

Math: Grade 6, Lesson 10, Refining Fractions

Lesson Focus: Refine strategies for solving problems involving division with fractions

Practice Focus: Students will focus on refining strategies used to divide fractions in order to understand the division of fractions.

Objective: Students will use strategies and visual models to divide fractions with a focus to connect strategies and visual models to the algorithm.

Key Vocabulary: reciprocal

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:

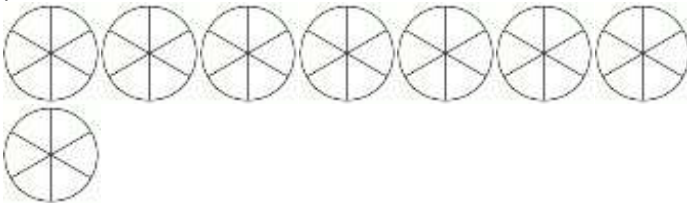
- Paper and a pencil, and a surface to write on
- Graph paper

Teacher Do	Student Do
<p><u>Opening:</u> (1 minutes)</p> <p>Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 6th graders out there, though all children are welcome to tune in. This lesson is the tenth in our series.</p> <p>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!</p> <p>If you didn't see our previous lesson, you can find it on the TN Department of Education's website at www.tn.gov/education. 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.</p> <p>Today we will be learning about dividing fractions by fractions including mixed numbers in mathematics! Before we get started, to participate fully in our lesson today, you will need:</p> <ul style="list-style-type: none"> • Paper and a pencil, and a surface to write on • Graph paper, if available <p>Ok, let's begin!</p>	<p>Students get materials ready for the lesson.</p>
<p><u>Intro</u> (4 minutes)</p> <p>Try this problem to get your brain engaged. [Write the board on the board as you read it.]</p>	<p>Students work the problem to get their brains thinking about the previous lessons and making</p>

Mr. Bernstein will cut 8 pies into pieces that are $\frac{1}{6}$ of the whole. After he cuts the 8 pies, how many pieces will Mr. Bernstein have? [Pause for 1 minute]

All right! Let's see how you solved it. Let's see what the problem is asking us to find. It asks us to figure out how many pieces he will have if he cuts the 8 pies into 6 pieces. There are several ways you could have solved this. I'll show you two.

[Draw 8 circles on the board. Then divide each circle into 6 parts.]



So 8 times 6 = 48 pieces

Another way: [Write and solve the problem on the board.]

$$8 \div \frac{1}{6}$$

What do we need to do to solve this problem? [Pause]
Right, we need to multiply by the reciprocal. Remember the reciprocal is two numbers where the product is equal to one. So the reciprocal of $\frac{1}{6}$ is $\frac{6}{1}$.

$$8/1 \times 6/1 = 48 \text{ pieces.}$$

Mr. Bernstein will have 48 pieces.

connections to models. Division of fractions with the unit fraction is a 5th grade standard.

Teacher Model (14 minutes)

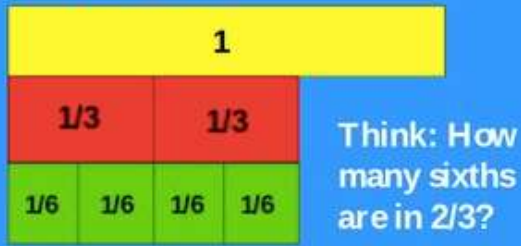
Objective 1: Typing to previous learning
 Read and write the problem on the board.]

$$\frac{2}{3} \div \frac{1}{6}$$

Students, write this problem on your paper. We're going to solve this problem several ways. First, let's use a visual model with fraction bars. If you have graph paper, it will help you be able to create the model more accurately. If not, just do you best. [Draw the model or use fraction bars to show the problem.]

Objective 1: Students will use several strategies (a model, find a common denominator and multiply by the reciprocal) to solve the problem.

Divide $2/3 \div 1/6$.



So there are 4.

Let's solve it using common denominators.

$2/3 \div 1/6$ Let's change the $2/3$ to $4/6$

$$4/6 \div 1/6 \quad 4 \div 1 = 4$$

Let's solve the problem one more way. Let's solve it by multiplying by the reciprocal.

$$2/3 \div 1/6$$

$2/3 \times$ _____ What is the reciprocal of $1/6$? [Pause] Right, $6/1$

$$\text{So, } 2/3 \times 6/1 = 12/3 = 4$$

Wow, we solved the same problem using 3 different methods. Now, let's apply this knowledge to solve some word problems.

Objective 2: Solve multi-step word problems involving fractions

[Write the problem on the board.] Sarah used this recipe to make the trail mix. She puts the trail mix in small bags. Each bag holds $1 \frac{1}{4}$ cups. How many bags does Sarah fill?

Trail Mix	
$2 \frac{1}{2}$ cups almonds	
$\frac{3}{4}$ cup dried cherries	
$2 \frac{1}{4}$ cups walnuts	
$\frac{3}{4}$ cup raisins	

Wow! Let's think about this problem. We have to interpret what the problem is asking us to find. What information do we know?

[Underline, highlight, or write as you talk through what we know.]

The trail mix includes $2 \frac{1}{2}$ cups of almonds, $\frac{3}{4}$ cup of dried cherries, $2 \frac{1}{4}$ cups of walnuts, and $\frac{3}{4}$ cup raisins

We'll need to find the total number of cups in one recipe.

Objective 2:

Students will refine their understanding of finding common denominators with addition and division of fractions.

Then we can divide the total amount by $1 \frac{1}{4}$ cups since each bag hold that amount.

