BRIDGES IN MATHEMATICS 4

GRADE 4 SUPPLEMENT

Set A9 Number & Operations: Adding & Subtracting Fractions

Includes

Skills & Concepts

★ Decompose a fraction into a sum of fractions with the same denominator in multiple ways

★ Use fraction models to represent the addition of fractions with like denominators and record each decomposition with an equation

★ Solve problems involving the addition of fractions with like denominators

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Bridges in Mathematics Grade 4 Supplement
Set A9 Number & Operations: Adding & Subtracting Fractions

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Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set A9 ★ Activity 1

ACTIVITY

Last Equation Wins!

Overview

The class works together to find multiple ways to decompose a visual fraction model into a sum of fractions with the same denominator. Then the class plays a game in which players take turns decomposing a given fraction into a sum of fractions with the same denominator, proving equations with sketches.

Skills & Concepts

- ★ decompose a fraction into a sum of fractions with the same denominator in multiple ways (CCSS 4.NF.3b)
- ★ use fraction models to represent the addition of fractions with like denominators and record each decomposition with an equation (CCSS 4.NF.3b)
- ★ solve problems involving the addition of fractions with like denominators (CCSS 4.NF.3d)

You'll Need

- ★ class set of tile and a set for demonstration
- ★ Use Student Math Journals or Grid Paper, page A9.6 (Run a double-sided class set, plus 1 copy for display)
- ★ pens or colored pencils for use at display
- ★ colored pencils for students
- ★ die numbered 1 to 6, two for each pair of students and two for demonstration

Note When you represent the symbolic form for a fraction, please use a horizontal bar.

Instructions for Last Equation Wins!

1. Distribute tile for each pair of students. On the overhead or document camera, write $\frac{4}{5}$, explaining that it's been a very busy lunch hour, and this fraction represents what remains of your sub sandwich. Ask students to each build a tile model that represents $\frac{4}{5}$, and explain their thinking to a partner. Ask a volunteer to share with the entire group.

> ***Tim*** *I put down 5 tile. Each one is worth $\frac{1}{5}$ of your sandwich. I used 4 blue to show the $\frac{4}{5}$ that's left and 1 red to show the $\frac{1}{5}$ that you already ate. You must still be hungry!*

Display a model with $\frac{4}{5}$ in one color, $\frac{1}{5}$ in another color. For clarity, consider using one consistent color as a placeholder for the portion of the sandwich that's been eaten.

> ***Teacher*** *For our work today, I'm going to use yellow to represent the missing part of my sub sandwich. So for $\frac{4}{5}$ of a sandwich, I'll show 4 in blue and 1 in yellow. Why do you think I want to show the part I've already eaten?*
>
> ***Laura*** *If you only used 4 pieces we wouldn't know what each one was worth.*
>
> ***Jon*** *With just 4 pieces it might be $\frac{4}{4}$ or one whole.*

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Activity 1 Last Equation Wins! (cont.)

Amy *The yellow piece is like the missing piece. We need to count all the pieces to figure out what the denominator is. Your sandwich was cut into five pieces.*

2. Tell students that you plan to cut up the leftover sandwich to eat in portions throughout the rest of the day. How many different combinations of leftover pieces are possible if the denominator stays the same? To show the combinations, ask students to work with a partner to make an equation representing the sum of the fractional pieces represented by $^4/_5$. Discuss as a class.

A likely response is $^1/_5 + {}^1/_5 + {}^1/_5 + {}^1/_5 = {}^4/_5$. If students don't bring it up, ask them to think of other equations that are modeled by the tile. Change the colors of the tile as needed to clearly show other sums. For example, $^2/_5$ might be shown in green and then each remaining $^1/_5$ will be shown in blue. The last $^1/_5$ in yellow.

