STEMscopes™
MATH

Take & Teach

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What's Inside This Sample Lesson?

- A fully guided **Explore activity** written to meet rigorous state and national standards
- **Teacher Edition** pages, **Student Workbook** pages, and **other helpful resources** to fully experience a STEMscopes Math Explore activity
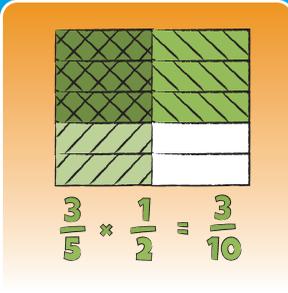
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Grade 5, Model Fraction Multiplication - Explore 1

Go Online!
Explore the digital resources for this lesson.

$$\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$$

GRADE 5　**NUMBER AND OPERATIONS - FRACTIONS**

MODEL FRACTION MULTIPLICATION

FOCUS STANDARDS

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

- Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

    a. Interpret the product $(\frac{a}{b}) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(\frac{2}{3}) \times 4 = \frac{8}{3}$, and create a story context for this equation. Do the same with $(\frac{2}{3}) \times (\frac{4}{5}) = \frac{8}{15}$. (In general, $(\frac{a}{b}) \times (\frac{c}{d}) = \frac{ac}{bd}$.)

- Interpret multiplication as scaling (resizing), by:

    a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

    b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $\frac{a}{b} = \frac{(n \times a)}{(n \times b)}$ to the effect of multiplying $\frac{a}{b}$ by 1.

CONNECTING STANDARDS

Use equivalent fractions as a strategy to add and subtract fractions.

- Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{(ad+bc)}{bd}$.)

ENGAGE ACTIVITIES

ACCESSING PRIOR KNOWLEDGE

Students will explore and model the multiplication of a unit fraction by a whole number to deepen their understanding of fractions.

- Students will use a grid to create a visual fraction model representing the multiplication of a unit fraction by a whole number.
- They will collaborate with peers to discuss and describe their models and solutions.
- Students will use a number line to identify the range between whole numbers where the product of the multiplication lies.
- The activity emphasizes understanding that multiplying by a proper fraction results in a product smaller than the whole number.

HOOK - MULTIPLYING FRACTIONS: A PIECE OF CAKE

Students explore the concept of multiplying a whole number by a fraction to understand the size of the product relative to the factors.

- Students work in groups to model the multiplication of a whole number by a fraction using a cake model.
- They visualize and solve a real-world problem involving estimating the number of cakes needed for a party.
- Students use whiteboards to draw fraction models, write equations, and discuss their reasoning.
- The activity encourages critical thinking about multiplication and its effects when involving numbers less than, equal to, or greater than one.

EXPLORE ACTIVITIES

JUMP IN HERE

EXPLORE 1 - MULTIPLY FRACTIONS BY WHOLE NUMBERS

Students explore the concept of multiplying a fraction by a whole number through hands-on modeling and reasoning.

- Students work in groups to complete tasks at different stations, using fraction tiles, two-color counters, and number lines to model multiplication scenarios.
- They engage in guided discussions to connect repeated addition and multiplication, and to understand the relationship between the size of the product and its factors.
- Students document their models and reasoning in a Student Journal, and participate in a class discussion to reflect on their learning and strategies.
- The activity concludes with an Exit Ticket to assess understanding, and opportunities for students to share and refine their strategies and insights.

EXPLORE 2 - MULTIPLY FRACTIONS BY FRACTIONS

Students explore the concept of multiplying fractions by fractions through modeling and reasoning about the size of the product in relation to the factors.

- Students work in small groups to model multiplication of fractions using fraction tiles, rulers, and sentence strips.
- They create area models and number lines to visualize and solve problems related to hiking trail distances.
- Students develop multiplication equations for each scenario and compare the product to the original factors.
- The activity encourages discussion and reasoning about why the product of two fractions is less than the factors, challenging prior assumptions about multiplication.

EXPLORE 3 - SCALING

Students explore the concept of resizing and its impact on the area of a space through collaborative reasoning and modeling.

- Students work in pairs to compare and contrast business plans for a farm, focusing on how resizing dimensions affects area.
- They use drawings, models, or manipulatives to justify their reasoning and explore different strategies.
- Pairs discuss and record their findings in Student Journals, identifying similarities and differences in their approaches.
- The activity concludes with a Math Chat to share observations and reinforce understanding of multiplication as scaling.

