

**Math: Grade 6, Lesson 6, Dividing Fractions**

**Lesson Focus:** Explore Dividing Fractions

**Practice Focus:** Students will focus on exploring division of fractions by whole numbers using models in order to represent the quotients.

**Objective:** Students will learn to divide fractions by whole numbers with a focus on visual models.

**Key Vocabulary:** fraction, fraction model, divide, quotient

**TN Standards:** 6.NS.A.1

**Teacher Materials:**

- White board and markers or smart board
- Visual Fraction Models (fraction bars, fraction circles, number lines, grid paper)
- Student Practice Packet

**Student Materials:**

- Paper and a pencil, and a surface to write on

Teacher Do	Student Do
<p><u>Opening</u> (1 minutes)</p> <p><b>Hello! Welcome to Tennessee’s At Home Learning Series for math! Today’s lesson is for all our 6<sup>th</sup> graders out there, though all children are welcome to tune in. This lesson is the sixth in our series.</b></p> <p><b>My name is ____ and I’m a ____ grade teacher in Tennessee schools! I’m so excited to be your teacher for this lesson! Welcome to my virtual classroom!</b></p> <p><b>If you didn’t see our previous lesson, you can find it on the TN Department of Education’s website at <a href="http://www.tn.gov/education">www.tn.gov/education</a>. You can still tune in to today’s lesson if you haven’t see any of our others. But, it might be more fun if you first go back and watch our other lessons since we’ll be talking about things we learned previously.</b></p> <p><b>Today we will be exploring what it means to divide fractions in mathematics! Before we get started, to participate fully in our lesson today, you will need:</b></p> <ul style="list-style-type: none"><li>• Paper and a pencil</li></ul> <p><b>Ok, let’s begin!</b></p>	<p>Students get materials ready for the lesson.</p>
<p><u>Intro</u> (4 minutes)</p> <p>[Write the title Which One Doesn’t Belong? on the board alongside the 3 expressions in the chart. This activity supports students in recognizing key parts of expressions.]</p> <p><b>Which One Doesn’t Belong?</b> [Pause]</p>	<p>Students will look at the 3 expressions and brainstorm on possible reasons</p>

**Students, look at the following expressions and think of a reason why each of these expressions doesn't belong with the other two. Make sure that you do this with A, B and C. There is not one right answer, so get your brains going!**

$\frac{1}{4} \div 2$ A	$\frac{1}{4} \times 2$ B	$\frac{1}{4} \times \frac{1}{2}$ C
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[Pause to allow students to determine ways that A, B or C does not belong.]

**Let's share some possible solutions. You might have said A is the only expression written as a division expression, or B is the only expression that is not equivalent to 3, or even that C is the only expression that does not include a whole number. All of those are great observations!**

one of the 3 doesn't belong to the set. They will do this for A, B and C.

Teacher Model (14 minutes)

Objective 1: Prepare for Dividing Fractions

[Since this is the only fraction standard for Grade 6, students need to begin by engaging in the lesson with previous knowledge about fractions. This lesson allows students to recall vocabulary and strengthen fraction knowledge.]

**Think about what you know about fractions. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can. I can't wait to see and hear them all!**

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graph TD
    A([fraction]) --- B[What is it?]
    A --- C[What I Know About It]
    A --- D[Examples]
    A --- E[Examples]
  
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Objective 1:

Students will be reviewing what they know about fractions to connect today's lesson to previous knowledge. This allows students to recall key features and terms related to fractions.

[Draw the Frayer Model on the board. Pause 1-2 minutes to allow students to fill in the boxes. Carefully, discuss possible answers given below. Pay close attention to terms such as parts, whole, numerator, denominator, division]

**Ok! Let's look at your responses!**

[Have empty model on board and fill it in, with pauses for student responses, while you read each question.]

