LearnZillion

# Mathematics Instructional Cycle Guide

## Dividing Fractions 6.NS.1

Created by Mary Kay Rendock, 2014 Connecticut Dream Team Teacher

## CT CORE STANDARDS

This Instructional Cycle Guide relates to the following *Standards for Mathematical Content* in the *CT Core Standards for Mathematics*:

**Apply and extend previous understandings of multiplication and division to divide fractions by fractions.**

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

This Instructional Cycle Guide also relates to the following *Standards for Mathematical Practice* in the *CT Core Standards for Mathematics*:

**MP4 Model with mathematics.**

- *How do students represent the context of the story problem with a model?*
- *Are they able to match the equation to the model?*

**MP7 Look for and make use of structure.**

- *Are students able to develop strategies when solving measurement division and partitive division story problems?*
- *Do they notice patterns?*

## WHAT IS INCLUDED IN THIS DOCUMENT?

- A Mathematical Checkpoint to elicit evidence of student understanding and identify student understandings and misunderstandings **(page 4)**
- A student response guide with examples of student work to support the analysis and interpretation of student work on the Mathematical Checkpoint **(pages 5-8)**
- A follow-up lesson plan designed to use the evidence from the student work and address the student understandings and misunderstandings revealed **(pages 9-16)**
- Supporting lesson materials **(pages 17-22)**
- Precursory research and review of standard **insert standard code** and assessment items that illustrate the standard **(pages 23-26)**

## HOW TO USE THIS DOCUMENT

1) Before the lesson, administer the **Dividing Fractions *Mathematical Checkpoint*** individually to students to elicit evidence of student understanding.
2) Analyze and interpret the student work using the ***Student Response Guide***
3) Use the next steps or ***follow-up lesson plan*** to support planning and implementation of instruction to address student understandings and misunderstandings revealed by the Mathematical Checkpoint
4) Make instructional decisions based on the checks for understanding embedded in the follow-up lesson plan

## MATERIALS REQUIRED

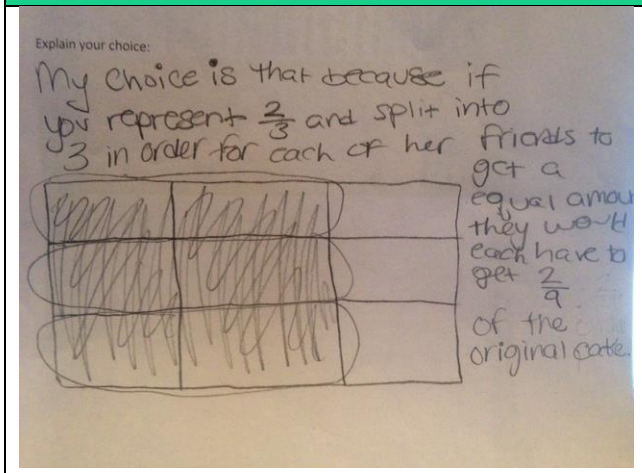
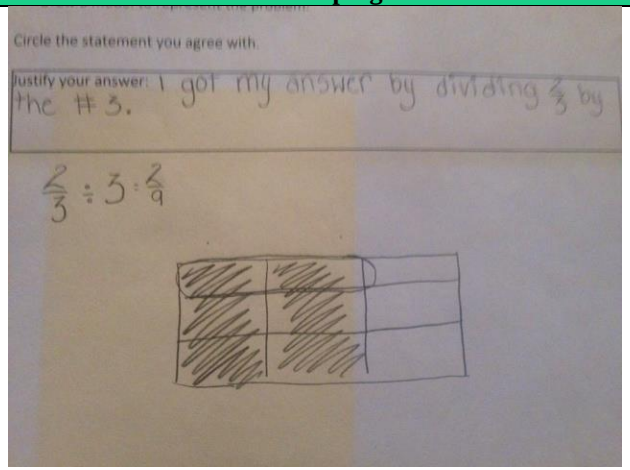
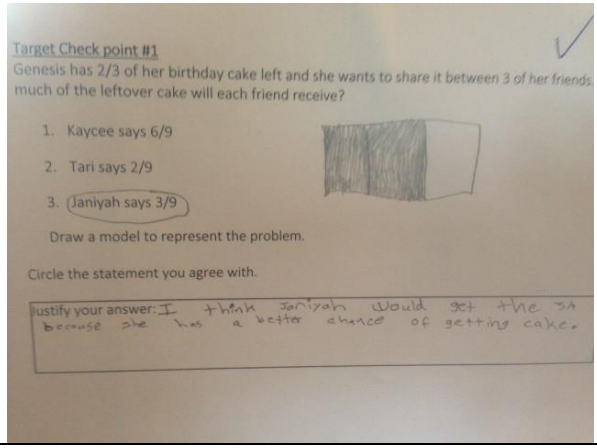
- Response boards, markers and erasers
- Twin popsicles, Hershey bars or graham crackers
- Card stock to make the Memory Game