Teacher *Work with a partner to create an addition equation to represent the $^4/_5$ shown in your model. What fractional pieces of my sandwich can you add together to make $^4/_5$? For our work today, the denominator in the equation will stay the same. And I'll keep the yellow piece to show what's been eaten.*

Angie *We said that you have 4 pieces of sandwich that are each worth $^1/_5$. $^1/_5 + {}^1/_5 + {}^1/_5 + {}^1/_5 = {}^4/_5$.*

Teacher *Many of you said that $^1/_5 + {}^1/_5 + {}^1/_5 + {}^1/_5 = {}^4/_5$. I could eat four little pieces during four breaks today. Are there other equations you could make?*

Suzie *Sure. You could say that $^1/_5 + {}^3/_5 = {}^4/_5$.*
I can model it with tile. Each tile is worth $^1/_5$. If 1 of the tile is red, that's $^1/_5$ of the sandwich. If 3 of the tile are blue, that's three $^1/_5$ths or $^3/_5$ of the sandwich. That makes 4 total tile that are each worth $^1/_5$. So $^1/_5 + {}^3/_5 = {}^4/_5$.

Jess *We used two reds and two greens to show $^2/_5 + {}^2/_5 = {}^4/_5$*

3. Using a new fraction, $^4/_6$, give students several moments, working in pairs, to record in their Student Math Journals or on the Grid Paper all the possible combinations of sums in which the denominator stays the same and the total remains $^4/_6$. Encourage students to build models with tile, then sketch their results on grid lines and record an equation that matches the model.

Model one sketch by tracing the perimeter of a 1 × 6 rectangular area. Draw the lines in between each box so that 6 boxes are clearly outlined. Cross out the last two boxes to show the $^2/_6$ that are not included. Then use two or more colors to define the areas being added.

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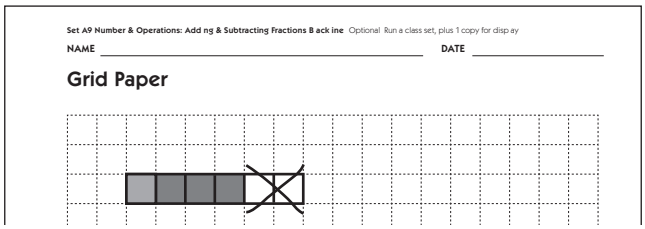
Activity 1 Last Equation Wins! (cont.)

Teacher *Since the denominator is 6, I'll begin by outlining a rectangle with an area of 6. Since I only have $^4/_6$ of a sandwich, I'll put x's through the last two boxes to show that they've been eaten. Then I'll color the 4 boxes to represent my addition equation. I'll make one box red and the other 3 blue. $^1/_6 + {}^3/_6 = {}^4/_6$. What other equations could we make?*


Set A9 Number & Operations: Add ng & Subtracting Fractions B ack ine Optional Run a class set, plus 1 copy for disp ay

NAME _____ DATE _____

Grid Paper

4. As a class, compile a list of all the addition equations that students have made. Ask each volunteer pair to write the equation that matches the visual model at the display, and show a sketch from their Student Math Journals or Grid Paper to prove the answer.

Students *We said $^4/_6 = {}^1/_6 + {}^1/_6 + {}^2/_6$. We colored 1 square red, 1 square blue, and 2 squares green. Each tile is worth $^1/_6$.*

5. Now introduce a game called "Last Equation Wins!" in which you and the class take turns decomposing a given fraction into a sum of fractions with the same denominator. Each answer must be proven with a sketch. Play continues until no additional equations can be made. The team with the final equation wins. In each round, players alternate who goes first.

Note *Equations with the same addends but in a different order are considered the same because of the communicative property.*

Begin by rolling 2 die. Use the smaller number as the numerator, the larger as the denominator. Write the fraction on the board. Draw a t-chart on a blank page of Student Math Journal or Grid Paper. Label the columns and sketch the outline of the total fraction in the teacher column.

Teacher *I rolled a 6 and a 3, so I'm going to make the fraction $^3/_6$. I'll sketch an area with 6 boxes and cross out 3 of them since I only have $^3/_6$. I will use colored pencils in the 3 boxes that remain to represent my fraction. I go first, so I'll create the first equation. For this one, I'll use 3 colors. $^1/_6 + {}^1/_6 + {}^1/_6 = {}^3/_6$*

Teacher *Now it's your turn. Work with your partner to create another sum of fractions with the same denominator that equal $^3/_6$. Draw it in your journals. Who would like to share?*

Jessie *We have one. We needed 2 colors. $^1/_6 + {}^2/_6 = {}^3/_6$*

Teacher *Now it's my turn. Let's see. I already split it into fractions with a numerator of 1. And then you made $^1/_6 + {}^2/_6 = {}^3/_6$. Hmm. Are there any more options?*

