Unit 2, Lesson 14

Area Situations

Standards

Addressing **5.NF.B, 5.NF.B.4**

Instructional Routines

- MLR4 Information Gap
- Number Talk

Goals

- Determine what information is needed to solve a multi-step area problem involving multiplication of a whole number and a fraction. Ask (orally) questions to elicit that information.

Student Facing Learning Goals

Let's apply what we've learned about fraction multiplication.

Lesson Purpose

The purpose of this lesson is for students to apply their understanding of multiplying a whole number by a fraction to solve mathematical and real-world problems.

Narrative

In previous lessons, students used a range of skills to solve problems involving the multiplication of a whole number by a fraction. They represented situations with diagrams and expressions, and they solved problems using a variety of strategies.

In this lesson, students use their conceptual understanding to build procedural fluency with multiplication of whole numbers by fractions. Students also apply these skills to solve problems in an *Info Gap* activity. Students use what they know about interpreting multiplication as area to ask questions of their peers about the missing information in the problems and explain their reasoning for needing that information.

As in the previous lessons, students will encounter problems with fractions greater than 1. Students are encouraged to rewrite fractions greater than 1 as whole numbers when possible. They are not required to rewrite fractions greater than 1 as mixed numbers.

Access for Students with Disabilities

- Representation

Required Materials

Materials to Copy

- Info Gap: Area (1 copy for every 2 students): Activity 1

Lesson Timeline

Warm-up	10 min

Teacher Reflection Questions

If you were to teach this lesson over again, what activity would you redo? How would your proposed changes support student learning?

Activity 1	20 min
Activity 2	15 min
Synthesis Estimate	10 min
Cool-down	5 min

Warm-up

10 min

Number Talk: Multiply Fractions

Standards

Addressing **5.NF.B.4**

Instructional Routines

- Number Talk

This *Number Talk* encourages students to think about the relationship between division and fractions and the order of operations in order to strategically multiply whole numbers by fractions. The strategies elicited here will be helpful later in the lesson when students find the missing value in multiplication equations for a whole number and a fraction.
To use the properties of operations, students need to look for and make use of structure (MP7). In explaining strategies, students need to be precise in their word choice and use of language (MP6).

Student Task Statement

Find the value of each expression mentally.

- $3 \times (10 \div 2)$
- $\frac{3}{2} \times 10$
- $\left(\frac{14}{7}\right) \times 10$
- $14 \times \frac{10}{7}$

Student Response

- 15: I know $10 \div 2 = 5$ and $3 \times 5 = 15$.
- 15: This is the same as $\frac{3 \times 10}{2}$ or $3 \times (10 \div 2)$.
- 20: I know $\frac{14}{7} = 2$ and $2 \times 10 = 20$.
- 20: This is equivalent to the last one.

Launch

- Display one problem.
- "Give me a signal when you have an answer and can explain how you got it."
- 1 minute: quiet think time

Activity

- Record answers and strategy.
- Keep problems and work displayed.
- Repeat with each problem.

Activity Synthesis

- "How can rearranging the numbers and operations help find the value of the last expression?" (I know that $\frac{14}{7}$ is 2 so finding this first and then multiplying by 10 is easier than trying to work with the fraction $\frac{10}{7}$.)

Activity 1

20 min

Info Gap: Area

Standards

Addressing **5.NF.B.4**

Instructional Routines

- MLR4 Information Gap

This *Info Gap* activity gives students an opportunity to determine and request the information needed to solve multi-step problems involving multiplication of a whole number by a fraction. In each case, there are multiple ways to solve the problem but the information card does not have the one piece of information—the missing side length—that the student with the problem card could use to find the area. The cards are designed this way to encourage the students to discuss and communicate further.

This activity uses MLR4 Information Gap.

The *Info Gap* structure requires students to make sense of problems by determining what information is necessary, and then ask for the information they need to solve it. This may take several rounds of discussion if their first requests do not yield the information they need (MP1). Moreover, they are prompted by their partner to explain why they need each piece of information so they need to articulate their strategy and reasoning. The *Info Gap* structure also allows them to refine the language they use and ask increasingly more precise questions until they get the information they need (MP6).

Required Materials

Materials to Copy

- Info Gap: Area (1 copy for every 2 students): Activity 1

Required Preparation

Create a set of cards from the blackline master for each group of 2.

Student Task Statement

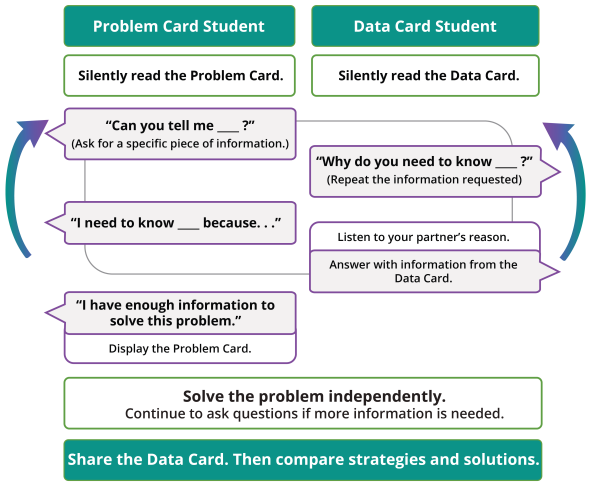
Your teacher will give you either a Problem Card or a Data Card. Do not show or read your card to your partner.