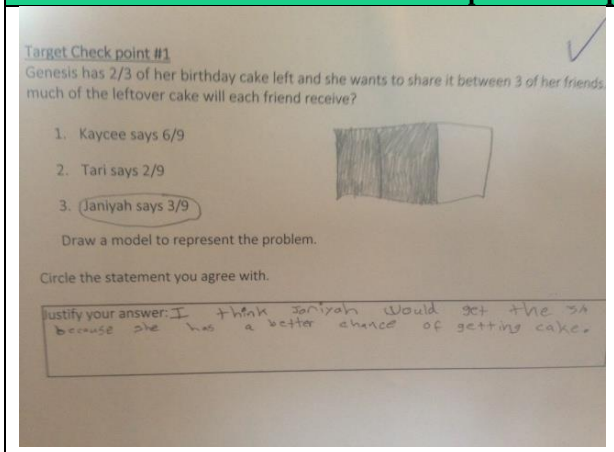
## TIME NEEDED

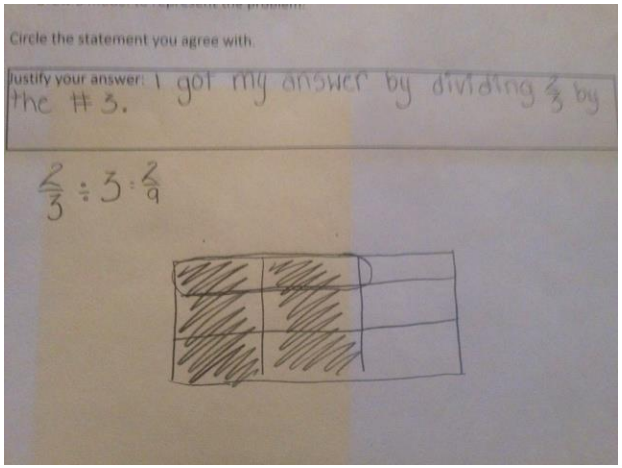
Dividing Fractions Checkpoint administration: **15 minutes**
Follow-Up Lesson Plan: **1 to 2 lesson periods**

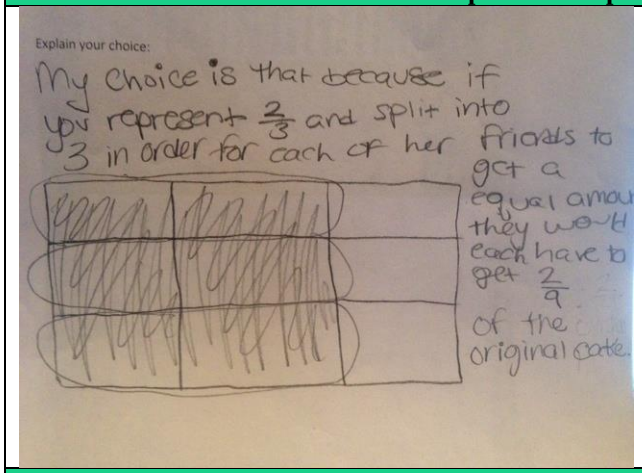
***Timings are only approximate. Exact timings will depend on the length of the instructional block and needs of the students in the class.***

<table>
<tr><th colspan="3">Step 1: Elicit evidence of student understanding</th></tr>
<tr><th colspan="3">Mathematical Checkpoint</th></tr>
<tr><th>Question(s)</th><th colspan="2">Purpose</th></tr>
<tr><td rowspan="2"><u>Target Check point</u><br><br>Genesis has 2/3 of her birthday cake left and she wants to share it between 3 of her friends. How much of the original cake will each friend receive?<br><br>Draw a model to represent the problem and circle the statement you agree with.<br><br>1. Kaycee says 6/9<br>2. Tari says 2/9<br>3. Janiyah says 3/9<br><br>Explain your choice:</td><td>CT Core Standard:</td><td>CCSS.MATH.CONTENT.6.NS.A.1<br>Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?</td></tr>
<tr><td>Target question addressed by this checkpoint:</td><td>Do students understand how to divide a fraction by a whole number in a real world problem using a model? To what extent do they:<ul><li>Draw a model that correctly represents the dividend?</li><li>Divide the dividend correctly into equal portions according to the divisor?</li><li>Interpret the quotient correctly?</li><li>Connect their model and the quotient to the division equation?</li></ul></td></tr>
</table>

