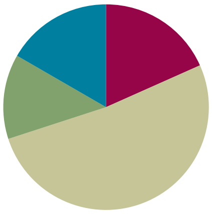
Lesson 1

Objective: Measure and compare pencil lengths to the nearest $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of an inch, and analyze the data through line plots.

Suggested Lesson Structure

🟥	Fluency Practice	(11 minutes)
🟩	Application Problem	(8 minutes)
🟨	Concept Development	(31 minutes)
🟦	Student Debrief	(10 minutes)
	Total Time	**(60 minutes)**



Fluency Practice (11 minutes)

- Compare Fractions **4.NF.2** (4 minutes)
- Decompose Fractions **4.NF.3** (4 minutes)
- Equivalent Fractions **4.NF.1** (3 minutes)

Compare Fractions (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity review prepares students for this lesson's Concept Development.

T: (Project a tape diagram labeled as one whole and partitioned into 2 equal parts. Shade 1 of the parts.) Say the fraction.

S: 1 half.

T: (Write $\frac{1}{2}$ to the right of the tape diagram. Directly below the tape diagram, project another tape diagram partitioned into 4 equal parts. Shade 1 of the parts.) Say this fraction.

S: 1 fourth.

T: (Write $\frac{1}{2}$ ______ $\frac{1}{4}$ to the right of the tape diagrams.) On your personal white board, use the greater than, less than, or equal sign to compare.

S: (Write $\frac{1}{2} > \frac{1}{4}$.)

Continue with the following possible suggestions: $\frac{1}{2}$ ___ $\frac{1}{8}$, $\frac{1}{8}$ ___ $\frac{1}{4}$, $\frac{1}{2}$ ___ $\frac{1}{4}$, $\frac{1}{3}$ ___ $\frac{1}{4}$, $\frac{2}{4}$ ___ $\frac{3}{6}$, $\frac{3}{4}$ ___ $\frac{3}{8}$, $\frac{2}{5}$ ___ $\frac{2}{3}$, $\frac{3}{10}$ ___ $\frac{3}{8}$, and $\frac{2}{3}$ ___ $\frac{6}{9}$.

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Decompose Fractions (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity review prepares students for this lesson's Concept Development.

T: (Write a number bond with $\frac{2}{3}$ as the whole and $\frac{1}{3}$ as the part.) Say the whole.

S: 2 thirds.

T: Say the given part.

S: 1 third.

T: On your personal white board, write the number bond. Fill in the missing part.

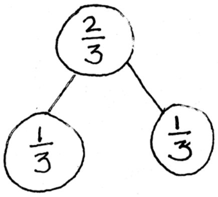
S: (Write $\frac{1}{3}$ as the missing part.)

T: Write an addition sentence to match the number bond.

S: $\frac{1}{3}+\frac{1}{3}=\frac{2}{3}$.

T: Write a multiplication sentence to match the number bond.

S: $2 \times \frac{1}{3}=\frac{2}{3}$.



$\frac{1}{3}+\frac{1}{3}=\frac{2}{3}$

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

Continue with the following possible suggestions: $\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$, $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$, and $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{3}{8}$.

Equivalent Fractions (3 minutes)

T: (Write $\frac{1}{2}$.)

T: Say the fraction.

S: 1 half.

T: (Write $\frac{1}{2}=\frac{}{4}$.)

T: 1 half is equal to how many fourths?

S: 2 fourths.

Continue with the following possible sequence: $\frac{1}{2}=\frac{}{6}$, $\frac{1}{3}=\frac{}{6}$, $\frac{2}{3}=\frac{}{12}$, $\frac{3}{4}=\frac{}{16}$, and $\frac{3}{5}=\frac{}{25}$.

T: (Write $\frac{1}{2}$.)

T: Say the fraction.

S: 1 half.

T: (Write $\frac{1}{2}=\frac{2}{}$.)

T: 1 half, or 1 part of 2, is the same as 2 parts of what unit?

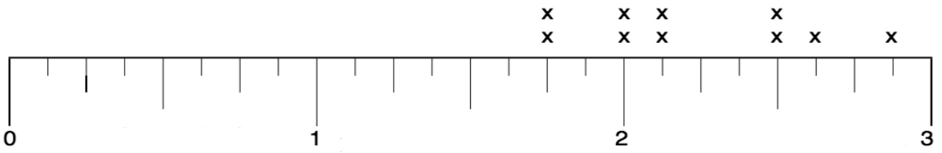
S: Fourths.

Continue with the following possible sequence: $\frac{1}{2}=\frac{2}{}$, $\frac{1}{5}=\frac{2}{}$, $\frac{2}{5}=\frac{8}{}$, $\frac{3}{4}=\frac{9}{}$, and $\frac{4}{5}=\frac{16}{}$.

Application Problem (8 minutes)

The following line plot shows the growth, in inches, of 10 bean plants during their second week after sprouting:

Bean Growth in Inches During Week Two



a) $1\frac{3}{4}$ in.

b) 2 plants

c) $2\frac{7}{8}$ in.

d) $2\frac{7}{8} - 1\frac{3}{4}$

$= 1\frac{7}{8} - \frac{3}{4}$

$= 1\frac{7}{8} - \frac{6}{8}$

$= 1\frac{1}{8}$ in.

a. What is the measurement of the shortest plant?

b. How many plants measure $2\frac{1}{2}$ inches?

c. What is the measurement of the tallest plant?

d. What is the difference between the longest and shortest measurements?

Note: This Application Problem provides an opportunity for a quick, formative assessment of students' ability to read a customary ruler and simple line plot. Because today's lesson is time intensive, the analysis of this plot data is simple.

Concept Development (31 minutes)

Materials: (S) Inch ruler, Problem Set, $8\frac{1}{2}$" × 1" strip of paper (with straight edges) per student

Note: Before beginning the lesson, draw three number lines, one beneath the other, on the board. The lines should be marked 0–8 with increments of halves, fourths, and eighths, respectively. Leave plenty of room to position the three line plots directly beneath each other. Students compare these line plots later during the lesson.

T: Cut the strip of paper so that it is the same length as your pencil.

S: (Measure and cut.)

T: Estimate the length of your pencil strip to the nearest inch, and record your estimate on the first line in your Problem Set.

T: If I ask you to measure your pencil strip to the nearest half inch, what do I mean?

S: I should measure my pencil and see which half-inch or whole-inch mark is closest to the length of my strip. → When I look at the ruler, I have to pay attention to the marks that split the inches into 2 equal parts and then look for the one that is closest to the length of my strip. → I know that I will give a measurement that is either a whole number or a measurement with a half in it.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Use colored paper for the pencil measurements to help students see where their pencil paper aligns on the rulers.

Discuss with students what they should do if their pencil strips are between two marks (e.g., 6 and $6\frac{1}{2}$). Remind students to round up any measurement that is more than halfway.

T: Use your ruler to measure your strip to the nearest half inch. Record your measurement by placing an X on the picture of the ruler in Problem 2 on your Problem Set.

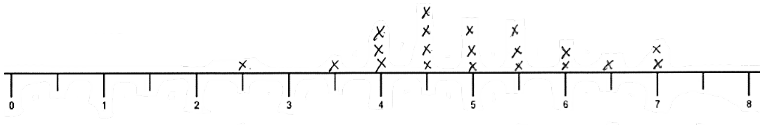
T: Was the measurement to the nearest half inch accurate? Let's find out. Raise your hand if your actual length was on or very close to one of the half-inch markings on your ruler.

S: (Raise hands.)

T: It seems that most of us had to round our measurement to mark it on the sheet. Let's record everyone's measurements on a line plot. As each person calls out his measurement, I'll record the measurements on the board as you record the measurements on your Problem Set. (Poll the students.)

A typical class line plot might look similar to the following:

Class Pencil Lengths (Nearest Half Inch)



T: Which pencil measurement is the most common, or frequent, in our class? Turn and talk.

Answers will vary by class. In the plot above, $4\frac{1}{2}$ inches is most frequent.

MP.5

T: Are all of the pencils used for these measurements *exactly* the same length? (Point to the X's above the most frequent data point: $4\frac{1}{2}$ inches on the exemplar line plot.) Are they exactly $4\frac{1}{2}$ inches long?

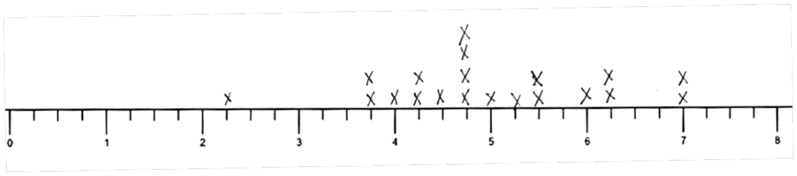
S: No. These measurements are to the nearest half inch. → The pencils are different sizes. We had to round the measurement of some of them. → My partner and I had pencils that were different lengths, but they were close to the same mark. We had to put our marks on the same place on the sheet even though they weren't really the same length.

T: Now, let's measure our strips to the nearest quarter inch. How is measuring to the quarter inch different from measuring to the half inch? Turn and talk.

S: The whole is divided into 4 equal parts instead of just 2 equal parts. → Quarter inches are smaller than half inches. → Measuring to the nearest quarter inch gives us more choices about where to put our X's on the ruler.

Follow the same sequence of measuring and recording the strips to the nearest quarter inch. The line plot might look similar to the following:

Class Pencil Lengths (Nearest Quarter Inch)



T: Which pencil measurement is the most frequent this time?

Answers will vary by class. The most frequent above is $4\frac{3}{4}$ inches.

T: If the length of our strips didn't change, why is the most frequent measurement different this time? Turn and talk.

S: The unit on the ruler we used to measure and record was different. → The smaller units made it possible for me to get closer to the real length of my strip. → I rounded to the nearest quarter inch, so I had to move my X to a different mark on the ruler. Other people probably had to do the same thing.

T: Yes, the ruler with smaller units (every quarter inch instead of every half inch) allowed us to be more precise with our measurement. This ruler (point to the $\frac{1}{4}$-inch plot on the board) has more fractional units in a given length, which allows for a more precise measurement. It's a bit like when we round a number by hundreds or tens. Which rounded number will be closer to the actual number? Why? Turn and talk.

S: When we round to the tens place, we can be closer to the actual number because we are using smaller units.

T: That's exactly what's happening here when we measure to the nearest quarter inch versus the nearest half inch. How did your measurements change or not change?

S: My first was 4 inches, but my second was closer to 4 and a quarter inches. → My first measurement was 4 and a half inches. My second was 4 and 2 quarter inches, but that's the same as 4 and a half inches. → When I measured with the half-inch ruler, my first was closer to 4 inches than 3 and a half inches, but when I measured with the fourth-inch ruler, it was closer to 3 and 3 quarter inches. This was because it was a little closer to 3 and 3 quarter inches than 4 inches.

T: Our next task is to measure our strips to the nearest eighth of an inch and record our data in a third line plot. Look at the first two line plots. What do you think the shape of the third line plot will look like? Turn and talk.

S: The line plot will be flatter than the first two. → There are more choices for our measurements on the ruler, so I think that there will be more places where there will only be one X compared to the other line plots. → The eighth-inch ruler will show the differences between pencil lengths more than the half-inch or fourth-inch rulers.

Follow a similar sequence for measuring and recording this line plot.

T: Let's find out how accurate our measurements are. Raise your hand if your actual strip length was on or very close to one of the eighth-inch markings on the ruler. (It is likely that many more students raise their hands than before.)

S: (Raise hands.)

T: Work with your partner to answer Problem 5 on your Problem Set.

Recording the line plots on the board for later analysis with the class is highly recommended.

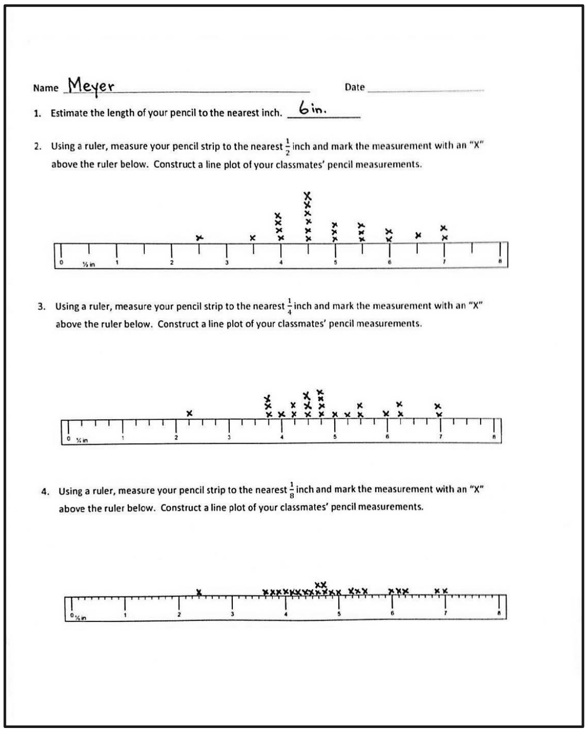
NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Write math vocabulary words on sentence strips, and display as they are used in context (e.g., *precise, accurate*).

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. Some problems do not specify a method for solving. This is an intentional reduction of scaffolding that invokes MP.5, Use Appropriate Tools Strategically. Students should solve these problems using the RDW approach used for Application Problems.

For some classes, it may be appropriate to modify the assignment by specifying which problems students should work on first. With this option, let the purposeful sequencing of the Problem Set guide your selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Consider assigning incomplete problems for homework or at another time during the day.



Name Meyer Date

1. Estimate the length of your pencil to the nearest inch. 6 in.

2. Using a ruler, measure your pencil strip to the nearest $\frac{1}{2}$ inch and mark the measurement with an "X" above the ruler below. Construct a line plot of your classmates' pencil measurements.

3. Using a ruler, measure your pencil strip to the nearest $\frac{1}{4}$ inch and mark the measurement with an "X" above the ruler below. Construct a line plot of your classmates' pencil measurements.

4. Using a ruler, measure your pencil strip to the nearest $\frac{1}{8}$ inch and mark the measurement with an "X" above the ruler below. Construct a line plot of your classmates' pencil measurements.

Student Debrief (10 minutes)

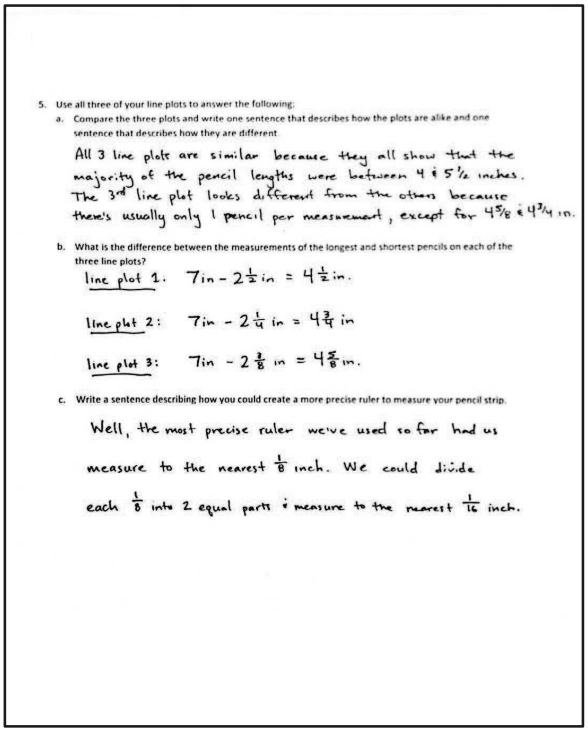
Lesson Objective: Measure and compare pencil lengths to the nearest $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of an inch, and analyze the data through line plots.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion. However, it is recommended that the first bullet be a focus for this lesson's discussion.

- How many of you had a pencil length that didn't fall directly on an inch, a half-inch, a quarter-inch, or an eighth-inch marking?
  - If you wanted a more precise measurement of your pencil's length, what could you do? (Guide students to see that they could choose smaller fractional units.)



5. Use all three of your line plots to answer the following:
   a. Compare the three plots and write one sentence that describes how the plots are alike and one sentence that describes how they are different.

      All 3 line plots are similar because they all show that the majority of the pencil lengths were between 4 & $5\frac{1}{2}$ inches. The 3rd line plot looks different from the others because there's usually only 1 pencil per measurement, except for $4\frac{5}{8}$ & $4\frac{3}{4}$ in.

   b. What is the difference between the measurements of the longest and shortest pencils on each of the three line plots?

      line plot 1: $7\text{in} - 2\frac{1}{2}\text{in} = 4\frac{1}{2}\text{in}.$

      line plot 2: $7\text{in} - 2\frac{1}{4}\text{ in} = 4\frac{3}{4}\text{ in}$

      line plot 3: $7\text{in} - 2\frac{3}{8}\text{ in} = 4\frac{5}{8}\text{in}.$

   c. Write a sentence describing how you could create a more precise ruler to measure your pencil strip.

