-choice problem.
- Have students read the problem in **Solve** and choose the best answer. Remind students to check their maths.
- Examine **Check** with students. Discuss the correct and incorrect choices.

#### PAGE 9

- Monitor students as they complete **Your Turn**.
- Organise students in pairs or small groups and have them discuss why each answer choice is correct or not and what errors may have been made.
- Review the answers with the class.



### ADDITIONAL ACTIVITY

See Vocabulary Activity (page 38).

### Answer Analysis

3. Ⓐ This shows 4 groups of  $\frac{1}{6}$  as addition.  
 ● This shows 6 groups of  $\frac{1}{4}$ .  
 Ⓒ This shows 4 groups of  $\frac{1}{6}$  as multiplication.  
 Ⓓ This shows reversed order of factors.
4. Ⓐ Used numerator as number of groups in second expression.  
 Ⓑ Considered reciprocal of fraction as same fraction.  
 Ⓒ Changed value of whole number in addition to changing order of factors.  
 ● Both expressions represent 3 groups of  $\frac{2}{3}$ .
5. Ⓐ Multiplied denominator by 10 and kept numerator.  
 Ⓑ Before multiplying, wrote 10 as  $\frac{10}{10}$  instead of  $\frac{10}{1}$ .  
 ●  $10 \times \frac{5}{8} = \frac{10}{1} \times \frac{5}{8} = \frac{50}{8} = 6\frac{2}{8} = 6\frac{1}{4}$ .  
 Ⓓ Added instead of multiplying.
6. Ⓐ Added whole number to numerator.  
 ●  $5 \times \frac{11}{15} = \frac{5}{1} \times \frac{11}{15} = \frac{55}{15} = 3\frac{10}{15} = 3\frac{2}{3}$ .  
 Ⓒ Simplified incorrectly.  
 Ⓓ Added instead of multiplying.

## Modelled Practice

PART FOUR: Write the best answer

Study the model. It is a good example of a written answer.

**Student model**

Dominique is reading a book for English class. On Monday she read  $\frac{3}{8}$  of the book. On Tuesday she read another  $\frac{3}{8}$  of the book. How much of the book has she read now?

Show your work and simplify your answer. Then explain how you found the solution.

The student shows each step.

Multiply  $2 \times \frac{3}{8}$ .

$$2 \times \frac{3}{8} = \frac{2}{1} \times \frac{3}{8} = \frac{6}{8}$$

Simplify the answer.

$$\frac{6}{8} \div \frac{2}{2} = \frac{3}{4}$$

**Solution:** Dominique has read  $\frac{3}{4}$  of the book.

**Explanation:**

She read  $\frac{3}{8}$  of the book each day. I drew a picture to help me see the problem. Then I multiplied 2 times  $\frac{3}{8}$ . I wrote 2 as  $\frac{2}{1}$  and then multiplied  $\frac{2}{1}$  by  $\frac{3}{8}$  to get  $\frac{6}{8}$ . I simplified my answer by dividing the numerator and denominator by 2, getting the final answer of  $\frac{3}{4}$ .

The student correctly answers the question asked.

The student gives important details about how to find the amount read.

The student uses the maths words multiply, numerator, denominator and simplify.

## Guided Practice

Multiply whole numbers by fractions

**Your Turn** Solve the problem. Use what you learned from the model.

CHECKLIST

Did you ...

show each step?

answer the question asked?

give important details?

use maths words?

7. Rachel has 6 classes every school day. Each class is  $\frac{3}{4}$  of an hour long. How much time does Rachel spend in class during the school day?

Show your work and simplify your answer. Then explain how you found the solution.