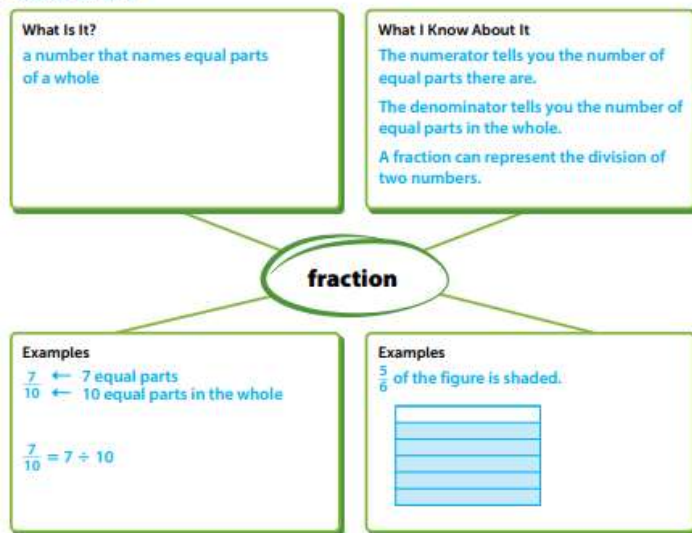
**Fraction: What is it?** [Pause]

**Fraction: What do we know about it?** [Pause]

**Fraction: What are some examples with words and numbers?** [Pause]

**Fraction: What are some examples with pictures?** [Pause]

Possible answers:



Objective 2: Explore Dividing Fractions

**Previously, you learned what it means to operate with fractions. In this lesson, you will learn more about dividing fractions. Use what you know to try to solve this problem. Don't forget you can use words, numbers, drawings or models to help you. Also, remember that division is splitting a quantity into equal groups to find the number or size of the groups.**

[Write the problem on the board. Allow students time to read the problem before reading it for them. Once you have read it, allow students 1-2 minutes to respond.]

**Ramona is making clay animals with her friends. She has  $\frac{3}{4}$  lb of clay. She shares the clay equally among herself and 3 friends. How much clay does each person have? Dividing  $\frac{3}{4}$  lb of clay equally among several people is a division situation that involves fractions. As when you**

**Objective #2:**

Students will be building off of their work with fraction bars in lower grades. They will divide the  $\frac{3}{4}$  into fourths using numbers, words, or models. They will respond to the teacher as the models are discussed

divide with whole numbers, it can be helpful to estimate a quotient before you divide. Let's work on estimating.

Estimate whether  $\frac{3}{4} \div 4$  is greater than or less than the dividend,  $\frac{3}{4}$ .

While we are working, please let me know when you agree with an idea and don't forget to add details to your work.

[Pause to allow students to think and process the idea.]

Less than  $\frac{3}{4}$  since each portion will weigh less than  $\frac{3}{4}$  lb because you divide the  $\frac{3}{4}$  lb into 4 smaller parts.

[Work through both sample responses below for students to show them how to use the visual fraction models, as called for by the standard.]

In this first solution path, we will use the fraction model, a fraction bar. Our fraction bars, which is a bar model, allow us to see each part of the whole. We must start with the total amount of clay we are given. How much clay does Ramona have? [Allow for student responses.]

Yes!  $\frac{3}{4}$  of a pound. How many parts are we dividing the clay into? [Allow for student responses.]

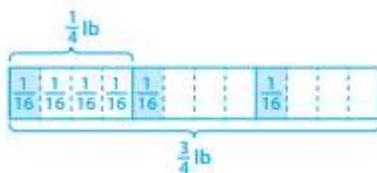
You're right! 4 parts. Why is it not 3 parts? [Pause] Yes, Ramona wants clay too.

Let's first divide the  $\frac{3}{4}$  into fourths so we can better see how much clay we have to portion out.



Does this model allow us to see how much clay each of the 4 people will have to work with? [Pause for student answer] Not really! I think we need more detail. Since there are 4 people, each person gets  $\frac{1}{4}$  of each  $\frac{1}{4}$  lb of clay. Let's look at that!

Each  $\frac{1}{4}$  is divided into 4 pieces. Notice that  $\frac{1}{4}$  of each fourth is  $\frac{1}{16}$  or  $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ . [Pause for students to look at the model and think about the visual]



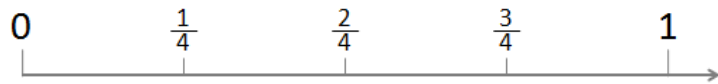
If we give each person  $\frac{1}{4}$  of each  $\frac{1}{4}$  lb of clay, how much clay would each person have?

