PBS Lesson Series

Math: Grade 5, Lesson 6, Subtracting Fractions with Unlike Denominators

Lesson Focus: Subtracting Fractions with Unlike Denominators
Practice Focus: Students will focus on finding equivalent fractions in order to subtract fractions with unlike denominators using common multiples and drawing fraction bar models
Objective: Students will use equivalent fractions to subtract fractions with unlike denominators with a focus on finding equivalent fractions using fraction bar models
Key Vocabulary: equivalent fractions, multiple, common multiple, denominator, common denominator
TN Standards: 5.NF.A.1
Teacher Materials:

- paper and pencil or white board and markers
- bolt and nut to show as an example
- student practice packet

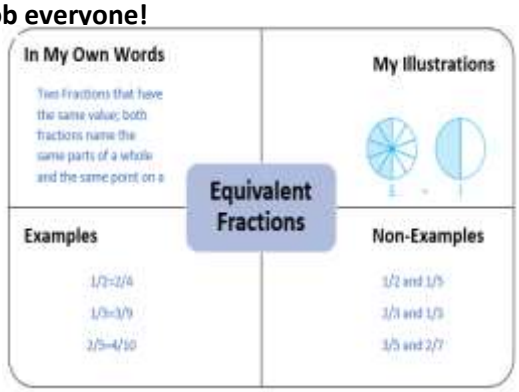
Student Materials:

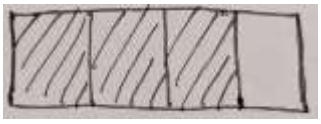
- Paper and a pencil, and a surface to write on

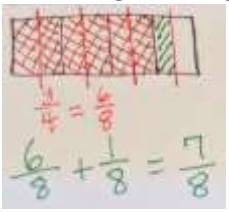
**Note: When writing fractions, remember to write them with a horizontal fraction bar and numerator and denominator lined up one on top of the other. This will help students avoid confusion when working with mixed numbers.*

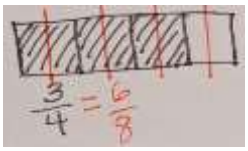
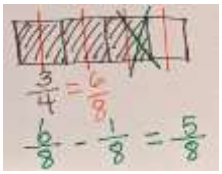
Teacher Do	Student Do
Opening (1 minute) **Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 5th graders out there, though all children are welcome to tune in. This lesson is the sixth lesson in our series.** **My name is ____ and I'm a 5th grade teacher in 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 seen 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 subtracting fractions with unlike denominators 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 (5 minutes) **Let's review what we know about equivalent fractions by drawing a graphic organizer.** **Draw a large square on your paper and divide it into 4 equal sections like this.** [Teacher either shows a 4-square Frayer model or draws one. Completed example at end of Intro] [Teacher labels each section while talking through the following] **Let's label the first section** [top left] **In My Own Words.** **And label the second section** [top right] **My Illustrations.** **The third section should be labeled** [bottom left] **Examples.** **And the fourth section** [bottom right] **is for Non-Examples.** **Let's title this graphic organizer Equivalent Fractions.** **So what do we mean when we say "Equivalent Fractions"?** [pause] **I'm going to give you a minute to write in the first section** [indicate top left] **in your own words, what equivalent fractions are.** [pause] **What do you think of when you hear equivalent fractions?** [pause, listening] **Equal fractions? Ok, I'm going to write "Two fractions that have the same value."** [teacher writes this in the top left section] **How do we know they have the same value?** [pause] **I'm hearing lots of good answers. So I will add to this "both fractions name the same part of a whole and the same point on a number line."** [teacher also writes this in the top left section] **Good job! Now in the second section, let's draw a picture of two equivalent fractions. Let's draw 5/10 and show how it's equivalent to 1/2. I'll give you a minute to do that.** [pause, looking out as though looking at students' drawings] **Hold up your drawings and show me.** [pause, looking] **Very nice! I'm seeing some great drawings modeling these fractions. Some are rectangles and some are circles. I'm going to draw two circles** [teacher draws two circles and divides and shades as she explains]**, and divide the first one into 10 parts to represent tenths. Then I'll shade in 5 of those parts to show 5/10.** [teacher writes 5/10 below the first circle] **Then I'll divide the second one into 2 parts to represent halves and I'll shade in one of them to show 1/2.** [Teacher writes 1/2 below the second circle and puts an equal sign between the two fractions.] **Now we can see that 5/10 is equal to 1/2 because these are equivalent fractions.**	With teacher guidance, students will model their understanding of equivalent fractions using the Frayer model (see example graphic organizer).

