ST Math
Summer Immersion

Grade 3 | Module 2

Topic: Partitioning a whole into equal sections (fractions)

Module 2 Resources

Students use their understanding of fair sharing whole numbers into equal groups to partition one whole into equal fractional sections. Students partition a whole into halves, thirds, fourths, and eighths. They understand that a fraction 1/b is the quantity formed by 1 part of a whole partitioned into b equal parts. Students work with puzzles that involve selecting a fraction of size 1/b to create a fraction a/b (b>0).

Module 2 at a Glance

Printed Resources

- **Bookmarks**
  - Problem Solving Process Bookmark
  - Problem Solving Facilitation Bookmark
- **Grades 3-5 Table Games**
  - Equivalent Fraction Concentration
  - Multiplication Connect Four
  - *Traffic Lights Tic-Tac-Toe (optional)*
  - *Dara (optional)*
  - Number Line Fraction Bingo (Day 4)
  - Final Countdown (Day 4)
- **Problem Solving Journal** (pages 8–13)
  - 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 15–27)

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

Supplies

- Paper fraction strips or other fraction model manipulatives

Supplies for Table Games (per group)

- **Equivalent Fraction Concentration** - 1 deck of Equivalent Fractions cards (2 sheets cut)
- **Multiplication Connect Four** - 2 paper clips, 2 sets of 20 colored game pieces or chips (different colors), 1 printed Multiplication Connect Four Game Board.

My Thinking Path

- This module, students reflect on partitioning a whole into equal sections (fractions).

ST Math Puzzle Talks

- Pie Monster
- Match Fractions

Problem Solving

Day 1:

- **Problem of the Day** - Joe the baker baked 2 apple pies for the Hughes family. There are 8 people in the Hughes family. The family shared the pies equally. How much pie did each family member get?

Day 2:

- **Problem of the Day** - Joe the baker baked 7 apple pies to sell in his shop. Four people came in at the same time to buy pie. Joe sold the 7 pies to the four people. Each person got an equal amount of pie. How much pie did each person buy?

Day 3:

- **Problem of the Day** - Gordon baked a pan of lasagna for his family of 4. He cut the lasagna into eight equal pieces. Explain how much lasagna each family member might eat.

Day 4:

- **Problem of the Day** - Brett and 3 classmates were given a bulletin board to present their Math Challenge. They decided to divide the bulletin board so that each of them had an equal amount of space. Show two different ways they could partition the board. Prove that one partition from your first bulletin board example is equivalent to one partition from the second example.

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.

Station 1: Small Group Instruction

- Show and work through puzzles from Balance Pies
- Show and work through rich problems similar to the Problems of the Day.

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: Number Sense Games

- Select Equivalent Fraction Concentration or Multiplication Connect Four.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

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Grade 3 | Module 2 | Day 1

My Thinking Path (5-10 minutes)

- Remind students of the My Thinking Path document to students. Have them write in the topic, “Solving problems involving partitioning a whole into equal sections (fractions).”
- Have students work on the My Thinking Path page in their journals.
- Discuss their ideas, and allow students to add to their paper any additional thoughts they have.
- Begin each of Days 1–4 with time for students to reflect on their learning and prepare for the day.
- Have students complete the Pre-Quiz (optional).

Puzzle Talk: Pie Monster (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 in Level 1. Ask: "What do you notice? What do you wonder?" Allow a few students to share out.
- Ask students to think of their strategy for solving the puzzle and predict what will happen when they try it.

Predict and Justify

- Have students think-pair-share their strategy with a partner, explaining their reasoning.
- Have students share out. Ask the students to think about if they agree/disagree with the strategy and why. How does it relate to their strategy?

Test and Observe

- Try one of the students’ ideas. (As you try students’ strategies, be sure to try strategies that work and those that don’t.)
- Watch the feedback together for correct and incorrect tries, and discuss what you saw.

Analyze and Learn

- Ask students to think about how what they saw happen compares to their prediction.
- Show another puzzle. Have students prepare to show how they would solve it.
- Share several examples. Look for students who also wrote the number, or ask students to write the number.
- Look for mixed numbers and a/b (b>0) fractions. Discuss counting fractions compared to counting whole numbers and equivalence. Ask how they know this fraction is equivalent to this mixed number (e.g., why is 2 the same as 4/2).

Connect and Extend

- Open up some puzzles from Level 2. (Make sure you include puzzles with thirds and fourths.) Have students do a think-pair-share with a partner about what they notice. How is it different from Level 1?
- Continue to show a few other puzzles in Level 2 (especially partitioned into halves).
  - Have students share ideas on how they would solve the puzzle.
  - Share out several examples. Look for students who also wrote the number, or ask students to write the number.
  - Look for mixed numbers and a/b fractions. Discuss counting fractions compared to whole numbers.
  - Discuss the equivalence.
- Do the same as above, but with puzzles from Level 3 showing thirds and fourths. Questions to ask: “How many thirds/halves/fourths did you need for each whole pie? How many thirds/halves/fourths are there altogether?“

How does the student:

- figure out how many unit fractions are needed for one whole?
- count unit fractions to find the total?
- understand that the a/b (b>0) fraction is equivalent to the mixed number?

