



Grade 5 | Module 3

Topic: Multiplying whole numbers and fractions by a fraction

[Module 3 Resources](#)

Students work with different models to explore solving problems involving multiplying a fraction or a whole number by a fraction.

Module 3 at a Glance

Printed Resources

- **Bookmarks**
 - Problem Solving Process Bookmark
 - Problem Solving Facilitation Bookmark
- **Grades 3-5 Table Games**
 - Number Line Fraction Bingo
 - Final Countdown
 - *Traffic Lights Tic-Tac-Toe (optional)*
 - *Dara (optional)*
 - *Equivalent Fraction Concentration (optional)*
 - *Multiplication Connect Four (optional)*
 - Race to 2 (Day 4)
 - Five for Twenty-Five (Day 4)
- **Math Mat**
 - Fraction Number Lines Math Mat 02

- **Problem Solving Journal** (pages 14–19)

- My Thinking Path
- Problem of the Day
- Exit Tickets
- ST Math Reflections

Optional Printed Resources

- Accomplishments Log
- ST Math Activity Pages
- Pre/Post Quizzes

Teacher Resources

- Teacher Planner

Immersion Slide Deck (slides 28–40)

- The Immersion Slide Deck is intended to be projected to the class in a whole group setting.

Supplies for Table Games (per group)

- **Number Line Fraction Bingo** - 1 set of fraction cards, number line for each player, 4 centimeter cubes for each player
- **Final Countdown** - deck of cards, 3 game pieces per player to be used as Multiplication Chips

My Thinking Path

- Daily reflection time for students on multiplying whole numbers and fractions by a fraction.

ST Math Puzzle Talks

- Unit Multiplication on the Number Line
- Unit Multiples
- Fraction Area

Problem Solving

Day 1:

- **Problem of the Day** - Partner A: Ribbon at Jones' Ribbon Shop is sold in various lengths. Rebecca bought two pieces of red ribbon to make hair bows. She selected the red ribbon from the bin with lengths of $\frac{3}{4}$ foot. How much ribbon did Rebecca buy? Compare your problem to your partner's problem.
 - Partner B: Ribbon at Jones' Ribbon Shop is sold in various lengths. Chris bought a piece of ribbon that was 2 feet long. He used $\frac{3}{4}$ of the ribbon. How much ribbon did he use?

Day 2:

- **Problem of the Day** - Partner A: Janet discovered that the distance to the park and back to her house is $\frac{3}{4}$ mile. She ran to the park and back home 5 times. How far did she run? Compare your problem to your partner's problem. Partner B: Bailey lives 5 miles from the park. She decided to run to the park. She got $\frac{3}{4}$ of the way there, stopped, and called her mother to pick her up. How far did Bailey run? Compare your problem to your partner's problem.

Day 3:

- **Problem of the Day** - James built a launch pad for his toy space ship. The pad was 2 feet by $\frac{7}{8}$ foot. What was the area of James' launch pad?

Day 4:

- **Problem of the Day** - LeVonne tiled her bedroom with carpet squares. Her bedroom is 12 tiles by 16 tiles. The carpet tiles she used were $\frac{3}{4}$ foot by $\frac{3}{4}$ foot. What is the area of LeVonne's bedroom?

Instructional Stations

On Days 1–3, each student will visit two stations per day following the schedule in the [Instructional Stations Overview](#). On Day 4, students do not participate in Instructional Stations. Consider assigning students who need additional support to Station 1 to work with the teacher on concepts they are struggling with.

Station 1: Small Group Instruction

- Engage students in a rich math conversation around this problem: Kevin poured 8 glasses of water from a jug. Each glass held $\frac{5}{8}$ cup of liquid. How much water was in Kevin's jug?
- Engage students in a math conversation around more problems that involve adding or multiplying fractions.

Station 2: ST Math Puzzles

- Have students sign in and play ST Math puzzles.
- Remind students to use manipulatives and/or paper and pencil to help them solve problems.
- With 5 minutes left, have students stop playing and complete their Puzzle Reflection and Accomplishments Log.

Station 3: Table Games

- Select Number Line Fraction Bingo or Final Countdown.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.



