ST Math
Summer Immersion

Grade 4 | Module 4 (TX)

Topic: Adding and subtracting fractions and mixed numbers

Module 4 Resources

Students work with area models and number line models to add and subtract fractions and mixed numbers. Students use a number line to represent addition and subtraction of fractions as jumps to the right or left. They relate this to addition and subtraction of whole numbers. Students solve rich problems involving addition and subtraction of fractions.

Module 4 At A Glance

Printed Resources

- **Bookmarks**
  - Problem Solving Process Bookmark
  - Problem Solving Facilitation Bookmark
- **Grades 3-5 Table Game Directions**
  - Race to 2
  - Five for Twenty-Five
  - *Traffic Light (optional)*
  - *Dara (optional)*
  - *Equivalent Fraction Concentration (optional)*
  - *Number Line Fraction Bingo (optional)*
  - *Final Countdown (optional)*
  - Sudoku Puzzles (Day 5)
- **Problem Solving Journal** (pages 20–25)
  - My Thinking Path
  - Problem of the Day
  - Exit Tickets
  - ST Math Reflection
- **Design Challenge Station Booklet**
  - Page 16

Teacher Resources

- Teacher Planner

Optional Printed Resources

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

Immersion Slide Deck (Slides 41–53)

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

Supplies for Table Games (per group)

- **Race to 2** -1 set of fraction cards, number line 0 to 2 for each player, 1 small game piece for each player
- **Five for Twenty-Five** - 1 deck of cards

My Thinking Path

- Daily reflection time for students on adding and subtracting fractions and mixed numbers.

ST Math Puzzle Talks

- Alien Bridge Symbolic
- JiJi Cycle Select Basket Symbolic
- Crank Pies Addition and Subtraction Symbolic
- Scale Fraction Addition and Subtraction Symbolic

Problem Solving

Day 1:

- **Problem of the Day -** Erica needs 2 1/2 yards of cloth to make a blanket. She found 1 6/8 yards of red cloth and 4/8 of a yard of blue cloth. Does she have enough to make the blanket? Explain how you know.

Day 2:

- **Problem of the Day** - Demarius made pizza for his family. He gave 3/8 of the pizza to his mom, 1/8 of the pizza to his sister, and ate the rest himself. Who ate more Demarius or his family? Explain how you know.

Day 3:

- **Problem of the Day** - Carlos drinks 2/6 cup of milk at breakfast and again at lunch. At dinner, Carlos drinks 4/6 cup of milk. How much milk does Carlos drink in one day? Explain how you know.

Day 4:

- **Problem of the Day** - Bev is knitting a scarf for her mother. She knits 4/3 feet on Monday, 2/3 of a foot on Tuesday, and 1 2/3 feet on Wednesday. Bev thinks she has knitted 4 feet of her scarf. Is she correct? Explain how you know.

Instructional Stations

On Days 1–4, each student will visit two stations a day for 20 minutes each. On Day 5, students do not rotate. They can either be assigned to a station or allowed to choose which one to go to. 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

- Days 1 - 4: Engage students in a math conversation about math concepts using a rich problem.

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 ST Math Puzzle Reflection.

Station 3: Table Games

- Select Race to 2 or Five for Twenty-Five. Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Days 1-4: Students will continue to make changes to their games, finalize their rules, and directions.

Day 5: Design Challenge (Whole Group)

- Have the students test their games with the other students, get feedback, and then see what additional improvements they need to do to improve their games.
- As students are playing games, monitor student game-play, and use facilitation questions to help support their thinking about games and about math.

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Grade 4 | Module 4 | Day 1

My Thinking Path (5-10 minutes)

- Have students write in the topic, “Adding and subtracting fractions and mixed numbers.”
- 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.
- Have students complete the Pre-Quiz (optional).

Puzzle Talk: Alien Bridge Symbolic (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? What do you wonder?” Allow a few students to share out.