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MODEL FRACTION MULTIPLICATION   **GRADE 5**

SCOPE **BIG IDEAS**
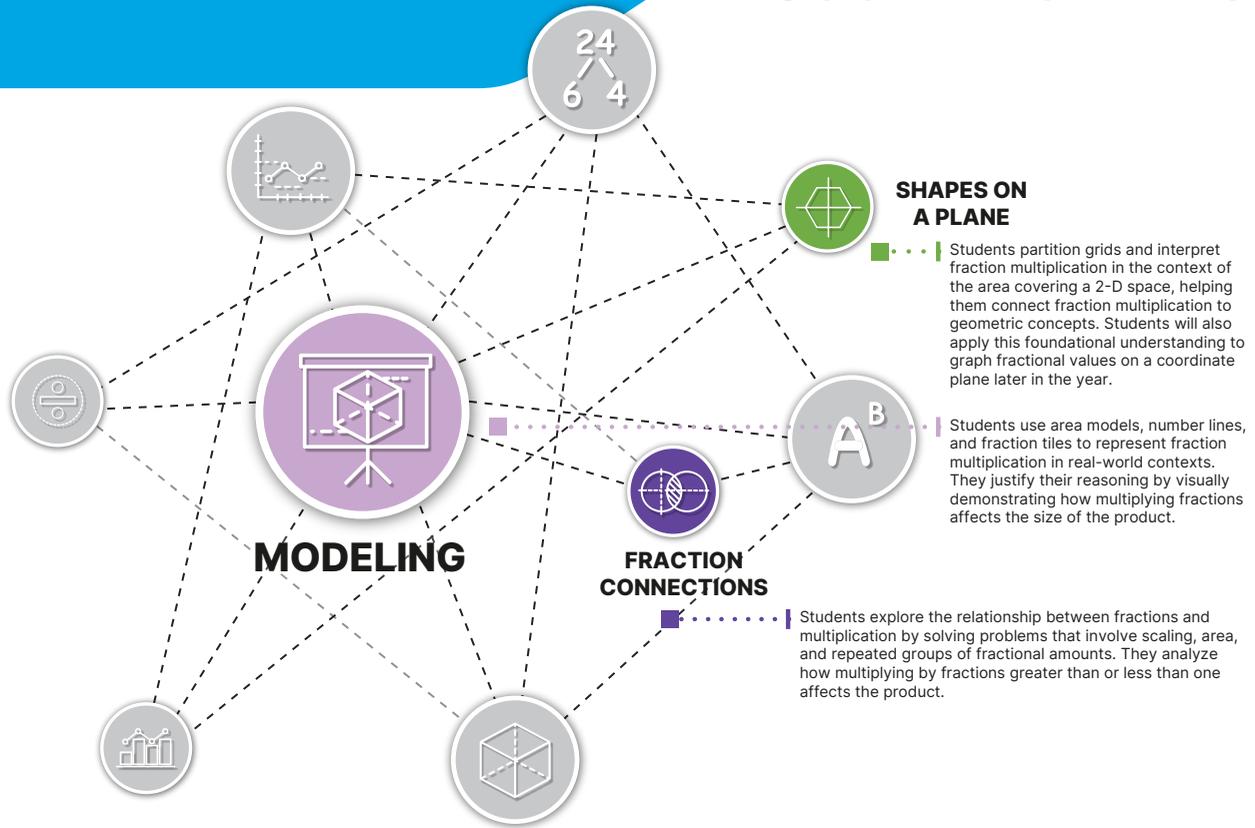
SHAPES ON A PLANE

Students partition grids and interpret fraction multiplication in the context of the area covering a 2-D space, helping them connect fraction multiplication to geometric concepts. Students will also apply this foundational understanding to graph fractional values on a coordinate plane later in the year.

Students use area models, number lines, and fraction tiles to represent fraction multiplication in real-world contexts. They justify their reasoning by visually demonstrating how multiplying fractions affects the size of the product.

MODELING

FRACTION CONNECTIONS

Students explore the relationship between fractions and multiplication by solving problems that involve scaling, area, and repeated groups of fractional amounts. They analyze how multiplying by fractions greater than or less than one affects the product.

KEY CONCEPTS

- I can use area models, tape diagrams, and number lines to make sense of the process for multiplying two fractions or for multiplying a fraction by a whole number.
- I can reason about how numbers change when they are multiplied by fractions.
- I can recognize that when multiplying by a fraction greater than 1, the number increases, and when multiplying by a number less than one, the number decreases.