| Student Response Guide | | |
|---|---|---|
| **Got It** | **Developing** | **Getting Started** |
|  |  |  |

| Getting Started | |
|---|---|
| **Student Response Example** | **Indicators** |
|  | Model represents the dividend but does not indicate understanding of the divisor<br><br>The student did not connect the context with the model.<br><br>There is no quotient noted in the model.<br><br>The student did not give an equation as a solution.<br><br>The student seems to have confused splitting with 3 friends and each getting 1/3 with the quotient of 3/9. |
| **In the Moment Questions/Prompts** | **Closing the Loop (Interventions/Extensions)** |
| **P**: Tell me about your model.<br><br>**Q**: How much cake is left over? How did you represent the leftover cake?<br><br>**Q**: What operation can you use to find out how the friends divided this? How can you represent that with the model?<br><br>**P Q**: One way to think about division is by asking "If I divide ____ into equal parts, how much is one part?" How can thinking of division in this way help you write an equation to represent this story?<br><br>**Q**: Where do you see one of the equal parts in the model? How can you represent this?<br><br>**Q**: What does this quotient tell you? | Provide students with fractions strips to act out the problem.<br><br>Give students a less than whole pre-segmented candy bar and ask them to split it evenly among friends.<br><br>http://ctdreamteam.learnzillion.com/lessons/3592-divide-a-fraction-by-a-whole-number |

| Developing | |
|---|---|
| **Student Response Example** | **Indicators** |
| .   | The student understands that 2/3 is the dividend and that 3 is the divisor as shown on the equation.<br><br>The model represents 2/3 of the leftover cake divided into 3 parts.<br><br>The equation shows the student understands that division will solve the problem.<br><br>Student concludes that 2/9 is the quotient by recognizing that 1/3 of 2/3 is 2/9.<br><br>The quotient is shown, but the student does not state what the quotient means with words. Does 2/9 represent the portion of the original cake received or does 2/9 represent the portion of the left over cake each friend received? |
| **In the Moment Questions/Prompts** | |
| **P**: Tell me about your model.<br><br>**Q**: Genesis has 2/3 of her birthday cake left and she wants to share it between 3 of her friends. How much of the original cake will each friend receive?<br><br>**Q**: What does the 2/9 represent in your quotient?<br><br>**Q**: How much of the original cake does each friend receive?<br><br>**Q**: How much of the leftover cake does each friend receive?<br><br>**Q:** Will there be a remainder? | http://learnzillion.com/lessons/1381-solve-word-problems-involving-division-of-fractions-by-whole-numbers-using-picture-models |

| Got it | |
|---|---|
| **Student Response Example** | **Indicators** |
|  | The student clearly understands the dividend and the divisor through the explanation given as well as the model.<br><br>The student concludes that each friend will receive 2/9 of the original cake.<br><br>The equation is explained in the response, but it is not written numerically. |
| **In the Moment Questions/Prompts** | **Closing the Loop (Interventions/Extensions)** |
| **P**: Tell me about your model.<br><br>**Q**: Genesis has 2/3 of her birthday cake left and she wants to share it between 3 of her friends. How much of the original cake will each friend receive?<br><br>**Q**: How does your explanation relate to the model?<br><br>**Q**: What equation could you use to represent this problem?<br><br>**Q**: How much of the leftover cake does each friend receive? Where is this shown?<br><br>**Q**: How can you check your solution? | Have students attempt this type of problem with a dividend that will produce a remainder.<br><br>http://learnzillion.com/lessons/3593-compute-quotients-of-fractions-in-realworld-problems |

| Steps 3 and 4: Act on Evidence from Student Work and Adjust Instruction | |
|---|---|
| **Lesson Objective:** | Use models to represent fraction division problems in order to understand the dividend, divisor and quotient. |
| **Content Standard(s):** | 6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* |
| **Targeted Practice Standard :** | **MP4 Model with mathematics.**<br>• *How do students represent the context of the story problem with a model?*<br>• *Are they able to match the equation to the model?*<br>**MP7 Look for and make use of structure.**<br>• *Are students able to develop strategies when solving measurement division and partitive division story problems?*<br>• *Do they notice patterns?* |

| Mathematical Goals | Success Criteria |
|---|---|
| • Understand that division can be used to find how many groups of the divisor can be found in the dividend or the size of one of the groups.<br>• Students will understand how to represent the dividend, the divisor and the quotient in a fraction story problem with models. | • Draw a model to represent a fraction division problem and explain how the model shows the dividend, the divisor and the quotient.<br>• Write an equation that correctly represents the division story. |