First, let's find the total amount for 1 bag.

$$2 \frac{1}{2} + \frac{3}{4} + 2 \frac{1}{4} + \frac{3}{4}$$

Let's add the $\frac{3}{4}$ and $\frac{1}{4}$ to get 1 whole plus the 2 so 3. Let's re-write it.

$$2 \frac{1}{2} + 3 + \frac{3}{4}$$

I know that $\frac{1}{2}$ equals $\frac{2}{4}$ so let's use fourths as our common denominator.

$$2 \frac{2}{4} + 3 + \frac{3}{4} = 6 \frac{1}{4}$$

We have $6 \frac{1}{4}$ cup in each recipe. Now we need to see how many bags Sarah can fill.

$$6 \frac{1}{4} \div 1 \frac{1}{4}$$

Let's rewrite the problem using common denominator.

$$25/4 \div 5/4 = 25 \div 5 = 5$$

Sarah fills 5 bags with each recipe.

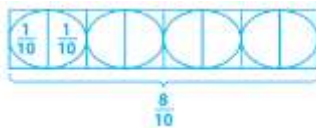
Objective 3: Solve division of fraction by multiplying the reciprocal

Let's look at another example.

[Write the problem on the board as you read it.]

A new nature trail is $\frac{8}{10}$ mi long. A park ranger divides the trail into 4 equal sections. How long is each section of the trail? Solve the problem at least two ways.

One solution path is for us to draw a visual model.



Each section is $\frac{2}{10}$ mi or $\frac{1}{5}$ mi.

Another solution path is to solve by multiplying by the reciprocal.

$$\frac{8}{10} \div 4$$

$\frac{8}{10} \times \underline{\hspace{1cm}}$ What is the reciprocal of 4? [Pause] Right, $\frac{1}{4}$.

$$\frac{8}{10} \times \frac{1}{4} = \frac{8}{40} = \frac{1}{5} \text{ mi.}$$

Tying the learning together:

Objective 3: Students will solve division of fractions by multiplying by the reciprocal. This connects the previous visual models to the algorithm.

Tying the Learning together:
Students are making connections between the different ways to divide fractions.

<p>So far, we have used visual models, common denominators, and multiplying by the reciprocal to solve division of fractions.</p>	
<p><u>Guided Practice</u> (9 minutes) Let's look at some more problems. You can choose how you want to solve the problems. [Write the problem on the board.]</p> <p>Estela has 10 ft³ of soil. She uses 3 ½ ft³ in her garden. She uses the rest of the soil for tomato plants. She needs ¾ ft³ of the soil for each tomato plant. How many tomato plants can she plant?</p> <p>Think about what we know. [Pause and give the students a minute to think about the problem, then underline, highlight, or write as you talk through what we know.]</p> <p>Let's compare your thoughts with mine.</p> <ul style="list-style-type: none"> • Estela has 10ft³ of soil, but she has already used 3 ½ ft³ in her garden. • She needs ¾ ft³ of soil for each tomato. • We need to figure out how many tomato plants she can plant. <p>Think about the steps you need to take to solve the problem. What do we need to do first? [Pause] You're right! We need to subtract the amount she has already used in the garden. $10 - 3 \frac{1}{2} = 6 \frac{1}{2}$ Estela has 6 ½ ft³ left for tomato plants. Now, what do we need to do? [Pause] Yes, we need to divide 6 ½ by ¾. Finish solving the problem, then we'll discuss it together. [Pause]</p> <p>Let's check your work. $6 \frac{1}{2} \div \frac{3}{4}$ I'm going to solve by multiplying the reciprocal.</p> <p>$13/2 \times 4/3 = 52/6$ or $8 \frac{4}{6}$</p> <p>So how many plants can she plant? [Pause] You're right. She can only plant 8 plants. She doesn't have enough soil to plant 9. In this situation, the remainder is not needed. We'll do one more problem together. This time I'll give you the problem, and I want you to solve it by yourself.</p> <p>Tiana uses 1 3/5 oz of detergent for each full load of laundry. How many full loads of laundry can she do with 100oz of</p>	<p>Guided Practice: Students will solve the problem as the teacher talks through the problems.</p>

<p>detergent? [Pause, allow 1-2 minutes for the student to work the problem.]</p> <p>All right! Let's check your work.</p> <p>$100 \div 1 \frac{3}{5} = 100 \div \frac{8}{5}$</p> <p>I'm going to multiply by the reciprocal. $100/1 \times 5/8 = 500/8$ or $62 \frac{1}{2}$ oz</p> <p>Now, let's make sure we answer the question. It wants to know how many full loads Tiana can do. Tiana can do 62 full loads of laundry.</p> <p><u>Additional Problems (if Needed):</u></p> <ol style="list-style-type: none"> 1. Shelby spreads grass seed on her lawn. She needs $\frac{5}{6}$ lb of grass seed to cover her whole lawn. She has $\frac{1}{3}$ lb of grass seed. How much of her lawn can she cover? 2. Amanda has a board that is 7 feet long. How many $\frac{1}{4}$ ft sections can she cut from this board? 	
<p><u>Independent Practice (1 minute)</u></p> <p>Great work! Today, we reviewed dividing fractions by fractions. I hope you're seeing some connections to models, using common denominators and multiplication when we divide! 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, www.tn.gov/education.</p> <p>[Teacher shows student practice page under document camera or camera zooms in on student practice page.]</p> <p>Good luck and do your best!"</p>	
<p><u>Closing (1 minute)</u></p> <p>I enjoyed learning how dividing fractions by fractions can be solved in several different ways. We can draw visual models, find common denominators, or multiply by the reciprocal 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!</p>	