Travis *Nope. We got the last one. Last equation wins!*

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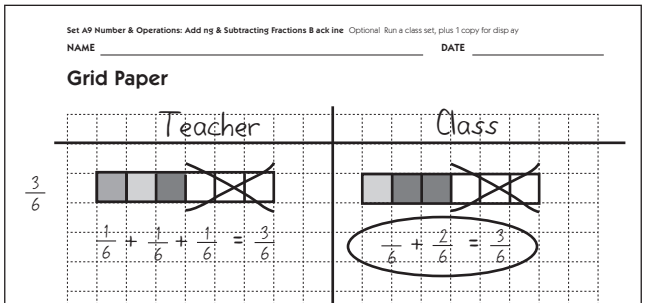
Activity 1 Last Equation Wins! (cont.)



Additional Example: Fraction = $^5/_6$

Students $^1/_6 + {}^1/_6 + {}^1/_6 + {}^1/_6 + {}^1/_6 = {}^5/_6$

Teacher $^1/_6 + {}^1/_6 + {}^1/_6 + {}^2/_6 = {}^5/_6$

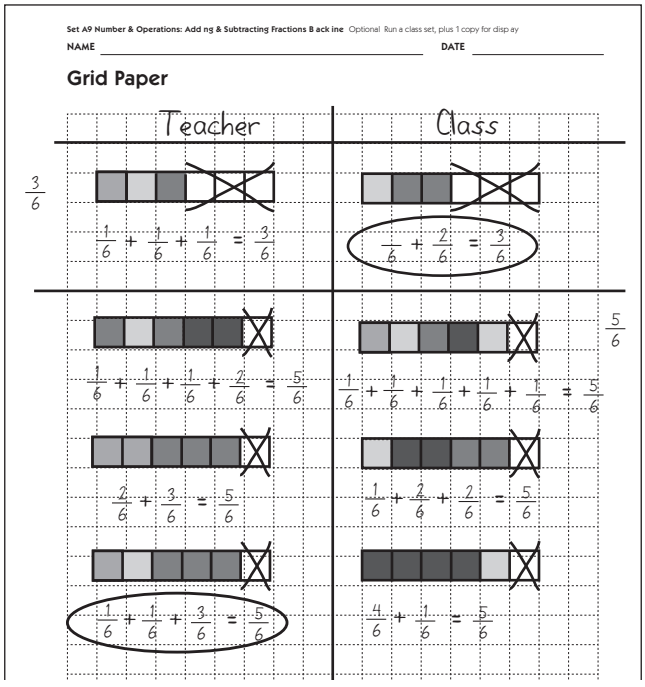
Student $^1/_6 + {}^2/_6 + {}^2/_6 = {}^5/_6$

Teacher $^2/_6 + {}^3/_6 = {}^5/_6$

Student $^4/_6 + {}^1/_6 = {}^5/_6$

Teacher $^1/_6 + {}^1/_6 + {}^3/_6 = {}^5/_6$

Students *We can't find any more. Teacher gets the point.*



One point is scored for each round. Play continues until one team reaches 3 points.

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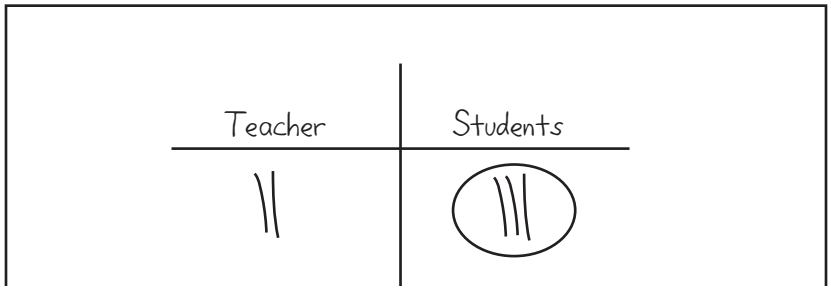
Activity 1 Last Equation Wins! (cont.)



Note *Students will likely notice that if they go first and get a fraction with a "1" in the numerator, they automatically win that round. Likewise, if a "2" is rolled in the numerator, the player who goes first will automatically lose. Do they have other observations? How will an odd or even numerator affect the game? Will an odd number always result in a win for the first player?*

6. After one round with the entire class, students pair up to play one another, building models with tile or sketches and recording addition equations in their Student Math Journals or on Grid Paper.

