PBS Lesson Series

Math: Grade 6, Lesson 7, When the Divisor is a Fraction

Lesson Focus: Interpreting a Division When the Divisor Is a Fraction
Practice Focus: Students will focus on practicing visual models for dividing fractions (including mixed numbers) by fractions and using models in order to understand division of fractions.
Objective: Students will use strategies to divide fractions with a focus on dividing fractions by fractions.
Key Vocabulary: fraction, quotient, models, double number line
TN Standards: 6.NS.A.1
Teacher Materials:

- White board and markers or smart board
- Visual fraction models (fraction bars, fraction circles, area model, number line, etc…)
- Student Practice Packet

Student Materials:

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

Teacher Do	Student Do
Opening: (1 minutes) **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 seventh in our series.** **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!** **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.** **Today we will be learning about dividing when the divisor is a fraction in mathematics! Before we get started, to participate fully in our lesson today, you will need:** • **Paper and a pencil, and a surface to write on** **Ok, let's begin!**	Students get materials ready for the lesson.
Intro (4 minutes) [Write the title Which Would You Rather? on the board with the two given situations. This is a way to allow students to start thinking about fractional parts of fractions which connects to 5th grade.] **Which Would You Rather?**	Students will look at the 2 expressions and brainstorm on possible reasons one of the 2 is preferred over the other.

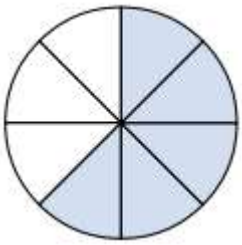
Students, look at the two given situations and determine which you would rather have and why.

$\frac{3}{4}$ **of** $\frac{1}{3}$ **of an apple**	$\frac{1}{3}$ **of** $\frac{9}{10}$ **of an apple**
A	**B**

[Pause and allow students to think about both situations and form an answer. This situation doesn't have a correct or an incorrect answer.]

Let's share some possible solutions. Your answer may even depend on if you like apples! You might have said A because it is the lesser amount, ¼. You may have selected B because it is the greater amount, 3/10. Those are both great observations. These build on knowledge that you have of taking a fraction of a fraction from 5th grade when you multiplied fractions.

Keep in mind that a fraction is a number that names equal parts of a whole. To review, we see the fraction circle below is one whole circle. It is divided into 8 parts. We also see that 5 of the 8 parts are shaded. We will build on parts today as we review division of fractions.



Teacher Model (14 minutes)

Objective 1: Connection to Previous Knowledge

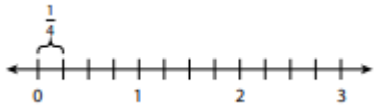
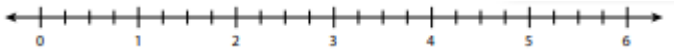
Let's review how we divide a whole number by a unit fraction. We may need a model to fully understand what this problem is asking.

Mr. Putnam wants to cut a 3-foot rope into ¼ - foot sections. How can we determine how many sections he will get?

Let's create a visual model to fully understand what this problem is asking. A model is a visual representation of the numbers represented in the problem. Visual fractions models that we have used before may include area model, fraction circles, number lines, fraction bars, and MORE!

[Pause for students to read the situation and respond]

Objective 1:
Students will begin by reviewing by dividing a whole number by a unit fraction from 5th grade. This allows students to build on previous knowledge as we move to dividing fractions by fractions.