Grade 5 | Module 3 | Day 1

My Thinking Path (5-10 minutes)

- Have students write in the topic, “Solving problems involving multiplying a fraction or a whole number by a fraction.”
- Have students begin working on the My Thinking Path page.
- Discuss their ideas and allow students to add to their paper any additional thoughts they have.
- Have students complete the Pre-Quiz (optional).

Puzzle Talk: Unit Multiplication on the Number Line (20-25 minutes)

- Focus on student thinking and developing problem solving skills using the Problem Solving Process.
- Provide students with whiteboards/dry erase markers.

Notice and Wonder

- Display the first puzzle. Ask: “What do you wonder? What do you notice?” Allow a few students to share out.

Predict and Justify

- Have students make a prediction about how they will solve the puzzle. Ask students: “Where do you think we need to place JiJi’s rocket? Why?” Have students share their prediction, strategy, and why they think they have the correct solution.
- Ask: “What is happening in this equation? What size are the jumps JiJi makes? How many jumps does JiJi make?” ($6 \times \frac{1}{3}$ would represent 6 groups of $\frac{1}{3}$ or 6 jumps of $\frac{1}{3}$ each.)
- Try one of the student’s solution strategies. Before trying the strategy, discuss it with the other students (agree/disagree; what do they think will happen).

Test and Observe

- Watch the feedback, and talk with students about what happened as they solved the puzzle.
- Ask students to think about how what they saw happen compares to what they thought would happen. What did they learn from the feedback about their strategy?

Analyze and Learn

- Ask students to represent the feedback by writing a repeated addition sentence. Connect the whole number times a fraction repeated addition sentence (e.g., $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$) to a whole number multiplication repeated addition sentence (e.g., 6×3 would be $3 + 3 + 3 + 3 + 3 + 3$). Say to students: “This equation represents ___ groups of ___ (e.g., 6 groups of $\frac{1}{3}$).”
- Display the first puzzle in Level 3. Ask students: “How is this puzzle different from the ones in Level 1? If the fraction is the first number in the equation, how does that change the way we model this equation?”
- Have students share their ideas. Ask students to draw a number line and record JiJi’s jumps on their number line and solve the puzzle. Share students’ solutions, and ask them about their strategy for solving the puzzle.
- Ask students: “What size are the jumps JiJi makes? How many jumps does JiJi make?”

Connect and Extend

- Talk about and prove the commutative property. Say to students: “Does order matter when we multiply? In other words, is 5×6 equal to the same product as 6×5 ($\frac{1}{3} \times 6$ and $6 \times \frac{1}{3}$)?”
- Display the next puzzle in Level 3. Say to students: “Another way to think about this puzzle as ___ of ___ (e.g., $\frac{1}{3} \times 5$ is the same as $\frac{1}{3}$ of 5).”
- Model for students how to draw rectangles to represent the whole number, and then partition each whole into the given fraction (e.g., for $\frac{1}{3} \times 5$, draw 5 rectangles, partition each rectangle into thirds and shade in $\frac{1}{3}$ of each rectangle).

- Ask students to use the model to find the product in the puzzle.
- Repeat with additional puzzles in Level 3.

How does the student:

- determine how to partition the number line?
- determine the size and number of jumps to make?
- represent an a/b ($b > 0$) fraction times a whole number on a number line?
- represent a whole number times an a/b ($b > 0$) fraction on a number line?
- use the commutative property as a strategy?
- explain an a/b ($b > 0$) fraction times a whole number problem as a division situation?

Problem Solving (20-25 minutes)

Engage students in problem solving discussions. Read and discuss the problem, share student work, compare strategies, and make connections.

Problem of the Day

- Divide students into two groups. Assign the problems to the students according to their group. NOTE: the students will join together in A/B pairs tomorrow to compare and discuss their problems, strategies, and solutions.
 - Partner A: Ribbon at Jones' Ribbon Shop is sold in various lengths. Rebecca bought two pieces of red ribbon to make hair bows. She selected the red ribbon from the bin with lengths of $3/4$ foot. How much ribbon did Rebecca buy?
 - Partner B: Ribbon at Jones' Ribbon Shop is sold in various lengths. Chris bought a piece of ribbon that was 2 feet long. He used $3/4$ of the ribbon. How much ribbon did he use?
 - Compare your problem to your partner's problem.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). See [Instructional Stations Overview](#).