FUNDAMENTAL QUESTIONS

- What strategies can I use to represent the multiplication of two fractions or of a fraction and a whole number?
- How do numbers change when they are multiplied by fractions?
- How does the magnitude of a product depend on the size of the fractions being multiplied?

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GRADE 5   MODEL FRACTION MULTIPLICATION

EXPLORE > EXPLORE 1

INSTRUCTIONAL LESSON

EXPLORE 1 - MULTIPLY FRACTIONS BY WHOLE NUMBERS

Standard(s)

- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**
  Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)

- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**
  Interpret multiplication as scaling (resizing), by: Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**
  Interpret multiplication as scaling (resizing), by: Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a / n \times b)$ to the effect of multiplying a/b by 1.

Big Ideas	Standards for Mathematical Practice	Content Connections	Drivers of Investigation
Fraction Connections Modeling Shapes on a Plane	**MP.1** Make sense of problems and persevere in solving them. **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.	**CC2** Exploring Changing Quantities **CC3** Taking Wholes Apart, Putting Parts Together **CC4** Discovering Shape and Space	**DI1** Make Sense of the World (Understand and Explain) **DI2** Predict What Could Happen (Predict) **DI3** Impact the Future (Affect)

DESCRIPTION

Students model multiplication of a fraction and a whole number and reason about the size of the product in relation to both factors.

MATERIALS

PRINTED

- 1 Student Journal (per student)
- 2 Sets of Station Cards (per class)
- 1 Exit Ticket (per student)

REUSABLE

- 6 Bins or containers (per class)
- 14 Sets of fraction tiles (per class)
- 2 Sets of two-color counters (per class)
- 2 Rulers (per class)

CONSUMABLE

- 3 Strips of manila paper, measuring 3 × 18 inches (per student)
- 2 Rolls of tape (per class)

MODEL FRACTION MULTIPLICATION **GRADE 5**

EXPLORE > EXPLORE 1

PREPARATION

- Plan to have students work in 6 groups to complete this activity.
- Print the Student Journal and an Exit Ticket for each student.
- Print and cut apart two sets of Station Cards, on card stock for durability, for the class.
- Gather six bins or containers to create stations.
- Prepare six stations around the room: Station 1 will have two identical bins, Station 2 will have two identical bins, and Station 3 will have two identical bins.
  - Each Station 1 bin should have the following materials:
    - Three sets of fraction tiles
    - Station 1 card
  - Each Station 2 bin should have the following materials:
    - 1 set of two-color counters (12 or more)
    - Station 2 card
  - Each Station 3 bin should have the following materials:
    - Four sets of fraction tiles
    - Ruler
    - Tape
    - 18 Manila paper strips
    - Station 3 card
- For students who need more support in recalling information, see our Fraction Strips, Fraction Circles, and Open Number Line Supplemental Aids elements in the Intervention section.
- **Go Digital!** Have students explore or present their solutions using virtual manipulatives. The manipulatives used in this lesson can be found in the Explore drop-down menu and can be digitally assigned to students. (Fraction Tiles, Fraction Circles, and Number Lines)

PROCEDURE AND FACILITATION POINTS

1. Read the following scenario to the class: Today, you will be the production manager for the Fresh Sips Beverage Company. A production manager has quite a few responsibilities. As you go through the factory, it is your responsibility to ensure everything runs smoothly. In room 1, also known as Station 1, you will be helping the Sassy Strawberry-Lemon Punch workers use the proper ingredients to fill the order. In room 2, or Station 2, the supply room workers need help determining the amount of supplies needed for the big birthday order. Finally, in room 3, or Station 3, you will have to solve some problems the accountants are having with the weekly production totals.

2. Help students access the task by asking the following guiding questions:
   a. Do you think math skills are important when managing a business?
   b. What is your favorite beverage?
   c. What do you already know about the connection between repeated addition and multiplication?

3. Explain to students there will be different models found in each station. In Station 1, students will use fraction tiles. In Station 2, they will use two-color counters. Finally, in Station 3, students will use number lines.

4. Assign groups of students to their first station. Ask them to review the card at their station. Discuss the following questions: (Answers will vary depending on the station.)
   a. **DOK-1** What information do you know? We know there is an order for 5 gallons of punch, and each gallon requires $2/5$ of a gallon of lemon juice.
   b. **DOK-1** What does the problem ask you to determine? We need to determine the total amount of lemon juice needed for the order.
   c. **DOK-2** What operation can be used to solve? We can multiply or use repeated addition.
      i. For groups at Station 2, clarify that finding a fraction of a group can be solved using multiplication (and therefore also repeated addition) as well.

