

Sharing: Division Statements and Fractions

Strand:	Number and Number Sense
Topic:	Identifying and interpreting the division statement that represents a fraction using models.
Primary SOL:	4.2 The student will c) identify the division statement that represents a fraction, with models and in context.
Related SOL:	4.2ab

Materials

- Play dough (or paper rectangles, circles, and scissors)
- Shared Snack Recording Sheet (attached)
- Circle (Pizza) and Stick (Licorice) Sample Paper Cutouts (attached)
- From Fractions to Division—What a Story activity sheet (attached)
- Sharing Brownies activity sheet (attached)

Vocabulary

denominator, dividend, division statement, divisor, fraction, numerator, part, represent, whole

Student/Teacher Actions: What should students be doing? What should teachers be doing?

- **Division of whole numbers when the dividend is larger than the divisor.**
 1. To prepare students to think about division, ask them to solve the following problem with pictures and numbers: “Mary has 12 markers to share with two friends. How many markers will Mary and each of her friends receive so that each has a fair share?”
 - a. Circulate around the room. Identify a student’s picture that shows the partitive division method (dealing out or size of groups unknown) and students who may have used other strategies. Also, look for number sentences written as $12 \div 3 = 4$.
 - b. After students have some time to work, call on volunteers to share and explain their work on the board. Use the student work to connect the idea of when you know how many groups to make but you are looking for how many go in each group (the operation of division). One way to write the idea is with numbers ($12 \div 3 = 4$), where 12 is the amount to be shared, 3 is the number of people (groups) sharing, and 4 is the amount each person receives.
- **Division of whole numbers when the dividend is smaller than the divisor.**
 2. Arrange students in pairs to work with an area model to explore this situation. Provide each pair with a small container of play dough and the Shared Snack Recording Sheet. If play dough is unavailable, provide same-size precut paper circles from the Circle (Pizza) and Stick (Licorice) Sample Paper Cutouts. Give students a minute or two to adjust to the feel of the play dough and then provide the following instructions.
 - a. Use the play dough to form two circles about the size of a small pizza. Draw a model on the board. Make sure the circles you and your partner form are the same size.

- b. Tell the student pairs: *“Using your circular pizza models, show how much pizza three people would get if both circles were shared or divided equally so that each person receives a fair share or the same amount.”* Draw a picture and show your written work on your recording sheet for how much each person should receive. Be prepared to explain your model and how you know each person will receive a fair share. Let students know that the class will work together to answer questions a-d.
 - Some students may cut each circle in thirds and share one-third from each pizza until all the pizza is gone. Other students may cut each pizza in thirds but share out two-thirds to each friend at a time.
 - As you circulate around the room ask students why they divided each pizza in thirds. How they know each person will get a fair share? Identify a couple of pairs who used different strategies to show their work on the board tell how they shared the pizza.
 - c. As a whole class, debrief and help the class complete questions 1a, b, and c on the recording sheet. Then invite the pairs who were identified to come up to share and explain their strategy at the board. You may want to ask the class whether the process of actions to solve the problem reminded them of anything they have done with whole numbers.
 - Ask the class why the sharers did not get a whole pizza or why the answer is a fraction. Remind students that each person got two $\frac{1}{3}$, which is the same as $\frac{2}{3}$.
 - Then ask the class how showing the need to divide two pizzas among three friends might be expressed with just numbers and symbols. Listen to the students’ ideas and for an idea that sounds like “2 divided by 3,” then show the students how to write this on the recording sheet with a symbol, $2 \div 3$, so now the problem and solution can be written as $2 \div 3 = ?$.
 - d. Ask students how the amount of pizza each person received would be recorded as a fraction. Write $\frac{2}{3}$ and label it as the division statement that represents their fraction models: $2 \div 3 = \frac{2}{3}$.
 - e. Solicit student comments on the relationship between the division statement and the fraction. Listen for and highlight that $\frac{2}{3}$ means the same as 2 divided by 3 or $2 \div 3$.
2. Now students will work with a linear model to explore division when there is a remainder. Instruct students to combine all of the thirds from both circles back into one whole.
 - a. They will now use the play dough to construct four same-size licorice-stick models or use the paper models on the Circle (Pizza) and Stick (Licorice) Sample Paper Cutouts activity sheet. Each partner should make sure that all of the licorice stick models are the same size.
 - b. Tell students, *“Using your licorice stick models, show how much licorice three people would get if all of the licorice were shared or divided equally so that each person receives the same amount. Record your written responses for the questions 2a-d and be prepared to explain your model as I walk around.”*