Station 1: Small Group Instruction

- Have students solve the following problem.
 - Kevin poured 8 glasses of water from a jug. Each glass held $5/8$ cup of liquid. How much water was in Kevin's jug?
- Discuss how they could model the problem on a number line using jumps.
- Have students explain and defend their answers.
- Discuss how to change the wording to make a problem that changes the order of the factors. Give students more problems that involve adding or multiplying fractions. For example,
 - Four laps around a track equals 1 mile. How far is one lap?
 - Kory ran $2 \frac{5}{6}$ laps. How far did Kory run?
- Ask other questions involving adding or multiplying fractions related to running laps around the track.

Station 2: ST Math Puzzles

- Have students sign in and play ST Math puzzles.
- Remind students to use manipulatives and/or paper and pencil to help them solve problems.
- With 5 minutes left, have students stop playing and complete their Puzzle Reflection and Accomplishments Log.

Station 3: Table Games

- Select Number Line Fraction Bingo or Final Countdown.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.



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My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving multiplying a fraction or a whole number by a fraction.

Puzzle Talk: Unit Multiplication on the Number Line (20-25 minutes)

- Focus on student thinking and developing problem solving skills using the Problem Solving Process.
- Provide students with the [Fraction Number Lines Math Mat 02](#) and/or whiteboards/dry erase markers.

Notice and Wonder

- Display the first puzzle in Level 4. Ask: “What do you notice that is similar/different from the puzzles we did yesterday?” Discuss how these puzzles compare to the previous ones.

Predict and Justify

- Have some students share their predictions. Discuss. Ask: “What size are the jumps JiJi makes? How many jumps does JiJi make?”
- Give students the Fraction Number Lines Math Mat 02, and have them partition their math mat number line and record the jumps before solving. Discuss how they partitioned the number line and determined the jumps. Did everyone partition it the same?
- Ask a volunteer to share their prediction and their reasoning. Have another student who solved it differently share and compare the two strategies. Did they result in the same solution?

Test and Observe

- Try both students’ solutions, and watch the feedback. Discuss and compare the two strategies with the whole group.
- Play additional puzzles and make predictions on game mats prior to solving.
- Continue to discuss strategy with partner or whole group by asking questions, such as:
 - How did you determine how to partition your number line?
 - How could we represent this puzzle with a repeated addition sentence?
 - How could we think of this equation as a division problem?
 - How could we use the commutative property to help us solve this equation?

Analyze and Learn

- Select a student’s strategy to try. Pause the animation. Ask students to explain what is happening with the bars and the number line.

Connect and Extend

- Continue playing puzzles from Level 4 and discussing students’ reasoning and strategies.
- Show puzzles from Level 5, and have students represent them on a number line.
- Share reasoning with the whole group.

How does the student:

- determine how to partition the number line?
- determine the size and number of jumps to make?
- represent an a/b ($b > 0$) fraction times a whole number on a number line?
- represent a whole number times an a/b ($b > 0$) fraction on a number line?
- use the commutative property as a strategy?
- explain an a/b ($b > 0$) fraction times a whole number problem as a division situation?

Problem Solving (20-25 minutes)

Engage students in problem solving discussions. Read and discuss the problem, share student work, compare strategies, and make connections.

Problem of the Day

- Join students together in A/B Pairs from yesterday.
- Partner A: Janet discovered that the distance to the park and back to her house is $3/4$ mile. She ran to the park and back home 5 times. How far did she run?
- Partner B: Bailey lives 5 miles from the park. She decided to run to the park. She got $3/4$ of the way there, stopped, and called her mother to pick her up. How far did Bailey run?
- Compare your problem to your partner's problem.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). See [Instructional Stations Overview](#).