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GRADE 5 MODEL FRACTION MULTIPLICATION

EXPLORE > EXPLORE 1

5. Have students discuss with their groups how they can model the scenarios and work together within their station using the materials provided to model and solve the problems. As students work, move from group to group and scaffold as needed. Remind students to draw their models and record their thinking on their Student Journal for each station.

6. For station 1, monitor and talk with students as needed to check for understanding by using the following guiding questions: (Answers will vary depending on the problem.)

   a. **DOK-1** Tell me about the parts of your model. I used the fraction tiles to represent the fraction in the scenario, and then repeated this fraction representation for as many times as needed in the scenario.

   b. **DOK-2** What addition expression can be used to represent this scenario? We could use *2/5 + 2/5 + 2/5 + 2/5 + 2/5* because there were 5 gallons of punch that each used *2/5* of a gallon of lemon juice.

   c. **DOK-2** What multiplication expression can be used to represent this scenario? We could use *2/5 × 5* because there were 5 gallons of punch that each used *2/5* of a gallon of lemon juice.

   d. **DOK-1** Explain your process for calculating the total. I calculated the total by using fraction manipulatives to represent the scenario, and then wrote an expression to represent my model and used that expression to solve.

   e. **DOK-2** How is the model related to both the addition and multiplication expressions? The model represents the ingredient being repeated in fractional parts and we can use that representation to write and solve a multiplication expression.

   f. **DOK-2** How did you use your model to determine the solution? I looked at the completed model to see how many wholes and how many extra parts were shaded in all. Then, I wrote that as a mixed number or a fraction greater than 1.

7. For station 2, monitor and talk with students as needed to check for understanding by using the following guiding questions: (Answers will vary depending on the problem.)

   a. **DOK-1** Tell me about the parts of your model. I used the counters to show the whole number. I arranged them in columns based on my denominator. For example, when finding *3/4* of 12, I arranged 12 counters into 4 equal columns. Then I circled or flipped over 3 of the 4 columns of counters to represent the fractional portion of the group.

      i. Students may also choose to make 4 equal rows. Allow them to discover that either method works, and emphasize the flexibility of strategies by highlighting a variety of accurate representations.

Explore

Model Fraction Multiplication
Explore 1

Name: _____ Date: _____

Fresh Sips Beverages

Station 1: Sassy Strawberry-Lemon Punch

Lemon Juice
_5_ groups of $\frac{2}{5}$
Model:
The factory needs 2 or $\frac{10}{5}$ gallons of lemon juice for 5 batches.
Multiplication expression: $5 \times \frac{2}{5}$

Strawberries
_3_ groups of $\frac{5}{6}$
Model:
The factory needs $2\frac{3}{6}$ or $2\frac{1}{2}$ or $\frac{15}{6}$ pounds of strawberries for Tuesday.
Multiplication expression: $3 \times \frac{5}{6}$

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Explore

Model Fraction Multiplication
Explore 1

Station 2: Big Birthday Order

Grape-ade Straws
$\frac{3}{4}$ of the _12_
Model:
Fresh Sips has 9 or $\frac{36}{4}$ boxes of straws for the Goofy Grape-ade pouches.
Multiplication expression: $\frac{3}{4} \times 12$

Gallons of Gallons
$\frac{1}{2}$ of the _10_
Model:
The factory has 5 or $\frac{10}{2}$ gallon containers for the Kooky Kiwi beverage.
Multiplication expression: $\frac{1}{2} \times 10$

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STUDENT JOURNAL
ANSWER KEY

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Explore

Station 3: Fresh Sips Production

Packing Peanuts
$\frac{2}{3}$ of the ___6___
Model:

Fresh Sips uses $\frac{12}{3} = 4$ pounds of peanuts for shipping.

Multiplication expression:
$6 \times \frac{2}{3}$

Wacky Watermelon
___5___ groups of $\frac{5}{8}$
Model:

Wacky Watermelon uses $3\frac{1}{8}$ or $\frac{25}{8}$ gallons of fresh watermelon.

Multiplication expression:
$5 \times \frac{5}{8}$

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Explore

Reflect

1. What connections did you make during this activity?

   The ways I can model it are similar to modeling other multiplication problems. It didn't matter if it was ingredients or supplies or production problems—it all can be modeled the same. It seemed just like adding the same fractional amount over and over (repeated addition).