[Pause for student response.]

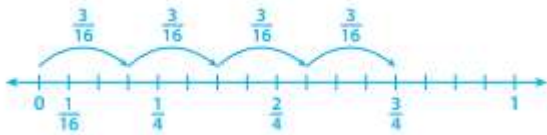
Yes, we have  $\frac{3}{16}$  lb of clay for each person. [Go to the model on the board and show students the  $\frac{1}{16}$ ,  $\frac{1}{16}$  and  $\frac{1}{16}$  shaded for a total of  $\frac{3}{16}$ ]

Another type of visual model that we can use for this problem is the number line. Let's try it!

Draw a number line on your paper. What parts should we divide our number line into? [Pause for student response]. I agree, the number line should be divided into fractional parts of  $\frac{1}{4}$  since we have  $\frac{3}{4}$  lb of clay to divide to the friends and Ramona.



Since we have 4 people (remember Ramona wants clay too), it is easy to think that we will divide by 4, but we have to visualize what it means to divide  $\frac{3}{4}$  into 4 parts. For this, we need to divide each  $\frac{1}{4}$  into  $\frac{1}{4}$  parts. As we saw on the fraction bars, when we divide fourths into fourths, we will have sixteenths. [Make sure to first draw a number line dividing fourths into fourths. This will allow students to see the sixteenths. Then show students the equal division of  $\frac{3}{4}$ .



$\frac{3}{4} = \frac{12}{16}$ . When you divide  $\frac{12}{16}$  into 4 equal parts, each part is  $\frac{3}{16}$ . Each person has  $\frac{3}{16}$  lb of clay.

We did it! We got the same response using two different models. Which model do you personally think is easier to visualize the situation? [Pause for students to think.]



There is not a "correct" model for this situation, but it is important to remember that models allow us to "see" the problem. You may remember using bar models, grid paper and even fraction circles in earlier grades. They are all additional models that could be used for this situation.

Tying the learning together:

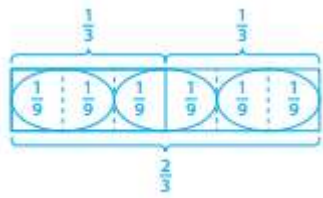
In this problem, we were trying to use what we already knew about fractions to solve the problem. We used a visual fraction model and a number line. In numbers and symbols, how would we write this problem?

Tying the learning together:

Students will listen to the teacher do a think aloud about what the models represent in numbers and symbols. They will not write a specific problem,

<p>[Pause for responses.]</p> <p><b>You are right! It is a division problem with a fraction! It is written as <math>\frac{3}{4} \div 4</math>, since there is <math>\frac{3}{4}</math> lb of clay divided out to the 4 friends. By dividing <math>\frac{3}{4}</math> into 4 equal parts, we are actually finding <math>\frac{1}{4}</math> of <math>\frac{3}{4}</math>. We will learn more about this as the week progresses.</b></p> <p><b>We saw that this means that we have <math>\frac{3}{4} \times \frac{1}{4}</math>. From 5<sup>th</sup> grade, we remember that we multiply the numerators and denominators to get an answer of <math>\frac{3}{16}</math>.</b></p>	<p>but will instead begin seeing the connection.</p>
<p><u>Guided Practice</u> (9 minutes)</p> <p><b>Let's do one together so that we can make sure you understand. Here is our situation:</b></p> <p><b>Patrick is using layers of colored sand in an art project. He divides <math>\frac{2}{3}</math> lb of blue sand into 3 equal parts in order to make 3 layers.</b></p> <ol style="list-style-type: none"> <li><b>How much total blue sand does Patrick have?</b> [Allow students time to read and respond.] <b>Yes, he has <math>\frac{2}{3}</math> lb of blue sand.</b></li> <li><b>How many parts is he dividing the <math>\frac{2}{3}</math> lb into?</b> [Allow students time to read and respond.] <b>He is dividing it into 3 parts</b></li> <li><b>Use what you know to solve this problem. Draw a model (you choose) and determine the amount of sand that Patrick will use in each layer. I'll wait!</b> [Allow students 1-2 minutes to read, draw and respond. Do not post full answer while they are working. Wait until you are ready to discuss to draw to help students that struggle with beginning the drawing.]</li> </ol> <p><b>This model shows that the <math>\frac{2}{3}</math> lb of sand must be divided into 3 parts.</b></p>  <p><b>We now must divide each part into 3 parts.</b></p>  <p><b>How many parts do we have now?</b> [Allow for students to respond] <b>I agree, there are 9. Let's label each as <math>\frac{1}{9}</math>. Now, what do you think we do next?</b> [Pause for students to think.]</p>	<p><b>Guided Practice:</b></p> <p>Students will be given time to read the problem, draw a model and give a solution. Allow the students time to draw the model to better understand what it means to divide fractions by whole numbers.</p>