      Well, the most precise ruler we've used so far had us measure to the nearest $\frac{1}{8}$ inch. We could divide each $\frac{1}{8}$ into 2 equal parts & measure to the nearest $\frac{1}{16}$ inch.

  - When someone tells you, “My pencil is 5 and 3 quarters inches long,” is it reasonable to assume that her pencil is *exactly* that long? (Guide students to see that, in practice, all measurements are approximations, even when assuming they are exact for the sake of calculation.)
- How does the most frequent pencil length change with each line plot? How does the number of each pencil length for each data point change with each line plot? Which line plot had the most repeated lengths? Which had the fewest repeated lengths?
- What is the effect of changing the precision of the ruler? What happens when you split the wholes on the ruler into smaller and smaller units?
- If you only know the data from the second line plot, can you reconstruct the first line plot? (No. An X at $3\frac{3}{4}$ inches on the second line plot could represent a pencil as short as $3\frac{1}{2}$ inches or as long as 4 inches on the first line plot. However, if an X is on a half-inch mark—3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, etc.,—on the second line plot, then we know that it is at the same half-inch mark on the first line plot.)
- Can the first line plot be completely reconstructed knowing only the data from the third line plot? (Generally, no. However, more of the first line plot can be reconstructed from the third line plot rather than the second line plot.)
- The following can accommodate high-performing students: Which points on the third line plot can be used, and which ones cannot be used to reconstruct the first line plot?
- Which line plot contains the most accurate measurements? Why? Why are smaller units generally more accurate?
- Are smaller units always the better choice when measuring? (Guide students to see that different applications require varying degrees of accuracy. Smaller units allow for greater accuracy, but greater accuracy is not always required.)

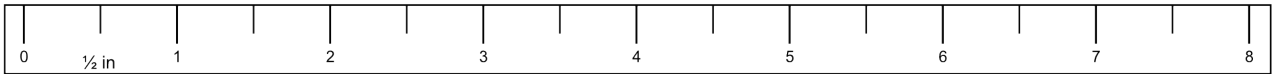
Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students’ understanding of the concepts that were presented in today’s lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

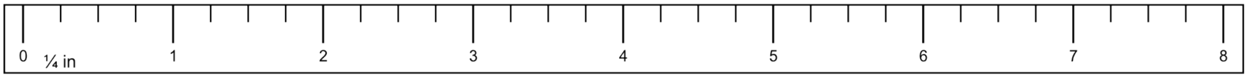
Name ____ Date ______________________

1. Estimate the length of your pencil to the nearest inch. ______________

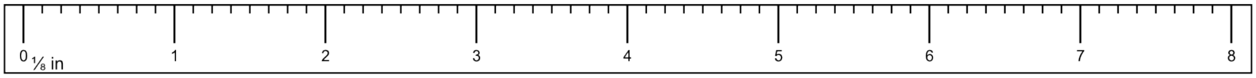
2. Using a ruler, measure your pencil strip to the nearest $\frac{1}{2}$ inch, and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.



3. Using a ruler, measure your pencil strip to the nearest $\frac{1}{4}$ inch, and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.



4. Using a ruler, measure your pencil strip to the nearest $\frac{1}{8}$ inch, and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.



5. Use all three of your line plots to complete the following:
   a. Compare the three plots, and write one sentence that describes how the plots are alike and one sentence that describes how they are different.

   b. What is the difference between the measurements of the longest and shortest pencils on each of the three line plots?

   c. Write a sentence describing how you could create a more precise ruler to measure your pencil strip.

Name ______________________________ Date ________________

1. Draw a line plot for the following data measured in inches:

   $1\frac{1}{2}, 2\frac{3}{4}, 3, 2\frac{3}{4}, 2\frac{1}{2}, 2\frac{3}{4}, 3\frac{3}{4}, 3, 3\frac{1}{2}, 2\frac{1}{2}, 3\frac{1}{2}$

2. Explain how you decided to divide your wholes into fractional parts and how you decided where your number scale should begin and end.

Name ____ Date ______________________

A meteorologist set up rain gauges at various locations around a city and recorded the rainfall amounts in the table below. Use the data in the table to create a line plot using $\frac{1}{8}$ inches.

a. Which location received the most rainfall?

b. Which location received the least rainfall?

c. Which rainfall measurement was the most frequent?

d. What is the total rainfall in inches?

Location	Rainfall Amount (inches)
1	$\frac{1}{8}$
2	$\frac{3}{8}$
3	$\frac{3}{4}$
4	$\frac{3}{4}$
5	$\frac{1}{4}$
6	$1\frac{1}{4}$
7	$\frac{1}{8}$
8	$\frac{1}{4}$
9	1
10	$\frac{1}{8}$

Topic B

Fractions as Division

5.NF.3

Focus Standard:	5.NF.3	Interpret a fraction as division of the numerator by the denominator (*a/b = a ÷ b*). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
Instructional Days:	4	
Coherence -Links from:	G4–M5	Fraction Equivalence, Ordering, and Operations
	G4–M6	Decimal Fractions
-Links to:	G6–M2	Arithmetic Operations Including Division of Fractions

Topic B focuses on interpreting fractions as division. Equal sharing with area models (both concrete and pictorial) provides students with an opportunity to understand the division of whole numbers with answers in the form of fractions or mixed numbers (e.g., seven brownies shared by three girls, three pizzas shared by four people). Discussion also includes an interpretation of remainders as a fraction (**5.NF.3**). Tape diagrams provide a linear model of these problems. Moreover, students see that, by renaming larger units in terms of smaller units, division resulting in a fraction is similar to whole number division.

Topic B continues as students solve real-world problems (**5.NF.3**) and generate story contexts for visual models. The topic concludes with students making connections between models and equations while reasoning about their results (e.g., between what two whole numbers does the answer lie?).

A Teaching Sequence Toward Mastery of Fractions as Division

Objective 1: Interpret a fraction as division.
(Lessons 2–3)

Objective 2: Use tape diagrams to model fractions as division.
(Lesson 4)

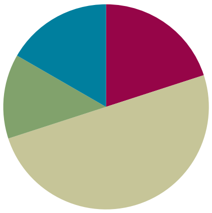
Objective 3: Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.
(Lesson 5)

Lesson 2

Objective: Interpret a fraction as division.

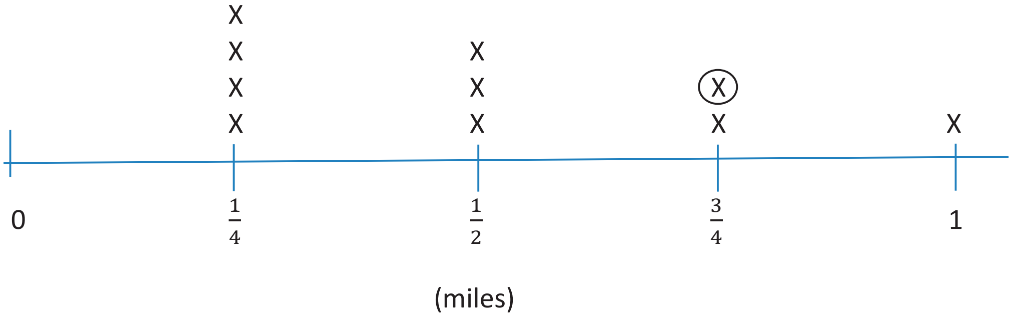
Suggested Lesson Structure

🟩 Application Problem	(8 minutes)
🟥 Fluency Practice	(12 minutes)
🟨 Concept Development	(30 minutes)
🟦 Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Application Problem (8 minutes)

The line plot shows the number of miles run by Noland in his PE class last month, which is rounded to the nearest quarter mile.



a. If Noland ran once a day, how many days did he run?

b. How many miles did Noland run altogether last month?

c. Look at the circled data point. The actual distance Noland ran that day was at least ____ mile and less than ____ mile.

Note: This Application Problem reinforces the work of the previous lesson. Part (c) provides an extension for early finishers.

a. He ran for 10 days.

c. The actual distance Noland ran that day was at least $\frac{3}{4}$ mile and less than 1 mile.

b. $(4 \times \frac{1}{4}) + (3 \times \frac{1}{2}) + (2 \times \frac{3}{4}) + 1$

$= \frac{4}{4} + \frac{3}{2} + \frac{6}{4} + 1$

$= 1 + 1\frac{1}{2} + 1\frac{1}{2} + 1$

$= 5$

Noland ran 5 miles altogether.

Fluency Practice (12 minutes)

- Factors of 100 **4.NF.5** (2 minutes)
- Compare Fractions **4.NF.2** (4 minutes)
- Decompose Fractions **4.NF.3** (3 minutes)
- Divide with Remainders **5.NF.3** (3 minutes)

Factors of 100 (2 minutes)

Note: This fluency activity prepares students for fractions with denominators of 4, 20, 25, and 50 in Topic G.

T: (Write 50 × ____ = 100.) Say the equation, filling in the missing factor.

S: 50 × 2 = 100.

Continue with the following possible sequence: 25 × ____ = 100, 4 × ____ = 100, 20 × ____ = 100, and 50 × ____ = 100.

T: I'm going to say a factor of 100. You say the other factor that will make 100.

T: 20.

S: 5.

Continue with the following possible sequence: 25, 50, 5, 10, and 4.

Compare Fractions (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews concepts from Grade 4 and Grade 5 Module 3.

T: (Project a tape diagram partitioned into 2 equal parts. Shade 1 of the parts.) Say the fraction.

S: 1 half.

T: (Write $\frac{1}{2}$ to the right of the tape diagram. Directly below the first tape diagram, project another tape diagram partitioned into 4 equal parts. Shade 3 of the parts.) Say this fraction.

S: 3 fourths.

T: What's a common unit that we could use to compare these fractions?

S: Fourths. → Eighths. → Twelfths.

T: Let's use fourths. (Below the tape, write $\frac{1}{2}$ ____ $\frac{3}{4}$ and $\frac{\ }{4}$ ____ $\frac{3}{4}$.) On your personal white board, write in the unknown numerator and a greater than or less than symbol.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

For English language learners or students who must review the relative size of fractional units, folding square paper into various units of halves, thirds, fourths, and eighths can be beneficial. Allow students time to fold, cut, label, and compare the units in relation to the whole and each other.

S: (Write $\frac{2}{4} < \frac{3}{4}$.)

Continue with, and compare, the following possible sequence: $\frac{1}{2}$ and $\frac{3}{8}$, $\frac{5}{8}$ and $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$, and $\frac{3}{4}$ and $\frac{7}{8}$.

Decompose Fractions (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews concepts from Grade 4 and Grade 5 Module 3.

T: (Write a number bond with $\frac{3}{5}$ as the whole and 3 missing parts.) On your personal white board, break apart 3 fifths into unit fractions.

S: (Write $\frac{1}{5}$ for each missing part.)

T: Say the multiplication equation for this bond.

S: $3 \times \frac{1}{5} = \frac{3}{5}$.

Continue with the following possible sequence: $\frac{2}{3}$, $\frac{3}{10}$, and $\frac{5}{8}$.

Divide with Remainders (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for this lesson's Concept Development.

T: (Write 8 ÷ 2 = _____.) Say the quotient.

S: 4.

T: Say the remainder.

S: There isn't one. → 0.

T: (Write 9 ÷ 2 = _____.) Quotient?

S: 4.

T: Remainder?

S: 1.

Continue with the following possible sequence: 25 ÷ 5, 27 ÷ 5, 9 ÷ 3, 10 ÷ 3, 16 ÷ 4, 19 ÷ 4, 12 ÷ 6, and 11 ÷ 6.

Concept Development (30 minutes)

Materials: (S) Personal white board, 15 square pieces of paper per pair of students

Problem 1

$2 \div 2$

$1 \div 2$

$1 \div 3$

$2 \div 3$

T: Imagine we have 2 crackers. Use two pieces of your paper to represent the crackers. Share the crackers equally between 2 people.

S: (Distribute 1 cracker per person.)

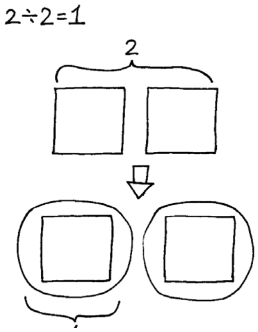
T: How many crackers did each person get?

S: 1 cracker.

T: Say a division sentence that tells what you just did with the crackers.

S: $2 \div 2 = 1$.

T: I'll record that with a drawing. (Draw the $2 \div 2 = 1$ image on the board.)



MP.4

T: Now, imagine that there is only 1 cracker to share between 2 people. Use your paper and scissors to show how you would share the cracker.

S: (Cut the paper into halves.)

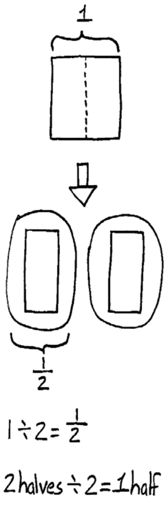
T: How much will each person get?

S: 1 half of a cracker.

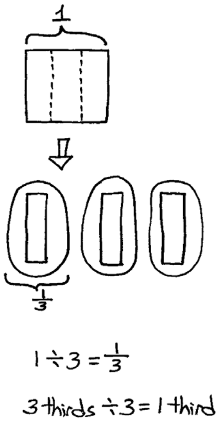
T: Work with your partner to write a number sentence that shows how you shared the cracker equally.

S: $1 \div 2 = \frac{1}{2}$. → $\frac{2}{2} \div 2 = \frac{1}{2}$. → 2 halves ÷ 2 = 1 half.

T: I'll record your thinking on the board with another drawing. (Draw the $1 \div 2$ model, and write the number sentence beneath it.)



Repeat this sequence with $1 \div 3$.



T: (Point to both division sentences on the board.) Look at these two number sentences. What do you notice? Turn and talk.

S: Both problems start with 1 whole, but it gets divided into 2 parts in the first problem and 3 parts in the second one. → I noticed that both of the answers are fractions, and the fractions have the same digits in them as the division expressions. → When you share the same size whole with 2 people, you get more than when you share it with 3 people. → The fraction looks a lot like the division expression, but it's the amount that each person receives out of the whole.

T: (Point to the number sentences.) We can write the division expression as a fraction. 1 divided by 2 is the same as 1 half. 1 divided by 3 is the same as 1 third.

T: Let's consider sharing 2 crackers with 3 people. Thinking about 1 divided by 3, how much do you think each person would receive? Turn and talk.

S: It's double the amount of crackers shared with the same number of people. Each person should receive twice as much as before, so they should receive 2 thirds. → The division sentence can be written similarly to a fraction, so 2 divided by 3 would be the same as 2 thirds.

T: Use your materials to show how you would share 2 crackers with 3 people.

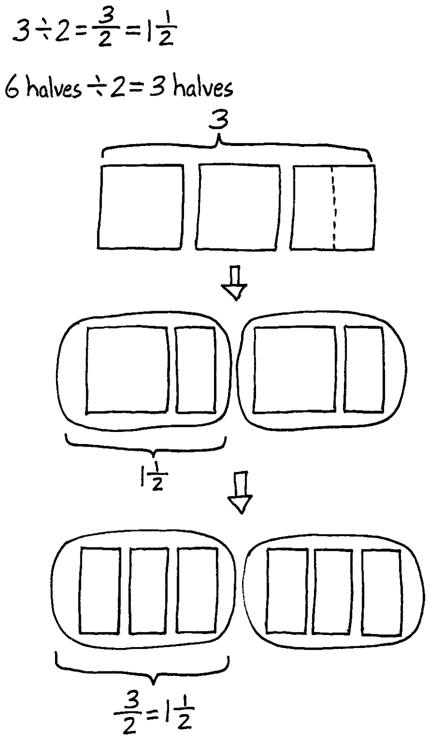
S: (Work.)

NOTES ON MULTIPLE MEANS OF EXPRESSION:

Students with fine motor deficits may find the folding and cutting of the concrete materials difficult. Consider allowing them to serve as reporters for their learning groups to share the findings or allowing them to use online virtual manipulatives.

Problem 2

3 ÷ 2



T: Now, let's take 3 crackers and share them equally with 2 people. (Draw 3 squares on the board. Underneath the squares, draw 2 circles to represent the portion each person receives.) Turn and talk about how you can share these crackers. Use your materials to show your thinking.

S: I have 3 crackers, so I can give 1 whole cracker to both people. Then, I'll just have to split the third cracker into halves and share it. → Since there are 2 people, we could cut each cracker into 2 parts and then share them equally that way.