2. Why is a product not always bigger than the factors?

   When multiplying a whole number by a fraction, the answer will be less than the whole number factor because we are only taking a part of it. We aren't repeating it one time. We are multiplying a whole number by a fraction, which is less than 1.

3. Why is the product larger than the fraction factor?

   When we multiply the fraction by a number greater than 1, then we are repeating the fraction more than one time so the product will be greater than the factor we started with.

4. Explain why the denominator did not change.

   You are combining equal groups of fractional parts. The denominator just tells you how many it takes to make one whole; that does not change just because you are combining multiple parts.

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STUDENT JOURNAL
ANSWER KEY

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b. **DOK-2** Did you notice a relationship among the number in each group, the number of groups selected, and the solution? We noticed the solution can be found by taking the total and dividing it by the number of groups to find the amount in each group, then multiplying the number of groups by the amount in each group.

c. **DOK-3** Where in this process can you find each of the four operations represented? In the straws scenario, we see addition because we can count up the amount in each group to determine the number of boxes the factor has (3 + 3 + 3), or we could use multiplication to determine the total (3 × 3). We see division because the model has 12 divided into equal sized groups (12 ÷ 4). We see subtraction because we can subtract the amount not circled to determine the amount of boxes of straws the factory has (12 − 3).

8. For Station 3, monitor and talk with students as needed to check for understanding by using the following guiding questions: (Answers will vary depending on the problem.)

   a. **DOK-1** How can you set up a number line using the materials provided? We can tape strips together and use a ruler to draw a straight line down the middle of each strip.

      i. Instruct students to each use three of the strips of manila paper and tape them together along the short ends to make a longer strip.

      ii. Next, have students use the ruler to draw an unlabeled number line in the middle of the strip, along the full length of the strip.

   b. **DOK-2** How can you represent one whole using a number line? You can use one of the whole fraction tiles.

      i. Have students place a mark near the left side of the line for 0.

      ii. Have them use the whole fraction tile to mark the whole-number intervals on the line by laying the 1 whole tile under the number line, starting at 0 and using the other end to mark 1.

   c. **DOK-1** How can you use the fraction tiles to mark the number line? You can put the tile under the number line, placing the left end at 0. The right end is the location of the whole interval. You can mark it on the number line.

      i. They can move the left end of the whole fraction tile to 1 and mark 2, etc.

      ii. Have students continue until they have at least 5 whole units. Use the fraction pieces to tick mark the fractional parts of the number line.

   d. **DOK-2** How can you show an amount if it is less than one whole? You can use the other fraction tile models, such as halves, and put marks along the line. Or you could lay them along the top of the number line.

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e. **DOK-2** How can you represent the scenario on the number line? The scenario can be thought of as multiplication or repeated addition. So I will show the jump based on the fractional amount and then the number of jumps will be based on the whole number.

9. When students draw a model, look for regrouping strategies. The focus should be that there are repeated groups of fractions. Some students will also start to connect that they are actually multiplying the fractions. Students should record their expressions used to find the product.

10. After groups have completed their stations, discuss the following questions as a class:

a. **DOK-1** What did you notice about the products relative to the whole numbers in the multiplication expressions in this Explore? The product was always less than the whole number.

b. **DOK-2** Why do you think that is? When we multiply any number by 1, the product is always that number because we are repeating that number one time. When you multiply any number by a number that is less than 1, the product has to be less than the other factor because we are repeating it less than one time. We are only taking a part of it.

c. **DOK-3** How can you prove it? When we built a model, we first drew the whole number, but then we only shaded part of it, not the entire amount.

d. **DOK-1** What did you notice about the products relative to the fractions in the multiplication expressions in this Explore? The product was greater than the fraction.

e. **DOK-2** Why do you think that is? Multiplying any number by 1 keeps the product the same as that number. When multiplying a number that is more than 1, it is repeated more than one time, so there is a greater number of that amount.

f. **DOK-3** How can you prove it? Create the fraction model. Then repeat the fraction the number of times indicated by the whole number. The product has to be more than the factor since you are repeating it more than one time.

g. **DOK-2** Before you start modeling or multiplying, what can you predict about the product when multiplying a fraction and a whole number? The product will be greater than the fraction but less than the whole number.

11. Have students work with their group to answer the reflection questions at the end of the Student Journal.

12. Ask students to share their strategies, and encourage them to ask each other questions and make connections. Encourage students to notice the similarities and differences between the strategies used to multiply whole numbers by fractions.

