# CONNECTING FRACTION DIVISION EQUATIONS TO VISUAL MODELS

* **Subject**: Math
* **Grade**: 6
* **Claim** #2: Problem Solving
* **Target** B: The Number System
* **Standard**: CCSS 6.NS.A.1
* **Playlist**: Grade 6 Fractions

Organization: Illustrative Mathematics

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## Outline

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## GET STARTED

### Overview

Students engage with division of fraction tasks that use the same context but require students to divide the fractions in the opposite order. Students solve the tasks by creating visual models, selecting the equations that appropriately represents the situations, and confirming their solutions by solving said equations and comparing back to the visual models. Students will work to answer the question, “How do these numbers and operations work together?”

### Learning Goal

* The student can solve real-world and mathematical one-step problems involving division of fractions by fractions.

### Success Criteria

* Students will be able to construct visual models to solve contextual problems involving division of fractions.
* Students will be able to pair visual fraction models with appropriate equations.
* Students will be able to compute the quotients of fractions.

## STEP-BY-STEP

### 1: Engage Students

Initiate the task by engaging students in the topic and clarifying intended learning. There are many different approaches for this. This task utilizes an approach called a (FA icon) Conceptual Bridge.

Ask students a simple division problem that you know they’ll be successful at – what is four divided by two? Ask a few students to share how they did the problem. They will likely say that they tried to figure out how many times three goes into six. Next ask them – what is two divided by ½? They will likely grapple through the task of figuring out how many times ½ goes into four. Ask them to explain why four makes sense. Then ask them – what is ½ divided by two – and ask a few students to share how they solved the problem and why. Then ask them – what is 2/3 divided by 1/2? Explain that is the type of problem they will be working to solve.

### 2: Introduce Visual Representations

Ask students to create a visual representation of the following scenario: ½ cup of water fills 2/3 of a container.

Whiteboard or scratch paper may be useful for this task.

As students are working, (FA icon) circulate the room to observe students working. As you circulate the room, pay attention to the following look-fors and take action to help move students forward as needed.

* Confused about the terminology – cup vs. container. Clarify that a “cup” is a fixed amount, whereas a container can be a variety of sizes.
* Struggling to understand what is meant by the word “fills”. Clarify that in this problem the ½ cup equals 2/3 of a container.
* Not considering the scale of their drawings. Help them by explaining that it will help them to solve the problem if they consider the size of their representations.
* Having trouble getting started. Help them start with the ½ cup since it is a simpler fraction. Depending on how they represent the ½ (e.g. area model, tape diagram, number line), help them then represent 2/3.
* Labeling their representation appropriately. Work with students to add this element and explain the importance of labels.

Students will create a visual model independently. You can pair them together to share their visual representations and explain their reasoning. Facilitate students providing (FA icon) peer-to-peer feedback. Consider providing sentence frames to support actionable student feedback. The students may adjust their models as their thinking and reasoning changes through discussion.

Strategically select student samples to be shared under a document camera for example, so that various types of visual fraction models will be explored by the whole class (e.g. area model, tape diagram, number line). Select student samples that represent variety amongst student work. Prime students prior to share their answers to these questions, so they will be confident in the moment.

Some possible questions to prompt students:

* What are some advantages of each type of model?
* What are some disadvantages of each type of model?
* What other types of models may be appropriate for this situation?

Provide (FA icon) verbal feedback to students on-the-fly.

### 3: Numerical Representation

When students are ready, ask them (i.e., display the first problem in the student handout from Illustrative Mathematics): If 1/2 cup of water fills 2/3 of a plastic container, how many containers will 1 cup fill? Have them grapple independently before moving to a partner, and then whole class discussion.

Display the possible numerical representations. Students will independently select the equations that appropriately match their representations and solve the equations.