Station 1: Small Group Instruction

- Have students solve the following problem.
 - Kevin poured 8 glasses of water from a jug. Each glass held $5/8$ cup of liquid. How much water was in Kevin's jug?
- Discuss how they could model the problem on a number line using jumps.
- Have students explain and defend their answers.
- Discuss how to change the wording to make a problem that changes the order of the factors. Give students more problems that involve adding or multiplying fractions. For example,
 - Four laps around a track equals 1 mile. How far is one lap?
 - Kory ran $2 \frac{5}{6}$ laps. How far did Kory run?
- Ask other questions involving adding or multiplying fractions related to running laps around the track.

Station 2: ST Math Puzzles

- Have students sign in and play ST Math puzzles.
- Remind students to use manipulatives and/or paper and pencil to help them solve problems.
- With 5 minutes left, have students stop playing and complete their Puzzle Reflection and Accomplishments Log.

Station 3: Table Games

- Select Number Line Fraction Bingo or Final Countdown.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.



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My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving multiplying a fraction or a whole number by a fraction.

Puzzle Talk: Unit Multiples (20-25 minutes)

- Focus on student thinking and developing problem solving skills using the Problem Solving Process.
- Provide students with Fraction Number Lines Math Mat 02 and/or whiteboards/dry erase markers.

Notice and Wonder

- Display the first puzzle in Level 1. Ask: “What do you notice? What do you wonder?” Allow a few students to share out.

Predict and Justify

- Ask students: “How would you solve this puzzle?” Ask students to think of their strategy for solving the puzzle and predict what will happen when they try it. Have them show their predictions on the game mat.
- Have some students share their predictions. Discuss.
- Try one of the students’ strategies. Before trying the strategy, discuss it with the other students. Ask students if they agree or disagree and what they think will happen. Share students’ thinking as a whole class.

Test and Observe

- Watch the feedback together and discuss what they saw. Was it like their prediction?

Analyze and Learn

- Replay the puzzle. Pause the puzzle before JiJi crosses the screen, and talk about what students see. Discuss the equation at the top of the puzzle and what it means. Ask students: “How does this model represent $__ \times __$, or $__$ groups of $__$?” (For example, 8×9 or 8 groups of 9.)
- Show the next puzzle in Level 1, and focus your discussion on the area model representing multiplication sentences.
- Display the first puzzle in Level 2. Have students discuss with a neighbor the question: “Why do you think JiJi wants us to cut a whole?”
- Show and discuss feedback from a Level 2 puzzle ($1/a \times b$). Ask students to discuss with their partner these questions: “How is this puzzle different from the ones we just solved? What is the same about the problems? How do fractions represent division?” (NOTE: The first step is to build just the first factor, not the answer.)

Connect and Extend

- Now display the first puzzle in Level 3. Compare this puzzle to the puzzles in Level 2. Push students to think about the Commutative Property (e.g., Does the model for 4×5 look the same as 5×4 ?) How will the area model look different for this puzzle?”
- Discuss how multiplying whole numbers is alike and different from multiplying whole numbers by a fraction. Examples:
 - They are similar because when multiplying by a fraction, it is equivalent to adding the fraction n number of times similar to multiplying whole numbers together as repeated addition (e.g., $3 \times 1/3 = 1/3 + 1/3 + 1/3$ is equivalent to $3 \times 4 = 3 + 3 + 3 + 3$).

- They are different because multiplying fractions (less than 1) by a whole number results in a product that is smaller than the whole number (e.g., $6 \times \frac{1}{3} = 2$ and $6 > 2$).
- Show the next puzzle in Level 3. Give students the Fraction Number Line Game Mat. Have students model the problem on their number line.
- Focus on the feedback and how it represents the equation at the top of the puzzle. Repeat with additional puzzles in Level 3.

How does the student:

- represent whole number multiplication?
- relate whole number multiplication to multiplying a whole number by a fraction?
- represent multiplying a whole number by a fraction?
- discuss the role of the numerator and denominator in the visual representation and the multiplication expression?
- explain how a fraction, such as $\frac{3}{4}$ or $\frac{1}{2}$, represents division?
- find the product?

Problem Solving (20-25 minutes)

Engage students in problem solving discussions. Read and discuss the problem, share student work, compare strategies, and make connections.

Problem of the Day

- James built a launch pad for his toy space ship. The pad was 2 feet by $\frac{7}{8}$ foot. What was the area of James' launch pad?