13. After the Explore, invite the class to a Math Chat to share their observations and learning.

Explore

Model Fraction Multiplication
Explore 1

Name: _____　Date: _____

Model Fraction Multiplication Exit Ticket

Read the problem below. Create a model and expression to represent the situation, and answer the question.

Fresh Sips Beverage Company uses $\frac{4}{5}$ of a gallon of fresh apple juice to make each gallon of Awesome Apple Cider. Each day, they make 7 gallons of cider.

Awesome Apple Cider
___7___ groups of ___$\frac{4}{5}$___
Model:
The factory needs ___$5\frac{3}{5}$___ gallons of fresh apple juice to make 7 gallons of Awesome Apple Cider.
Multiplication expression: $7 \times \frac{4}{5}$
The size of the product is ___less___ than the whole number factor and ___greater___ than the fraction being multiplied because _only a part of the whole is being repeated, which makes the product less than the whole, but the fraction is being added repeatedly, or multiplied, making the total greater._

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EXIT TICKET
ANSWER KEY

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MODEL FRACTION MULTIPLICATION **GRADE 5**

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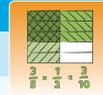
Show What You Know

Model Fraction Multiplication
Part 1

Name: _____ Date: _____

Model Fraction Multiplication

Part 1: Multiply Fractions by Whole Numbers

- Read each scenario carefully.
- Create a model to represent the situation.
- Record the solution (total value represented).
- Write the multiplication equation that corresponds with the model you created.
- Explain your reasoning about the product value—is the product value greater or less than the value of the factors and why?

Scenario
Sarah's sister Margo invited Sarah to a tea party. Sarah poured herself, Margo, and Margo's teddy bear each a $\frac{2}{3}$ cup serving of tea. How many total cups of tea did Sarah pour?

Model Model varies. Sample response:

Solution: ___2___

Multiplication Equation	Product Value
$\frac{2}{3} \times 3 = 2$ or $3 \times \frac{2}{3} = 2$	Sample reasoning: The product is $> \frac{2}{3}$ and < 3 because we are only taking part of the whole number but 3 times more than the fraction.

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Show What You Know

Model Fraction Multiplication
Part 1

Scenario
Jeremy had a birthday party with his 3 best friends. Each of his friends had different dietary restrictions, so his mom ordered each boy his own individual pizza. Each pizza was the same size and was cut into 8 equal size slices. Each boy only ate 3 slices. If you were to combine the slices the 4 boys ate, how many pizzas were collectively eaten?

Model Models vary. Sample response:

Solution: $\frac{12}{8}$ or $1\frac{4}{8}$ or $1\frac{1}{2}$ pizzas

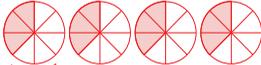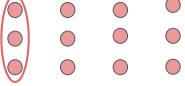| Multiplication Equation	Product Value
$\frac{3}{8} \times 4 = \frac{12}{8}$ or $4 \times \frac{3}{8} = \frac{12}{8}$	Sample reasoning: The product is $> \frac{3}{8}$ and < 8 because we are only taking part of the whole number but 4 times more than the fraction.

Scenario
Sam had 12 marbles. He accidentally dropped $\frac{1}{4}$ of them down a crack by the elevator at his mom's office. How many marbles did Sam lose?

Model Model varies. Sample response:

Solution: ___3___

Multiplication Equation	Product Value
$12 \times \frac{1}{4} = \frac{12}{4}$ or $\frac{1}{4} \times 12 = \frac{12}{4}$	Sample reasoning: The product is $> \frac{1}{4}$ and < 12 because we are only taking part of the whole number but 12 times more than the fraction.

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SHOW WHAT YOU KNOW PART 1
ANSWER KEY

MATH CHAT

- **Choose a Structured Conversation routine to facilitate the following question:**
  - **DOK-3** What connections did you make during this Explore? The ways I can model these problems are similar to modeling other multiplication problems. I can use repeated addition or a visual model, such as a number line.
- **DOK-2** Why is the product less than the whole number factor? When multiplying a whole number by a fraction, the answer will be less than the whole number factor because we are only taking a part of it. We aren't repeating it one time. We are multiplying a whole number by a fraction, which is less than 1.
- **DOK-2** Why is the product greater than the fraction factor? When we multiply the fraction by a number greater than 1, then we are repeating the fraction more than one time so the product will be greater than the factor we started with.
- **DOK-3** Would two-color counters be a helpful model to represent
- 2/3 of 20? Why or why not? It would not work well to use counters if the denominator and the total number of items were not compatible numbers. For example, if there are 20 items, and we needed to find 2/3 of the items, we could not use counters to split 20 into 3 equal groups because 3 is not a factor of 20.
- **DOK-3** What did you notice about the denominator when multiplying a fraction and a whole number? Explain. I noticed the denominator did not change. I think this is because the size of the share, or fraction, is the same throughout the problem. Also, we can think of multiplication as repeated addition, and I know the denominator does not change when adding fractions. For example, when calculating the total number of gallons when 2/5 of a gallon is repeated 5 times, we are finding the total number of fifths. Therefore, the answer is 10/5, which is equivalent to 2 whole gallons.