- Some students may give everyone a whole stick and then divide the fourth stick in thirds to pass out $\frac{1}{3}$ to each person and record a fair share as $1\frac{1}{3}$. Other students may cut each stick in thirds and share one-third from each pizza until all the licorice is gone and record their answer as $\frac{4}{3}$, they may then simplify or they may not. Also, note how students recorded 2d. Identify students who use each of these methods and any other different methods to share in the whole class discussion.
 - As you circulate around the room, ask students to explain how they decided what to do: “How do they know each person will get a fair share?” Based on the form of their answer, ask, “What does $\frac{4}{3}$ or $1\frac{1}{3}$ mean in the context of this problem?”
- c. Facilitate a whole-class discussion. Invite students you identified to share their pictures and their thinking about the problem at the board. After students have a chance to share and discuss their representations, display a representation of the four stick models being cut and shared. Remind students that they can revise their answer sheets if they need to do so.
- Call on volunteers to share how they responded to 2a and 2b.
 - Discuss with the class the response to 2c and 2d. Ask students how the process for dividing the licorice sticks would look as a division expression. Record the response 4 divided by 3 as $4 \div 3$, then highlight that this division can also be written as $\frac{4}{3}$.
 - Restate that when three people share four licorice sticks, each receives four-thirds of a licorice stick, which can also be described as one and one-third. Symbolically, this can be written in two ways: $4 \div 3 = 1\frac{1}{3}$ and $\frac{4}{3} = 1\frac{1}{3}$.
3. In the next activity, students will translate a fraction into a story problem that can be solved with division. Students will continue to work with a partner. Ask students to think about the pizza and licorice stories they just worked on and how the action in the story leads to division. Remind them that they now know that division can be written symbolically in two ways: such as, when we have 8 divided by 3, we can write $8 \div 3$ or $\frac{8}{3}$. However, if we have 3 divided by 8 we would write it as $3 \div 8$ or $\frac{3}{8}$. You may want to write these statements on the board for students to refer to as they work on their problems.
- a. Ask half the class to work with a partner to write a story problem for $\frac{8}{3}$, and the other half of the class to work with a partner and write a story problem for $\frac{3}{8}$.
- Student pairs can write their story problems on dry-erase boards (if available). Some students may have trouble getting started, and you can refer them to the pizza or licorice story and ask what the numerator and denominator (use the numbers from the fraction story) represented. Then ask what situation they can they think of that involves something that can be shared.
 - As you circulate around the room, identify pairs that you want to invite to share their stories with the class.

- Bring students back for a class discussion, and invite the students you identified to share their story. Ask the class whether they think the story can be represented by division written as a fraction, then ask why or why not.
 - Have one pair of students from each story meet to read one another's stories. They should ask questions of each other when they are not sure of the writers' intent, and if they think the story needs revision, they should offer their opinion with the reason why.
4. Provide each student with the From Fractions to Division-What a Story activity sheet. Students will work in pairs to complete their handouts. Remind students to discuss their ideas, but each is to record the work on their own sheets. Circulate around the room to support students who have trouble getting started and to pose questions to determine how students are thinking about the problems.
- a. Collect the students' papers to review as a formative assessment. Identify the most common mistakes. Look for three to five pieces of work that reflect the common mistakes, where the work is almost correct or has a critical misconception. Use the problems, with no marks from the teacher, to prepare a handout for students to work with the next day in class. Also, prepare questions that will guide the students as they review the problems to think about the concepts in the lesson and determine where a misconception or other mistake caused a problem. Make suggestions for how to correct the problem.
 - b. Take a few minutes to share with students some things you saw that showed the students were gaining an understanding of the concepts and using the symbol for division. Then share the important misconceptions that the class will continue to work on today. Provide specific examples of the misconceptions. Let students know that you have selected some samples of work from the previous day that are like the mistakes that others in class also made. Their task is to use the guiding questions to review the work, describe where the error is in the work on another sheet of paper, and then show the correct work.
 - c. Close the lesson with a class discussion. Have volunteers share why they think the mistake occurred and how to correct it.