Predict and Justify

- Have students make a prediction. After they have had some think time, have them think-pair-share about what they would like to try, what will happen when they try it, and why they think it will work.
- Select one of the students’ strategies. Ask the students if they agree or disagree with the strategy.

Test and Observe

- Try a student’s solution, and watch the feedback. Ask students to describe what happened.

Analyze and Learn

- Ask students to think about how what they saw happen compares to their prediction. What did the feedback tell them? How many total equal pieces do we have?
- Ask students to talk to a neighbor and determine if there is any other way to solve this puzzle. Have them justify their answer.
- Now that they know what the feedback teaches, show a new puzzle. Be sure to select one with a fraction greater than 1. Say to students: “If this is the sum, what might the two addends be?” Have students use their whiteboards to write an equation that results in the fraction on the alien ship. Remind students that their fractions need to have the same denominators.
- Have students share their fractions with a neighbor and justify their equation. Explain to the students that they should use the puzzle to prove they are correct.
- Try one of the student’s equations. Pause the animation and discuss.
- Repeat with additional puzzles from Level 3.

Connect and Extend

- Show a puzzle from Level 4.
- Ask students: “How is this puzzle the same and how is it different from the other puzzles we solved for this game?”
- Ask: “What do you think happens when we add the two fractions? How could we name the total? Is there more than one way to name the fraction (e.g., a sum of 5/4 could also be named 1 1/4)?”
- Have students share out and then prove their answer using the game.
- Repeat with other puzzles from Level 4.

How does the student:

- determine the correct denominator?
- determine the correct numerator?
- explain the role of the numerator and denominator?
- name the number as both a fraction and a mixed number (when applicable)?

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

- Erica needs 2 1/2 yards of cloth to make a blanket. She found 1 6/8 yards of red cloth and 4/8 of a yard of blue cloth. Does she have enough to make the blanket? Explain how you know.

Instructional Stations (40 minutes)

Students will visit two stations today (spending 20 min in each station). They will visit the other two tomorrow.

Station 1: Small Group Instruction

- Work with students on the ST Math game, *Pie Monster Symbolic*.
- Use the Problem Solving Process to discuss the game with the group.
- Have students draw a number line and show the solution on the number line.
- Discuss how they determined where to place it on the number line.

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 Race to 2 or Five for Twenty-Five.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Students will finalize their rules on page 13 of their Design Challenge Station Booklet.
- Have students work on creating an advertisement for their game.
- What is the name of the game?
- What math does it teach?
- What do they want people to know about their game?

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Grade 4 | Module 4 | Day 2

My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving adding and subtracting fractions and mixed numbers.

Puzzle Talk: JiJi Cycle Select Basket Symbolic (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? How is this like the puzzles we have solved before?" Allow a few students to share out. Students should notice that instead of visually showing the fraction like the puzzles in Module 3, this game names the fraction.

Predict and Justify

- Have students make a prediction. After they have had some think time, have them think-pair-share about what they would like to try, what will happen when they try it, and why they think it will work. Then have students share out whole group

Test and Observe

- Before you try a student's solution, ask students if they agree or disagree with the strategy you are going to try. Try a student's solution and watch the feedback. Ask students to describe what happened.

Analyze and Learn

- Ask students to think about how what they saw happen compares to what they thought would happen. What did they learn from the feedback? How does this affect their strategy?
- Pull up the next puzzle and ask: "How is this problem different from the previous one? What did they learn from the last puzzle that will work here?"
- Have students think, pair, share their ideas for solving the puzzle. Have some students share with the whole group.
- Ask students: "How did you determine where to put the balloon basket? How did you count along the number line?"
- Have students share their strategies. Try a student's solution and watch the feedback and discuss.
- Ask students: "How would we write this puzzle as an equation?"
- Repeat with additional puzzles in Level 1.