T: Let's record these ideas by drawing. We have 3 crackers. I heard someone say that there is enough for each person to receive a whole cracker. Draw a whole cracker in each circle.

S: (Draw.)

T: How many crackers remain?

S: 1 cracker.

T: What must we do with the remaining cracker if we want to continue sharing equally?

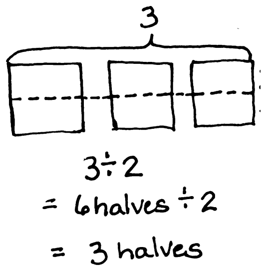
S: Divide it into 2 equal parts. → Split it in half.

T: How many halves will each person receive?

S: 1 half.

T: Record that by drawing one-half of the cracker within each circle. How many crackers did each person receive?

S: 1 and $\frac{1}{2}$ crackers.



T: (Write $3 \div 2 = 1\frac{1}{2}$ beneath the drawing.) How many halves are in 1 and 1 half?

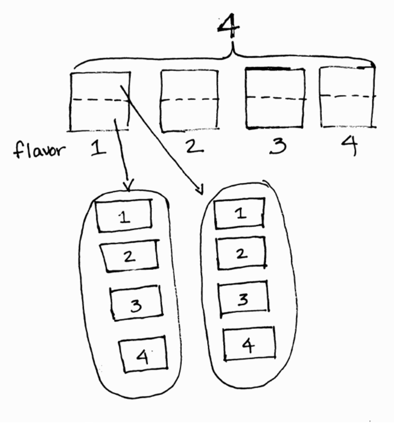
S: 3 halves.

T: (Write $\frac{3}{2}$ next to the equation.) I noticed that some of you cut the crackers into 2 equal parts before you began sharing. Let's draw that way of sharing. (Redraw 3 wholes. Divide them into halves horizontally.) How many halves were in 3 crackers?

S: 6 halves.

T: What's 6 halves divided by 2? Draw it.

S: (Draw.) 3 halves.



Problem 3

$4 \div 2$

$5 \div 2$

T: Imagine 4 crackers shared with 2 people. How many would each person receive?

S: 2 crackers.

T: (Write $4 \div 2 = 2$ on the board.) Let's now imagine that all four crackers are different flavors, and both people would like to taste all of the flavors. How could we share the crackers equally to make that possible? Turn and talk.

S: To be sure everyone got a taste of all 4 crackers, we would need to split all of the crackers in half first and then share.

T: How many halves would we have to share in all? How many would each person get?

S: 8 halves in all. Each person would receive 4 halves.

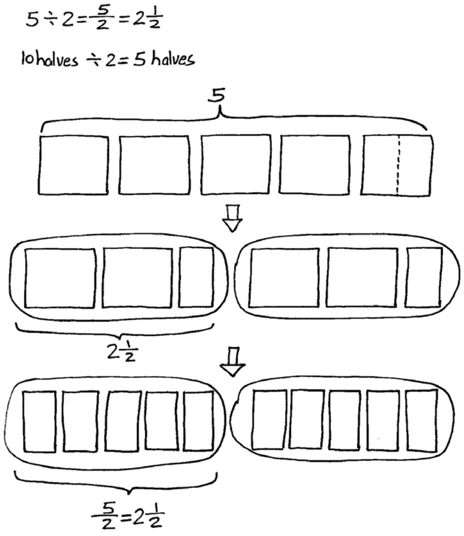
T: Let me record that. (Write 8 halves ÷ 2 = 4 halves.) Although the crackers were shared in units of one-half, what is the total amount of crackers each person receives?

S: 2 whole crackers.

Follow the sequence above to discuss $5 \div 2$ using 5 crackers of the same flavor, followed by 5 differently flavored crackers. Discuss the two ways of sharing.

T: (Point to the division equations that have been recorded.) Look at all the division problems we just solved. Talk to your neighbor about the patterns you see in the quotients.

S: The numbers in the problems are the same as the numbers in the quotients. → The division expressions can be written as fractions with the same digits. → The numerators are the wholes that we shared. The denominators show how many



equal parts we made. → The numerators are like the dividends, and the denominators are like the divisors. → Even the division symbol looks like a fraction. The dot on top could be a numerator, and the dot on the bottom could be a denominator.

T: Will this always be true? Let's test a few. Since 1 divided by 4 equals 1 fourth, what is 1 divided by 5?

S: 1 fifth.

T: (Write $1 \div 5 = \frac{1}{5}$.) What is $1 \div 7$?

S: 1 seventh.

T: 3 divided by 7?

S: 3 sevenths.

T: Let's try expressing fractions as division. Say a division expression that is equal to 3 eighths.

S: 3 divided by 8.

T: 3 tenths?

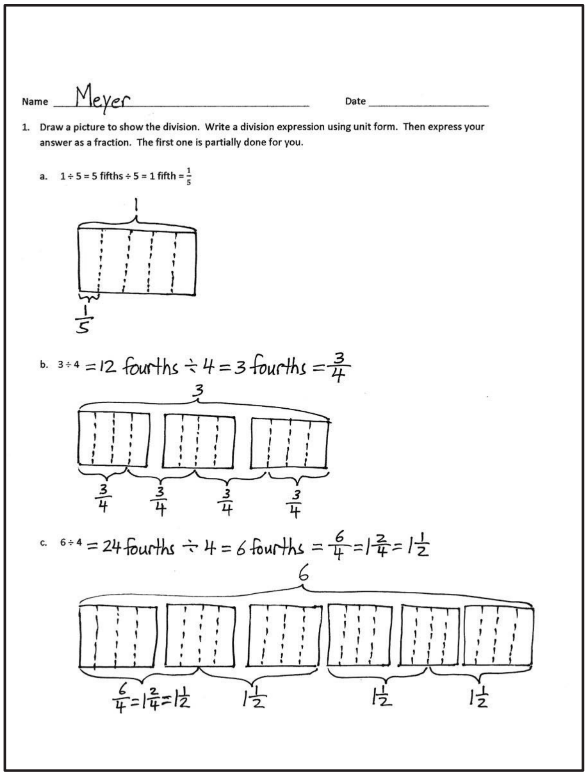
S: 3 divided by 10.

T: 3 hundredths?

S: 3 divided by 100.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.



Name Meyer Date

1. Draw a picture to show the division. Write a division expression using unit form. Then express your answer as a fraction. The first one is partially done for you.

a. $1 \div 5 = 5$ fifths $\div 5 = 1$ fifth $= \frac{1}{5}$

b. $3 \div 4 = 12$ fourths $\div 4 = 3$ fourths $= \frac{3}{4}$

c. $6 \div 4 = 24$ fourths $\div 4 = 6$ fourths $= \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$

Student Debrief (10 minutes)

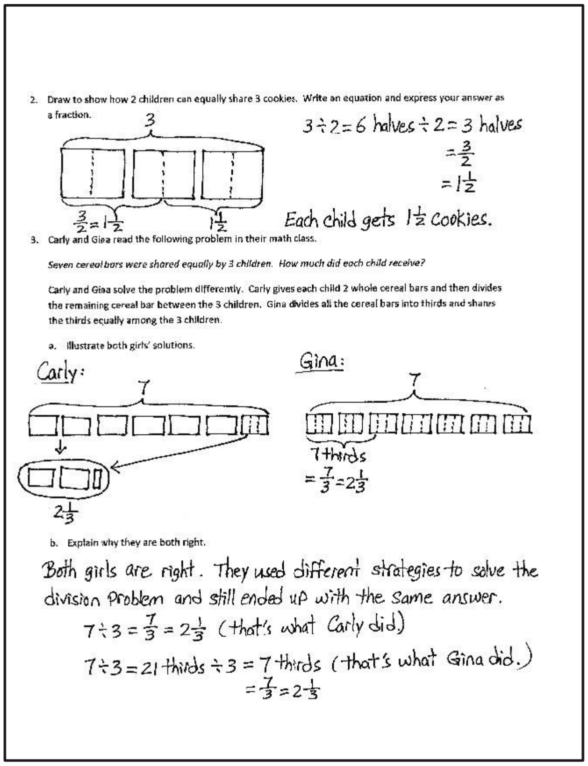
Lesson Objective: Interpret a fraction as division.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- What did you notice about Problems 4(a) and (b)? What were the wholes, or dividends, and what were the divisors?
- What was your strategy to solve Problem 1(c)?
- What pattern did you notice between 1(b) and (c)? What was the relationship between the size of the dividends and quotients?
- Discuss the division sentence for Problem 2. What number is the whole, and what number is the divisor? How is the division sentence different from 2 ÷ 3?
- Explain to your partner the two sharing approaches in Problem 3. (The first approach is to give each girl 2 wholes and then partition the remaining bars. The second approach is to partition all 7 bars, 21 thirds, and share the thirds equally.) When might one approach be more appropriate? (If the cereal bars were different flavors, and each person wanted to try each flavor.)
- True or false? Dividing by 2 is the same as multiplying by $\frac{1}{2}$. (If needed, revisit the fact that $3 \div 2 = \frac{3}{2} = 3 \times \frac{1}{2}$.)



2. Draw to show how 2 children can equally share 3 cookies. Write an equation and express your answer as a fraction.

3

$\frac{3}{2} = 1\frac{1}{2}$ $1\frac{1}{2}$

$3 \div 2 = 6$ halves $\div\ 2 = 3$ halves

$= \frac{3}{2}$

$= 1\frac{1}{2}$

Each child gets $1\frac{1}{2}$ cookies.

3. Carly and Gina read the following problem in their math class.

Seven cereal bars were shared equally by 3 children. How much did each child receive?

Carly and Gina solve the problem differently. Carly gives each child 2 whole cereal bars and then divides the remaining cereal bar between the 3 children. Gina divides all the cereal bars into thirds and shares the thirds equally among the 3 children.

a. Illustrate both girls' solutions.

Carly:

7

$2\frac{1}{3}$

Gina:

7

7 thirds

$= \frac{7}{3} = 2\frac{1}{3}$

b. Explain why they are both right.

Both girls are right. They used different strategies to solve the division problem and still ended up with the same answer.

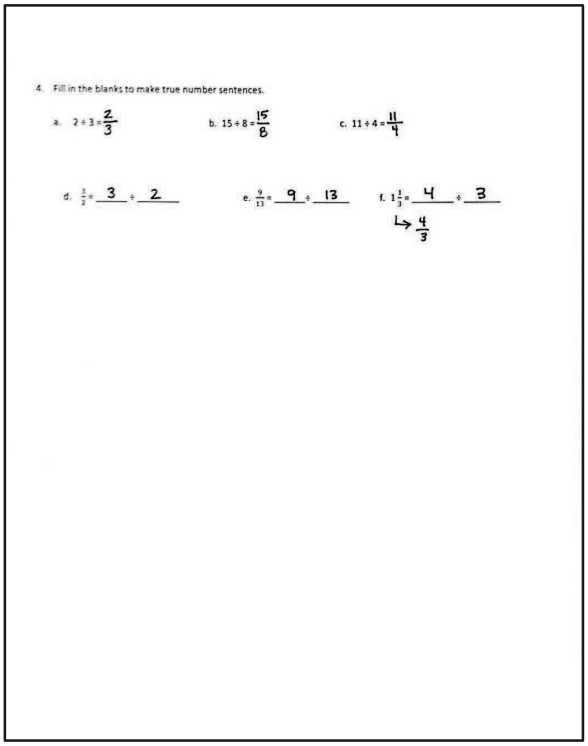
$7 \div 3 = \frac{7}{3} = 2\frac{1}{3}$ (that's what Carly did)

$7 \div 3 = 21$ thirds $\div\ 3 = 7$ thirds (that's what Gina did.)

$= \frac{7}{3} = 2\frac{1}{3}$

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



4. Fill in the blanks to make true number sentences.

a. $2 \div 3 = \frac{2}{3}$

b. $15 \div 8 = \frac{15}{8}$

c. $11 \div 4 = \frac{11}{4}$

d. $\frac{3}{2} =$ 3 ÷ 2

e. $\frac{9}{13} =$ 9 ÷ 13

f. $1\frac{1}{3} =$ 4 ÷ 3

↳ $\frac{4}{3}$

Name ______________________________ Date ________________

1. Draw a picture to show the division. Write a division expression using unit form. Then, express your answer as a fraction. The first one is partially done for you.

   a. 1 ÷ 5 = 5 fifths ÷ 5 = 1 fifth = $\frac{1}{5}$

   b. 3 ÷ 4

   c. 6 ÷ 4

2. Draw to show how 2 children can equally share 3 cookies. Write an equation, and express your answer as a fraction.

3. Carly and Gina read the following problem in their math class:

   Seven cereal bars were shared equally by 3 children. How much did each child receive?

   Carly and Gina solve the problem differently. Carly gives each child 2 whole cereal bars and then divides the remaining cereal bar among the 3 children. Gina divides all the cereal bars into thirds and shares the thirds equally among the 3 children.

   a. Illustrate both girls' solutions.

   b. Explain why they are both right.

4. Fill in the blanks to make true number sentences.

a. 2 ÷ 3 = $\frac{\quad}{\quad}$

b. 15 ÷ 8 = $\frac{\quad}{\quad}$

c. 11 ÷ 4 = $\frac{\quad}{\quad}$

d. $\frac{3}{2}$ = _______ ÷ _______

e. $\frac{9}{13}$ = _______ ÷ _______

f. $1\frac{1}{3}$ = _______ ÷ _______

Name ____ Date ______________________

1. Draw a picture that shows the division expression. Then, write an equation and solve.

a. $3 \div 9$

b. $4 \div 3$

2. Fill in the blanks to make true number sentences.

a. $21 \div 8 = \frac{\quad}{\quad}$

b. $\frac{7}{4}$ = ______ ÷ ______

c. $4 \div 9 = \frac{\quad}{\quad}$

d. $1\frac{2}{7}$ = ______ ÷ ______

Name ______________________________ Date ________________

1. Draw a picture to show the division. Express your answer as a fraction.

   a. 1 ÷ 4

   b. 3 ÷ 5

   c. 7 ÷ 4

2. Using a picture, show how six people could share four sandwiches. Then, write an equation and solve.

3. Fill in the blanks to make true number sentences.

a. $2 \div 7 = \frac{\quad}{\quad}$

b. $39 \div 5 = \frac{\quad}{\quad}$

c. $13 \div 3 = \frac{\quad}{\quad}$

d. $\frac{9}{5}$ = _______ ÷ _______

e. $\frac{19}{28}$ = _______ ÷ _______

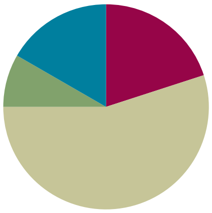
f. $1\frac{3}{5}$ = _______ ÷ _______

Lesson 3

Objective: Interpret a fraction as division.

Suggested Lesson Structure

🟥 Fluency Practice	(12 minutes)
🟩 Application Problem	(5 minutes)
🟨 Concept Development	(33 minutes)
🟦 Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

▪ Convert to Hundredths **4.NF.5**	(3 minutes)
▪ Compare Fractions **4.NF.2**	(4 minutes)
▪ Fractions as Division **5.NF.3**	(3 minutes)
▪ Write Fractions as Decimals **4.NF.5**	(2 minutes)

Convert to Hundredths (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for decimal fractions later in the module.

T: I'll say a factor, and then you'll say the factor you need to multiply it by to get 100. 50.

S: 2.

Continue with the following possible sequence: 25, 20, and 4.

T: (Write $\frac{1}{4} = \frac{}{100}$.) How many fours are in 100?

S: 25.

T: Write the equivalent fraction.

S: (Write $\frac{1}{4} = \frac{25}{100}$.)

Continue with the following possible sequence: $\frac{3}{4} = \frac{}{100}$, $\frac{1}{50} = \frac{}{100}$, $\frac{3}{50} = \frac{}{100}$, $\frac{1}{20} = \frac{}{100}$, $\frac{3}{20} = \frac{}{100}$, $\frac{1}{25} = \frac{}{100}$, and $\frac{2}{25} = \frac{}{100}$.

Compare Fractions (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews concepts from Grade 4 and Grade 5 Module 3.

T: (Write $\frac{1}{2}$ ___ $\frac{1}{6}$.) Compare these fractions, and write a greater than or less than symbol.

S: (Write $\frac{1}{2} > \frac{1}{6}$.)

T: Why is this true?

S: Both have 1 unit, but halves are larger than sixths.

Continue with the following possible sequence: $\frac{2}{3}$ and $\frac{1}{8}$, $\frac{3}{4}$ and $\frac{3}{8}$, $\frac{2}{5}$ and $\frac{9}{10}$, and $\frac{5}{8}$ and $\frac{5}{7}$.