Multiply  $6 \times \frac{3}{4}$ .

$$6 \times \frac{3}{4} = \frac{6}{1} \times \frac{3}{4} = \frac{18}{4}$$

Simplify the answer.

$$\frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$$

**Solution:** Rachel spends  $4\frac{1}{2}$  hours in class during the school day.

**Explanation:**

There are 6 classes that are each  $\frac{3}{4}$  of an hour long. So I multiplied 6 times  $\frac{3}{4}$ . I wrote 6 as  $\frac{6}{1}$  and then multiplied  $\frac{6}{1}$  by  $\frac{3}{4}$  to get  $\frac{18}{4}$ . I simplified my answer and wrote it as a mixed number, getting the final answer of  $4\frac{1}{2}$  hours.

### AT A GLANCE

Students study a model answer to an extended-response problem.

### STEP BY STEP

#### PAGE 10

- Tell students that this page models building the solution to a problem one step at a time and writing to explain the solution.
- Have students read the problem in **Show**. Discuss how the drawing and each mathematical step lead to the solution.

**Tip:** Make sure students don't mistake each group as a series of 8 books. Each group represents a single book. The parts represent how much of the book has or has not been read.

- Read **Explain** with students. Have students circle the maths words in the explanation.
- Direct students' attention to the notes in the right margin. Tell students that this model would receive a high score for the reasons described in these notes.

### PAGE 11

- Monitor students as they complete **Your Turn**.
- Encourage students to follow the **Checklist** to write the best answer.
- Have students discuss their work with a partner. Then discuss the correct answer as a class.

### Answer and Explanation

7. See the sample answer. This answer shows all of the steps taken to solve the problem. The solution answers the question. The explanation provides important details about how the problem was solved and uses the maths words *multiply*, *mixed number* and *simplify*.



#### ADDITIONAL ACTIVITY

See **Real-World Connection** (page 38).




#### ADDITIONAL ACTIVITY

See **School-Home Connection** (page 38).



### Independent Practice


**PART FIVE: Prepare for a test**



**When you multiply whole numbers by fractions, remember to:**

- draw pictures to show equal groups and then multiply.
- simplify your answer.
- use repeated addition to check your work.

8. Which equation **cannot** be used to find the total of the shaded areas?



A  $\frac{1}{3} \times 5 = \square$   
 B  $5 \times \frac{1}{3} = \square$   
 C  $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \square$   
 D  $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \square$

9. Which expression is the same as  $2 \times \frac{5}{8}$ ?

A  $\frac{5}{6} + \frac{5}{6}$   
 B  $\frac{2}{1} + \frac{2}{1} + \frac{2}{1} + \frac{2}{1} + \frac{2}{1}$   
 C  $\frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$   
 D  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

10. Finn is cutting up oranges for the football team. Each player needs  $\frac{1}{72}$  of an orange. There are 18 players on the football team. How many oranges does Finn need?

A  $\frac{1}{72}$  of an orange  
 B  $\frac{4}{18}$  of an orange  
 C  $4\frac{1}{2}$  oranges  
 D 72 oranges

11. What is the product of 4 and  $\frac{9}{10}$ ?

A  $\frac{9}{40}$   
 B  $\frac{9}{10}$   
 C  $3\frac{3}{4}$   
 D  $3\frac{3}{5}$

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### Independent Practice

Multiply whole numbers by fractions

12. Ava is running laps around an oval. It takes her  $\frac{2}{5}$  of a minute to complete one lap. How long will it take her to complete 6 laps?

A  $\frac{2}{15}$  of a minute     C 2 minutes  
 B  $1\frac{2}{3}$  minutes         D  $4\frac{4}{5}$  minutes

13. Solve.  $9 \times \frac{2}{3} = \square$

A  $\frac{2}{27}$                        C  $3\frac{2}{3}$   
 B  $\frac{1}{6}$                           D 6

14. Lacy is painting her bedroom. It takes  $\frac{2}{5}$  of a can of paint to do one coat. She wants to do 3 coats. How much paint does she need?

Write an addition equation and a multiplication equation that show the amount of paint Lacy needs.