Launch

- Groups of 2

MLR4 Information Gap

- Recall, if necessary, the steps of the *Info Gap* routine.
- "I will give you either a problem card or a data card. Silently read your card. Do not read or show your card to your partner."
- Distribute the first set of cards.
- Remind students that after the person with the problem card asks for a piece of information, the person with the data card should respond with: "Why do you need to know _____ [that piece of information]?"



Pause here so your teacher can review your work. Ask your teacher for a new set of cards. Repeat the activity, trading roles with your partner.

Student Response

Problem 1: $\frac{121}{2}$ square inches. Sample response: The width of the paper towel is $\frac{1}{2} \times 11$ which is $\frac{11}{2}$ inches. The area is length times width or $11 \times \frac{11}{2}$ square inches. That's $\frac{121}{2}$ square inches.
Problem 2: $8\frac{1}{3}$ square miles. Sample response: The corn field is 3 times as long as it is wide so that's $3 \times 1\frac{2}{3}$ or 5 miles. The area of the field is $5 \times 1\frac{2}{3}$ and that's $8\frac{1}{3}$ square miles.

Activity

- 4–6 minutes: partner work time
- After students solve the first problem, distribute the next set of cards. Students switch roles and repeat the process with Problem Card 2 and Data Card 2.

Activity Synthesis

- Select 2–3 students to share the correct answers and discuss the process of solving the problems.
- "What questions did you ask to get the information you needed to solve the problems?" (I was missing just one piece of information—the width of the paper towel or the length of the corn field. I asked for this information but my partner did not have it. I was stuck and then my partner said they had information comparing the length and width. I was able to use that to find the width or length and then the area.)

Activity 2: Optional

15 min

Fill in the Blank

Standards

Addressing **5.NF.B**

The purpose of this activity is for students to find the missing value in equations involving a whole number and a fraction. They find missing factors or products to make equations true. Many of the problems encourage students to think in steps, interpreting a fraction $\frac{a}{b}$ in terms of division by the denominator and multiplication by the numerator.

Access for Students with Disabilities

Representation: Internalize Comprehension. Synthesis: Invite students to identify which details were most important to solve the problems. Display the sentence frame: "The next time I solve multiplication problems of a

whole number by a fraction, I will pay attention to . . . ."
Supports accessibility for: Conceptual Processing, Memory

Student Task Statement

Fill in the blanks to make each equation true.

1. $\frac{1}{3} \times 18 = \_\_\_\_$
2. $\frac{7}{9} \times \_\_\_\_ = \frac{21}{9}$
3. $\frac{1}{15} \times \_\_\_\_ = 2$
4. $9 \times 6\frac{2}{3} = \_\_\_\_$
5. $14\frac{99}{100} \times 10 = \_\_\_\_$
6. $7\frac{3}{5} \times 6 = \_\_\_\_$
7. $4 \times 6\frac{9}{10} = \_\_\_\_$

Student Response

1. 6
2. 3
3. 30
4. 60
5. $149\frac{9}{10}$
6. $45\frac{3}{5}$
7. $27\frac{6}{10}$

Launch

- Groups of 2

Activity

- 5–8 minutes: independent work time
- 1–2 minutes: partner discussion
- Monitor for:
  - Partners who use different strategies.
  - Students who are challenged but persevere to arrive at a viable solution.

Activity Synthesis

- Ask previously selected students to share their responses.
- "What was different about you and your partner's strategies?"
- "Which problem did you find most challenging and why?"
- "Which problem made the most sense to you and why?"

Lesson Synthesis

"Today we multiplied whole numbers by fractions greater than 1 in different forms."

"We have learned a lot about multiplying a whole number by a fraction or mixed number. What have you learned? What do you still wonder?"

Consider giving students time to respond in their journals before sharing.

Suggested Centers

- Rectangle Rumble (3–5) , Stage 4: Whole Number and Fraction Factors (Addressing)
- Rectangle Rumble (3–5) , Stage 3: Factors 1–10 (Supporting)

Cool-down

5 min

Find the Values

Standards

Addressing **5.NF.B.4**

Student Task Statement

Find the value of each product. Show your thinking. Organize it so it can be followed by others.

1. $\frac{5}{3} \times 15$
2. $1\frac{3}{4} \times 8$
3. $\frac{10}{25} \times 10$

Student Response

1. $\frac{75}{3}$ or 25 (or equivalent). Sample response: I multiplied 15 and 5 and have that many $\frac{1}{3}$s.
2. 14. Sample response: $8 \times 1 = 8$ and $\frac{3}{4} \times 8 = 6$ and $8 + 6 = 14$
3. $\frac{100}{25}$ or 4 (or equivalent). Sample response: I multiplied 10 and 10 and have that many $\frac{1}{25}$s.

Responding to Student Thinking

Students write values for the expressions other than $\frac{75}{3}$ or 25 (or equivalent), 14, and $\frac{100}{25}$ or 4 (or equivalent).

Next Day Supports

Create a poster with a diagram that represents the *Cool-down* from previous lessons.