SESSION 4A.2

# Multiplying Whole Numbers by Fractions and Mixed Numbers

## Math Focus Points

- Writing and interpreting multiplication equations involving a fraction and a whole number
- Using a representation and reasoning to multiply a whole number by a fraction or mixed number

| Today's Plan | | Materials |
|---|---|---|
| 1 DISCUSSION **Writing and Interpreting Equations** | 15 MIN, CLASS | • **C20, Fraction Bars** Make copies. (1 per student; from Session 4A.1) |
| 2 ACTIVITY **Bicycle Race Training** | 35 MIN, INDIVIDUALS | • *Student Activity Book,* pp. 74–75 or **C24–C25, Bicycle Race Training** Make copies. (as needed)<br>• **C20, Fraction Bars** Make copies. (1 per student; from Session 4A.1) |
| 3 DISCUSSION **Multiplying Fractions** | 10 MIN, CLASS | • *Student Activity Book*, p. 74 or C24 (completed) |
| 4 SESSION FOLLOW-UP **Daily Practice** | | • *Student Activity Book,* p. 76 or **C26, Another Bicycle Race** Make copies. (as needed) |

## Ten-Minute Math

***Estimation and Number Sense*** Using Digit Cards (M5–M7), make two 5-digit minus 4-digit subtraction problems (_ _,_ _ _ – _,_ _ _). Give students 30 seconds to mentally estimate differences as close as possible to the exact answers. Students may write down partial differences if they wish. Some students may determine the exact answers. Have two or three students explain their work for each problem, and record these strategies on the board or overhead.

DISCUSSION

# 1 Writing and Interpreting Equations

15 MIN CLASS

## Math Focus Points for Discussion

- Writing and interpreting multiplication equations involving a fraction and a whole number

Write $\frac{2}{3} \times 90 =$ on the board and ask students these questions:

**What does this equation mean? Who can tell a story the equation could represent in the race context we have been using? Let's use [Alicia's] story: *Mitch is riding his bike 90 miles. He's gone $\frac{2}{3}$ of the way. How many miles has he gone?***

**Before you solve this problem, let's think about how big the answer is going to be. Is it going to be more or less than 90? How do you know? Is the answer going to be more or less than 45? How do you know?**

Students should recognize the answer is more than 45, because $\frac{1}{2}$ of 90 is 45, and $\frac{2}{3}$ is greater than $\frac{1}{2}$. Ask students to represent the equation with a fraction bar, either drawing one, or using a copy of Fraction Bars (C20). Have them show what their representation means in the race context and find the answer. Ask one or two students to share their representations on the board. Make certain students can explain what the numbers in the equation ($\frac{2}{3}$ , 90, 60) mean in the context of the bicycle race.

**You are going to solve some problems about bike racers. Here is another problem: *Margaret trains on a bike path that is 16 miles long. One day she bikes $1\frac{1}{2}$ times the length of the bike path. What equation can we write that matches this problem?***

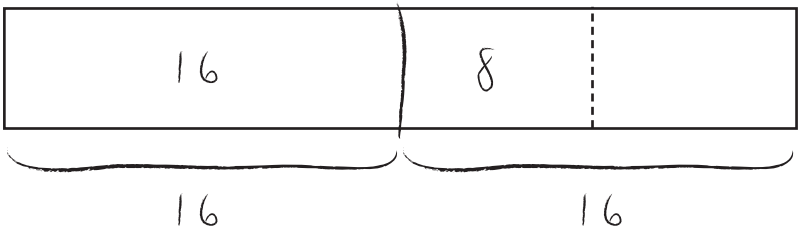
Write $1\frac{1}{2} \times 16 =$ on the board.

**This problem is a little different from other problems you worked on because you are multiplying a mixed number and a whole number. Before we solve the problem, let's think about how big the answer is going to be. Do you think the answer is going to be more or less than 16? Why? Is it going to be more or less than 32? Why?**

How can we use the fraction bars to represent this problem? Let's connect the fraction bars to show that Margaret went $1\frac{1}{2}$ times 16.