Students should be able to reason about these comparisons without the need for common units. Reasoning, such as *greater* or *less than* half or *the same number* of different sized units, should be the focus.

Fractions as Division (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 2 content.

T: (Write 1 ÷ 3.) Write a complete number sentence using the expression.

S: (Write $1 \div 3 = \frac{1}{3}$.)

Continue with the following possible sequence: 1 ÷ 4 and 2 ÷ 3.

T: (Write 5 ÷ 2.) Write a complete number sentence using the expression.

S: (Write $5 \div 2 = \frac{5}{2}$ or $5 \div 2 = 2\frac{1}{2}$.)

Continue with the following possible sequence: 13 ÷ 5, 7 ÷ 6, and 17 ÷ 4.

T: (Write $\frac{4}{3}$.) Say the fraction.

S: 4 thirds.

T: Write a complete number sentence using the fraction.

S: (Write $4 \div 3 = \frac{4}{3}$ or $4 \div 3 = 1\frac{1}{3}$.)

Continue with the following possible sequence: $\frac{13}{2}$, $\frac{23}{4}$, and $\frac{32}{5}$.

Write Fractions as Decimals (2 minutes)

Note: This fluency activity prepares students for fractions with denominators of 4, 20, 25, and 50 in Topic G.

T: (Write $\frac{1}{10}$.) Say the fraction.

S: 1 tenth.

T: Say it as a decimal.

S: Zero point one.

Continue with the following possible sequence: $\frac{2}{10}, \frac{3}{10}, \frac{7}{10}, \frac{5}{10}$, and $\frac{9}{10}$.

T: (Write 0.1 = ____.) Write the decimal as a fraction.

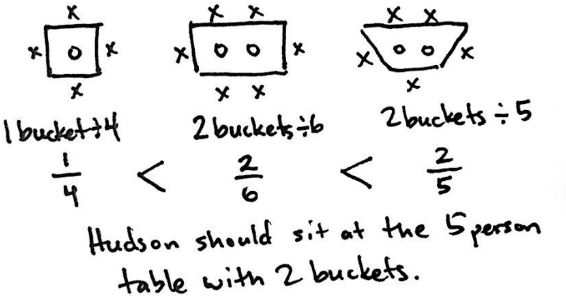
S: (Write 0.1 = $\frac{1}{10}$.)

Continue with the following possible sequence: 0.2, 0.4, 0.8, and 0.6.

Application Problem (5 minutes)

Hudson is choosing a seat in art class. He scans the room and sees a 4-person table with 1 bucket of art supplies, a 6-person table with 2 buckets of supplies, and a 5-person table with 2 buckets of supplies. Which table should Hudson choose if he wants the largest share of art supplies? Support your answer with pictures.

Note: Students must first use division to see which fractional portion of art supplies is available at each table. Then, students compare the fractions and determine which one represents the largest value.

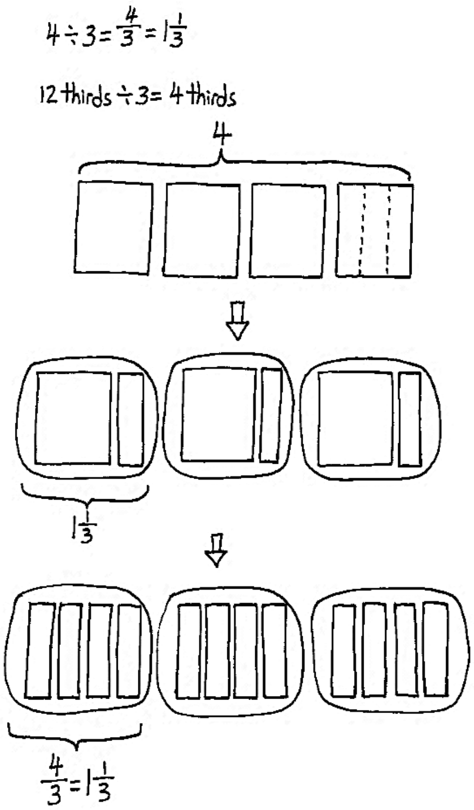


Concept Development (33 minutes)

Materials: (S) Personal white board

Problem 1

A baker poured 4 kilograms of oats equally into 3 bags. What is the weight of each bag of oats?



T: In our story, which operation is needed to find the weight of each bag of oats?

S: Division.

T: Turn and discuss with your partner how you know, as well as what the division expression would be.

S: When you share equally, it means taking what you have and dividing it into equal groups. → The total is 4 kilograms of oats being divided into 3 bags, so the division expression is 4 divided by 3. → The whole is 4, and the divisor is 3.

T: Say the division expression.

S: 4 ÷ 3.

T: (Write 4 ÷ 3, and draw 4 squares on the board.) Let's represent the kilograms with squares like we did yesterday. Squares are easier to cut into equal shares than circles.

T: Turn and talk about how you'll share the 4 kilograms of oats equally in 3 bags. Draw a picture to show your thinking.

S: Every bag will get a whole kilogram of oats, and then we will split the last kilogram equally into 3 thirds to share. So, each bag gets a whole kilogram and one-third of another one. → I can cut all 4 kilograms into thirds and then split them into the 3 bags. Each bag will get 4 thirds of a kilogram. → I know the answer is 4 over 3, or 4 thirds, because that is just another way to write 4 divided by 3.

T: As we saw yesterday, there are two ways of dividing the oats. Let me record your approaches. (Draw the approaches on the board and restate.) Let's say the division sentence with the quotient.

S: 4 ÷ 3 = 4 thirds. → 4 ÷ 3 = 1 and 1 third.

T: (Point to the diagram on the board.) When we cut them all into thirds, how many thirds were there to share?

S: 12 thirds.

T: Say the division sentence in unit form, starting with 12 thirds.

S: 12 thirds ÷ 3 = 4 thirds.

T: (Write 12 thirds ÷ 3 = 4 thirds on the board.) What is 4 thirds as a mixed number?

S: 1 and 1 third.

T: (Write the algorithm on the board.) Let's show how we divided the oats using the division algorithm.

T: How many groups of 3 can I make with 4 kilograms?

S: 1 group of three.

T: (Record 1 in the quotient.) What's 1 group of three?

S: 3.

T: (Record 3 under 4.) How many whole kilograms are left to share?

S: 1.

T: What did we do with this last kilogram? Turn and discuss with your partner.

$$\begin{array}{r} 1\frac{1}{3} \\ 3\overline{)4} \\ -3 \\ \hline 1 \end{array}$$

Check: $3 \times 1\frac{1}{3}$

$= 1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3}$

$= 3 + \frac{3}{3}$

$= 4$

Each bag of oats weighs $1\frac{1}{3}$ Kilograms.

S: This one remaining kilogram was split into 3 equal parts to continue sharing it. → I had to split the last kilogram into thirds to share it equally. → The quotient is 1 whole kilogram, and the remainder is 1. → The quotient is 1 whole kilogram and 1 third kilogram. → Each of the 3 bags gets 1 and 1 third kilogram of oats.

T: Let's record what you said. (Point to the remainder of 1.) This remainder is 1 kilogram. To keep sharing it, we split it into 3 parts (point to the divisor), so each bag gets 1 third. I'll write 1 third next to the 1 in the quotient. (Write $\frac{1}{3}$ next to the quotient of 1.)

T: Use the quotient to answer the question.

S: Each bag of oats weighs $1\frac{1}{3}$ kilograms.

T: Let's check our answer. How can we know if we put the right amount of oats in each bag?

S: We can total up the 3 parts that we put into each bag when we divided the kilograms. → The total should be the same as our original whole. → The sum of the equal parts should be the same as our dividend.

T: We have 3 groups of $1\frac{1}{3}$. Say the multiplication expression.

S: $3 \times 1\frac{1}{3}$.

T: Express 3 copies of $1\frac{1}{3}$ using repeated addition.

S: $1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3}$.

T: Is the total the same number of kilograms we had before we shared?

S: The total is 4 kilograms. → It is the same as our whole before we shared. → 3 ones plus 3 thirds is 3 plus 1. That's 4.

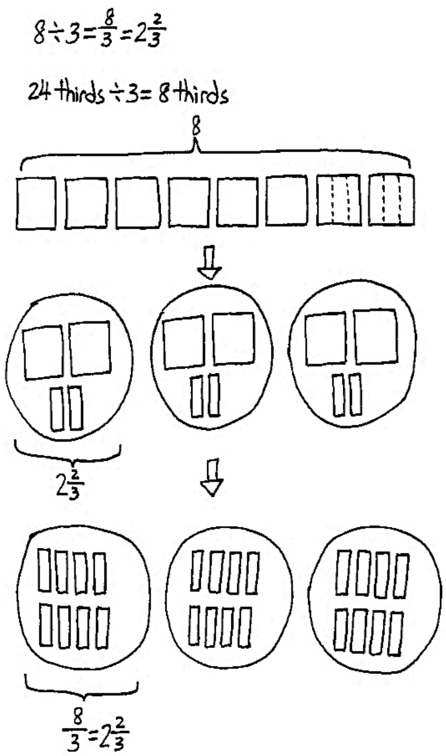
T: We've seen more than one way to write down how to share 4 kilograms in 3 bags. Why is the quotient the same using the algorithm?

S: The same thing is happening to the oats. It is being divided into 3 parts. → We are just using another way to write it.

T: Let's use different strategies in our next problem as well.

Problem 2

If the baker doubles the number of kilograms of oats to be poured equally into 3 bags, what is the weight of each bag of oats?



T: What's the whole in this problem? Turn and share with your partner.

S: 4 doubled is 8. → 4 times 2 is 8. → The baker now has 8 kilograms of oats to pour into 3 bags.

T: Say the whole.

S: 8.

T: Say the divisor.

S: 3.

T: Say the division expression for this problem.

S: 8 ÷ 3.

T: Compare this expression with the one we just completed. What do you notice?

S: The whole is twice as much as the problem before. → The number of shares is the same.

T: Using that insight, make a prediction about the quotient of this problem.

S: Since the whole is twice as much shared with the same number of bags, then the answer should be twice as much as the answer to the last problem. → Two times 4 thirds is equal to 8 thirds. → The answer should be double. So, it should be $1\frac{1}{3} + 1\frac{1}{3}$, and that is $2\frac{2}{3}$.

T: Work with your partner to solve, and confirm the predictions you made. Each partner should use a different strategy for sharing the kilograms and draw a picture of his thinking. Then, work together to solve using the standard algorithm.

$$\begin{array}{r} 2\frac{2}{3} \\ 3\overline{)8} \\ -6 \\ \hline 2 \end{array}$$

Check: $3 \times 2\frac{2}{3}$

$= 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3}$

$= 6 + \frac{6}{3}$

$= 6 + 2$

$= 8$

Each bag of oats weighs $2\frac{2}{3}$ Kilograms.

Circulate as students work.

T: How many kilograms are in each bag this time? Whisper and tell your partner.

S: Each bag gets 2 whole kilograms and $\frac{2}{3}$ of another one. → Each bag gets a third of each kilogram, which would be 8 thirds. → 8 thirds is the same as $2\frac{2}{3}$ kilograms.

T: If we split all of the kilograms into thirds before we share, how many thirds are in all 8 kilograms?

S: 24 thirds.

T: Say the division sentence in unit form.

S: 24 thirds ÷ 3 = 8 thirds.

T: (Set up the standard algorithm on the board, and solve it together.) The quotient is 2 wholes and 2 thirds. Use the quotient to answer the question.

S: Each bag of oats weighs $2\frac{2}{3}$ kilograms.

T: Let's check it now. Say the addition sentence for 3 groups of $2\frac{2}{3}$.

S: $2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} = 8$.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

For students who need the support of concrete materials, continue to use square paper and scissors to represent the equal shares, as well as the pictorial and abstract representations.

T: So, $8 \div 3 = 2\frac{2}{3}$. How does this quotient compare to our predictions?

S: This answer is what we thought it would be. → It was double the last quotient, which is what we predicted.

T: Great. Now, let's change our whole one more time and see how it affects the quotient.

Problem 3

If the baker doubles the number of kilograms of oats again, and they are poured equally into 3 bags, what is the weight of each bag of oats?

Repeat the process used in Problem 2. When predicting the quotient for Problem 3, ensure students notice that, this time, the baker has four times the amount of oats as Problem 1 and twice as much as Problem 2. This is important for the scaling interpretation of multiplication.

$16 \div 3 = \frac{16}{3} = 5\frac{1}{3}$

$$\begin{array}{r} 5\frac{1}{3} \\ 3\overline{)16} \\ -15 \\ \hline 1 \end{array}$$

Check: $3 \times 5\frac{1}{3}$

$= 5\frac{1}{3} + 5\frac{1}{3} + 5\frac{1}{3}$

$= 15 + \frac{3}{3}$

$= 16$

Each bag of oats weighs $5\frac{1}{3}$ Kilograms.

The closing extension of the dialogue, in which students realize the efficiency of the algorithm, is detailed below.

T: Say the division expression for this problem.

S: 16 ÷ 3.

T: Say the answer as a fraction greater than 1.

S: 16 thirds.

T: Which strategy would be easier to use for solving this problem? Draw out 16 wholes to split into 3 groups, or use the standard algorithm? Turn and discuss with a partner.

S: (Share.)

T: Solve this problem independently using the standard algorithm. If you want, you may also draw.

S: (Work.)

T: Let's solve using the standard algorithm. (Set up the standard algorithm, and solve it on the board.) What is 16 thirds as a mixed number?

S: $5\frac{1}{3}$.

T: Use the quotient to answer the question.

S: Each bag of oats weighs $5\frac{1}{3}$ kilograms.

T: Let's check with repeated addition. Say the entire addition sentence.

S: $5\frac{1}{3} + 5\frac{1}{3} + 5\frac{1}{3} = 16$.

T: So, $16 \div 3 = 5\frac{1}{3}$. How does this quotient compare to our predictions?

S: This answer is what we thought it would be. → It was quadruple the first quotient. → We were right; it was twice as much as the last quotient.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Fractions are generally represented in student materials by equation editing software using a horizontal line to separate the numerator from the denominator (e.g., $\frac{3}{5}$). However, it may be wise to expose students to other formats of notating fractions, such as formats that use a diagonal line to separate the numerator from the denominator (e.g., $^{3}/_{5}$).

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Interpret a fraction as division.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

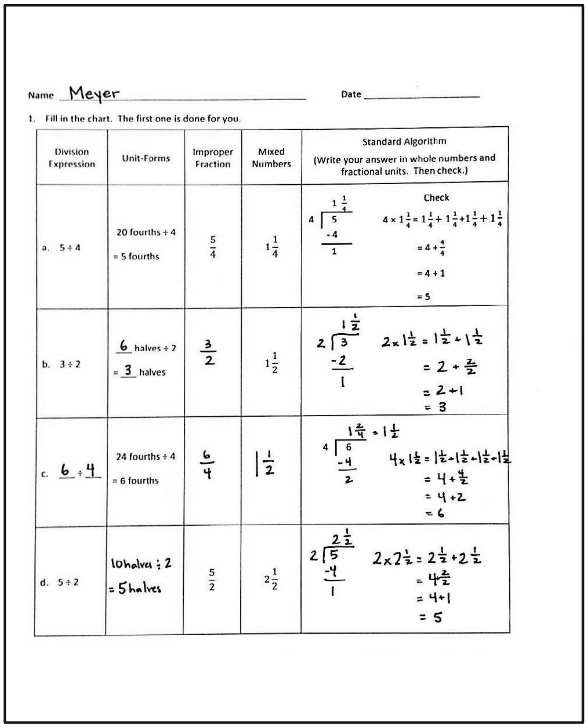
Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- What pattern did you notice between Problems 1(b) and 1(c)? Look at the whole and divisor. Is 3 halves greater than, less than, or equal to 6 fourths? What about the answers?
- What's the relationship between the answers for Problems 2(a) and 2(b)? Explain it to your partner. (Students should note that Problem 2(b) is four times as much as 2(a).) Can you generate a problem where the answer is the same as Problem 2(a) or the same as 2(b)?
- Explain to your partner how you solved Problem 3(a). Why do we need one more warming box than the actual quotient?
- We expressed our remainders today as fractions. Compare this with the way we expressed our remainders as decimals in Module 2. How is it similar? How is it different?