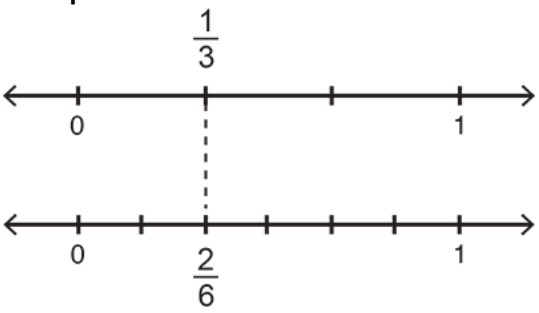
Let's start with a number line to help us. You can draw a number line to represent 3 feet of rope. There are three 1-foot sections.  **What do you think we should do next?** [Allow time for student thought] **Right, you should mark fourths on the number line to represent ¼ foot. You can see there are twelve ¼ - foot sections in 3 feet.** **3 ÷ ¼ = 12**  **When you divide 3 by ¼, you are dividing 3 into parts smaller than 1. So, there will be more than 3 of those parts.** **Let's dig a little deeper into situations where we are given a fraction of something, such as a ½ of an apple, and are asked to find a fractional part, such as ¼ of that ½ apple to share with someone else.** <u>Objective 2: Develop Dividing by Fractions</u> **Let's solve a problem together. You can use words, numbers, drawings or models to solve.** [Read and show on chart paper, if possible.] **Mia has a ribbon that she wants to cut into smaller parts. Mia cuts her 6-yard length of ribbon into 3/4 yard pieces. How many pieces of ribbon does Mia have now?** **You try to solve it first. Remember you can use words, numbers, drawings, or models to solve.** [pause] **Great work! Let me show you how I solved it!** **Mia cuts a 6-yard length of ribbon into ¾ - yard pieces. To figure out how many pieces Mia cut, I need to consider, How many three-fourths are in 6. What do you think? How many three-fourths are in 6?** [Allow students to respond.] **We can use a number line again to help us visualize. What length do we start with?** [short pause] **Yes! 6 yards.**  	Objective 2: Students will work alongside teacher in 3 examples to develop understanding of dividing by fractions. These examples progress from a whole number divided by a fraction to a fraction divided by a fraction.

You can circle three ¼ sections to represent 3/4 –yard pieces. You can see there are eight ¾-yard pieces in 6 yards. [Circle each on your empty number line.]

This shows us that 6 ÷ ¾ = 8.

Let's try another one together.
[Read and show on chart paper] **Kate has 2/3 yards of fabric to make small flags. Each flag requires 1/6 yard of fabric. How many flags can Kate make?**
What do we need to know? [Pause for student responses]
We need to find out how many $\frac{1}{6}$s are in $\frac{2}{3}$.

Since we learned about double number lines this school year, let's try one! A double number line is often used when two different units, or measures, of equivalence are being compared. They show each of the quantities on its own number line with corresponding values lined up. Here is an example of a double number line with fractions.



For this problem, since Kate has 2/3 yards of fabric to use, the number lines below are divided into thirds. Label 2/3 on the top number line to represent 2/3 yards of fabric. [Draw along with students]

We also know that each flag requires 1/6 yard of fabric. Divide the bottom number line into sixths to show how many sixths are in 2/3. Remember, these are equivalent fractions. [Draw along with students.]

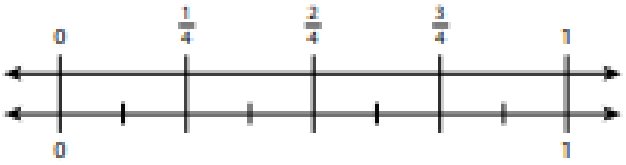
Look at the bottom number line. How many sixths are there in 2/3? [Allow students to respond]
Yes! There are 4. We can clearly see them! What does this tell me? [Pause for student response]
Yes! You are right. It allows me to see that Kate can make 4 flags.
If we pull this all together, we can see that this shows us that $\frac{2}{3} \div \frac{1}{6} = 4$.

Let's do another one.
[Read and show on chart paper] **Eli ran ¾ of a mile. Every 1/8 of a mile, he jumped over a hurdle. There was a final hurdle at the ¾ mile mark. How many hurdles did Eli jump over?**

Where should we begin? [Pause for student responses] **Let's picture it! What is the total distance that Eli ran?** [Pause for student response] **He did run ¾ of a mile.**

What intervals do we want to divide the ¾ of a mile into? [Pause for student response] **Yes. $\frac{1}{8}$s.**

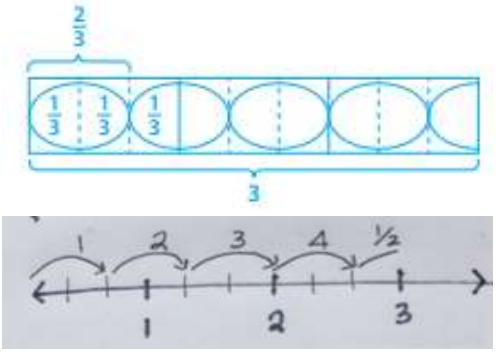
Here's a double number line to represent our situation:



Look at the given double number line and see what all it can tell us. [Allow students to look at graphs to better understand.] **Why is the top number line divided into fourths?** [Allow for student responses]
The top number line is divided into fourths to mark ¾, the total distance Eli ran.