Ask students to draw two connected bars. Alternatively, they can cut out and reposition the fraction bars on C20.

How many miles does each fraction bar represent? (*16 miles*) Where should we draw a line to show $1\frac{1}{2}$? How many miles did Margaret bike?




**Students might say:**

"It's 24 miles. The first bar shows 16 miles, and $\frac{1}{2}$ is 8 miles, so that's 24 miles."

"I agree. I knew it before we started though because 1 × 16 is 16, and $\frac{1}{2}$ of 16 is 8, so it's 24."

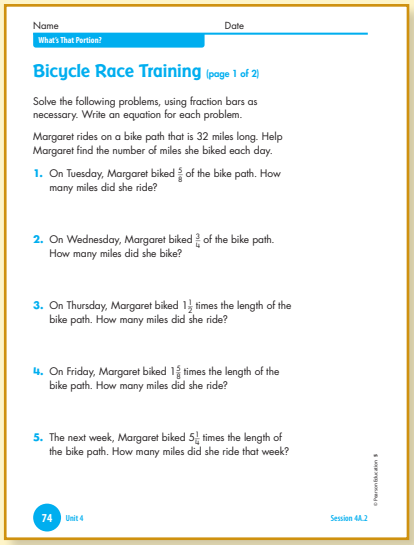
## 2 ACTIVITY

# Bicycle Race Training

35 MIN INDIVIDUALS

Give students copies of Fraction Bars (C20), and draw their attention to *Student Activity Book* pages 74–75 or C24–C25.

You're going to solve some more multiplication of fraction problems like this on *Student Activity Book* pages 74–75 or C24–C25. You can draw fraction bars to help you find the answers. You can also use what you know about multiplication and fractions as well. Continue thinking about what you know about fractions and multiplication to determine how big your product should be and whether or not your answer seems reasonable. We're going to discuss Problem 1 at the end of the session today. You'll have more time tomorrow to work on all the problems.



Name Date

What's That Portion?

**Bicycle Race Training** (page 1 of 2)

Solve the following problems, using fraction bars as necessary. Write an equation for each problem.

Margaret rides on a bike path that is 32 miles long. Help Margaret find the number of miles she biked each day.

1. On Tuesday, Margaret biked $\frac{5}{8}$ of the bike path. How many miles did she ride?
2. On Wednesday, Margaret biked $\frac{3}{4}$ of the bike path. How many miles did she bike?
3. On Thursday, Margaret biked $1\frac{1}{2}$ times the length of the bike path. How many miles did she ride?
4. On Friday, Margaret biked $1\frac{3}{8}$ times the length of the bike path. How many miles did she ride?
5. The next week, Margaret biked $5\frac{1}{4}$ times the length of the bike path. How many miles did she ride that week?



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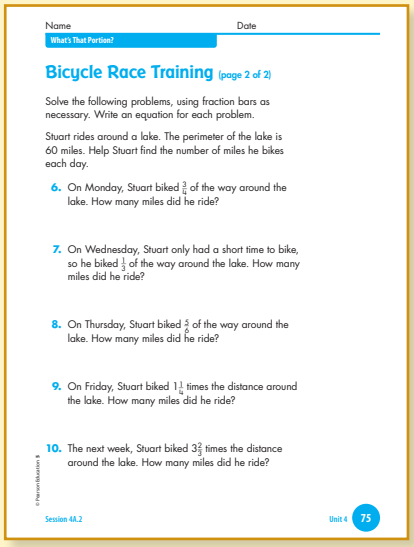
▲ Student Activity Book, Unit 4, p. 74; Resource Masters, C24



Name Date

What's That Portion?

**Bicycle Race Training** (page 2 of 2)

Solve the following problems, using fraction bars as necessary. Write an equation for each problem.

Stuart rides around a lake. The perimeter of the lake is 60 miles. Help Stuart find the number of miles he bikes each day.