Connect and Extend

- Display the first puzzle in Level 2. Ask students: "How is this level like the one we just played? How is it different?" (This level the puzzles represent thirds and fourths. In Level 1, the puzzles represent wholes and halves.)
- Have students share their ideas for solving the puzzle.
- Ask students: "How did you determine where to put the balloon basket? What was the same or different about how you counted along the number line?"
- Have students share their strategies. Try a student's solution. Watch the feedback, and discuss.
- Ask students: "How would we write this puzzle as an equation? Can you think of a story problem that this equation could represent?" Have a student turn and talk to a neighbor, and then have some students share out. Repeat with additional puzzles from Level 2.
- Solve additional puzzles in Level 2.

How does the student:

- name the fractions shown in the puzzle?
- determine whether the puzzle is an addition or subtraction situation?
- show the action of adding and subtracting fractions as jumps on a number line?
- write equations to represent the puzzle?
- write fractions greater than 1 as fractions and mixed numbers?

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

- Demarius made pizza for his family. He gave 3/8 of the pizza to his mom, 1/8 of the pizza to his sister, and ate the rest himself. Who ate more Demarius or his family? Explain how you know.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). They will visit the other two tomorrow.

Station 1: Small Group Instruction

- Work with students on the ST Math game, *Pie Monster Symbolic*.
- Use the Problem Solving Process to discuss the game with the group.
- Have students draw a number line and show the solution on the number line.
- Discuss how they determined where to place it on the number line.

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 Race to 2 or Five for Twenty-Five.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Students will finalize their rules on page 13 of their Design Challenge Booklet.
- Have students work on creating an advertisement for their game.
- What is the name of the game?
- What math does it teach?
- What do they want people to know about their game?

ST Math
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Grade 4 | Module 4 | Day 3

My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving adding and subtracting fractions and mixed numbers.

Puzzle Talk: Crank Pies Addition and Subtraction Symbolic (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 that shows addition. Ask: "What do you notice? What do you wonder?"
- Hover over the fraction circles and call students attention to the box in the bottom right. (They should notice that as you hover a denominator appears.) Ask: "What do you think this number in the box means?" Allow students to share out.
- Ask: "What do you think you need to do to solve this puzzle?" Allow a few students to share out.

Predict and Justify

- Have students make a prediction. After some think time, have students think-pair-share, and then ask some students to share out their strategies to the whole group.

Test and Observe

- Select one of the students' strategies and discuss if students agree or disagree with the strategy and why.
- Try a student's solution, and watch the feedback. Ask students to describe what happened.

Analyze and Learn

- Ask students to compare what they thought would happen to what they observed from the feedback. Ask: "What did they learn from the feedback? Will they change their strategy? Do they think there is more than one way to solve this problem?" Discuss.
- Pull up the next puzzle that shows addition. Ask students to think about how they would solve this puzzle. Ask: "What is happening in this expression? What do we know about adding fractions that can help us solve this problem?"
- Ask students to talk with a neighbor about the following questions: "How are they deciding what denominator to choose. How many shaded equal parts do we need in all? Why?" After they discuss, allow students to share out.
- Select a student's strategy to try. Have students discuss what they think will happen.
- Try the strategy, and discuss. Use the puzzle controls to pause the animation to support the discussion.
- Pull up a puzzle that has a subtraction problem. Ask: "What is the same or different about this problem?"
- Move the cursor over the fraction circles and ask students: "Which denominator should we choose? How do you know?" Share students' thinking.
- Choose the correct denominator and then ask: "How are you going to solve this problem? What strategy will you use and why?"
- Select a students strategy to try and have students discuss what they think will happen.
- Try the strategy and discuss. Use the puzzle controls to pause the animation to support the discussion. Compare what is happening in this puzzle to what happened in the earlier addition puzzles.
- If needed, repeat using another subtraction puzzle.