Exit Ticket (3 minutes)

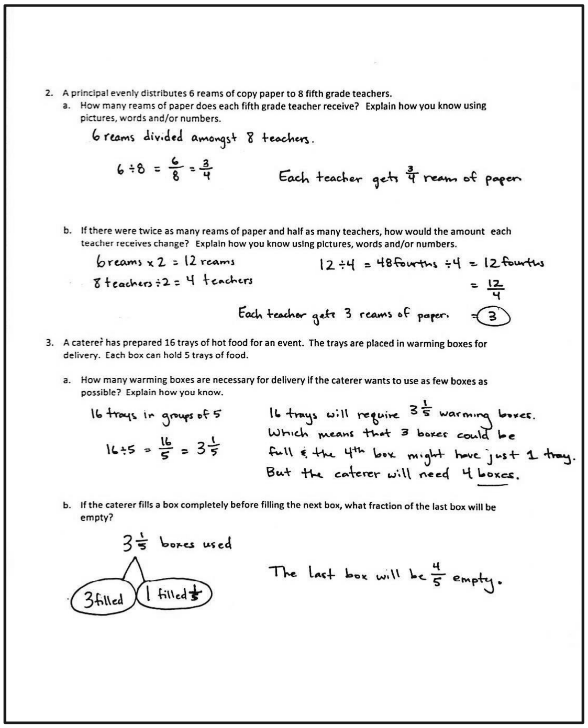
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



Name Meyer Date ____________

1. Fill in the chart. The first one is done for you.

Division Expression	Unit-Forms	Improper Fraction	Mixed Numbers	Standard Algorithm (Write your answer in whole numbers and fractional units. Then check.)
a. 5 ÷ 4	20 fourths ÷ 4 = 5 fourths	$\frac{5}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$ $4\overline{)5}$ -4 1 Check $4 \times 1\frac{1}{4} = 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4}$ $= 4 + \frac{4}{4}$ $= 4 + 1$ $= 5$
b. 3 ÷ 2	6 halves ÷ 2 = 3 halves	$\frac{3}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$ $2\overline{)3}$ -2 1 $2 \times 1\frac{1}{2} = 1\frac{1}{2} + 1\frac{1}{2}$ $= 2 + \frac{2}{2}$ $= 2 + 1$ $= 3$
c. 6 ÷ 4	24 fourths ÷ 4 = 6 fourths	$\frac{6}{4}$	$1\frac{1}{2}$	$1\frac{2}{4} = 1\frac{1}{2}$ $4\overline{)6}$ -4 2 $4 \times 1\frac{1}{2} = 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2}$ $= 4 + \frac{4}{2}$ $= 4 + 2$ $= 6$
d. 5 ÷ 2	10halves ÷ 2 = 5halves	$\frac{5}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$ $2\overline{)5}$ -4 1 $2 \times 2\frac{1}{2} = 2\frac{1}{2} + 2\frac{1}{2}$ $= 4 + \frac{2}{2}$ $= 4 + 1$ $= 5$



2. A principal evenly distributes 6 reams of copy paper to 8 fifth grade teachers.
   a. How many reams of paper does each fifth grade teacher receive? Explain how you know using pictures, words and/or numbers.

6 reams divided amongst 8 teachers.

$6 \div 8 = \frac{6}{8} = \frac{3}{4}$

Each teacher gets $\frac{3}{4}$ ream of paper

   b. If there were twice as many reams of paper and half as many teachers, how would the amount each teacher receives change? Explain how you know using pictures, words and/or numbers.

6 reams × 2 = 12 reams

8 teachers ÷ 2 = 4 teachers

$12 \div 4 = 48$ fourths $\div 4 = 12$ fourths

$= \frac{12}{4}$

$= \boxed{3}$

Each teacher gets 3 reams of paper.

3. A caterer has prepared 16 trays of hot food for an event. The trays are placed in warming boxes for delivery. Each box can hold 5 trays of food.
   a. How many warming boxes are necessary for delivery if the caterer wants to use as few boxes as possible? Explain how you know.

16 trays in groups of 5

$16 \div 5 = \frac{16}{5} = 3\frac{1}{5}$

16 trays will require $3\frac{1}{5}$ warming boxes. Which means that 3 boxes could be full & the 4th box might have just 1 tray. But the caterer will need 4 boxes.

   b. If the caterer fills a box completely before filling the next box, what fraction of the last box will be empty?

$3\frac{1}{5}$ boxes used

3filled

1 filled $\frac{1}{5}$

The last box will be $\frac{4}{5}$ empty.

Name ______________________________ Date ________________

1. Fill in the chart. The first one is done for you.

Division Expression	Unit Forms	Improper Fraction	Mixed Numbers	Standard Algorithm (Write your answer in whole numbers and fractional units. Then check.)
a. 5 ÷ 4	20 fourths ÷ 4 = 5 fourths	$\frac{5}{4}$	$1\frac{1}{4}$	$1\ \frac{1}{4}$ $4\overline{)\ 5}$ $- 4$ 1 Check $4 \times 1\frac{1}{4} = 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4}$ $= 4 + \frac{4}{4}$ $= 4 + 1$ $= 5$
b. 3 ÷ 2	___ halves ÷ 2 = ___ halves		$1\frac{1}{2}$	
c. ___ ÷ ___	24 fourths ÷ 4 = 6 fourths			$4\overline{)\ 6}$
d. 5 ÷ 2		$\frac{5}{2}$	$2\frac{1}{2}$	

2. A principal evenly distributes 6 reams of copy paper to 8 fifth-grade teachers.

   a. How many reams of paper does each fifth-grade teacher receive? Explain how you know using pictures, words, or numbers.

   b. If there were twice as many reams of paper and half as many teachers, how would the amount each teacher receives change? Explain how you know using pictures, words, or numbers.

3. A caterer has prepared 16 trays of hot food for an event. The trays are placed in warming boxes for delivery. Each box can hold 5 trays of food.

   a. How many warming boxes are necessary for delivery if the caterer wants to use as few boxes as possible? Explain how you know.

   b. If the caterer fills a box completely before filling the next box, what fraction of the last box will be empty?

Name ______________________________ Date ________________

A baker made 9 cupcakes, each a different type. Four people want to share them equally. How many cupcakes will each person get?

Fill in the chart to show how to solve the problem.

Division Expression	Unit Forms	Fractions and Mixed numbers	Standard Algorithm
Draw to show your thinking:			

Name ______________________________ Date ________________

1. Fill in the chart. The first one is done for you.

Division Expression	**Unit Forms**	**Improper Fractions**	**Mixed Numbers**	**Standard Algorithm** (Write your answer in whole numbers and fractional units. Then check.)
a. 4 ÷ 3	12 thirds ÷ 3 = 4 thirds	$\frac{4}{3}$	$1\frac{1}{3}$	$\begin{array}{r} 1\frac{1}{3} \\ 3\overline{)4} \\ -3 \\ \hline 1 \end{array}$ Check $3 \times 1\frac{1}{3} = 1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3}$ $= 3 + \frac{3}{3}$ $= 3 + 1$ $= 4$
b. ___ ÷ ___	___ fifths ÷ 5 = ___ fifths		$1\frac{2}{5}$	
c. ___ ÷ ___	___ halves ÷ 2 = ___ halves			$2\overline{)7}$
d. 7 ÷ 4		$\frac{7}{4}$		

2. A coffee shop uses 4 liters of milk every day.

   a. If there are 15 liters of milk in the refrigerator, after how many days will more milk need to be purchased? Explain how you know.

   b. If only half as much milk is used each day, after how many days will more milk need to be purchased?

3. Polly buys 14 cupcakes for a party. The bakery puts them into boxes that hold 4 cupcakes each.

   a. How many boxes will be needed for Polly to bring all the cupcakes to the party? Explain how you know.

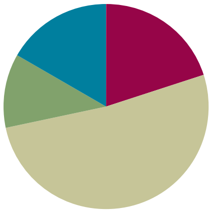
   b. If the bakery completely fills as many boxes as possible, what fraction of the last box is empty? How many more cupcakes are needed to fill this box?

Lesson 4

Objective: Use tape diagrams to model fractions as division.

Suggested Lesson Structure

🟥 Fluency Practice	(12 minutes)
🟩 Application Problem	(7 minutes)
🟨 Concept Development	(31 minutes)
🟦 Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

▪ Write Fractions as Decimals **5.NF.3**	(4 minutes)
▪ Convert to Hundredths **4.NF.5**	(4 minutes)
▪ Fractions as Division **5.NF.3**	(4 minutes)

Write Fractions as Decimals (4 minutes)

Note: This fluency activity prepares students for Topic G.

T: (Write $\frac{1}{10}$.) Say the fraction.

S: 1 tenth.

T: Say it as a decimal.

S: Zero point one.

Continue with the following possible sequence: $\frac{2}{10}$, $\frac{3}{10}$, $\frac{8}{10}$, and $\frac{5}{10}$.

T: (Write $\frac{1}{100}$ = _____.) Say the fraction.

S: 1 hundredth.

T: Say it as a decimal.

S: Zero point zero one.

Continue with the following possible sequence: $\frac{2}{100}$, $\frac{3}{100}$, $\frac{9}{100}$, and $\frac{13}{100}$.

T: (Write 0.01 = _____.) Say it as a fraction.

S: 1 hundredth.

T: (Write 0.01 = $\frac{1}{100}$.)

Continue with the following possible sequence: 0.02, 0.09, 0.11, and 0.39.

Convert to Hundredths (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for Topic G.

T: (Write $\frac{1}{4} = \frac{\ \ }{100}$.) Write the equivalent fraction.

S: (Write $\frac{1}{4} = \frac{25}{100}$.)

T: (Write $\frac{1}{4} = \frac{25}{100} =$ _____.) Write 1 fourth as a decimal.

S: (Write $\frac{1}{4} = \frac{25}{100} = 0.25$.)

Continue with the following possible sequence: $\frac{3}{4}$, $\frac{1}{50}$, $\frac{7}{50}$, $\frac{12}{50}$, $\frac{1}{20}$, $\frac{7}{20}$, $\frac{11}{20}$, $\frac{1}{25}$, $\frac{2}{25}$, $\frac{9}{25}$, and $\frac{11}{25}$.

Fractions as Division (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews content from Lessons 2 and 3.

T: (Write 1 ÷ 2.) Solve.

S: (Write $1 \div 2 = \frac{1}{2}$.)

Continue with the following possible sequence: 1 ÷ 5 and 3 ÷ 4.

T: (Write 7 ÷ 2.) Solve.

S: (Write $7 \div 2 = \frac{7}{2}$ or $7 \div 2 = 3\frac{1}{2}$.)

Continue with the following possible sequence: 12 ÷ 5, 11 ÷ 6, 19 ÷ 4, 31 ÷ 8, and 49 ÷ 9.

T: (Write $\frac{5}{3}$.) Write the fraction as a whole number division expression.

S: (Write 5 ÷ 3.)

Continue with the following possible sequence: $\frac{11}{2}$, $\frac{15}{4}$, and $\frac{24}{5}$.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

If students are comfortable with interpreting fractions as division, consider foregoing the written component of this fluency activity, and ask students to visualize the fractions, making this activity more abstract.

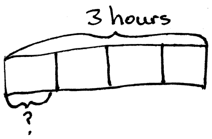
Application Problem (7 minutes)

Four grade levels need equal time for indoor recess, and the gym is available for three hours.

a. How many hours of recess will each grade level receive? Draw a picture to support your answer.

b. How many minutes?

c. If the gym can accommodate two grade levels at once, how many hours of recess will 2 grade levels receive in 3 hours?



Each grade level gets 3/4 of an hour, or 45 min.

For 2 grade levels at once, the time doubles to 90 min or $1\frac{1}{2}$ hours.

4 units = 3 hours
1 unit = $\frac{3}{4}$ hours
$\frac{3}{4}$ hour × 1 hour =
$\frac{3}{4}$ hour × 60 minutes =
$\frac{3}{\cancel{4}_{1}} \times \frac{\cancel{60}^{15}}{1} = 45$ minutes

45 minutes × 2 = 90 minutes
$\frac{90}{60} = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$ hours

Note: Students practice division with fractional quotients, which leads into today's lesson. Note that the whole remains constant in Part (c), while the divisor is cut in half. Guide students to analyze the effect of this halving on the quotient as related to the doubling of the whole from previous problems.

Concept Development (31 minutes)

Materials: (S) Personal white board

Problem 1

Eight tons of gravel is equally divided between 4 dump trucks. How much gravel is in one dump truck?

T: Say a division sentence to solve the problem.

S: 8 ÷ 4 = 2.

T: Model this problem with a tape diagram. (Pause as students work.)

T: We know that 4 units are equal to 8 tons. (Write 4 units = 8.) We want to find what 1 unit is equal to.

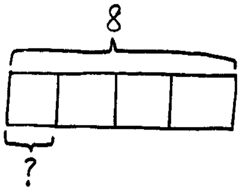
T: (Write 1 unit = 8 ÷ 4.)

T: How many tons of gravel are in one dump truck?

S: 2.

T: Use your quotient to answer the question.

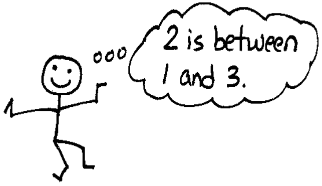
S: Each dump truck held 2 tons of gravel.



$$\begin{array}{r} 2 \\ 4\overline{)8} \\ -8 \\ \hline 0 \end{array}$$

Check: 4 × 2 = 8

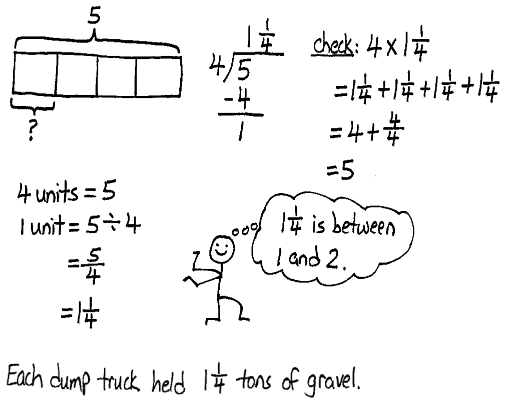
4 units = 8
1 unit = 8 ÷ 4
= 2



Each dump truck held 2 tons of gravel.

Problem 2

Five tons of gravel is equally divided between 4 dump trucks. How much gravel is in one dump truck?



T: (Change the value from the previous problem to 5 tons on the board.) How would our drawing be different if we had 5 tons of gravel?

S: Our whole would be different—5, not 8. → The tape diagram is the same, except for the value of the whole. We'll still partition it into fourths because there are still 4 trucks.

T: (Partition a new bar into 4 equal parts labeled with 5 as the whole.)

T: We know that these 4 units are equal to 5 tons. (Write 4 units = 5.) We want to find what 1 unit is equal to. (Write a question mark beneath 1 fourth of the bar.) What is the division expression you'll use to find what 1 unit is?

S: 5 ÷ 4.

T: (Write 1 unit = 5 ÷ 4.) 5 ÷ 4 is …?

S: 5 fourths.

T: So, each unit is equal to 5 fourths tons of gravel. Can we prove this using the standard algorithm?

T: What is 5 ÷ 4?

S: One and one-fourth.

T: (Write 5 ÷ 4 = $1\frac{1}{4}$.) Use your quotient to answer the question.

S: Each dump truck held one and one-fourth tons of gravel.

T: Visualize a number line. Between which two adjacent whole numbers is 1 and one-fourth?

S: 1 and 2.

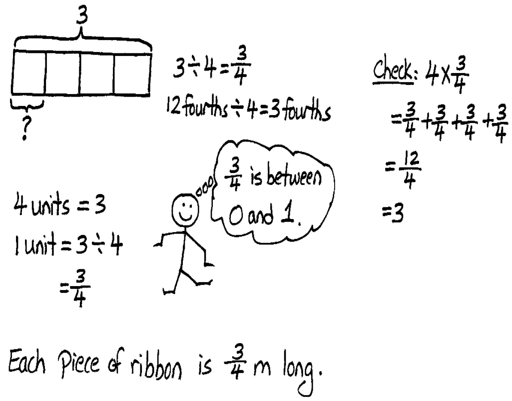
T: Check your work using repeated addition.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

Provide number lines with fractional markings for students who still need support to visualize the placement of the fractions.

Problem 3

A 3-meter ribbon is cut into 4 equal pieces to make flowers. What is the length of each piece?



T: (Write the word problem on the board.) Work with a partner, and draw a tape diagram to solve.

T: Say the division expression you solved.

S: 3 divided by 4.

T: Say the answer as a fraction.

S: Three-fourths.

T: (Write $\frac{3}{4}$ on the board.) In this case, does it make sense to use the standard algorithm to solve? Turn and talk.

S: No. It's just 3 divided by 4, which is $\frac{3}{4}$. → I don't think so. It's really easy. → We could, but the quotient of zero looks strange. It's just easier to say 3 divided by 4 equals 3 fourths.

T: Use your quotient to answer the question.