CHALLENGE

If students want an additional challenge, use mixed numbers or improper fractions. Roll 3 dice and arrange the numbers to form a mixed number (1, 3, 6 become $3\ 1/6$ or any other arrangement of those three numbers) or roll 2 dice, using the larger number as the numerator. A roll of 5 and 3, for example, would become $5/3$.

INDEPENDENT WORKSHEET

See Adding and Subtracting Fractions on pages A9.15–A9.17 for more practice.

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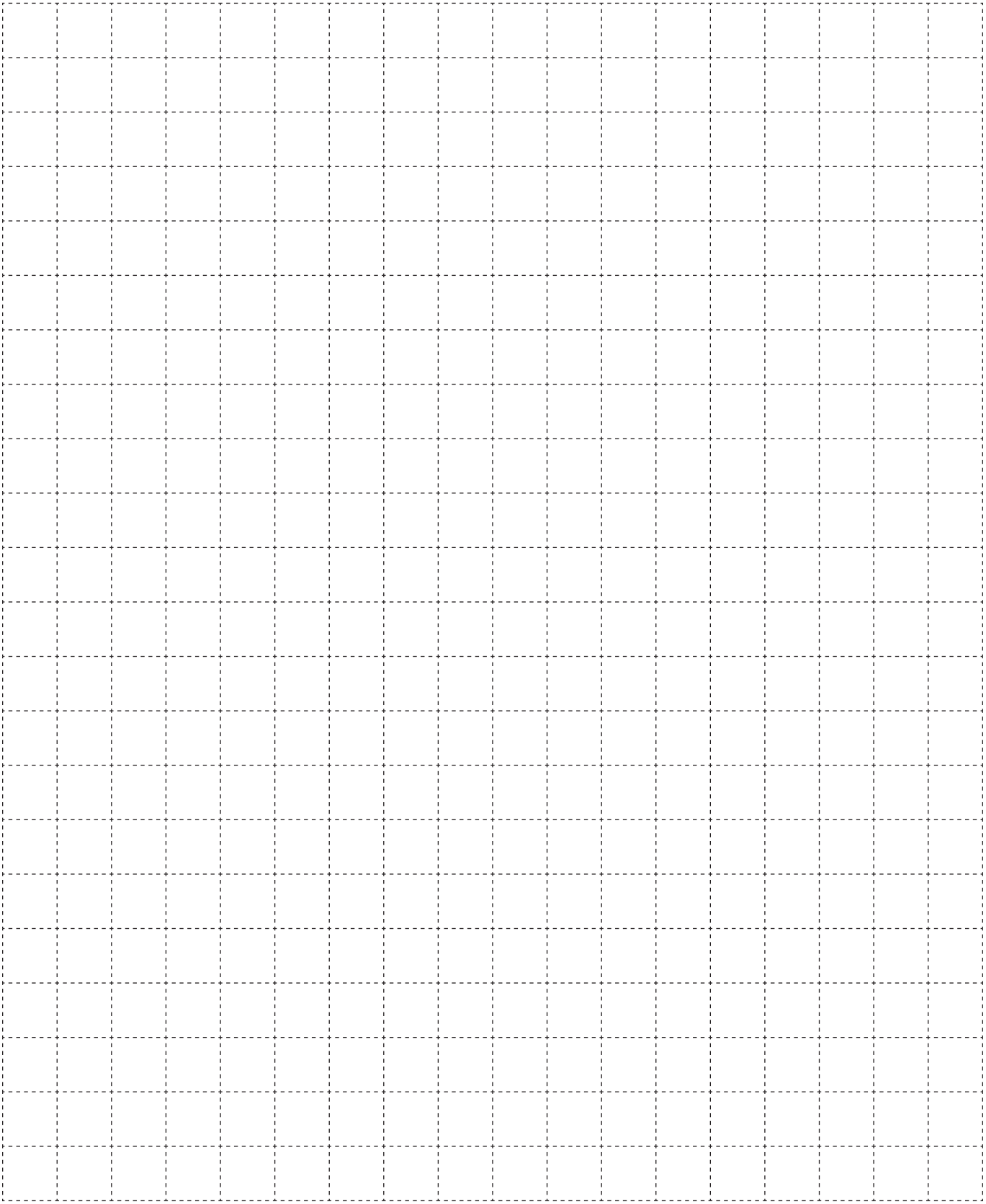
Grid Paper