Now in the third section, let's include some other examples. We just said that 5/10 is equivalent to 1/2. What is another fraction that is equivalent to 1/2? [Teacher writes "1/2 =" and then pauses listening] **I'm hearing a lot of good answers! I'm going to write down 2/4.** [teacher writes 2/4 next to 1/2 =] **What are some fractions that are equivalent to 1/3?** [Teacher writes "1/3 =" and then pauses listening] **Those are some great answers! I'm going to write down 3/9.** [teacher writes 3/9 next to 1/3 =] **Let's do one more. What are some fractions that are equivalent to 2/5?** [Teacher writes "2/5 =" and then pauses listening] **I'm hearing several good answers! I'm going to write down 4/10.** [teacher writes 4/10 next to 2/5 =] **Now what are some examples of two fractions that are not equivalent? Let's start with 1/2 again.** [Teacher writes 1/2 in the bottom right section with the word and beside it.] **Can you think of a fraction that is not equivalent to 1/2?** [pause, listening] **Wow! There are a lot to choose from, aren't there! I heard 1/4. 1/4 is not equivalent to 1/2.** [Teacher writes 1/4 beside "1/2 and".] **How do we know that 1/2 is not equivalent to 1/4?** [pause, listening] **It's only one part of two different wholes, isn't it? Good job!** **What about 2/3?** [Teacher writes "2/3 and", then pauses listening] **Hmmm. So many options. I heard someone say 1/3. That's a good choice since 1/3 can't be the same as 2/3, can it? It's two different amounts of the same whole.** [teacher writes 1/3 beside "2/3 and"] **How about one more. What are some fractions that are not equivalent to 3/5?** [Teacher writes "3/5 and", then pauses listening] **I heard lots of great choices for this one, too. I'm going to write down 2/7.** **Good job everyone!**  	

Teacher Model (10 minutes) Objective 1: Create models to show equivalent fractions. **Let's read through this problem together:** **Paul has a 3/4 inch long bolt. He buys a bolt that is 1/8 inch longer and a bolt that is 1/8 inch shorter than the 3/4 inch bolt. What are the lengths of the two bolts he buys?** **We are going to add and subtract fractions to solve this problem. In order to add and subtract fractions, we need to work with same size pieces. Right now, our denominators of 4 and 8 tell us that we have different size pieces. We need to re-write the fractions with like denominators.** **You may recall from our previous lessons that we can replace fractions with unlike denominators with equivalent fractions that have like denominators.** **How can we find equivalent fractions for 3/4 and 1/8?** [pause] **Did you say that we could draw models to find equivalent fractions? Great idea! Let's do that together!** **The length of Paul's bolt is 3/4 of an inch. Since we are going to be adding and subtracting eighths, we need to draw a model to see how many eighths are in 3/4. Draw these models on your paper with me.** [Teacher draws a bar model for 3/4 while saying the following]  **Paul's original bolt was 3/4 of an inch. Let's model that fraction by drawing a whole and dividing it into four equal parts or four fourths, then we can shade in three of those fourths to show the fraction 3/4** **Now, how can I turn this into eighths?** [pause] **Of course! I can divide each of the four pieces, or fourths, in half to get eight total pieces to represent eight eighths.** **So how many eighths are shaded?** [pause] **Oh! Now I see it.** **When I subdivide the fourths into eighths, I can see that 3 fourths are equivalent to 6 eighths.** [as you think aloud, add to the previous model so that the result is similar to:] 	Objective 1: Students will recognize the need for making the sizes of the pieces of two fractions to be the same in order to find their difference. Students will model equivalent fractions by drawing fraction bars. Exposure to visual models helps build conceptual understanding.