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

Joe the baker baked 2 apple pies for the Hughes family. There are 8 people in the Hughes family. The family shared the pies equally. How much pie did each family member get?

Instructional Stations (40 minutes)

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

Station 1: Small Group Instruction

- Work with students on the ST Math game, *Balance Pies*.
- Use the Problem Solving Process to discuss the game with the group.
- Work through Levels 2 on. Have students name fractions of pies. Discuss unit fractions and a/b (b>0) fractions.
- Students explore and discover how a/b (b>0) fractions are made up of a fractions of size 1/b.
- Have students solve the problems similar to the Problem of the Day and puzzles. For example:
  - Twana baked a small pan of lasagna for her family of 4. Explain how she might cut the lasagna to serve her family equal sized pieces. How much lasagna will each person get?
  - Discuss what they know in the problem and what they need to know to solve the problem.
- Bring the discussion about each problem to the equation, and discuss what each of the numbers in the equation represents.
- Ask students to compare their drawings, etc., to the numbers in the equations.

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: Number Sense Games

- Select Equivalent Fraction Concentration or Multiplication Connect Four.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

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Grade 3 | Module 2 | Day 2

My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving partitioning a whole into equal sections (fractions).

Puzzle Talk: Pie Monster (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 in Level 3. Ask: “What do you notice that is similar/different from the puzzle we did yesterday?”
- Allow a few students to share out.

Predict and Justify

- Ask students to think of their strategy for solving the puzzle and predict what will happen when they try it. Have students share out their predictions.

Test and Observe

- Select a student's solution to try, and watch the feedback. Ask students: “What happened when we tried that prediction? What did you see?"

Analyze and Learn

- Ask students to think about how what they saw happen compares to their prediction. Was our answer correct? What did they learn from the feedback?
- Show another puzzle, and have students discuss with a partner what they think they need to do to solve the problem.
- Try one of the students' strategies. Discuss the feedback.
- Continue to try Level 3 puzzles and launch into a discussion with students around mixed numbers, unit fractions, and equivalence:
  - How can you check to make sure both monsters get enough pie?
  - How many thirds/halves/fourths are there altogether?
  - How could you write the fraction and the mixed number for monster 1 and monster 2?
  - How do you know this fraction is equivalent to this mixed number(e.g., why is 2 the same as 4/2).

Connect and Extend

- Choose some puzzles for students to write equations for on paper or whiteboard.
- Ask students a challenge question: “What if Pie Monster got ___ more pies? How many pieces of pie would Pie Monster have now?”
- Have students solve the new problem, and then allow a few students to share their strategies and their answers.

How does the student:

- write equations and inequalities to compare fractions?
- figure out how many unit fractions are needed for the whole and for each monster?
- count unit fractions to find the total?
- understand that the a/b (b>0) fraction is equivalent to the mixed number?

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

Joe the baker baked 7 apple pies to sell in his shop. Four people came in at the same time to buy pie. Joe sold the 7 pies to the four people. Each person got an equal amount of pie. How much pie did each person buy?

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station).

Station 1: Small Group Instruction

- Work with students on the ST Math game, *Balance Pies*.
- Use the Problem Solving Process to discuss the game with the group.
- Work through Levels 2 on. Have students name fractions of pies. Discuss unit fractions and a/b (b>0) fractions.
- Students explore and discover how a/b (b>0) fractions are made up of a fractions of size 1/b.
- Have students solve the problems similar to the Problem of the Day and puzzles. For example:
  - Twana baked a small pan of lasagna for her family of 4. Explain how she might cut the lasagna to serve her family equal sized pieces. How much lasagna will each person get?
  - Discuss what they know in the problem and what they need to know to solve the problem.
- Bring the discussion about each problem to the equation, and discuss what each of the numbers in the equation represents.
- Ask students to compare their drawings, etc., to the numbers in the equations

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: Number Sense Games

- Select Equivalent Fraction Concentration or Multiplication Connect Four.
- 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 partitioning a whole into equal sections (fractions).

Puzzle Talk: Match Fractions (20-30 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?” Allow a few students to share out.

Predict and Justify

- Ask students to predict where the rocket will go and explain their prediction.
- You may probe students by asking: "What does the numerator represent? What does the denominator represent?"

Test and Observe

- Select a student to share how to move the slider, how many parts they are dividing and coloring in, and why.