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Set A9 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

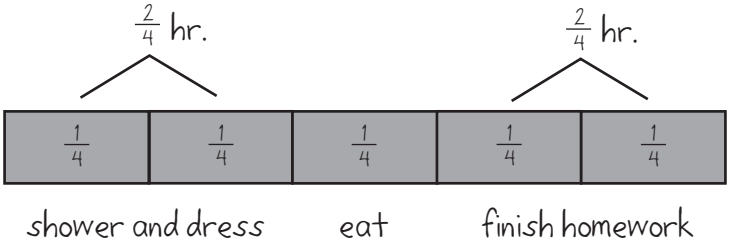
Fractions through the School Day

Make a labeled sketch to solve each of the problems below. Use words to explain your answer, and write an equation to match. Use your fraction kit to help if you want.

Note: If the answer turns out to be an improper fraction, change it to a mixed number.

ex Sam and Ali are friends. They're both in Mrs. Hill's fourth grade class. When Sam gets up on school days, it takes him $\frac{2}{4}$ of an hour to take a shower and get dressed, $\frac{1}{4}$ to eat breakfast, and $\frac{2}{4}$ of an hour to finish his homework. How long does it take Sam to get ready for school?

a Labeled Sketch



b Explanation (in words)

2 fourths plus 1 fourth plus 2 more fourths is 5 fourths in all. There are 4 fourths in an hour, so it takes him 1 and $\frac{1}{4}$ hours to get ready for school.

c Equation

$\frac{2}{4} + \frac{1}{4} + \frac{2}{4} = \frac{5}{4}$ $\frac{5}{4} = 1\frac{1}{4}$ hour

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Independent Worksheet 1 Fractions through the School Day (cont.)

1 Ali fixed eggs for her family this morning. She had $\frac{5}{6}$ of a carton when she started, and $\frac{2}{6}$ of a carton left when she finished. What fraction of the carton did Ali use?

a Labeled Sketch

b Explanation (in words)

c Equation

2 Sam and Ali's class had P.E. first thing this morning P.E. lasts $\frac{4}{8}$ of an hour. They spent $\frac{1}{8}$ of an hour running laps. What fraction of an hour did they have left after that?

a Labeled Sketch

b Explanation (in words)

c Equation

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Independent Worksheet 1 Fractions through the School Day (cont.)

3 Ali had $\frac{5}{6}$ of a granola bar in her lunchbox. She ate $\frac{3}{6}$ of the bar at recess. What fraction of the bar did she have left for lunch?

a Labeled Sketch

b Explanation (in words)

c Equation

4 Sam and Ali had a math test after recess. Mrs. Hill said, "You have $\frac{8}{12}$ of an hour to complete the test." After $\frac{6}{12}$ of an hour, Sam only had 1 page left to go. What fraction of an hour did he have left to finish the last page?

a Labeled Sketch

b Explanation (in words)

c Equation

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Independent Worksheet 1 Fractions through the School Day (cont.)

5 The 4th graders at Sam and Ali's school take turns picking up trash on the playground after lunch each day. The chart below shows how many pounds of trash each class has picked up so far this week. How many pounds have they collected in all?

Fifth Grade Class	Pounds of trash
Mrs. Hill's Class	$2\frac{1}{6}$ pounds
Mr. Wong's Class	$1\frac{2}{6}$ pounds
Mrs. Tejada's Class	$1\frac{4}{6}$ pounds

a Labeled Sketch

b Explanation (in words)

c Equation

6 The 4th graders are painting a mural about recycling on one of the walls by the playground. So far, they've used $1\frac{2}{8}$ gallons of red paint, $2\frac{5}{8}$ gallons of yellow paint, and $2\frac{3}{8}$ gallon of green paint. How many gallons of paint have they used in all?

a Labeled Sketch

b Explanation (in words)

c Equation

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Set A9 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

