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Primary Type: Formative Assessment

# Models of Fraction Division

Students are asked to explain the relationship between a fraction division word problem and either a visual model or an equation.

**Subject(s):** Mathematics
**Grade Level(s):** 6
**Intended Audience:** Educators

**Freely Available:** Yes

**Keywords:** MFAS, fraction, division, model, equation

**Instructional Component Type(s):** Formative Assessment

**Resource Collection:** MFAS Formative Assessments

## ATTACHMENTS

MFAS_ModelsOfFractionDivision_Worksheet.docx

## FORMATIVE ASSESSMENT TASK

**Instructions for Implementing the Task**

This task can be implemented individually, with small groups, or with the whole class.

1. The teacher asks the student to complete the problem on the *Models of Fraction Division* worksheet.
2. The teacher asks follow-up questions, as needed.

## TASK RUBRIC

### Getting Started

**Misconception/Error**

The student is unable to identify how either the visual model or the equation relates to the given problem and its solution.

**Examples of Student Work at this Level**

The student describes how to solve the problem (correctly or incorrectly) without regard to either the model or the equation. For example, the student attempts to divide $2\frac{5}{6}$ by $\frac{1}{4}$ without relating this operation to either the model or the equation.

**Questions Eliciting Thinking**

What is the question asking? How would you answer it? What mathematical operation do you need to use to answer the question?

What does the equation have to do with how many stones are needed for the path?

What does the long bar represent? What does the short bar represent? How can they be used to answer the question?

**Instructional Implications**

Review the concept of division as repeated subtraction, as breaking apart into equal shares, and as the inverse of multiplication. Ask the student to compose real-world contexts for division of fraction problems and use these three approaches to provide interpretations, models, and strategies. Begin with problems in which different real-world interpretations of division are applied to word problems that result in whole number quotients.

## Moving Forward

**Misconception/Error**

The student is unsuccessful in using either the visual model or the equation to answer the question posed in the problem.

**Examples of Student Work at this Level**

The student attempts to use either the visual model or the equation to determine the number of stones needed for the path but:

- Errs in describing the fraction of a stone when using the visual model.
- Is unable to correctly solve the equation.

**Questions Eliciting Thinking**

What is the significance of the marks on the model? Into how many sections is each stone divided? What fraction of the stone does each section represent?

Can you explain your strategy for solving the equation?

**Instructional Implications**

Ask the student to explain what it means to divide whole numbers and to complete division problems using whole numbers instead of fractions. Encourage the student to use number lines and fraction strips to model fraction division and to write equations to represent the relationship among quantities in problems. Give the student additional fraction division problems and encourage the student to use his or her understanding of whole number division as a guide to understanding fraction division.

## Almost There

**Misconception/Error**

The student is unable to explain how either the model or the equation can be used to answer the question posed in the problem.

**Examples of Student Work at this Level**

The student uses either the model or the equation to correctly answer the question posed in the problem. However, the student is unable to explain the relationship between the model or the equation and the solution strategy used. The student says:

- The model shows how many stones are needed but is unable to explain how.
- The equation can be solved by dividing but does not explain the relationship between the equation and the problem context.

**Questions Eliciting Thinking**

Why do you think the bars are divided into smaller pieces? What does each piece represent?

Where does this equation come from? What does it mean in the context of the problem?

**Instructional Implications**

Review the process of fraction division from the familiar perspective of, "How many groups of *x* can go into *y*?" (e.g., 34 ÷ 3 can be described as "How many threes can go into 34?" resulting in an answer of $11\frac{1}{3}$). Point out that fraction division can be thought of this way as well, but divisor and dividend must be rewritten as fractions with a common denominator for the connection to be apparent. In the worksheet problem, $\frac{17}{6} \div \frac{1}{4}$ can be rewritten as $\frac{34}{12} \div \frac{3}{12}$ and understood as, "How many sets of three twelfths can go into 34 twelfths?" which is equivalent to 34 ÷ 3. The model on the worksheet illustrates this perspective. Provide the student with other problems to consider in this manner and ask the student to generate a visual model similar to the one given in the worksheet for each problem.

Guide the student to interpret division problems as unknown factor problems. For example, 24 ÷ 8 can be rewritten as 8 × ? = 24 and thought of as the number of eights in 24. Likewise, $2\frac{5}{6} \div \frac{1}{4}$ can be rewritten as $\frac{1}{4} \times ? = 2\frac{5}{6}$ and thought of as the number of fourths in $2\frac{5}{6}$. The number of fourths in $2\frac{5}{6}$ is more easily found when both $\frac{1}{4}$ and $2\frac{5}{6}$ are rewritten with a common denominator (i.e., as $\frac{3}{12}$ and $\frac{34}{12}$) so the question becomes, "How many three twelfths are in 34 twelfths?" or equivalently, "How many threes are in 34?"

## Got It

**Misconception/Error**

The student provides complete and correct responses to all components of the task.

**Examples of Student Work at this Level**

The student explains that:

- The model represents the length of the path divided into $\frac{1}{4}$ meter long sections, each representing the length of a stone, and the question can be answered by counting the number of "stones" marked on the model.
- In solving the equation, one is dividing the length of the path, $2\frac{5}{6}$ meters, by the length of a stone, $\frac{1}{4}$ meter, which will result in the number of stones needed.

**Questions Eliciting Thinking**

Why was each stone divided into thirds in the model?

What fraction of the path does each stone represent in the model?

**Instructional Implications**

Ask the student to generate an explanation of how the problem strategy not chosen (visual model or equation) could be used to determine the number of stones needed for the path.

Provide the student with additional problems for which he or she can develop a visual model or an equation that represents the relationships among quantities described in the problem.

## ACCOMMODATIONS & RECOMMENDATIONS

### Special Materials Needed:

- *Models of Fraction Division* worksheet.

## SOURCE AND ACCESS INFORMATION

**Contributed by:** MFAS FCRSTEM
**Name of Author/Source:** MFAS FCRSTEM
**District/Organization of Contributor(s):** Okaloosa
**Is this Resource freely Available?** Yes
**Access Privileges:** Public


## Related Standards

| Name | Description |
|---|---|
| MAFS.6.NS.1.1: | 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?*<br><br>**Remarks/Examples:**<br>**Examples of Opportunities for In-Depth Focus**<br><br>This is a culminating standard for extending multiplication and division to fractions.<br><br>**Fluency Expectations or Examples of Culminating Standards**<br><br>Students interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. This completes the extension of operations to fractions. |