6. On Monday, Stuart biked $\frac{3}{4}$ of the way around the lake. How many miles did he ride?
7. On Wednesday, Stuart only had a short time to bike, so he biked $\frac{1}{3}$ of the way around the lake. How many miles did he ride?
8. On Thursday, Stuart biked $\frac{5}{6}$ of the way around the lake. How many miles did he ride?
9. On Friday, Stuart biked $1\frac{1}{4}$ times the distance around the lake. How many miles did he ride?
10. The next week, Stuart biked $3\frac{2}{5}$ times the distance around the lake. How many miles did he ride?



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▲ Student Activity Book, Unit 4, p. 75; Resource Masters, C25

## ONGOING ASSESSMENT: Observing Students at Work

Students solve word problems that involve multiplying a fraction and a whole number or a fraction and a mixed number.

- **How do students solve the problems?** Do they use the fraction bars? Do they use relationships to other fractions to help them? For the mixed numbers, do they multiply first by the whole number and then by the fraction and add the products together?
- **Do students correctly represent the problem in a multiplication equation?**

## DIFFERENTIATION: Supporting the Range of Learners

**Intervention** For students who are still working on making sense of multiplying with fractions, have them only solve the problems that involve fractions and not those with mixed numbers. If there are students who find it challenging to multiply by a non-unit fraction, ask them to use the fraction bars to solve the problem. Have them first solve a related problem with a unit fraction and then solve the actual problem.

**ELL** Some English Language Learners may have difficulty making sense of the idea of $1\frac{1}{2}$ times the length. Talk through similar situations that use objects you have available in the room or by drawing pictures. First talk through a whole-number problem, then a mixed number problem. For example, draw a tree that is 3 times as tall as a person or show a pencil that is $1\frac{1}{2}$ times as long as another pencil.

**Extension** Challenge students to write their own problems that require multiplying a fraction or a mixed number by a whole number. Students can then exchange their problems with a classmate's problems to solve and check.

## 3 DISCUSSION
# Multiplying Fractions

10 MIN CLASS

### Math Focus Points for Discussion

- Multiplying a fraction and a whole number

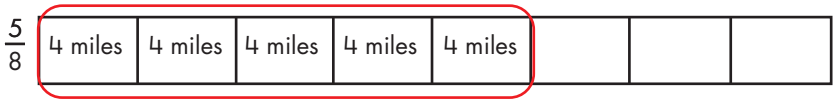
Discuss students' solutions to Problem 1 on *Student Activity Book* page 74 or C24.

On Tuesday, Margaret biked $\frac{5}{8}$ of the bike path. How many miles did she ride? First, what equation would we write to represent this problem?

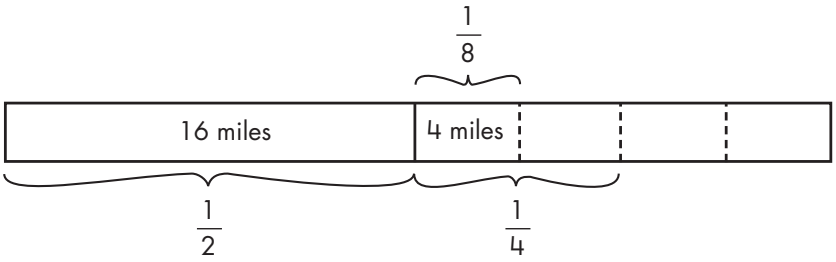
Write $\frac{5}{8} \times 32 =$ on the board. Ask 1 or 2 students to explain their solution, including the answer on the fraction bar.

**Students might say:**

"I divided the fraction bar into 8 parts to show eighths, and then marked $\frac{5}{8}$. I divided 32 by 8, and that's 4, so I put a 4 in each of the 5 parts of the fraction bar, and that's 20."