Analyze and Learn

- Ask students to explain what they learned from the feedback about numerators, denominators, and partitions. Replay the puzzle, and select the same answer. This time pause the feedback. Discuss.
- Ask students to share what they learned from the feedback. How can they use what they learned in the next puzzle?
- Show the next puzzle. Move the slider across the square at the bottom, and ask students to watch the animation. Ask: "How many pieces do you want to partition this square into so that it matches the fraction in the puzzle?"
- Remind students that the denominator tells how many equal pieces the whole has been divided into: “The denominator is ___, so we need to divide the square into ___ equal parts.” Select the correct denominator. Remind students that the numerator counts how many of the equal pieces you have. The numerator in the puzzle is 1, which means that we just need one of the pieces. Ask students: “How could we represent just one of the pieces?” Move the cursor over the square again to show how to shade in the pieces, and watch the feedback.
- Solve the puzzle and watch the feedback.

How does the student:

- discuss the size and number of partitions created as the cursor moves from left to right?
- discuss the meaning of the denominator in the fractions?
- discuss the meaning of the numerator in the fractions?
- discuss unit fractions and count by unit fractions?

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

- Gordon baked a pan of lasagna for his family of 4. He cut the lasagna into eight equal pieces. Explain how much lasagna each family member might eat.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station).

Station 1: Small Group Instruction

- Work with students on the ST Math game, *Balance Pies*.
- Use the Problem Solving Process to discuss the game with the group.
- Work through Levels 2 on. Have students name fractions of pies. Discuss unit fractions and a/b (b>0) fractions.
- Students explore and discover how a/b (b>0) fractions are made up of a fractions of size 1/b.
- Have students solve the problems similar to the Problem of the Day and puzzles. For example:
  - Twana baked a small pan of lasagna for her family of 4. Explain how she might cut the lasagna to serve her family equal sized pieces. How much lasagna will each person get?
  - Discuss what they know in the problem and what they need to know to solve the problem.
- Bring the discussion about each problem to the equation, and discuss what each of the numbers in the equation represents.
- Ask students to compare their drawings, etc., to the numbers in the equations

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: Number Sense Games

- Select Equivalent Fraction Concentration or Multiplication Connect Four.
- 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 partitioning a whole into equal sections (fractions). Students should complete the My Thinking Path reflection page in their journal.

Puzzle Talk: Match Fraction (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

- Show a puzzle from Level 2. Ask students: “What do you notice that is similar/different than the puzzles we did yesterday?"
- Have students predict how to solve the puzzle and share their prediction with a neighbor. Ask students: “Did your predictions match? What strategies did you use?”

Predict and Justify

- Have students share out. Try one of the students’ ideas.

Test and Observe

- Watch the feedback together, and discuss what they saw. Discuss how the animation shows the numerator and denominator of the fraction.

Analyze and Learn

- Ask students to think about what they saw happen and how it compares to their prediction. What did they learn from the feedback?
- Show another puzzle from Level 2. Discuss how they determine the number of partitions to select: “Where is a unit fraction? How many unit fractions is this?”
- Have students write an addition equation to show that it takes a unit fraction of size 1/b to equal the a/b (b>0) fraction (e.g., 1/6 + 1/6 = 2/6).

Connect and Extend

- Display the next puzzle and move the cursor along the square again. Ask students to turn to a partner and discuss what happens to the size of the fraction pieces as the denominator gets bigger. How many halves/thirds/fourths/fifths/sixths does it take to make 1 whole? Why? (Show that the bigger the denominator gets, the smaller the fraction pieces become.) Allow students to share their thinking whole group.
- Do a share-out, and try a student's solution, watching the feedback. Remind students that the numerator counts how many of the equal pieces you have (e.g., a numerator of 4 means that you have 1, 2, 3, 4 of the fraction pieces).
- Ask: "How many of these fraction pieces does it take to make the whole? Why?"

How does the student:

- discuss the size and number of partitions created as the cursor moves from left to right?
- discuss the meaning of the denominator in the fractions?
- discuss the meaning of the numerator in the fractions?
- discuss unit fractions and count by unit fractions?

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

- Brett and three classmates were given a bulletin board to present their Math Challenge. They decided to divide the bulletin board so that each of them had an equal amount of space. Show two different ways they could partition the board. Prove that one partition from your first bulletin board example is equivalent to one partition from the second example.

Whole Group Number Sense Games (15-20 minutes)

During this time you will introduce Number Line Fraction Bingo and Final Countdown. 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 game, *Pie Monster*.
- Play a few puzzles to help students understand the game.
- Have students turn to the ST Math Activity Page: *Pie Monster*.
- 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).
- 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.
- Have students review ST Math Problem Solving Journal pages for the module: My Thinking Path, Problem of the Day, Exit Tickets, and Puzzle Reflections.