**Launch (Probe and Build Background Knowledge)**

**Purpose: *Access and activate prior knowledge about dividing fractions.***

Ask 5 students to stand in front of the class holding one plain candy bar each. Next, have each one split the candy bar in half and invite a friend up to hold/share it. (You may use graham crackers or any other item that is pre-divided to aid in the demonstration.)

Ask the class the following questions:

- *What happened to the size of the candy bar when the "owner" split it with a friend? (they got smaller, they are half the original)*
- *What happened to the number of candy bars after they were divided in half? (the number increased, it doubled)*

- *What is a number sentence that can represent the 5 Hershey bars divided in half.(5 ÷1/2 = 10)*
- *How many ½ bars are there in the original 5 bars? How many groups of ½ are there in 5? (10 groups) (Note to teacher: this type of division is called "measurement division".)*

Have a Think, Pair, Share about the following question.

- *Dividing a whole number by a fraction less than one produced a larger number. Is this "normal" for a division quotient? (Students may think that "division makes smaller", but this is not always the case.)*

Have pairs share out their answers. *(Some might say division usually yields a smaller number than the dividend.)*

Now ask the" owners" of the 10 Hershey bars to consider sharing their chocolate equally between themselves and 5 friends. (6 altogether) Ask the group:

- *What happened to the size of the pieces when the "owner" split them equally with friends? (they got even smaller)*
- *What is a number sentence that can represent the half bar divided into 6 equal pieces? (1/2÷6 = x)*
- *How much of the original bar did each friend receive?(1/12 of a candy bar)*
- *If we split ½ equally into 6 pieces, how much of a whole candy bar is each piece? (1/12 of a bar)(Note to teacher: This type of division is called "partitive division")*

Write the 2 number sentences on the board to compare them, asking these questions:

$$6 \div \frac{1}{2} = 12 \text{ and } \frac{1}{2} \div 6 = \frac{1}{12}$$

- *What do you notice about the 2 quotients? How do they relate to the dividend?*

*Teacher notes: You may want to point out that when you divide a whole number by a fraction less than one, you get a larger number, and when you divide a fraction by a whole number you get a smaller fraction.*

**Instructional Task**

**Purpose:** ***Students will solve real world problems with division fraction models.***

**Engage (Setting Up the Task)**

1) Explain to the students that they are going to work in pairs to solve division word problems. Display the following story problem:

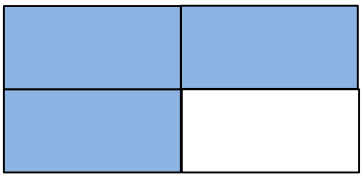
| |
|---|
| Wesley had a going away dinner for his friend. He ordered pizza for them, but before he got there Wesley's brother ate some. There was $\frac{3}{4}$ of the pizza left to share between Wesley and his friend. How much of the original pizza will each boy have? |

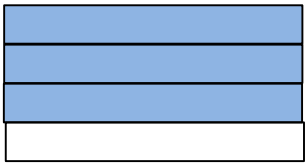
2) Conduct a Think, Pair Share with these questions:

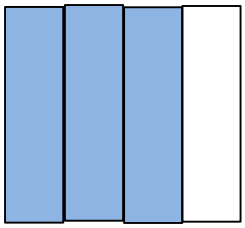
- *What is the story problem asking us in your own words?*
- *What operation can we use to determine how much of the original pizza each friend will receive?*
- *If the 2 boys are going to share $\frac{3}{4}$ of a pizza, would their equal shares be more or less than 1 whole? How do you know?*
- *Would the equal shares be more or less than $\frac{3}{4}$? How do you know?*

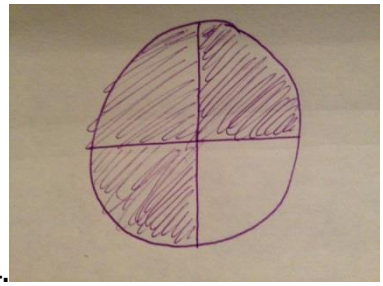
3) Have partners draw a model of the leftover pizza on their white boards. (Rectangles are much easier to use when modeling division of fractions and I recommend them. You can use circles also, but they can be tricky when trying to make the sections equal.)