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). See [Instructional Stations Overview](#).

Station 1: Small Group Instruction

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- Ask other questions involving adding or multiplying fractions related to running laps around the track.

Station 2: ST Math Puzzles

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- Remind students to use manipulatives and/or paper and pencil to help them solve problems.
- With 5 minutes left, have students stop playing and complete their Puzzle Reflection and Accomplishments Log.

Station 3: Table Games

- Select Number Line Fraction Bingo or Final Countdown.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.



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My Thinking Path (10 minutes)

- Have students reflect on what they have learned about solving problems involving multiplying a fraction or a whole number by a fraction. Students should complete the My Thinking Path reflection page in their journal.

Puzzle Talk: Fraction Area (20 minutes)

- Focus on student thinking and developing problem solving skills using the Problem Solving Process.
- Provide students with whiteboards/dry erase markers.

Notice and Wonder

- Display the first puzzle in Level 1. Ask: "What do you notice? What do you wonder? What do you think you need to do to solve this puzzle?" Allow a few students to share.
- Have students share their prior knowledge about area models for whole numbers (e.g., 3×5) and draw the area model for that problem on their paper/whiteboard.
- Display the first puzzle from Level 1 ($1/a \times 1/b$), and give time for students to draw a model.

Predict and Justify

- Have students think-pair-share to discuss their models and their reasoning.
- Select one of the students' models and have them share their strategy and prediction.
- Ask the students to think about if they agree/disagree with the strategy and why.

Test and Observe

- Try a student's solution, and watch the feedback. Ask students to describe what happened. Ask: "How can we use the scissors to help us create a model of this fraction multiplication expression?"
- Other questions to ask: "What did they learn from the feedback? What does this tell them about multiplying fractions?"

Analyze and Learn

- Discuss what happens to the areas of a square when they multiply it by a fraction.
 - What happens to the product?
 - Why is the product of a whole number times a fraction less than the whole number? Even though the number of partitions gets larger, the area is still smaller than a whole number.
- Solve additional puzzles from Level 1 using the Problem Solving Process.

Connect and Extend

- Display the first puzzle in Level 2.
- Give students opportunities to estimate the product and create a model.
- Ask: "What will happen if you change the 3 in your area model to $1/2$ ($3 \times 1/2$)? What will happen if you multiply by a fraction < 1 ?"
- Complete the remaining puzzles in Level 2.

How does the student:

- make connections between multiplying whole numbers and multiplying fractions?
- partition the squares when they represent the puzzles?
- understand that the product of the puzzle given will be less than the multipliers?

Problem Solving (20 minutes)

Engage students in problem solving discussions. Read and discuss the problem, share student work, compare strategies, and make connections.

Problem of the Day

- LeVonne tiled her bedroom with carpet squares. Her bedroom is 12 tiles by 16 tiles. The carpet tiles she used were $\frac{3}{4}$ foot by $\frac{3}{4}$ foot. What is the area of LeVonne's bedroom?

Whole Group Table Games (Teacher-led) (15-20 minutes)

During this time you will introduce Race to 2 and Five for Twenty-Five. Students will play these games in the next module in Station 3.

- Introduce one of the games.
- After explaining the game and playing it with the whole group, give students time to play it on their own.
- After playing the game, have them discuss:
 - What math did they learn or use?
 - What strategies did they try to win the game?
- Repeat with the second game.

Optional: ST Math Activity Page (15 minutes)

ST Math Activity Page

- Project the ST Math game, *Unit Multiplication*.
- Play a few puzzles to help students understand the game.
- Have students turn to the ST Math Activity Page: *Unit Multiplication*.
- Ask students what they notice about the content on the page. What do they wonder? Where do they want to start on the page?
- Give them time to complete the page.
- Discuss the page, and have students share their thinking.
- Take the time to compare strategies, and have students share their work.
- Make connections to the game.

Closing (10 minutes)

Thinking and Reflecting Time

- Have students complete the Post-Quiz (optional).
- Have students review their ST Math Puzzle Reflections, Exit Tickets, and Problem Solving work.
- Engage students in discussions about what they have learned in this module, what they have questions about, and what they would like to learn more about.