Assessment

- **Questions**
 - If I had a candy bar to share with one friend (two persons sharing the whole candy bar), how much would each person get? Record your response as a picture and a number sentence, using the fraction notation to show division.
 - If I had two candy bars to share equally among myself and two friends, how much would each person get? Record your response as a picture and a number sentence, using the fraction notation to show division.
 - If $\frac{8}{5}$ represents a division problem, what does 8 stand for and what does 5 stand for?
 - If $\frac{3}{4}$ represents a division problem, what does 3 stand for and what does 4 stand for?

- **Journal/Writing Prompts**

- In your mathematics journal, explain how a fraction can be used to represent symbolically three candy bars could equally be shared among nine friends. Identify how much each person would get, and explain how you know. Support your reasoning with an illustration.
- Write a short story about sharing a candy bar, brownie, or sandwich with friends. You decide how many persons will share the item. Your story should explain how much each person gets and how you divided the item. Support your reasoning with an illustration.

Extensions and Connections (for all students)

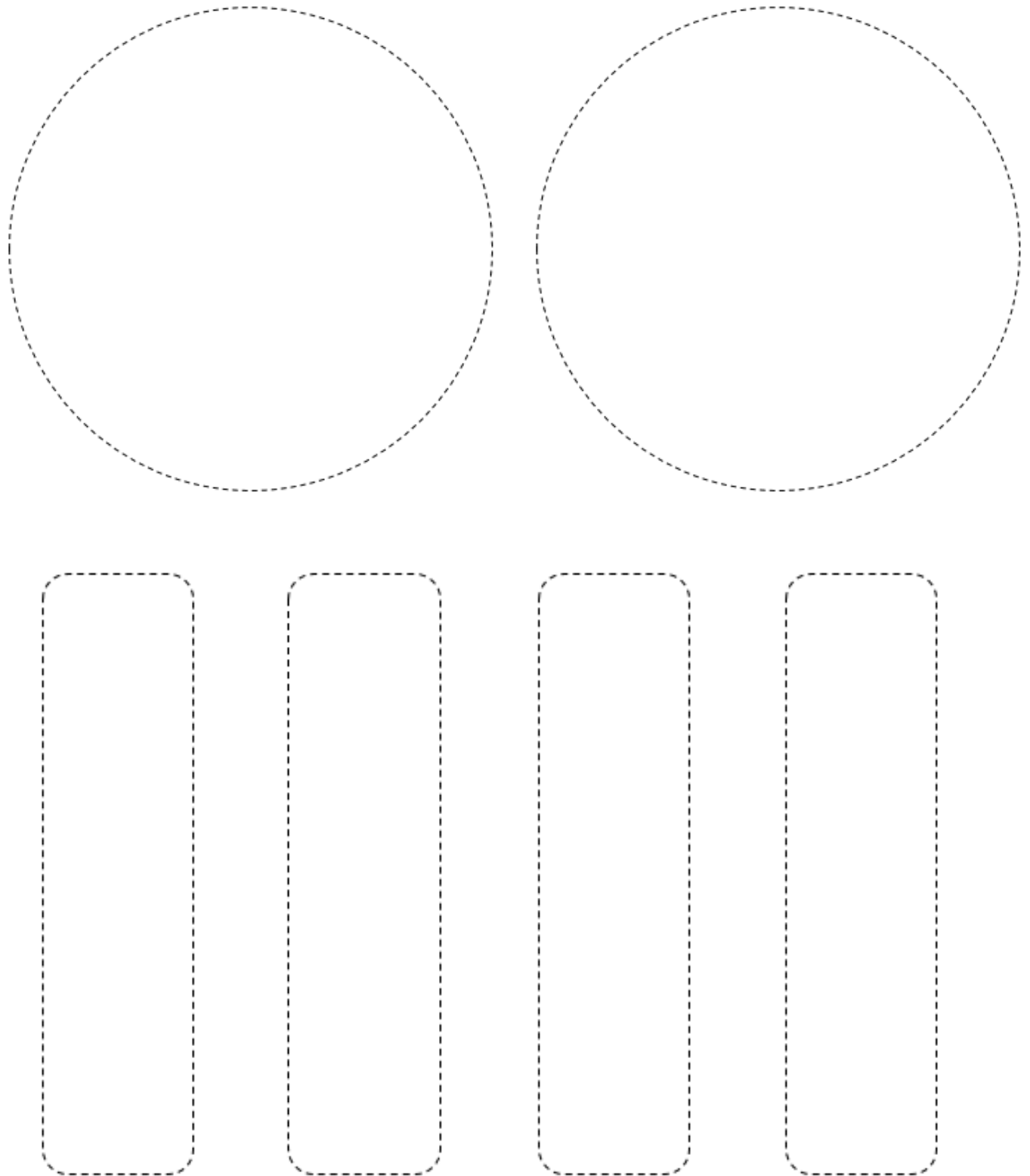
- Provide students with the Sharing Brownies activity sheet to explore what happens when the dividend remains the same but the divisor increases.
- We are going to prepare for a short quiz, and you will only need part of a piece of paper. Take out one sheet of paper and meet with five friends. How will you divide your paper so that everyone gets an equal piece? Have students work together to determine the best way to divide the paper and determine what fraction each student will get. Have students write the appropriate fraction as a division statement for each illustration.