Why is the bottom number line divided into eighths? [Allow for student responses]
The bottom number line is divided into eighths because Eli jumped over a hurdle every eighth mile.

Why do you think the visual model helps us figure out how many hurdles Eli jumped over? [Pause for student response**].**
I agree! We can count how many $\frac{1}{8}$s are in ¾. Let's count [Physically count with the students on the double number line].
How many hurdles did he jump over? [Pause] [after counting the 6 places] **Yes! 6.**

What does this mean? [Pause for student response] **Right, it shows us that $\frac{3}{4} \div \frac{1}{8} = 6$.** <u>Tying the learning together:</u> **In these problem, we were trying to use what we already knew about fractions to solve the problem. We used number lines to model the division. We had to understand the given information and how it could be used to determine our division problem. I'm going to let you try a few with me!**	Tying the learning together: Students will listen to the teacher do a think aloud about the ways that number lines can be used as visual fraction models. They will not write specific problems here, but instead, think through the connection of the visual representations to dividing fractions.
<u>Guided Practice</u> (9 minutes) **Let's do two together so that we can make sure you understand and we see different ways the situations can be presented.** **Here is our first problem:** **Mr. Lincoln is making slime for his kindergarten class. He has 3 cups of glue. Each batch of slime uses 2/3 cup of glue. How many batches of slime can Mr. Lincoln make? Make sure to show your model.** [Pause to allow students to work this one alone.] **Where did you begin? Remember that your model doesn't have to be perfect. It is a way to help you think and see what the problem represents**. [Pause for student response.] **You are heading in the right direction when you begin with 3 cups of glue and know you are dividing it by 2/3 cups of glue for each batch. There are multiple ways to model this. Here are 2 possible ways:**  **How did you summarize your model?** [Pause] **It does show us that** **3 ÷ 2/3 = 4½. This means that Mr. Lincoln can make 4 ½ batches of slime. Fun times!**	Guided Practice: Students will be given time to read the problems, 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 fractions.

Here's one for you to work all the way through. Don't forget to tie it all together at the end and ensure that you are answering the given question. [Pause and allow students to complete the following problem.]

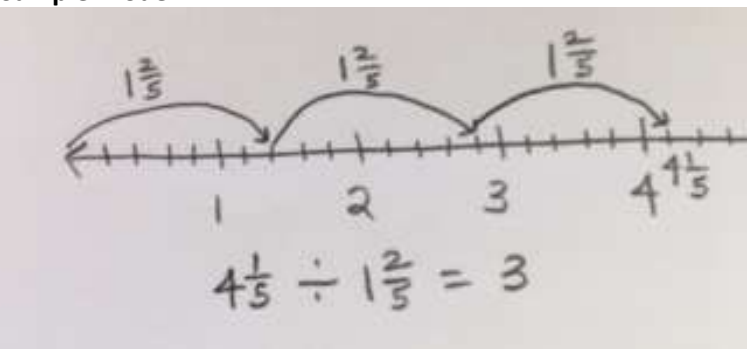
Sofia has pitchers that each hold $1\frac{2}{5}$ L. She has $4\frac{1}{5}$ L of iced tea.

Which division expression can you use to find the number of pitchers Sofia can fill with iced tea: $1\frac{2}{5} \div 4\frac{1}{5}$ or $4\frac{1}{5} \div 1\frac{2}{5}$?

How many pitchers can Sofia fill? Show your work. [Pause for students to work]

Right, the correct division expression is $4\frac{1}{5} \div 1\frac{2}{5}$.

Sample Model:



Yes! Sofia can fill 3 pitchers with sweet tea.

Additional Problems (if Needed):

1.) Andre is comparing the weights of his pets. His gerbil weighs 1/4 lb. His kitten weighs 7/8 lb. How many times the gerbil's weight is the kitten's weight? Show your work.
2.) A serving of dried fruit is 1/5 cup. A bag contains 9/10 cup of dried fruit. Which division expression can you use to find the number of servings in the bag:
3.) 1/5÷ 9/10 or 9/10 ÷1/5? Explain your reasoning.

Independent Practice (1 minute)

Great work! Today, we reviewed dividing fractions by fractions. I hope you're seeing some connections to models 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.

[Teacher shows student practice page under document camera or camera zooms in on student practice page.] **Good luck and do your best!**	
Closing (1 minute) **I enjoyed reviewing dividing fractions by 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!**	