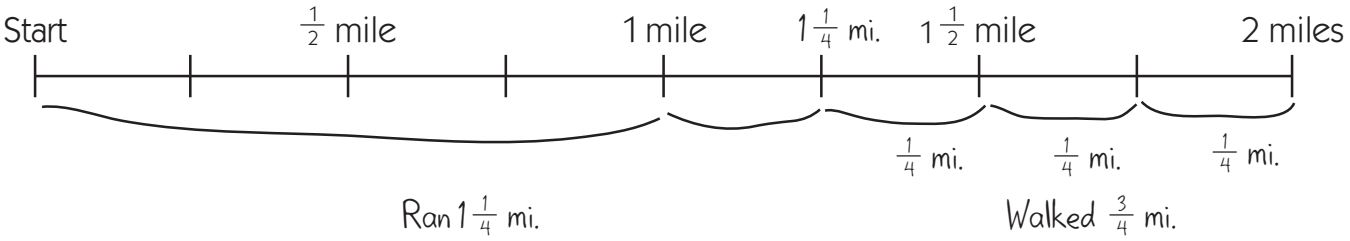
Fractions on the Trail

There is a 2-mile hiking trail behind Kennedy School. Make a labeled sketch to solve each of the problems below. Add more marks and fractions to the line if you need to. Use words to explain your answer, and write an equation to match.

Note: If the answer turns out to be an improper fraction change it to a mixed number.

ex Marissa and her mom ran the first $1\frac{1}{4}$ miles of the trail. They got tired, so they walked the rest of the way. How far did they walk?

a Labeled Sketch



b Explanation (in words)

They walked $\frac{3}{4}$ of a mile because 2 – 1 leaves 1 mile, and then they ran another $\frac{1}{4}$ of a mile. That left $\frac{3}{4}$ of mile to go.

c Equation

$2 - 1\frac{1}{4} = \frac{3}{4}$ mile

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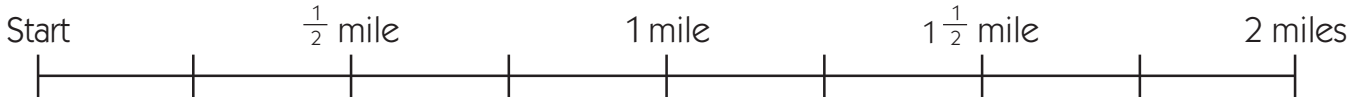
Independent Worksheet 2 Fractions on the Trail (cont.)

1 Tonio took his little brother for a walk on the trail. They walked $\frac{3}{4}$ of a mile Then they turned around and went back to the start. How many miles did they walk in all?

a Labeled Sketch

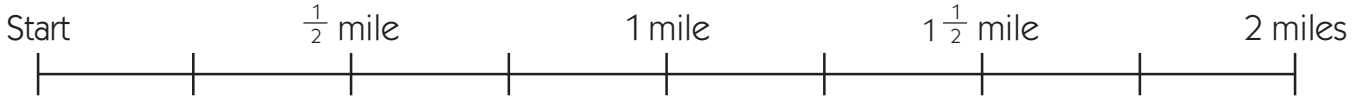


b Explanation (in words)

c Equation

2 Troy and Eric decided to run the whole 2 miles. Eric twisted his ankle after they'd gone $1\frac{1}{8}$ of a mile. They decided to walk the rest of the way and call Eric's dad to come get them. How many eighths of a mile did they have to walk to get to the end of the trail?

a Labeled Sketch



b Explanation (in words)

c Equation

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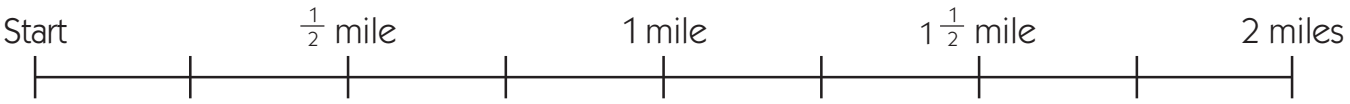
Independent Worksheet 2 Fractions on the Trail (cont.)