POST-EXPLORE

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

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GRADE 5　MODEL FRACTION MULTIPLICATION

EXPLORE > EXPLORE 1

INSTRUCTIONAL SUPPORTS

1. If students need additional support creating their models, then have them first represent the fraction given in the problem. In the first problem of Station 1, are THEY able to use fraction tiles to model 1/5? If not, then revisit the concept of fractions as equal parts of a whole and using multiple ways to represent a fraction.

2. If students need additional support converting an improper fraction to a mixed number, then remind them that mixed numbers have two components: a whole number part and a fractional part. Ask them how many wholes are in their model, and write it down. Ask them how many parts are left in their model that are not wholes, and write it down next to the whole number. This can also be related to division by showing that an example such as 25/8 (on Station Card 3) means 25 ÷ 8. Three whole groups of 8 can be made with 25, so 3 is the whole number and the remainder is 1 leftover eighth: 25/8 = 3 1/8.

3. If students need assistance drawing the models on their Student Journals, then consider providing Grid Paper, which is available as a Supplemental Aids element in the Intervention section. Students can draw their wholes, partition them, and shade fractional parts more easily using the lines of the grid paper.

4. If students need additional support in understanding why the denominator is not changing, then remind them that when adding fractions, the denominator remains the same. Help them make sense of this idea by discussing how multiplying a fraction by a whole number can be modeled with repeated addition. The denominator tells you the size of the pieces, and that doesn't change when they multiply a fraction by a whole number; they just have more pieces.

5. Some students may prefer to model the problems using repeated addition, and others may prefer using number lines. Allow them to use their preferred method for all problems.

6. Emphasize that the goal of the Explore is not to get the answer right away. It is to challenge their brains to grow and learn something new.

7. As an extension, prompt students to model the station problems in more than one way and look for relationships between their models.

LANGUAGE SUPPORTS

Before the Explore, provide examples of what it means for something to be repeated.

Clarify the meaning of any nonmath words that affect understanding of the Station Cards, such as supplies and shipping. Provide visuals when possible to improve understanding.

Clarify that the denominator tells you the number of equal parts in one whole and can be thought of as the noun telling you the name of the pieces. Use the following illustration: "Just as I would say 'I have 3 cats,' when you say 'I have 3 fourths,' you are saying what you have 3 of." Ask students to share other examples of nouns that might follow a number in math class, such as 3 sides or 5 digits.

Help students practice the correct pronunciation of the key terms in this scope (multiplication, equal groups, expression, and repeated addition) by breaking longer words into syllables and having students repeat after you.

Display sentence structures for students to use throughout the Explore, such as the following examples:

- Multiplication and repeated addition are similar because _____.
- To model the scenario, I will _____, and then I will _____.
- Multiplication can be used when _____.
- There are ____ counters split into ____ equal groups, with ____ in each group.
- ____ (fraction) of ____ (whole number) is ____.

After students answer the Reflect questions, have them share their responses with a partner and exchange constructive feedback. They can revise their responses as needed.

Once their Student Journals are complete, have students do a scavenger hunt with their Student Journals to practice the new vocabulary. Call out words or numbers from the handout, and challenge them to point to those items as quickly as they can. For example, "Point to a model that shows thirds" or "Point to the word expression."