With their partner, students will discuss their ideas. Again the teacher will (FA icon) circulate the room to elicit evidence of student thinking. Some looks-fors are:

* Did the student choose an equation with the wrong operation?
* Did the student choose an equation that reversed the dividend and divisor?
* When solving the problem, did the student make an error in application of the division algorithm? Is the error in a basic arithmetic fact? (e.g. if the error is a basic math fact issue it could be supported through use of work in the area of computational fluency, arithmetic fact charts or a calculator, or if the error is a misapplication of the division algorithm it could be supported through reteach, or use of an alternate division algorithm)

Teacher will select a few students to share their discoveries with the class.

Select students that represent a variety of ideas and approaches. Prime students prior to share their answers to these questions, so they will be confident in the moment.

Possible probing questions**:**

* Is your answer what you expected? Why?
* If your calculation didn’t match your model, in which result to you have more confidence? Why?

### 4: Check-in

Ask students to (FA icon) self-assess their understanding of the first problem. Ask them to decide whether they are ready to try what they’ve learned to a new problem, or more practice (training wheels). Depending on the votes, decide whether to have the whole class move on to a practice problem, reteach, or some combination where some of the class gets additional instruction while the rest of the class attempts the next problem. Additionally, you can ask students to line up according to how confident they are in creating visual representations of division fraction problems. Use the (FA icon) fold the line approach and have students partner with a students who is on the opposite end of the confidence spectrum. Have them solve the problem together.

### 5: Practice Problem

Depending on how the lesson is going you can decide how to make use of the following practice problem. Suggest using a (accessibility icon) highlighter strategy when working on word problems.

If 1/2 cup of water fills 2/3 of a plastic container, how many cups of water will the full container hold?

Solve the problem by drawing a picture.

Which of the following multiplication or divisions equations represents this situation? Explain your reasoning.

1/2×2/3=?

1/2÷2/3=?

2/3÷1/2=?

Solve the arithmetic problem you chose in part (3) and verify that you get the same answer as you did with your picture.

## ATTACHMENTS

**Illustrative Mathematics Task:** [**How Many Containers in One Cup / Cups in One Container?**](https://www.illustrativemathematics.org/content-standards/tasks/408)(website)

## DIFFERENTIATION

### Performance-based Differentiation

#### Support

Modify the numbers in the problems to include a whole number divided by a fraction. This may provide access to students who are still making sense of fraction division.

#### Challenge

Change one of the numbers to a mixed number to extend student understanding about division of fractions with fractions greater than one.

### Additional Differentiation Suggestions

[optional content a resource author may want to include specific to students learning English or students with disabilities]

### Accessibility Strategies Used in this Resource

#### Highlighter

[Highlighter definition] Learn more.

## FORMATIVE ASSESSMENT PROCESS

### How It is Used in This Resource

#### Clarifying Intended Learning

* Students will participate in a collaborative discussion to describe the success criteria in their own words. Students may use words or pictures to express their understanding of how they will know they have been successful with this task.

#### Elicit Evidence

* Students will create a visual model independently. The students may adjust their models as their thinking and reasoning changes through discussion.
* Students will independently select the equations that appropriately match their representations and solve the equations.
* Students will discuss their solutions – discussions will elicit evidence of student thinking.

#### Interpret Evidence

Review the visual models for accuracy: labeling, scale, operation, and application.

#### Act on Evidence

Feedback

* The initial feedback will occur peer to peer.
* As the teacher listens to the peer conversations, questioning techniques will be utilized to move learning forward.

Instructional Moves

If the student is struggling with:

* support students in creating fractional visual models
* select an equation that matches student skill
* perform error analysis of student calculations to address misconception

### Formative Assessment Strategies Used in this Resource

*Verbal Feedback*

[Definition] Learn more

*Peer-to-Peer Feedback*

[Definition] Learn more

*Collaborative Discussion*

[Definition] Learn more

*Circulate the Room*

[Definition] Learn more

*Self-Assess*

[Definition] Learn more

*Fold the Line*

[Definition] Learn more

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