3 Kendra and her grandma walked $1\frac{3}{8}$ of a mile down the trail. Then they turned around and walked back to the start. How many miles did they walk in all?

a Labeled Sketch

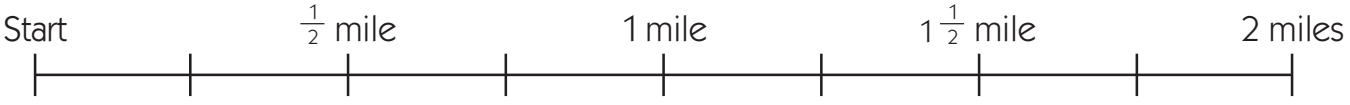


b Explanation (in words)

c Equation

4 Carter was walking down the trail. When he got to the $\frac{3}{4}$ mile marker, he realized that his glasses had slipped out of his pocket. He turned around and started to go back. He found his glasses right beside the $\frac{2}{4}$ mile marker. Then he turned around and walked to the end of the trail to meet his friend. How many miles did he walk in all?

a Labeled Sketch



b Explanation (in words)

c Equation

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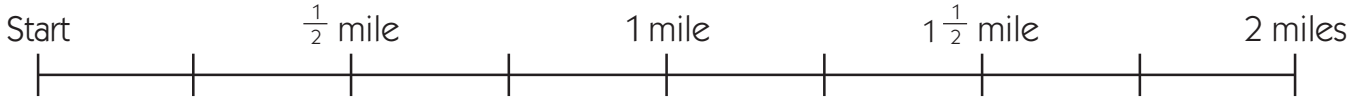
Independent Worksheet 2 Fractions on the Trail (cont.)

5 Everyday, Mrs. Goodman starts at the beginning of the trail and walks $1\frac{1}{4}$ miles. Then she turns around and walks back to the start. How many miles does she walk in 1 week (7 days)?

a Labeled Sketch



b Explanation (in words)

c Equation

CHALLENGE

6 Make up your own story problem about the hiking trail. Then give it to a classmate to solve. Be sure to check it first to make sure it works.

a My problem:

b Labeled Sketch

c Explanation (in words)

d Equation

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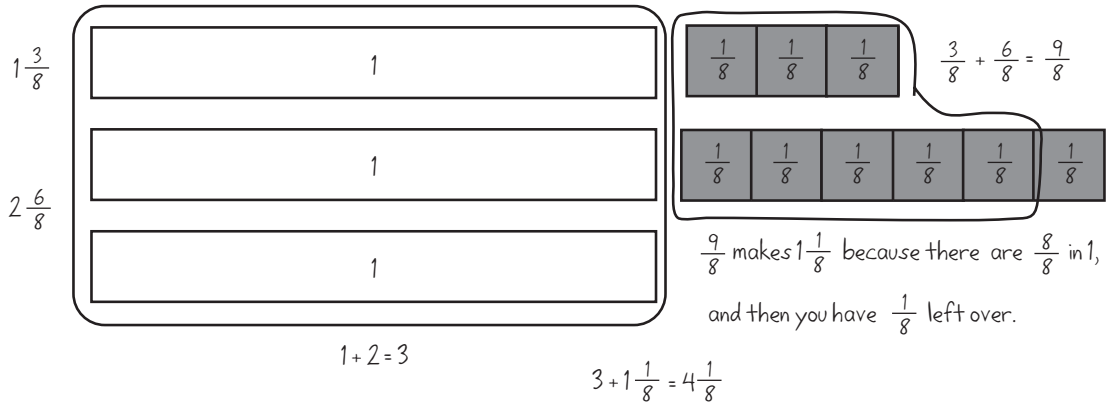
Set A9 ★ Independent Worksheet 3

INDEPENDENT WORKSHEET

Adding & Subtracting Fractions

Use numbers, words, and labeled sketches to solve each of the problems below. Show all of your work. Use your fraction kit to help if you want.

Note: If the answer turns out to be an improper fraction, change it to a mixed number.

Problem	Explanation
ex $1\frac{3}{8} + 2\frac{6}{8} = 4\frac{1}{8}$	
1 $\frac{5}{6} + \frac{3}{6} =$	

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Independent Worksheet 3 Adding & Subtracting Fractions (cont.)

Problem	Explanation
2 $\frac{7}{8} + \frac{4}{8} =$	
3 $2\frac{3}{4} + 3\frac{3}{4} =$	
4 $1\frac{7}{8} - \frac{5}{8} =$	

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Independent Worksheet 3 Adding & Subtracting Fractions (cont.)

Problem	Explanation
5 $3\frac{5}{6}$ $+\ 2\frac{3}{6}$	
6 $3\frac{4}{8}$ $-\ 2\frac{2}{8}$	

CHALLENGE

7 $4\frac{2}{6}$ $-\ 2\frac{5}{6}$	

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