Strategies for Differentiation

- Provide students with concrete models.
- Collaborate with peers.
- Use redirection and corrective feedback throughout the lesson.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Circle (Pizza) and Stick (Licorice) Sample Paper Cutouts



Shared Snack Recording Sheet

1. Use pictures and words to show how you divided the snack into equal parts and how you shared so each person got a fair share. Be able to justify that each person is getting a fair share.

- a. What is being shared? _____ How many sharers? _____
- b. How much will each sharer get? _____
- c. What division statement represents the idea of sharing? _____
- d. What is another way to show the division statement? _____

2. Use pictures and words to show how you divided the snack into equal parts and how you shared so each person got a fair share. Be able to justify that each person is getting a fair share.

- a. What is being shared? _____ How many sharers? _____
- b. How much will each sharer get? _____
- c. What division statement represents the idea of sharing? _____
- d. What is another way to show the division statement? _____

From Fractions to Division–What Story

<p>1. Write a sharing story problem that can be represented by $\frac{4}{5}$.</p> <p>a. Why can this sharing story be solved by division?</p> <p>b. Write division problem that can be used to solve the story problem.</p> <p>c. Solve and explain your work for the problem with pictures and words.</p> <p>d. Write a sentence that shows the solution and the answer to the question in your problem.</p>	<p>2. Write a sharing story problem that can be represented by $\frac{7}{2}$.</p> <p>a. Why can this sharing story be solved by division?</p> <p>b. Write division problem that can be used to solve the story problem.</p> <p>c. Solve and explain your work for the problem with pictures and words.</p> <p>d. Write a sentence that shows the solution and the answer to the question in your problem.</p>
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Sharing Brownies

For each sharing scenario listed below, draw and label a picture showing how much of the brownies each person gets. Write a number sentence using fraction notation to represent division.

Two people are sharing 3 large brownies so that each person gets the same amount.

Three people are sharing 3 large brownies so that each person gets the same amount.

Four people are sharing 3 large brownies so that each person gets the same amount.

Five people are sharing 3 large brownies so that each person gets the same amount.

What pattern do you notice in your pictures, labels, and number sentence statements each time another person is added to the number of sharers? Based on what you know, what do you think will happen if another person is added to the number of sharers? Use the back of this sheet to respond.