Examples:

**1.** 

**3.** 

**2.** 

**4.** 

**Explore (Solving the Task)**

4) Ask the partners to visualize how they might split the $\frac{3}{4}$ of the pizza between the 2 friends. Share the responses with the class.

- *Responses might include picturing 1 horizontal line across, drawing lines splitting each ¼ into 2 equal sections, etc.*

5) Ask each set of partners to use their whiteboards, draw a model and split their ¾ model into 2 equal sections.

*Some examples might include:*

*Model 1: divide each fourth evenly into 2 sections*
*Model 2: draw 1 horizontal line creating 2 equal sections of the whole*
*Model 3: draw 1 vertical line creating 2 equal sections of the whole.*
*Model 4: split each ¼ into 2 equal sections*

6) Circulate around the room observing the activity and checking on the models. Here are some possible questions:

| Focusing Questions | Probing Questions | Advancing Questions |
|---|---|---|
| • *What do you know that could help you solve this problem?*<br>• *How can you use your model to show the share of pizza each friend will get?* | • *Can you explain how you decided to show the number of friends sharing the pizza?*<br>• *Why did you set up your model that way?* | • *Can you think of another way to show how the friends might split the pizza?*<br>• *How might the model change of the boys were splitting a whole pizza?* |

**Elaborate (Discuss Task and Related Mathematical Concepts)**

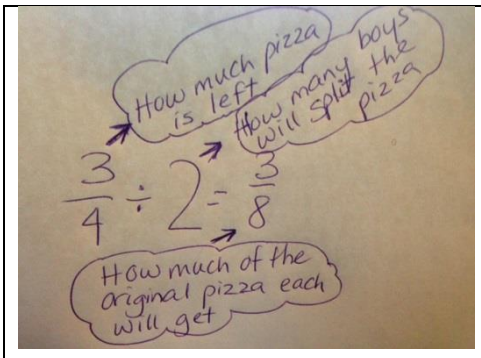
7) Have each pair join another pair and share their solutions. Ask the double groups to choose ONE solution and share it with the whole group. Display and discuss a correct example of each model being divided correctly.

8) Ask:

- What is the QUESTION being asked of us? (How much of the original pizza will each friend get?)
- Have the partners identify the 2 equal sections of the shaded area and circle them. Elicit how much ONE of those shares is and ask how it can be named as a fraction (you may need to remind them to think of the pizza before Wesley's brother ate some.)

If students are struggling here, have them count the pieces in the shaded area and think how they would divide that total into 2 equal groups.

Write the equation that represents the story problem: $\frac{3}{4} \div 2 = \frac{3}{8}$ (The equation should include labels that tell what each part represents: $\frac{3}{4}$ shows how much pizza is left, 2 tells how many friends are sharing the pizza and $\frac{3}{8}$ is the amount of the original pizza each friend will get.)




Have the students put the entire process together on a chart paper to be displayed around the room. Have a "Gallery Walk" and have them check their peer's work for the following:

- The dividend is represented by the shaded area.
- The divisor is used to divide the shaded section further.
- Equal shares should be represented by rings.
- The equation should include the correct dividend, divisor and quotient and be labeled

**Checking for Understanding**

**Purpose:** ***Pose the following statements in a True/False format to elicit evidence of students' understanding of how to construct area models to represent division of fractions.***

White boards for each student: answer True or False to the following statements:

- The dividend is represented by the shaded area. (True)
- The quotient is used to divide the shaded section further. (False -The divisor is used to divide the shaded area further.)
- Equal shares should be represented by rings.(True)
- The model should only represent the divisor. (False- the model should represent the dividend, divisor and quotient.)

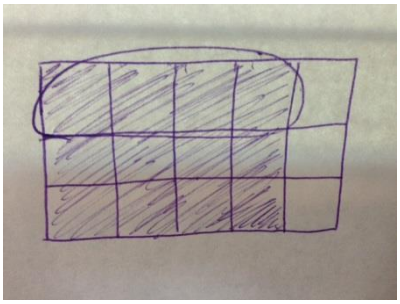
**Common Misunderstanding**

**Purpose**: ***Address a common misunderstanding students often have about interpreting the quotient from the model.***

Students may not understand where to find the quotient in the model. They may see the quotient as the equal portion of the shaded area rather than the whole OR as the equal portion of the whole rather than the shaded area, depending upon the question being asked.