Connect and Extend

- Pull up the first puzzle in Level 2. Ask: "What do you notice about the fractions in this level?" (There are fractions greater than 1.)
- Ask students to talk to a neighbor about how they would solve this puzzle. Are their strategies similar? What did they learn from Level 1 that helps them solve this problem.
- Allow students to share out and select a student's strategy to try. Try the strategy, and discuss the feedback.
- Ask students to write the equation that represents the problem.
- Repeat with addition and some subtraction puzzles within that level.

How does the student:

- determine the denominator to use?
- determine how many shaded equal pieces to select?
- count the pieces? Are they counting them as unit fractions or as whole numbers (1, 2, 3 instead of 1/4, 2/4, 3/4)?

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

- Carlos drinks 2/6 cup of milk at breakfast and again at lunch. At dinner, Carlos drinks 4/6 cup of milk. How much milk does Carlos drink in one day? Explain how you know.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). They will visit the other two tomorrow.

Station 1: Small Group Instruction

- Work with students on problems similar to the Problem of the Day. Use alternative number selections in the problem.
  - Wanda made cupcakes for her sister's birthday. Wanda mixed 1/3 (1/2, 1/4, 3/8) cup of chocolate icing and 4/3 (3/2, 5/8, 4/4) cup of white icing to put on each cupcake, how much icing did she make?
- Have students show the solution on a number line.
- Have students model the problem, and explain how the model represents the problem.

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 Race to 2 or Five for Twenty-Five.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Students will finalize their game rules.
- Students who have completed their game can work on creating an advertisement for their game.
- What is the name of the game?
- What math does it teach?
- What do they want people to know about their game?

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Grade 4 | Module 4 | Day 4

My Thinking Path (5-10 minutes)

- Have students reflect on what they have learned about solving problems involving adding and subtracting fractions and mixed numbers.

Puzzle Talk: Scale Fraction Addition and Subtraction Symbolic (20-25 minutes)

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

Notice and Wonder

- Display the first puzzle from Level 1. Ask students: "What do you notice? What do you wonder about this puzzle?" Allow a few students to share their thinking with the whole class.

Predict and Justify

- Ask students to think individually about how they could solve the puzzle. Focus students' attention on the numbers being added. Is there a way to estimate the sum?
- Have the students turn and share with a partner before sharing as a class.
- Students should provide mathematical reasoning for the idea they want to try. They can use their fraction tools and whiteboard to represent the puzzle.

Test and Observe

- Select one of the students' strategies. Solve the puzzle, and have students describe what happened.

Analyze and Learn

- Ask students how what happened compares to what they thought would happen.
- If the answer was incorrect, discuss what was learned and what they think they should try next. Have students share why that is the best way to solve the puzzle.
- If the answer was correct, how can they take what they learned and apply it to the next puzzle?
- Show the next puzzle. Have students share their answers and strategies.
- Continue with the rest of the puzzles in Level 1. Try to show a few incorrect solutions, and discuss why the solution was incorrect.
- Repeat with additional puzzles in Level 1.
- As you discuss the puzzles as questions, such as: "Can we estimate where we need to mark the number line? What happens when the numbers are added (or subtracted)? What do we need to do first? What would we do next? Can you predict the next step?"

Connect and Extend

- Display the first puzzle in Level 2.
- Ask students: "How is this puzzle different than the ones we just solved?" These puzzles involve subtraction of mixed numbers.
- Ask students: "How can you use what you know from the other puzzles to help you solve this one?"
- Have students think, ink (write down their solution), pair, share with a neighbor.
- Discuss some of the students' strategies and their thinking behind the strategies.
- Does the strategy that they used to add mixed numbers work with subtraction or do they need to adjust their method?
- Try their ideas, and watch the animation for feedback.
- Repeat with additional puzzles in Level 2

How does the student:

- use the partitions on the number line to place the marker?
- make use of strategies to add and subtract mixed numbers? (Do they work with the whole numbers first, or do they create a whole number out of the first mixed number and then add or subtract the remaining parts or, do they use another method?)
- describe the first whole that is displayed on the number line when the solution is revealed? (All of the remaining pieces that build on the number line are compared to the unit whole.)