**Addition equation:**

$$\frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5} = 1\frac{1}{5}$$

**Multiplication equation:**

$$3 \times \frac{2}{5} = \frac{3}{1} \times \frac{2}{5} = \frac{6}{5} = 1\frac{1}{5}$$

15. Benjamin and his friends are making homemade slime. The recipe needs  $\frac{3}{4}$  of a cup of glue for each batch of slime. If Benjamin plans to make 7 batches of slime, how much glue does he need?

Show your work and simplify your answer. Then explain how you found the solution.

Multiply.  $7 \times \frac{3}{4} = \frac{7}{1} \times \frac{3}{4} = \frac{21}{4}$

Simplify.  $\frac{21}{4} = 5\frac{1}{4}$

Check.  $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{21}{4} = 5\frac{1}{4}$

**Solution:** Benjamin needs  $5\frac{1}{4}$  cups of glue.

**Explanation:**

There are 7 batches that each need  $\frac{3}{4}$  of a cup of glue. I multiplied  $\frac{7}{1}$  by  $\frac{3}{4}$  to get  $\frac{21}{4}$ . I simplified my answer and wrote it as a mixed number, getting the final answer of  $5\frac{1}{4}$  cups. I used repeated addition  $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{21}{4}$  to check my answer.

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### AT A GLANCE

Students practise solving problems involving the multiplication of whole numbers and fractions that might appear on a mathematics test.

### STEP BY STEP

#### PAGES 12–13

- Tell students that they will practise solving multiplication problems using repeated addition and/or multiplication.
- Point out the tips at the top of page 12. Explain to students that these tips will help them answer the problems correctly.
- You may wish to have students review the hints for avoiding mistakes on page 9 as well.
- Tell students to complete problems 8–15 on pages 12 and 13. Encourage students to check their answers.
- Discuss the correct responses as a class.

### Answers and Explanations

8.  C This equation represents three groups of one-fifth, not five groups of one-third.
9.  A This expression represents two groups of five-sixths.
10.  C  $18 \times \frac{1}{4} = \frac{18}{1} \times \frac{1}{4} = \frac{18}{4} = 4\frac{1}{2}$
11.  D  $4 \times \frac{9}{10} = \frac{4}{1} \times \frac{9}{10} = \frac{36}{10} = 3\frac{6}{10} = 3\frac{3}{5}$
12.  D  $6 \times \frac{4}{5} = \frac{6}{1} \times \frac{4}{5} = \frac{24}{5} = 4\frac{4}{5}$
13.  D  $9 \times \frac{2}{3} = \frac{9}{1} \times \frac{2}{3} = \frac{18}{3} = 6$
14. The 3 coats are the groups. Each group has  $\frac{2}{5}$  of a can of paint. To find the total of 3 groups of  $\frac{2}{5}$ , add  $\frac{2}{5}$  three times or multiply  $3 \times \frac{2}{5}$ .
15. See the sample answer. This answer shows all of the steps the student took to solve the problem and check the solution using multiplication and repeated addition, respectively. The solution answers the question. The explanation provides important details about how the student solved the problem and uses the maths words *multiply*, *simplify* and *repeated addition*.



## ASSESSMENT AND REMEDIATION

- Ask students to solve the problem  $5 \times \frac{1}{10}$ . ( $\frac{5}{10} = \frac{1}{2}$ )
- For students who are still struggling, use the chart below to guide remediation.
- After providing remediation, check students' understanding. Ask students to explain their steps while solving the problem  $6 \times \frac{1}{3}$ . ( $\frac{6}{3} = 2$ )
- If a student is still having difficulty, use *STAMS® Plus Book D*, Lesson 9, pages 84–93 and *Book E*, Lessons 7 and 8, pages 64–83.