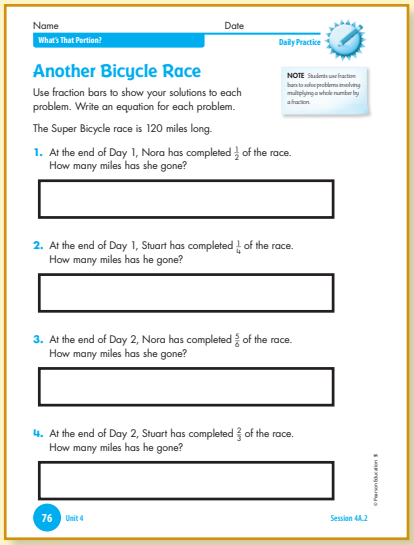



"I divided the fraction bar in half, and that's 16 miles. $\frac{1}{2}$ is the same as $\frac{4}{8}$, so I realized I only needed $\frac{1}{8}$ more. If $\frac{1}{2}$ is 16, then $\frac{1}{4}$ is 8, and $\frac{1}{8}$ is 4. So it's 20."




## 4 SESSION FOLLOW-UP
# Daily Practice

**Daily Practice:** For reinforcement of this unit's content, have students complete *Student Activity Book* page 76 or C26.



Name Date

What's That Portion? Daily Practice

**Another Bicycle Race**

Use fraction bars to show your solutions to each problem. Write an equation for each problem.

The Super Bicycle race is 120 miles long.

1. At the end of Day 1, Nora has completed $\frac{1}{2}$ of the race. How many miles has she gone?
2. At the end of Day 1, Stuart has completed $\frac{1}{4}$ of the race. How many miles has he gone?
3. At the end of Day 2, Nora has completed $\frac{5}{8}$ of the race. How many miles has she gone?
4. At the end of Day 2, Stuart has completed $\frac{2}{3}$ of the race. How many miles has he gone?

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▲ Student Activity Book, Unit 4, p. 76; Resource Masters, C26

# Bicycle Race Training (page 1 of 2)

Solve the following problems, using fraction bars as necessary. Write an equation for each problem.

Margaret rides on a bike path that is 32 miles long. Help Margaret find the number of miles she biked each day.

**1.** On Tuesday, Margaret biked $\frac{5}{8}$ of the bike path. How many miles did she ride?

**2.** On Wednesday, Margaret biked $\frac{3}{4}$ of the bike path. How many miles did she bike?

**3.** On Thursday, Margaret biked $1\frac{1}{2}$ times the length of the bike path. How many miles did she ride?

**4.** On Friday, Margaret biked $1\frac{5}{8}$ times the length of the bike path. How many miles did she ride?

**5.** The next week, Margaret biked $5\frac{1}{4}$ times the length of the bike path. How many miles did she ride that week?

# Bicycle Race Training (page 2 of 2)

Solve the following problems, using fraction bars as necessary. Write an equation for each problem.

Stuart rides around a lake. The perimeter of the lake is 60 miles. Help Stuart find the number of miles he bikes each day.

**6.** On Monday, Stuart biked $\frac{3}{4}$ of the way around the lake. How many miles did he ride?

**7.** On Wednesday, Stuart only had a short time to bike, so he biked $\frac{1}{3}$ of the way around the lake. How many miles did he ride?

**8.** On Thursday, Stuart biked $\frac{5}{6}$ of the way around the lake. How many miles did he ride?

**9.** On Friday, Stuart biked $1\frac{1}{4}$ times the distance around the lake. How many miles did he ride?

**10.** The next week, Stuart biked $3\frac{2}{3}$ times the distance around the lake. How many miles did he ride?

# Another Bicycle Race

Use fraction bars to show your solutions to each problem. Write an equation for each problem.

**NOTE** Students use fraction bars to solve problems involving multiplying a whole number by a fraction.

The Super Bicycle race is 120 miles long.

**1.** At the end of Day 1, Nora has completed $\frac{1}{2}$ of the race. How many miles has she gone?

**2.** At the end of Day 1, Stuart has completed $\frac{1}{4}$ of the race. How many miles has he gone?

**3.** At the end of Day 2, Nora has completed $\frac{5}{6}$ of the race. How many miles has she gone?

**4.** At the end of Day 2, Stuart has completed $\frac{2}{3}$ of the race. How many miles has he gone?