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

- Bev is knitting a scarf for her mother. She knits 4/3 feet on Monday, 2/3 of a foot on Tuesday, and 1 2/3 feet on Wednesday. Bev thinks she has knitted 4 feet of her scarf. Is she correct? Explain how you know.

Instructional Stations (40 minutes)

Students will visit two stations today (20 minutes in each station). They will visit the other two tomorrow.

Station 1: Small Group Instruction

- Work with students on problems similar to the Problem of the Day. Use alternative number selections in the problem.
  - Wanda made cupcakes for her sister's birthday. Wanda mixed 1/3 (1/2, 1/4, 3/8) cup of chocolate icing and 4/3 (3/2, 5/8, 4/4) cup of white icing to put on each cupcake, how much icing did she make?
- Have students show the solution on a number line.
- Have students model the problem and explain how the model represents the problem.

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 Race to 2 or Five for Twenty-Five.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Students will finalize their game rules.
- Students who have completed their game can work on creating an advertisement for their game.
- What is the name of the game?
- What math does it teach?
- What do they want people to know about their game?

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Design Challenge (40 minutes)

- Have the students test their games on the other students, get feedback, and then see what additional improvements they need to do to improve their games.
- Divide the students into groups. Rotate the games that the students created through the groups. (There should be one person in each group who helped create the game.)
- Give students 10-15 minutes to play the game.
- When students are done playing the game, ask them to rate the game using the Game Tester Report. You may want to have some students share their thoughts.
- Rotate the games so the group will get a new game. Have students play that game, and then complete a feedback sheet.
- As students are playing games, monitor student game play, and use facilitation questions to help support their thinking about games and about math.
- Have students answer the Game Feedback Form on page 16 in their Design Challenge Station Booklet.

Whole Group Table Games (20 minutes)

During this time, you will introduce JiJi Sudoku. Students will play these games in the next module in Station 3.

- Introduce JiJi Sudoku using the simple picture game boards.
- Allow students to work together to solve the picture puzzles.
- If there's time, explain that Sudoku is usually played with numbers and share one or two of the additional numeric Sudoku puzzles.

Optional: ST Math Activity Page (15 minutes)

ST Math Activity Page

- Pull up the ST Math game, *JiJi Cycle Symbolic,* from earlier in this module.
- Play a few puzzles to help students understand the game.
- Have students turn to the ST Math Activity Page: *JiJi Cycle Symbolic*
- 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.

Instructional Stations (20 minutes)

Focused Instructional Time

- During this station time, students do not rotate. They can either be assigned to a station or allowed to choose which one to go to.
- This is an excellent opportunity to pull students who need additional support to Station 1: Small Group Instruction, where they can work with the teacher on concepts they are struggling with. Use the Teacher Planner to help target this time with students.

Station 1: Small Group Instruction

- Identify specific students for intervention or extension.
- Choose the ST Math puzzle or problem solving question that the students struggled with.
- You may choose to use the Teacher Planner to help you plan your instruction.

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. They can ask themselves the questions that are on the Problem Solving Process Poster.
- With 5 minutes left, have students stop playing and complete their Puzzle Reflection and Accomplishments Log.

Station 3: Table Games

- Allow students to choose one of the games they have learned.
- Have students play that game.
- Ask students to complete an Exit Ticket during the final 5 minutes.

Station 4: Design Challenge

- Have students continue to build their games.
- Once they have finished building their games, they will play the games and a group to test them out. Have students complete page 16 in the Design Challenge Station Booklet.
- After they test their games, students can make any changes to their games they see are needed. The goal is to have them done so other students can play their games on Day 5 to test them out.

Closing (10 minutes)

Thinking and Reflecting Time

- Have students complete the Post-Quiz (optional).
- Have students review their ST Math Puzzle Reflection, 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.