S: Each piece of ribbon is $\frac{3}{4}$ m long.

T: Let's check the answer. Say the multiplication sentence, starting with 4.

S: $4 \times \frac{3}{4} = \frac{12}{4}$. → $4 \times \frac{3}{4} = 3$.

T: Our answer is correct. If we wanted to place our quotient of $\frac{3}{4}$ on a number line, between which two adjacent whole numbers would we place it?

S: 0 and 1.

Problem 4

14 gallons of water is used to completely fill 3 fish tanks. If each tank holds the same amount of water, how many gallons will each tank hold?

T: Let's read this problem together. (All read.) Work with a partner to solve this problem. Draw a tape diagram, and solve using the standard algorithm.

T: Say the division equation you solved.

S: $14 \div 3 = \frac{14}{3}$.

T: Say the quotient as a mixed number.

S: $4\frac{2}{3}$.

T: Use your quotient to answer the question.

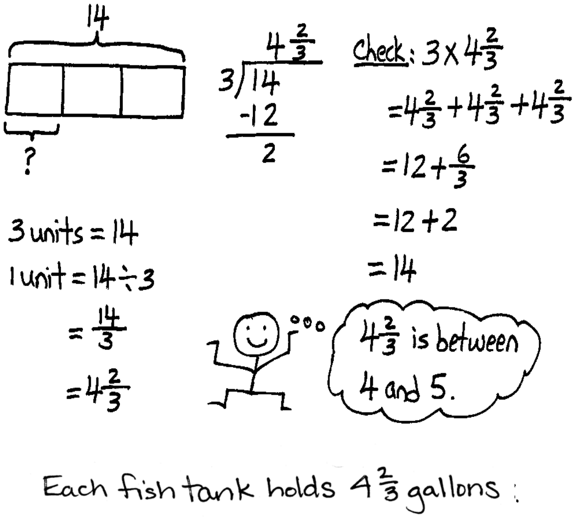
S: The volume of each fish tank is $4\frac{2}{3}$ gallons.

T: Between which two adjacent whole numbers does our answer lie?

S: Between 4 and 5.

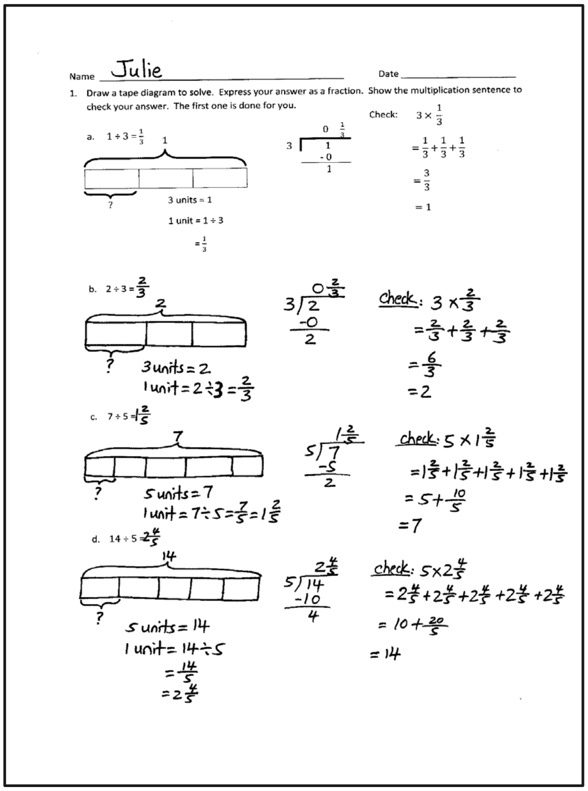
T: Check your answers using multiplication.

S: (Check answers.)



Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.



Name Julie Date

1. Draw a tape diagram to solve. Express your answer as a fraction. Show the multiplication sentence to check your answer. The first one is done for you.

a. $1 \div 3 = \frac{1}{3}$

1

?

3 units = 1

1 unit = 1 ÷ 3

$= \frac{1}{3}$

$0\ \frac{1}{3}$

3 | 1

- 0

1

Check: $3 \times \frac{1}{3}$

$= \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$

$= \frac{3}{3}$

$= 1$

b. $2 \div 3 = \frac{2}{3}$

2

?

3units = 2

1unit = $2 \div 3 = \frac{2}{3}$

$0\frac{2}{3}$

3 | 2

-0

2

Check: $3 \times \frac{2}{3}$

$= \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$

$= \frac{6}{3}$

$= 2$

c. $7 \div 5 = 1\frac{2}{5}$

7

?

5 units = 7

1 unit = $7 \div 5 = \frac{7}{5} = 1\frac{2}{5}$

$1\frac{2}{5}$

5 | 7

-5

2

check: $5 \times 1\frac{2}{5}$

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

$= 5 + \frac{10}{5}$

$= 7$

d. $14 \div 5 = 2\frac{4}{5}$

14

?

5 units = 14

1 unit = 14 ÷ 5

$= \frac{14}{5}$

$= 2\frac{4}{5}$

$2\frac{4}{5}$

5 | 14

-10

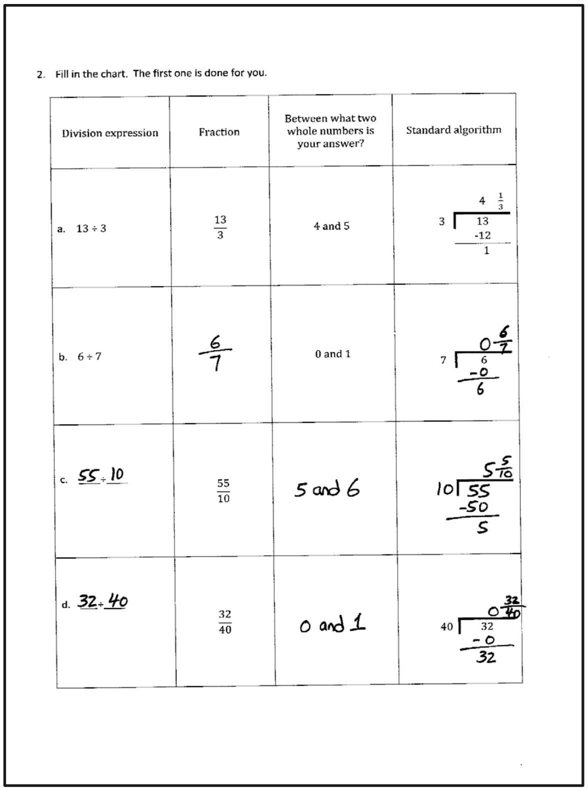
4

check: $5 \times 2\frac{4}{5}$

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

$= 10 + \frac{20}{5}$

$= 14$



2. Fill in the chart. The first one is done for you.

Division expression	Fraction	Between what two whole numbers is your answer?	Standard algorithm
a. 13 ÷ 3	$\frac{13}{3}$	4 and 5	$4\ \frac{1}{3}$ 3 | 13 -12 1
b. 6 ÷ 7	$\frac{6}{7}$	0 and 1	$0\frac{6}{7}$ 7 | 6 -0 6
c. 55 ÷ 10	$\frac{55}{10}$	5 and 6	$5\frac{5}{10}$ 10 | 55 -50 5
d. 32 ÷ 40	$\frac{32}{40}$	0 and 1	$0\frac{32}{40}$ 40 | 32 -0 32

Student Debrief (10 minutes)

Lesson Objective: Use tape diagrams to model fractions as division.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

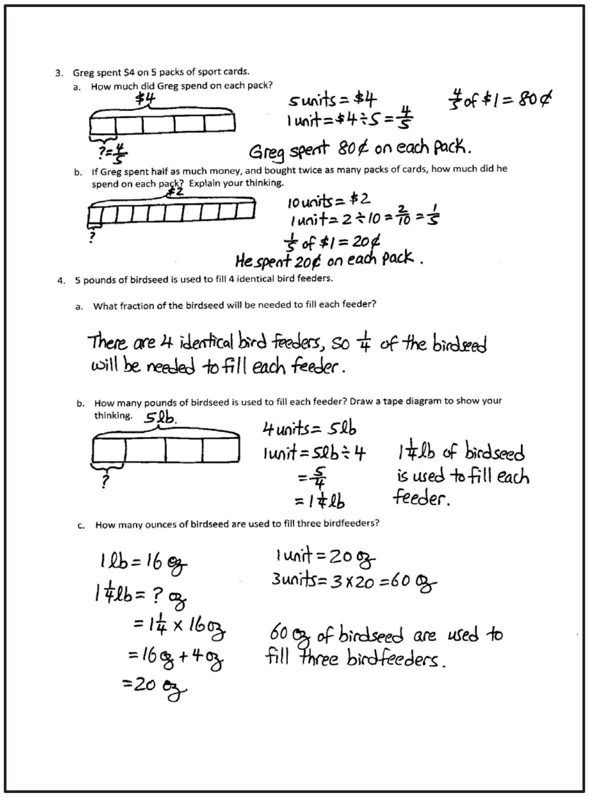
Any combination of the questions below may be used to lead the discussion.

- What pattern did you notice between Problem 1(a) and Problems 1(b), 1(c), and 1(d)? What did you notice about the wholes or dividends and the divisors?
- In Problem 2(c), can you name the fraction of $\frac{55}{10}$ using a larger fractional unit? In other words, can you simplify it? Are both fractions located at the same point on the number line?
- Compare Problems 3 and 4. What's the division sentence for each problem? What's the whole and divisor for each problem? (Problem 3's division expression is 4 ÷ 5, and Problem 4's division expression is 5 ÷ 4.)

- Explain to your partner the difference between the questions asked in Problems 4(a) and 4(b). (Problem 4(a) is asking *what fraction* of the seed is in each feeder, while 4(b) is asking *the number of pounds* of seed in each feeder.)
- How was our learning today built on what we learned yesterday? (Students may point out that the models used today were more abstract than the concrete materials used previously. Students may also point out that it was easier to see the fractions as division when presented as equations than before.)

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



3. Greg spent $4 on 5 packs of sport cards.

a. How much did Greg spend on each pack?

5 units = $4

1 unit = $4 ÷ 5 = $\frac{4}{5}$

$\frac{4}{5}$ of $1 = 80¢

Greg spent 80¢ on each pack.

b. If Greg spent half as much money, and bought twice as many packs of cards, how much did he spend on each pack? Explain your thinking.

10 units = $2

1 unit = 2 ÷ 10 = $\frac{2}{10}$ = $\frac{1}{5}$

$\frac{1}{5}$ of $1 = 20¢

He spent 20¢ on each pack.

4. 5 pounds of birdseed is used to fill 4 identical bird feeders.

a. What fraction of the birdseed will be needed to fill each feeder?

There are 4 identical bird feeders, so $\frac{1}{4}$ of the birdseed will be needed to fill each feeder.

b. How many pounds of birdseed is used to fill each feeder? Draw a tape diagram to show your thinking.

4 units = 5 lb

1 unit = 5 lb ÷ 4

= $\frac{5}{4}$

= $1\frac{1}{4}$ lb

$1\frac{1}{4}$ lb of birdseed is used to fill each feeder.

c. How many ounces of birdseed are used to fill three birdfeeders?

1 lb = 16 oz

$1\frac{1}{4}$ lb = ? oz

= $1\frac{1}{4}$ × 16 oz

= 16 oz + 4 oz

= 20 oz

1 unit = 20 oz

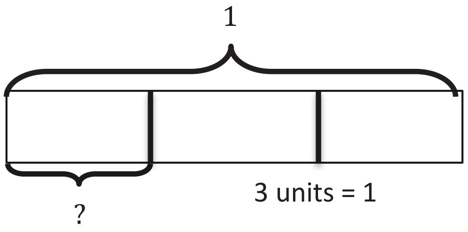
3 units = 3 × 20 = 60 oz

60 oz of birdseed are used to fill three birdfeeders.

Name ____ Date ______________________

1. Draw a tape diagram to solve. Express your answer as a fraction. Show the multiplication sentence to check your answer. The first one is done for you.

   a. $1 \div 3 = \frac{1}{3}$



3 units = 1

1 unit = 1 ÷ 3

$= \frac{1}{3}$

$$\begin{array}{r|l} & 0\ \ \frac{1}{3} \\ \hline 3 & 1 \\ & -0 \\ \hline & 1 \end{array}$$

Check: $3 \times \frac{1}{3}$

$$= \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$$

$$= \frac{3}{3}$$

$$= 1$$

   b. $2 \div 3 = \frac{}{}$

   c. $7 \div 5 = \frac{}{}$

   d. $14 \div 5 = \frac{}{}$

2. Fill in the chart. The first one is done for you.

Division Expression	**Fraction**	**Between which two whole numbers is your answer?**	**Standard Algorithm**
a. 13 ÷ 3	$\frac{13}{3}$	4 and 5	$4\ \frac{1}{3}$ $3\overline{)\,13}$ -12 1
b. 6 ÷ 7		0 and 1	$7\overline{)\,6}$
c. ____÷____	$\frac{55}{10}$		$\overline{)}$
d. ____÷____	$\frac{32}{40}$		$40\overline{)\,32}$

3. Greg spent $4 on 5 packs of sport cards.
   a. How much did Greg spend on each pack?

   b. If Greg spent half as much money and bought twice as many packs of cards, how much did he spend on each pack? Explain your thinking.

4. Five pounds of birdseed is used to fill 4 identical bird feeders.
   a. What fraction of the birdseed will be needed to fill each feeder?

   b. How many pounds of birdseed are used to fill each feeder? Draw a tape diagram to show your thinking.

   c. How many ounces of birdseed are used to fill three bird feeders?

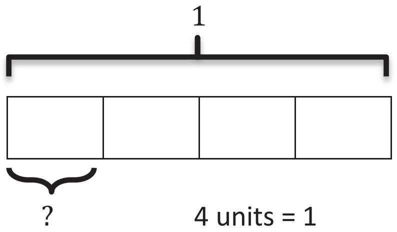
Name ____ Date ________________________

Matthew and his 3 siblings are weeding a flower bed with an area of 9 square yards. If they share the job equally, how many square yards of the flower bed will each child need to weed? Use a tape diagram to show your thinking.

Name ______________________________ Date ________________

1. Draw a tape diagram to solve. Express your answer as a fraction. Show the addition sentence to support your answer. The first one is done for you.

a. $1 \div 4 = \frac{1}{4}$



4 units = 1

1 unit = 1 ÷ 4

$= \frac{1}{4}$

$$\begin{array}{r|l} & 0\ \ \frac{1}{4} \\ \hline 4 & 1 \\ & -\ 0 \\ \hline & 1 \end{array}$$

Check:

$$4 \times \frac{1}{4}$$

$$= \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

$$= \frac{4}{4}$$

$$= 1$$

b. 4 ÷ 5 = ―

c. 8 ÷ 5 = ―

d. 14 ÷ 3 = ―

2. Fill in the chart. The first one is done for you.

Division Expression	Fraction	Between which two whole numbers is your answer?	Standard Algorithm
a. 16 ÷ 5	$\frac{16}{5}$	3 and 4	$3\ \frac{1}{5}$ 5 ⟌ 16 -15 1
b. ____÷____	$\frac{3}{4}$	0 and 1	
c. ____÷____	$\frac{7}{2}$		2 ⟌ 7
d. ____÷____	$\frac{81}{90}$		

3. Jackie cut a 2-yard spool into 5 equal lengths of ribbon.

   a. What is the length of each ribbon in yards? Draw a tape diagram to show your thinking.

   b. What is the length of each ribbon in feet? Draw a tape diagram to show your thinking.

4. Baa Baa, the black sheep, had 7 pounds of wool. If he separated the wool equally into 3 bags, how much wool would be in 2 bags?

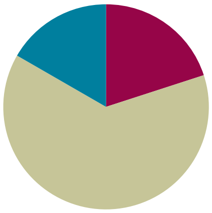
5. An adult sweater is made from 2 pounds of wool. This is 3 times as much wool as it takes to make a baby sweater. How much wool does it take to make a baby sweater? Use a tape diagram to solve.

Lesson 5

Objective: Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.

Suggested Lesson Structure

🟥 Fluency Practice	(12 minutes)
🟨 Concept Development	(38 minutes)
🟦 Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

▪ Fraction of a Set **4.NF.4**	(4 minutes)
▪ Write Division Sentences as Fractions **5.NF.3**	(3 minutes)
▪ Write Fractions as Mixed Numbers **5.NF.3**	(5 minutes)

Fraction of a Set (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for Lesson 6.

T: (Write $10 \times \frac{1}{2}$.) 10 copies of one-half is …?

S: 5.

T: (Write $10 \times \frac{1}{5}$.) 10 copies of one-fifth is …?

S: 2.