Post the following question along with the model answer. Have children pair up and discuss how the model matches the story problem.

To make hair ribbons, 3 friends bought $\frac{4}{5}$ of a yard of fancy ribbon. If they split it equally how much of a yard of ribbon will each friend get?



- Model: shade in $\frac{4}{5}$, divide it into 3rds, circle one of the 3 equal groups created. $\frac{4}{5} \div 3 = \frac{4}{15}$
- of a yard. (you need to use the unit of the whole yard as the denominator, with 15 as the denominator because the whole has been split into 15 pieces)

*Facilitate discussion with the following questions:*

- *How much of a yard did they buy? How did the model show this?*
- *How many friends are sharing the ribbons? If they are sharing it equally how can you divide the $\frac{4}{5}$?*
- *Will each friend receive a section of a yard? Or a section of the 4/5 of a yard?*
- *How much of a yard will each friend receive? $\frac{4}{5} \div 3 = \frac{4}{15}$ (You need to use the entire yard as the denominator (15 equal pieces) because the question is asking how much of a yard each will receive)*
- *Extension question: How much of the purchased ribbon will each friend receive? $\frac{4}{5} \div 3 = \frac{1}{3}$ (you need to use only the shaded area that represents what the girls purchased and after you divide it into 3rds, there are 3 equal pieces and each girl will receive one of the 3)*

**Checking for Understanding**

**Purpose: *Pose the following question as an exit ticket to elicit evidence of students' understanding of modeling real world division of fraction stories and representing the dividend, divisor and quotient.***

Maria has ½ a gallon of paint left. She needs to cover 3 more sections of a wall. How much paint will she have for each section?

- *Draw a model to represent the story problem.*
- *Write an equation that represents the model.*
- *Label each part of the equation, telling what each part means.*

## Closure

**Purpose:** ***Provide students an opportunity to self-assess their own learning related to the success criteria by projecting the questions below or providing students with a self-assessment to complete.***

*Think about dividing fractions using models. Circle the number that matches your level of success with each item.*

1. *I understand that division can be used to find how many groups of a divisor are in a dividend.*

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all* | | *I still have questions* | | *I've got it!* |

2. *I understand that division can be used to find the size of one of the groups.*

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all* | | *I still have questions* | | *I've got it!* |

3. *I can draw an area model to represent a fraction division problem and indicate the dividend, the divisor and the quotient.*

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all* | | *I still have questions* | | *I've got it!* |

4. *I can write an equation to represent a fraction situation.*

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all* | | *I still have questions* | | *I've got it!* |

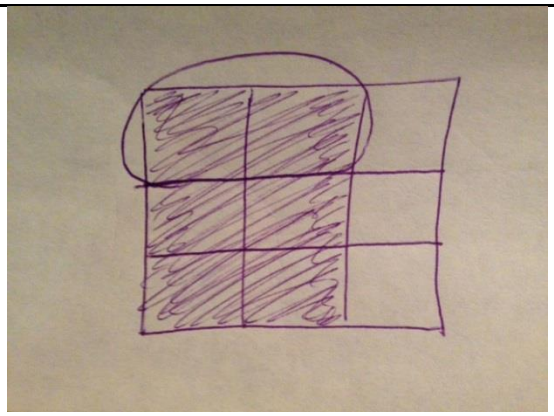
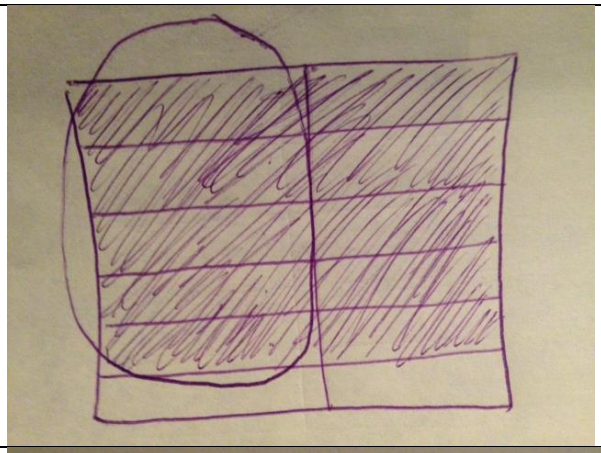
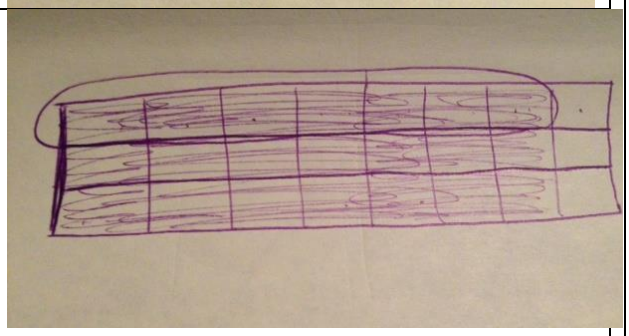
5. *I can draw a number line to represent a fraction division problem and indicate the dividend, the divisor and the quotient.*