Accelerate LEARNING
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Model Fraction Multiplication
Explore 1

Explore

Name: _____ Date: _____

Fresh Sips Beverages

Station 1: Sassy Strawberry-Lemon Punch

Lemon Juice
_____ groups of _____
Model:
The factory needs _____ gallons of lemon juice for 5 batches.
Multiplication expression:

Strawberries
_____ groups of _____
Model:
The factory needs _____ pounds of strawberries for Tuesday.
Multiplication expression:

1

Explore

Station 2: Big Birthday Order

Grape-ade Straws
_____ of the _____
Model:
Fresh Sips has _____ boxes of straws for the Goofy Grape-ade pouches.
Multiplication expression:

Gallons of Gallons
_____ of the _____
Model:
The factory has _____ gallon containers for the Kooky Kiwi beverage.
Multiplication expression:

2

⊙ Explore

Station 3: Fresh Sips Production

Packing Peanuts
_____ of the _____
Model:
Fresh Sips uses _____ pounds of peanuts for shipping.
Multiplication expression:

Wacky Watermelon
_____ groups of _____
Model:
Wacky Watermelon uses _____ gallons of fresh watermelon.
Multiplication expression:

3

Explore

Reflect

1. What connections did you make during this activity?

   _____

   _____

   _____

   _____

2. Why is a product not always bigger than the factors?

   _____

   _____

   _____

   _____

3. Why is the product larger than the fraction factor?

   _____

   _____

   _____

   _____

4. Explain why the denominator did not change.

   _____

   _____

   _____

4

Explore

Name: _____ Date: _____

Model Fraction Multiplication
Exit Ticket

Read the problem below. Create a model and expression to represent the situation, and answer the question.

Fresh Sips Beverage Company uses $\frac{4}{5}$ of a gallon of fresh apple juice to make each gallon of Awesome Apple Cider. Each day, they make 7 gallons of cider.

Awesome Apple Cider
_____ groups of _____
Model: The factory needs _____ gallons of fresh apple juice to make 7 gallons of Awesome Apple Cider .
Multiplication expression:
The size of the product is _____ than the whole number factor and _____ than the fraction being multiplied because _____ _____ _____

1

Explore

Station 1: Sassy Strawberry-Lemon Punch

The factory makes Sassy Strawberry-Lemon Punch.

- They received an order on Monday for 5 gallons of Sassy Strawberry-Lemon Punch. Each gallon requires $\frac{2}{5}$ of a gallon of lemon juice.
- The factory uses $\frac{5}{6}$ pounds of fresh strawberries for each of the 3 orders that they received on Tuesday.

Station 2: Big Birthday Order

The stock workers have to make sure that they have enough supplies for a big birthday party order.

- The factory has $\frac{3}{4}$ of the boxes of straws that are needed out of the 12 boxes ordered for the Goofy Grape-ade pouches.
- There is $\frac{1}{2}$ of the amount of gallon containers that are needed for the order of 10 Kooky Kiwi gallons.

1

(💡) Explore

Station 3: Fresh Sips Production

Fresh Sips was gathering the totals of sales for the week.

- To keep the bottles safe when shipping, the factory uses $\frac{2}{3}$ lb. of packing peanuts for each box shipped. They shipped out 6 boxes to Sensational Smoothies this week.

- Sensational Smoothies ordered 5 gallons of Wacky Watermelon. $\frac{5}{8}$ of each gallon was fresh watermelon.

2

Math Chat

Math Chat
What connections did you make during this Explore?
Why is the product less than the whole number factor?
Why is the product greater than the fraction factor?
Would two-color counters be a helpful model to represent $\frac{2}{3}$ of 20? Why or why not?
What did you notice about the denominator when multiplying a fraction and a whole number? Explain.

Show What You Know

Name: _____ Date: _____

Model Fraction Multiplication

Part 1: Multiply Fractions by Whole Numbers

- Read each scenario carefully.
- Create a model to represent the situation.
- Record the solution (total value represented).
- Write the multiplication equation that corresponds with the model you created.
- Explain your reasoning about the product value—is the product value greater or less than the value of the factors and why?

Scenario
Sarah's sister Margo invited Sarah to a tea party. Sarah poured herself, Margo, and Margo's teddy bear each a $\frac{2}{3}$ cup serving of tea. How many total cups of tea did Sarah pour?

Model
Solution: _____

Multiplication Equation	**Product Value**

1

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Show What You Know

Scenario
Jeremy had a birthday party with his 3 best friends. Each of his friends had different dietary restrictions, so his mom ordered each boy his own individual pizza. Each pizza was the same size and was cut into 8 equal size slices. Each boy only ate 3 slices. If you were to combine the slices the 4 boys ate, how many pizzas were collectively eaten?

Model

Solution: _____

Multiplication Equation	Product Value

Scenario
Sam had 12 marbles. He accidentally dropped $\frac{1}{4}$ of them down a crack by the elevator at his mom's office. How many marbles did Sam lose?

Model

Solution: _____

Multiplication Equation	Product Value

2

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