Continue with the following possible sequence: $8 \times \frac{1}{2}$, $8 \times \frac{1}{4}$, $6 \times \frac{1}{3}$, $30 \times \frac{1}{6}$, $42 \times \frac{1}{7}$, $42 \times \frac{1}{6}$, $48 \times \frac{1}{8}$, $54 \times \frac{1}{9}$, and $54 \times \frac{1}{6}$.

Write Division Sentences as Fractions (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 4.

T: (Write 9 ÷ 30 = _____.) Write the quotient as a fraction.

S: (Write 9 ÷ 30 = $\frac{9}{30}$.)

T: Express the fraction in its simplest form, and then write it as a decimal.

S: (Write 9 ÷ 30 = $\frac{3}{10}$ = 0.3.)

Continue with the following possible sequence: 28 ÷ 40, 18 ÷ 60, 63 ÷ 70, 24 ÷ 80, and 63 ÷ 90.

Write Fractions as Mixed Numbers (5 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 4.

T: (Write $\frac{13}{2}$ = _____ ÷ _____ = _____.) Write the fraction as a division problem and mixed number.

S: (Write $\frac{13}{2}$ = 13 ÷ 2 = $6\frac{1}{2}$.)

Continue with the following possible sequence: $\frac{11}{2}$, $\frac{17}{2}$, $\frac{44}{2}$, $\frac{31}{10}$, $\frac{23}{10}$, $\frac{47}{10}$, $\frac{89}{10}$, $\frac{8}{3}$, $\frac{13}{3}$, $\frac{26}{3}$, $\frac{9}{4}$, $\frac{13}{4}$, $\frac{15}{4}$, and $\frac{35}{4}$.

Concept Development (38 minutes)

Materials: (S) Problem Set

Suggested Delivery of Instruction for Solving Lesson 5 Word Problems

1. Model the problem.

Have two pairs of students who can successfully model the problem work at the board while the others work independently or in pairs at their seats. Review the following questions before beginning the first problem:

- Can you draw something?
- What can you draw?
- What conclusions can you make from your drawing?

As students work, circulate. Reiterate the questions above. After two minutes, have the two pairs of students share only their labeled diagrams. For about one minute, have the demonstrating students receive and respond to feedback and questions from their peers.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Appropriate scaffolds help all students feel successful. Students may use translators, interpreters, or sentence frames to present their solutions and respond to feedback. Models shared may include concrete manipulatives. If the pace of the lesson is a consideration, allow presenters to prepare beforehand.

2. Calculate to solve and write a statement.

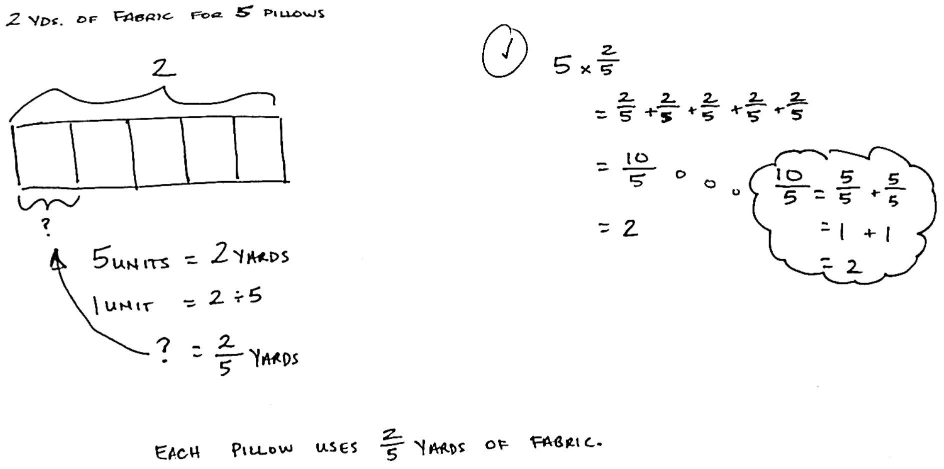
Give everyone two minutes to finish their work on that question, sharing their work and thinking with a peer. All students should write their equations and statements of the answers.

3. Assess the solution for reasonableness.

Give students one to two minutes to assess and explain the reasonableness of their solutions.

Problem 1

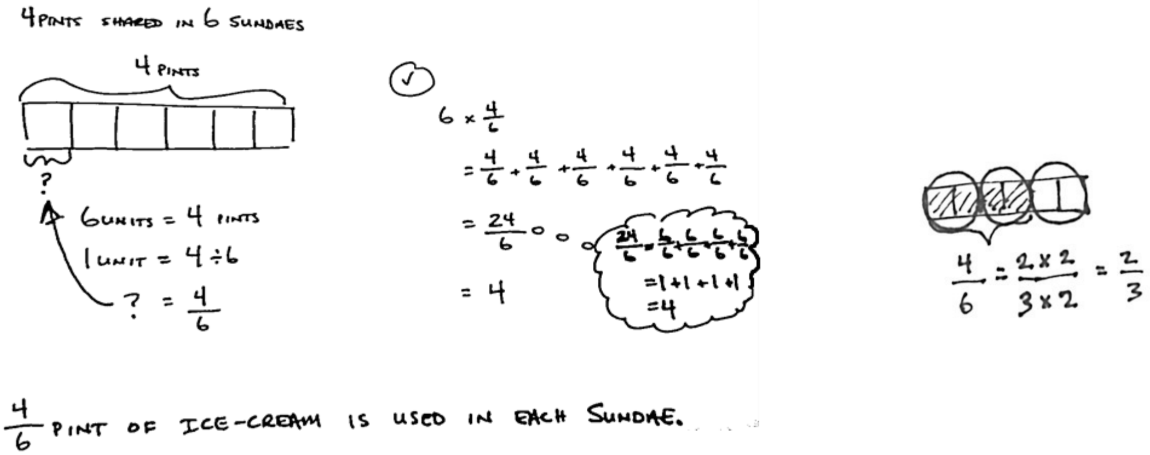
A total of 2 yards of fabric is used to make 5 identical pillows. How much fabric is used for each pillow?



This problem requires understanding of the whole and divisor. The whole of 2 is divided by 5, which results in a quotient of 2 fifths. Circulate, looking for different visuals (tape diagram and the region models from Lessons 2–3) to facilitate a discussion as to how these different models support the solution of $\frac{2}{5}$.

Problem 2

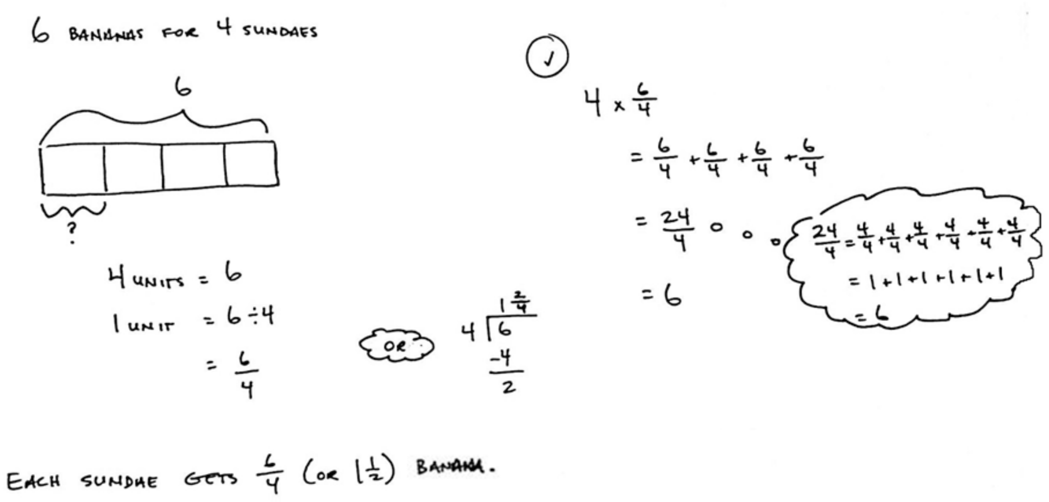
An ice cream shop uses 4 pints of ice cream to make 6 sundaes. How many pints of ice cream are used for each sundae?



This problem also requires students' understanding of the whole versus the divisor. The whole is 4, and it is divided equally into 6 units with the solution of 4 sixths. Students should not have to use the standard algorithm to solve because they should be comfortable interpreting the division expression as a fraction and vice versa. Circulate, looking for alternate modeling strategies that can be quickly mentioned or explored more deeply, if desired. Students might express 4 sixths as 2 thirds. The tape diagram illustrates that larger units of 2 can be made. Quickly model a tape with 6 parts (now representing 1 pint), shade 4, and circle sets of 2.

Problem 3

An ice cream shop uses 6 bananas to make 4 identical sundaes. How many bananas are used in each sundae? Use a tape diagram to show your work.



This problem has the same two digits (4 and 6) as the previous problem. However, it is important for students to realize that the digits take on a new role, either as whole or divisor, in this context. Six wholes divided by 4 is equal to 6 fourths or 1 and 2 fourths. Although it is not required that students use the standard algorithm, it can be easily used to find the mixed number value of $1\frac{2}{4}$.

Students may also be engaged in a discussion about the practicality of dividing the remainder of the 2 bananas into fourths and then giving each sundae 2 fourths. Many students may clearly see that the bananas can instead be divided into halves, and each sundae can be given 1 and 1 half. Facilitate a quick discussion with students about which form of the answer makes more sense given the story's context (i.e., should the sundae maker divide all of the bananas in fourths and then give each sundae 6 fourths, or should each sundae be given a whole banana and then divide the remaining bananas?).

NOTES ON MULTIPLE MEANS FOR ACTION AND EXPRESSION:

Support English language learners as they explain their thinking. Provide sentence starters and a word bank. Examples are given below.

Sentence starters:

"I had ____ (unit) in all."

"1 unit equals ____."

Word bank:

fraction of divided by remainder

half as much twice as many

Problem 4

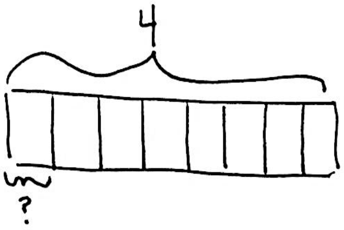
Julian has to read 4 articles for school. He has 8 nights to read them. He decides to read the same number of articles each night.

a. How many articles will he have to read per night?

b. What fraction of the reading assignment will he read each night?

4 ARTICLES IN 8 NIGHTS

a)



8 UNITS = 4 ARTICLES

1 UNIT = 4 ÷ 8

$= \frac{4}{8}$ ARTICLES

✓ $8 \times \frac{4}{8}$

$= \underbrace{\frac{4}{8}+\frac{4}{8}}_{1} + \underbrace{\frac{4}{8}+\frac{4}{8}}_{1} + \underbrace{\frac{4}{8}+\frac{4}{8}}_{1} + \underbrace{\frac{4}{8}+\frac{4}{8}}_{1}$

$= 4$

JULIAN MUST READ $\frac{4}{8}$ (OR $\frac{1}{2}$) OF AN ARTICLE EACH NIGHT.

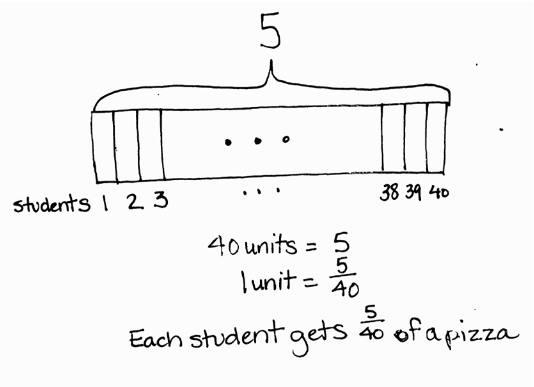
b) SINCE JULIAN IS READING FOR EACH OF 8 NIGHTS, HE READS $\frac{1}{8}$ OF HIS TOTAL ASSIGNMENT EACH NIGHT.

In this problem, Julian must read 4 articles throughout the course of 8 nights. The solution of 4 eighths of an article each night might imply that Julian can simply divide each article into eighths and read any 4 articles on any of the 8 nights. Engage in a discussion allowing students to see that 4 eighths must be interpreted as 4 consecutive eighths or 1 half of an article. It would be most practical for Julian to read the first half of an article one night and the remaining half the following night. In this manner, he will finish his reading assignment within the 8 days. Part (b) provides for deeper thinking about units being considered.

Students must differentiate between the article-as-unit and assignment-as-unit to answer. While 1 half of an article is read each night, the assignment has been split into eight parts. Take the opportunity to discuss with students whether the articles are all equal in length. Since the problem does not specify, a simplifying assumption is created to solve, which finds that, each night, 1 eighth of the total assignment must be read. Discuss how the answer would change if one article were twice the length of the other three.

Problem 5

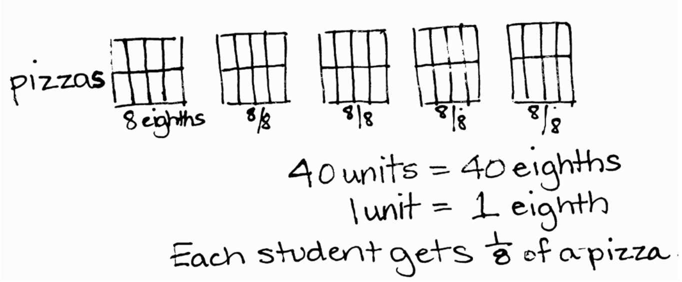
40 students shared 5 pizzas equally. How much pizza did each student receive? What fraction of the pizza did each student receive?



40 units = 5

1 unit = $\frac{5}{40}$

Each student gets $\frac{5}{40}$ of a pizza



40 units = 40 eighths

1 unit = 1 eighth

Each student gets $\frac{1}{8}$ of a pizza

Because this is the fifth problem on the page, students may recognize the division expression very quickly and realize that 5 divided by 40 yields 5 fortieths of the pizza per student. However, in this context, it is interesting to discuss with students the practicality of serving the pizzas in fortieths. Here, one might better ask, "How can I make 40 equal parts out of 5 pizzas?" This question leads to thinking about making the least number of cuts to each pizza—eighths. Now, the simplified answer of 1 eighth of a pizza per student makes more sense. The follow-up question highlights the changing of the unit from *how much pizza per student* (1 eighth of a pizza) to *what fraction of the total* (1 fortieth of the total amount). Because there are so many slices to be made, students may use the *dot, dot, dot* format to show the smaller units in their tape diagram. Others may opt to simply show their work with an equation.

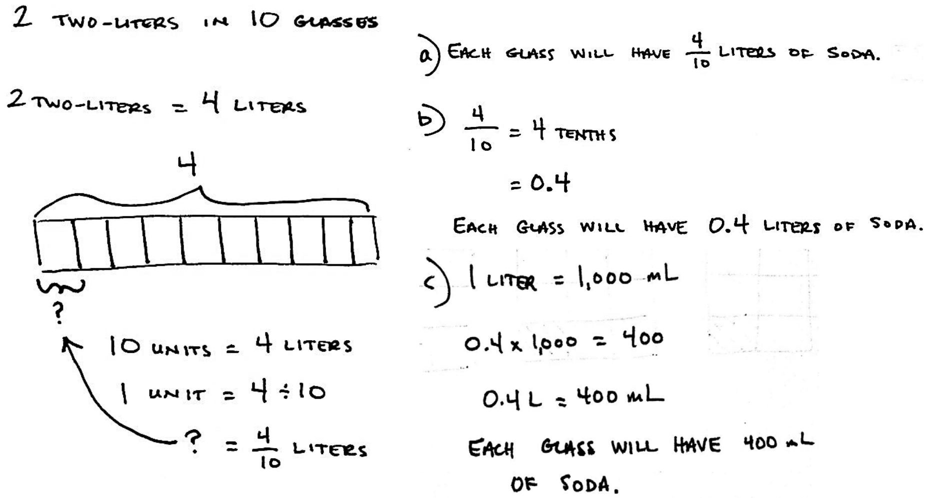
Problem 6

Lillian had 2 two-liter bottles of soda, which she distributed equally between 10 glasses.

a. How much soda was in each glass? Express your answer as a fraction of a liter.

b. Express your answer as a decimal number of liters.

c. Express your answer as a whole number of milliliters.



2 TWO-LITERS IN 10 GLASSES

2 TWO-LITERS = 4 LITERS

10 UNITS = 4 LITERS

1 UNIT = 4 ÷ 10

? = $\frac{4}{10}$ LITERS

a) EACH GLASS WILL HAVE $\frac{4}{10}$ LITERS OF SODA.

b) $\frac{4}{10}$ = 4 TENTHS

= 0.4

EACH GLASS WILL HAVE 0.4 LITERS OF SODA.

c) 1 LITER = 1,000 mL

0.4 x 1,000 = 400

0.4 L = 400 mL

EACH GLASS WILL HAVE 400 mL OF SODA.