If the error is . . .	Students may . . .	To remediate . . .
$\frac{5}{50} = \frac{1}{10}$	have used repeated addition, but added denominators as well as numerators, <i>or</i>	Encourage students to draw a picture, reinforcing the concept of a denominator as the number of equal parts into which a whole is divided, which remains the same when adding like fractions.
	have multiplied the whole number 5 by both numerator and denominator of the fraction.	Have students use grid paper to write each numeral in the numerator and the denominator of the two fractions in the problem in just one space, putting a 1 in the available space under the whole number to write it as a fraction.
$\frac{6}{11}$	have correctly written the multiplication expression $\frac{5}{1} \times \frac{1}{10}$ , but then added the corresponding parts of the fraction.	Remind students that a whole number times a fraction can be solved using repeated addition or multiplication, but these methods cannot be combined. Have students circle the operation sign(s) in their solution method of choice.
$\frac{1}{50}$	have written the multiplication problem as $\frac{1}{5} \times \frac{1}{10}$ .	Use fraction circles to reinforce the conceptual difference between $\frac{1}{5}$ and $\frac{5}{1}$ , showing that only $\frac{5}{1}$ is equivalent to 5 wholes.



## ADDITIONAL ACTIVITY

For students who have mastered the skills in this lesson, see **Challenge Activity** (page 38).

## ADDITIONAL ACTIVITIES



### Hands-on Activity

Use fraction circles to model a whole number times a fraction as repeated addition.

**Materials:** 3 sets of fraction circles per group

Organise students in small groups and distribute fraction circles. Tell students that they can use repeated addition to understand  $3 \times \frac{4}{6}$ . Write the phrase \_\_\_ groups of \_\_\_ on the board. Have students fill in the missing numbers.  $(3, \frac{4}{6})$  Then have students model  $3 \times \frac{4}{6}$  by showing 3 groups with 4 sixths pieces in each group. Have students count the sixths. Ask, “How many sixths are there in all?” (12) Point out that the model shows that  $3 \times \frac{4}{6} = \frac{12}{6}$ .

To simplify, have students rearrange the sixths to create as many wholes, or circles with 6 sixths, as possible. Ask, “How many whole circles can you make?” (2) Explain that the model shows that  $\frac{12}{6} = 2$  so  $3 \times \frac{4}{6} = 2$ .



### Reteaching Activity

Use grid paper to align factors.

**Materials:** grid paper with large squares

Distribute paper to each student. Tell students to write the problem  $4 \times \frac{2}{9}$ , where each digit of the problem must be in one square.

Ask students, “Where does the 4 go, in relation to the 2 and 9?” (It aligns horizontally with the 2) “Does anything line up with the 9?” (1, writing 4 as the fraction  $\frac{4}{1}$ ) “Why is it important to line up the whole number with the numerator of the fraction?” (So the correct numbers get multiplied.)



### Vocabulary Activity

Play “Concentration” to reinforce terms.

**Materials:** index cards

In pairs, have students write one vocabulary term on each index card. Then have students write a

definition or example of each term on another index card. Have students shuffle the cards and place them face down in an array. Students take turns flipping over two cards. If the player chooses a matching term and definition, he keeps the pair. If the cards do not match, he replaces them. The student with the most matched pairs wins.



### Real-World Connection

Solve whole number times fraction problems using recipes.

Bring in copies of a recipe that includes several ingredients with fractional quantities. Tell students that you want to triple the recipe to serve to a large group of people. Have them calculate the needed amount of each ingredient by finding the product of  $3 \times [quantity]$  and write the modified ingredients list.



### School-Home Connection

Inform families about multiplying whole numbers by fractions.

Give each student a copy of the School-Home Connection activity sheet for Lesson 1 (page 159) to share with the family. The activity included in the letter has the family examine a recipe to multiply a whole number by a fraction.



### Challenge Activity

Write word problems involving whole numbers multiplied by fractions.

Have students write a whole number times a fraction word problem. Remind students that the problem should involve finding the total of groups of the same fractional size. Students should use one-digit numbers for the number of groups. After students have written their problem, have them exchange it with a partner to solve.