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Not at all* | | *I still have questions* | | *I've got it!* |

## Extension Task

**Purpose:** ***Provide an extension task for those students who are ready to deepen their understanding of representing division stories with models. This extension task will ask students to interpret a model, provide the quotient and match it to the correct division story.***

Students will match the story problem to the area model, interpret the quotient and write an explanation that justifies their selection.

| | |
|---|---|
| We have $\frac{2}{3}$ of a gallon of orange juice for the breakfast. We have 3 pitchers to serve it. How much orange juice can we put in each pitcher? |  |
| Dot has 2 dogs that are hungry for dinner. She realizes she only has $\frac{5}{6}$ of a can of dog food left. How much of the can will she serve to each dog? |  |
| Peter has 3 homework assignments to do before soccer practice. He only has $\frac{7}{8}$ of an hour to do them. How much time can he spend on each one? |  |

Note to the teacher: The correct pairs are presented together. Retain this copy as your answer key. For the student activity, make copies on card stock, cut them up and present them as a mixed pile. Students will match them together and write their justification.

Answers: $\frac{2}{9}$ gallon of orange juice, $\frac{5}{12}$ of a can of food and $\frac{7}{24}$ of an hour

# Pizza Task

Wesley had a going away dinner for his friend. He ordered pizza for them, but before he got there Wesley's brother ate some. There was $\frac{3}{4}$ of the pizza left to share between Wesley and his friend. How much of the original pizza will each boy have?

Part A

What is the story problem asking us in your own words?

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Part B

Draw a model to represent the leftover pizza.

Part C

Write an equation to represent the problem. Label each part and tell what it represents.

# Student Self-Assessment

Think about dividing fractions using models. Circle the number that matches your level of success with each item.

1. I understand that division can be used to find how many groups of a divisor are in a dividend.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | I still have questions | | I've got it! |

2. I understand that division can be used to find the size of one of the groups

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | I still have questions | | I've got it! |

3. I can draw an area model to represent a fraction division problem and indicate the dividend, the divisor and the quotient.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | I still have questions | | I've got it! |

4. I can write an equation to represent a fraction situation.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | I still have questions | | I've got it! |

5. I can draw a number line to represent a fraction division problem and indicate the dividend, the divisor and the quotient.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | I still have questions | | I've got it! |

# Checking for Understanding

Write TRUE or FALSE for each sentence. If the sentence is False, write the sentence correctly.

1. The dividend is represented by the shaded area. _____

2. The quotient is used to divide the shaded section further. _____

3. Equal shares should be represented by rings. _____

4. The model should only represent the divisor. _____

# Gallery Walk Checklist

Walk around the room and analyze the work of your classmates. Check their work for the following:

_____The dividend is represented by the shaded area.

_____The divisor is used to divide the shaded section further.

_____Equal shares should be represented by rings.

_____The equation should include the correct dividend, divisor and quotient and be labeled

Comments:

# Exit Ticket

Maria has $\frac{1}{2}$ a gallon of paint left. She needs to cover 3 more sections of a wall. How much paint will she have for each section?

1. Draw a model to represent the story problem.

2. Write an equation that represents the model.

3. Label each part of the equation, telling what each part means.

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# Matching Game Recording Sheet

We have $\frac{2}{3}$ of a gallon of orange juice for the breakfast. We have 3 pitchers to serve it. How much orange juice can we put in each pitcher?

Model: Quotient:

Explanation: _____

_____

_____

Dot has 2 dogs that are hungry for dinner. She realizes she only has $\frac{5}{6}$ of a can of dog food left. How much of the can will she serve to each dog?