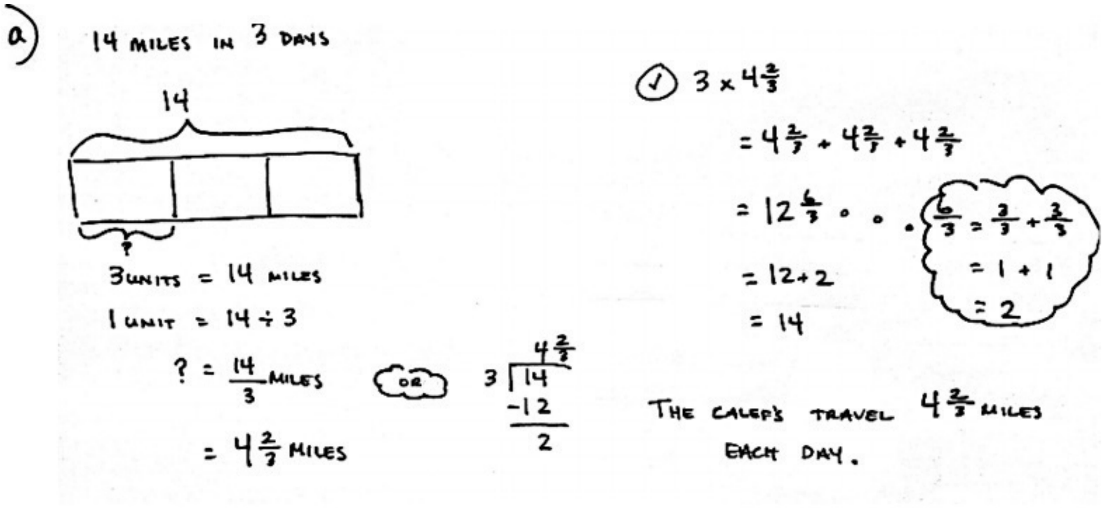
This is a three-part problem that asks students to find the amount of soda in each glass. Carefully guide students when reading the problem so they can interpret that 2 two-liter bottles are equal to 4 liters total. The whole of 4 liters is then divided by 10 glasses to obtain 4 tenths liters of soda per glass. To answer Part (b), students must remember how to express fractions as decimals (i.e., $\frac{1}{10} = 0.1$, $\frac{1}{100} = 0.01$, and $\frac{1}{1{,}000} = 0.001$). For Part (c), students may need to be reminded about the equivalency between liters and milliliters (1 L = 1,000 mL).

Problem 7

The Calef family likes to paddle along the Susquehanna River.

a. They paddled the same distance each day throughout the course of 3 days, traveling a total of 14 miles. How many miles did they travel each day? Show your thinking in a tape diagram.

b. If the Calefs went half their daily distance each day but extended their trip to twice as many days, how far would they travel?



a) 14 MILES IN 3 DAYS

3 UNITS = 14 MILES

1 UNIT = 14 ÷ 3

$? = \frac{14}{3}$ MILES

$= 4\frac{2}{3}$ MILES

$$\begin{array}{r} 4\frac{2}{3} \\ 3\overline{)14} \\ -12 \\ \hline 2 \end{array}$$

✓ $3 \times 4\frac{2}{3}$

$= 4\frac{2}{3} + 4\frac{2}{3} + 4\frac{2}{3}$

$= 12\frac{6}{3}$ . . . $\frac{6}{3} = \frac{3}{3} + \frac{3}{3}$

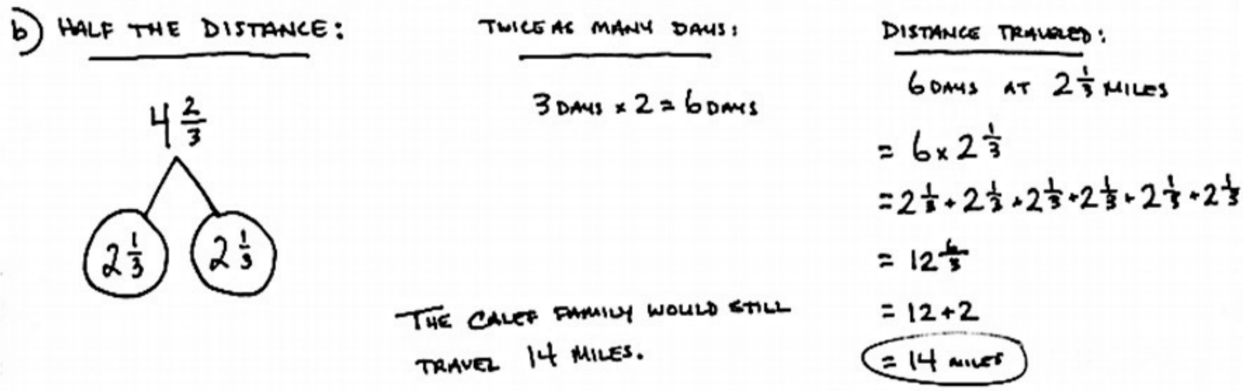
$= 1 + 1$

$= 2$

$= 12 + 2$

$= 14$

THE CALEF'S TRAVEL $4\frac{2}{3}$ MILES EACH DAY.



b) HALF THE DISTANCE:

TWICE AS MANY DAYS:

3 DAYS × 2 = 6 DAYS

DISTANCE TRAVELED:

6 DAYS AT $2\frac{1}{3}$ MILES

$= 6 \times 2\frac{1}{3}$

$= 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3}$

$= 12\frac{6}{3}$

$= 12 + 2$

$\boxed{= 14 \text{ miles}}$

THE CALEF FAMILY WOULD STILL TRAVEL 14 MILES.

In Part (a), students can easily use the standard algorithm to solve 14 miles divided by 3 days and determine that it is equal to 4 and 2 thirds miles per day. Part (b) requires some deliberate thinking. Guide students to read the question carefully before solving it.

Student Debrief (10 minutes)

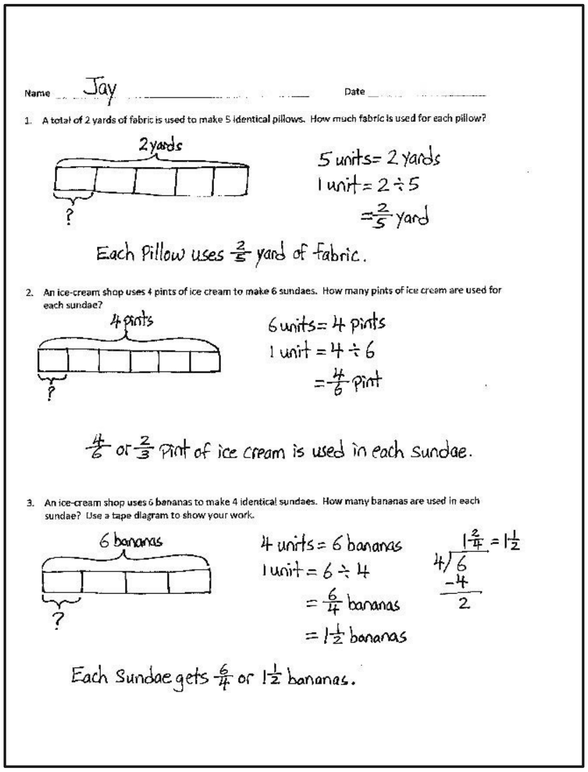
Lesson Objective: Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- How are the problems similar? How are they different?
- How was your solution the same as and different from those that were demonstrated?
- Did you see other solutions that surprised you or made you see the problems differently?
- Why should we assess reasonableness after solving?
- Were there problems in which it made more sense to express the answer as a fraction rather than a mixed number and vice versa? Give examples.



Name Jay Date

1. A total of 2 yards of fabric is used to make 5 identical pillows. How much fabric is used for each pillow?

5 units = 2 yards
1 unit = $2 \div 5$
$= \frac{2}{5}$ yard

Each Pillow uses $\frac{2}{5}$ yard of fabric.

2. An ice-cream shop uses 4 pints of ice cream to make 6 sundaes. How many pints of ice cream are used for each sundae?

6 units = 4 pints
1 unit = $4 \div 6$
$= \frac{4}{6}$ pint

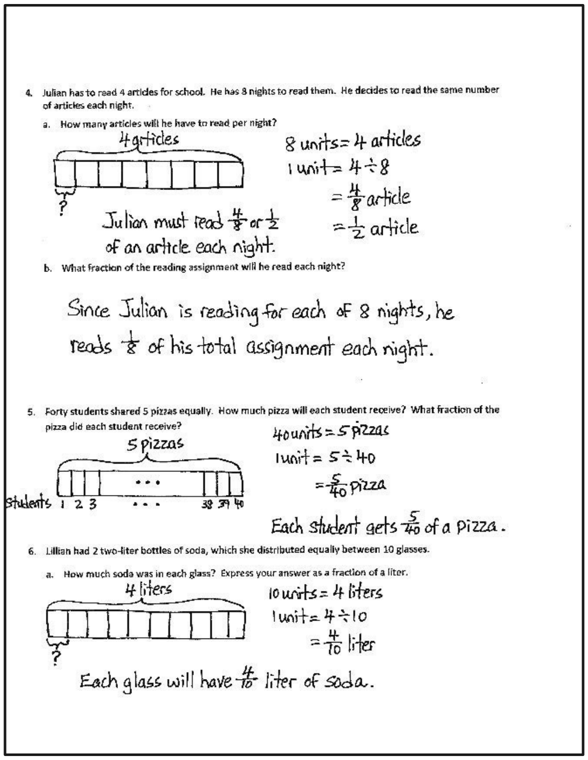
$\frac{4}{6}$ or $\frac{2}{3}$ pint of ice cream is used in each sundae.

3. An ice-cream shop uses 6 bananas to make 4 identical sundaes. How many bananas are used in each sundae? Use a tape diagram to show your work.

4 units = 6 bananas
1 unit = $6 \div 4$
$= \frac{6}{4}$ bananas
$= 1\frac{1}{2}$ bananas

$1\frac{2}{4} = 1\frac{1}{2}$
$4\overline{)6}$
-4
2

Each Sundae gets $\frac{6}{4}$ or $1\frac{1}{2}$ bananas.



4. Julian has to read 4 articles for school. He has 8 nights to read them. He decides to read the same number of articles each night.

   a. How many articles will he have to read per night?

8 units = 4 articles
1 unit = $4 \div 8$
$= \frac{4}{8}$ article
$= \frac{1}{2}$ article

Julian must read $\frac{4}{8}$ or $\frac{1}{2}$ of an article each night.

   b. What fraction of the reading assignment will he read each night?

Since Julian is reading for each of 8 nights, he reads $\frac{1}{8}$ of his total assignment each night.

5. Forty students shared 5 pizzas equally. How much pizza will each student receive? What fraction of the pizza did each student receive?

40 units = 5 pizzas
1 unit = $5 \div 40$
$= \frac{5}{40}$ pizza

Each student gets $\frac{5}{40}$ of a pizza.

6. Lillian had 2 two-liter bottles of soda, which she distributed equally between 10 glasses.

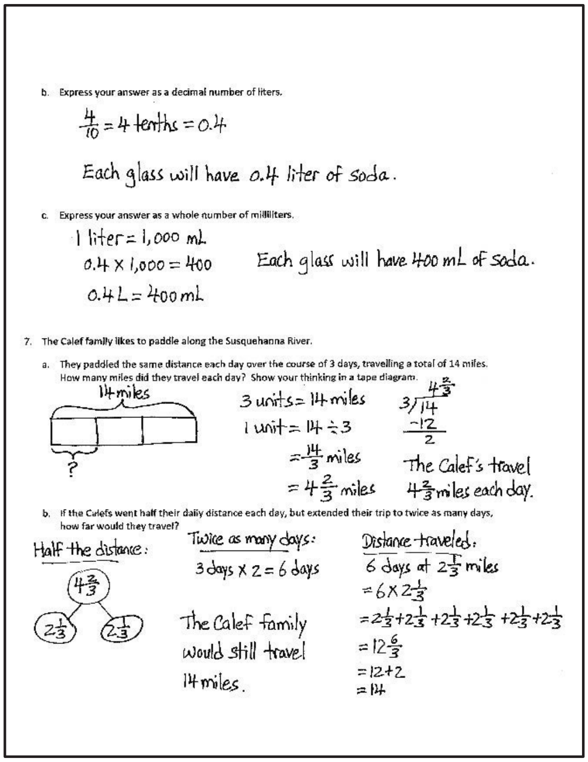
   a. How much soda was in each glass? Express your answer as a fraction of a liter.

10 units = 4 liters
1 unit = $4 \div 10$
$= \frac{4}{10}$ liter

Each glass will have $\frac{4}{10}$ liter of soda.

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



b. Express your answer as a decimal number of liters.

$\frac{4}{10}$ = 4 tenths = 0.4

Each glass will have 0.4 liter of soda.

c. Express your answer as a whole number of milliliters.

1 liter = 1,000 mL
0.4 × 1,000 = 400
0.4 L = 400 mL

Each glass will have 400 mL of soda.

7. The Calef family likes to paddle along the Susquehanna River.

a. They paddled the same distance each day over the course of 3 days, travelling a total of 14 miles. How many miles did they travel each day? Show your thinking in a tape diagram.

14 miles
?

3 units = 14 miles
1 unit = 14 ÷ 3
= $\frac{14}{3}$ miles
= $4\frac{2}{3}$ miles

$3\overline{)14}$ = $4\frac{2}{3}$
−12
2

The Calef's travel $4\frac{2}{3}$ miles each day.

b. If the Calefs went half their daily distance each day, but extended their trip to twice as many days, how far would they travel?

Half the distance:
$4\frac{2}{3}$
$2\frac{1}{3}$ $2\frac{1}{3}$

Twice as many days:
3 days × 2 = 6 days

The Calef family would still travel 14 miles.

Distance traveled:
6 days at $2\frac{1}{3}$ miles
$= 6 \times 2\frac{1}{3}$
$= 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3} + 2\frac{1}{3}$
$= 12\frac{6}{3}$
$= 12 + 2$
$= 14$

Name ______________________________________ Date ____________________

1. A total of 2 yards of fabric is used to make 5 identical pillows. How much fabric is used for each pillow?

2. An ice cream shop uses 4 pints of ice cream to make 6 sundaes. How many pints of ice cream are used for each sundae?

3. An ice cream shop uses 6 bananas to make 4 identical sundaes. How many bananas are used in each sundae? Use a tape diagram to show your work.

4. Julian has to read 4 articles for school. He has 8 nights to read them. He decides to read the same number of articles each night.
    a. How many articles will he have to read per night?

    b. What fraction of the reading assignment will he read each night?

5. 40 students shared 5 pizzas equally. How much pizza will each student receive? What fraction of the pizza did each student receive?

6. Lillian had 2 two-liter bottles of soda, which she distributed equally between 10 glasses.
    a. How much soda was in each glass? Express your answer as a fraction of a liter.

b. Express your answer as a decimal number of liters.

c. Express your answer as a whole number of milliliters.

7. The Calef family likes to paddle along the Susquehanna River.

   a. They paddled the same distance each day over the course of 3 days, traveling a total of 14 miles. How many miles did they travel each day? Show your thinking in a tape diagram.

   b. If the Calefs went half their daily distance each day but extended their trip to twice as many days, how far would they travel?

Name ____ Date ________________________

A grasshopper covered a distance of 5 yards in 9 equal hops. How many yards did the grasshopper travel on each hop?

a. Draw a picture to support your work.

b. How many yards did the grasshopper travel after hopping twice?

Name ____ Date ______________________

1. When someone donated 14 gallons of paint to Rosendale Elementary School, the fifth grade decided to use it to paint murals. They split the gallons equally among the four classes.

   a. How much paint did each class have to paint their mural?

   b. How much paint will three classes use? Show your thinking using words, numbers, or pictures.

   c. If 4 students share a 30-square-foot wall equally, how many square feet of the wall will be painted by each student?

   d. What fraction of the wall will each student paint?

2. Craig bought a 3-foot-long baguette and then made 4 equally sized sandwiches with it.
   a. What portion of the baguette was used for each sandwich? Draw a visual model to help you solve this problem.

   b. How long, in feet, is one of Craig's sandwiches?

   c. How many inches long is one of Craig's sandwiches?

3. Scott has 6 days to save enough money for a $45 concert ticket. If he saves the same amount each day, what is the minimum amount he must save each day in order to reach his goal? Express your answer in dollars.