Yes! We have to divide this into sand for the 3 layers.



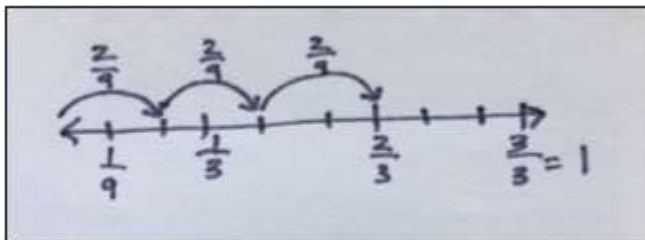
How much sand does each layer contain?

What is the solution to this problem?

[Allow for students to respond and summarize]

**Solution:** The weight of the sand in each layer of blue sand is  $\frac{2}{9}$  lb.

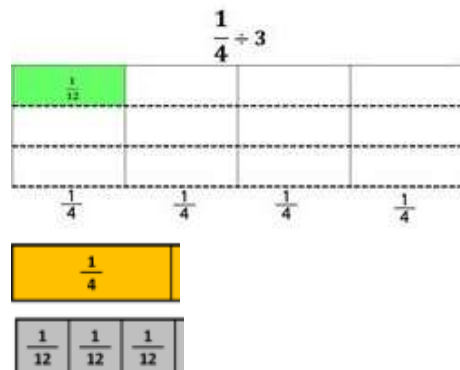
Here's a sample number line to show, if time allows.

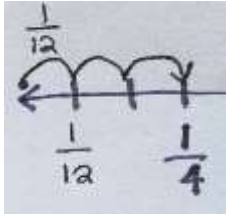


Now, here is one for you to try on your own. Use a model to show your answer.

Jasmine wanted to make ribbons for her friends. She has  $\frac{1}{4}$  yard of fabric to make ribbons for 3 friends. How much fabric will each ribbon contain? [Allow students to answer this problem alone. After pause, share answer below for students to check work.]

Let's check your work. Here are some possible models that you could have used while you solved the given situation.



 <p><math>\frac{1}{4}</math> divided into 3 equal parts, we get <math>\frac{1}{12}</math> of the fabric.</p> <p><b>You've done great today! I am so glad we've had some time to work together.</b></p> <p>Extra Problems (if needed)</p> <ol style="list-style-type: none"> <li>1.) Use a number line to show and explain why <math>\frac{4}{10} \div 2</math> is equal to <math>\frac{2}{10}</math>.</li> <li>2.) Cory wants to pour <math>\frac{1}{2}</math> of a quart of juice equally into 6 glasses. How much juice will he pour into each glass?</li> </ol>	
<p><u>Independent Practice</u> (1 minute)</p> <p><b>Great work! Today, we explored dividing fractions by whole numbers with visual models. I hope you're seeing some connections to the models you used in previous grades! You sure did a great job! After the video, you will have some problems to practice on your own. I will show you the independent practice problems now, or you can find them in the student practice for this lesson posted on our website, <a href="http://www.tn.gov/education">www.tn.gov/education</a>.</b></p> <p>[Teacher shows student practice page under document camera or camera zooms in on student practice page.]</p> <p><b>Good luck and do your best!</b></p>	
<p><u>Closing</u> (1 minute)</p> <p><b>I enjoyed exploring division of fractions with you! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series! Bye!</b></p>	

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