Model: Quotient:

Explanation: _____

_____

_____

Peter has 3 homework assignments to do before soccer practice. He only has $\frac{7}{8}$ of an hour to do them. How much time can he spend on each one?

Model: Quotient:

Explanation: _____

_____

_____

| Research and review of standard | |
|---|---|
| **Content Standard(s):** | **Standard(s) for Mathematical Practice:** |
| 6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*. | MP2 Reason abstractly and quantitatively.<br><br>MP4 Model with mathematics.<br><br>MP7 Look for and make use of structure. |
| **Smarter Balanced Claim** | ***Smarter Balanced Item*** |
| **Claim 1: Concepts and Procedures**<br>Students can explain and apply mathematical procedures with precision and fluency. | Hisaki is making sugar cookies for a school bake sale. He has 3 1/2 cups of sugar. The recipe calls for 3/4 cups of sugar for one batch of cookies. Which equation cab be used to find b, the total number of batches of sugar cookies Hisaki can make?<br><br>A. 3 1/2 x 3/4 = b<br>B. 3 1/2 ÷ ¾ = b<br>C. 3 ½ + b = ¾<br>D. 3 ½ - b = ¾ |

| | |
|---|---|
| CPR Pre-Requisites | **Conceptual Understanding and Knowledge**<br>• Understand that division can be used to find the number of groups that can be made from a starting value when it is partitioned into equal groups (measurement division)<br>• Understand that division can be used to find the size of each share when the starting value is partitioned into equal shares (partitive division)<br>• Understand the dividend in the starting value, or the total amount being partitioned.<br>• Understand the divisor is the number of groups (measurement), or the size of each group (partitive), being used to partition a certain value.<br>• Understand the quotient is the number of groups (measurement), or size of the groups (partitive) that can be made for partitioning the starting value.<br>• Understand how the size of the dividend and divisor affect the quotient (i.e.: if a fractional dividend is larger than a fractional divisor, then the quotient will be larger than both)<br>• Understand that a/b is the same as a x 1/b<br><br>**Procedural Skills**<br>• Divide unit fractions by whole numbers and whole numbers by unit fractions.<br>• Multiply a fraction or a whole number by a fraction.<br><br>**Representational**<br>• Represent fraction division problems using visual fraction models<br><br>**Social knowledge**<br>• Know that the dividend is written to the left of the division symbol in a division expression<br>• Know that the divisor is written to the right of the division symbol in a division expression |

| **Standards Progression**<br><br>**Look at LearnZillion lessons and expert tutorials, the Progressions documents, learning trajectories, and the "Wiring Document" to help you with this section* | | |
|---|---|---|
| **Grade(s) below** | **Target grade** | **Grade(s) above** |
| 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.<br><br>5.NF.B.7.A Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3*. | 6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.<br><br>6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. | 7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.<br>*For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour*. |

| | | |
|---|---|---|
| 5.NF.B.7.B Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4*.<br><br>5.NF.B.7.C Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* | | 7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.<br><br>7.NS.A.2.B Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number.<br>If *p* and *q* are integers, then -(*p*/*q*) = (-*p*)/*q* = *p*/(-*q*). Interpret quotients of rational numbers by describing real-world contexts.<br><br>7.NS.A.2.C Apply properties of operations as strategies to multiply and divide rational numbers. |

## Common Misconceptions/Roadblocks

*What characteristics of this problem may confuse students?*

- Students may have difficulty recognizing division in context. (I think that students often have difficulty deciding whether to divide or multiply in story problems that require them to work with groups.)
- Students may be unaware of what a "batch" means.

*What are the common misconceptions and undeveloped understandings students often have about the content addressed by this item and the standard it addresses?*

- Students may not understand the difference between measurement and partitive division (i.e.: when students are interpreting the answer, they need to know if they are looking for the size of one partition OR if they are looking for the number of equal groups that can be made. )
- Students may be unsure of exactly what model (area, number, number line) may be best to represent the number sentence in a particular situation
- Students may have trouble identifying the whole in the problem
- Students may have difficulty interpreting the quotient from the model and applying it to the story.
- Students might only be able to divide with the algorithm and therefore may not understand.

*What overgeneralizations may students make from previous learning leading them to make false connections or conclusions***?**

- Students may believe that you always divide the 1st number by the 2nd number
- Students may believe that a division number sentence will always produce a smaller value.
- Students may believe that a multiplication number sentence always produces a larger value.