Now both of the fractions have the same denominator, 8, so we can add and subtract the like denominators when we are ready to solve the problem.	
Objective 2: Use common multiples to find equivalent fractions. **I could also find the multiples of each denominator to find one they have in common. This would give us the common denominator. Multiples are what you get when you multiply a number by whole numbers.** **Let's look at the first three multiples of each denominator.** **The first denominator was 4, so multiply:** **4 times 1 is 4** [write 4] **4 times 2 is 8** [write 8] **4 times 3 is 12** [write 12] **The second denominator was 8, so multiply:** **8 times 1 is 8…I see 8 in my multiples of 4. So since 8 is a common multiple of 4 and 8, I can use 8 as my common denominator.** **Do you see how we used 8 as our common denominator using the drawings we did earlier?** [show the drawings] **8 worked because it's a common multiple of both denominators.**	Objective 2: Students will recognize the need for making the sizes of the pieces of two fractions to be the same in order to find their difference. Students will make equivalent fractions by listing common multiples.
Objective 3: Solve a word problem involving fractions with unlike denominators. **Let's re-visit the problem we are solving:** **Paul has a 3/4 inch long bolt. He buys a bolt that is 1/8 inch longer and a bolt that is 1/8 inch shorter than the 3/4 inch bolt. What are the lengths of the two bolts he buys?** **In our problem, we know that Paul buys one bolt that is longer and one bolt that is shorter than his 3/4-inch bolt.** **So how can we find the length of the longer bolt?** [pause] **Did I hear someone say add? Yes, to find the length of the longer bolt, we will need to add 1/8 to 3/4.** Remember, earlier we found that 3/4 = 6/8. **So to show the bolt that is one eighth inch longer, I can just shade in another eighth.** [shade in another eighth using a different color:  	Objective 3: Students will use the equivalent fractions generated in objectives 1 and 2 to solve a fraction word problem.

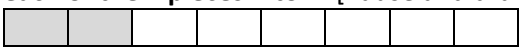
So I can see that 6/8 + 1/8 = 7/8. So, the longer bolt is 7/8 inch long! **Notice that when I use 6/8 instead of 3/4 in my equation, all of my fractions have the same denominator of 8. 6/8 + 1/8 = 7/8. We call this the common denominator. Common denominators are important whenever we add or subtract fractions like this. They tell us we are using all the same size parts, just like in our drawings.** **How can we find the length of the shorter bolt?** [pause] **Oh! I heard someone say subtract! Yes, to find the length of the shorter bolt, we will need to subtract 1/8 from 3/4.** **We'll do the same thing to model the bolt that is an eighth inch shorter than 3/4, except this time, we will need to subtract an eighth.** **This represents the original bolt. Now I can subdivide it into eighths again.** [As you think aloud add to the model so that the result is similar to the following:  **and this time I'm taking away one of the eighths to represent the shorter bolt.**  **6/8 – 1/8 = 5/8. So, the shorter bolt is 5/8 of an inch long!** **To review, sometimes I can use drawings to help me find the common denominator, but sometimes I can use multiples.** **Thanks for thinking through that problem with me. Now, let's try another subtraction problem with fractions with unlike denominators.**	
<u>Guided Practice</u> (10 mins) [I do] **Let's practice another adding and subtracting fractions word problem together today. This is similar to the problem we just solved with different values. Follow along with me as I read the problem aloud:**	Students work alongside the teacher as the teacher thinks aloud.

Solange has a nut that is 5/8 inch wide. She buys a nut that is 1/4 inch wider and a nut that is 1/4 inch narrower than the 5/8-inch nut. What are the widths of the two nuts she buys?

Let's think through these questions to make sense of the problem.
What is this question about? [Pause]
This question is about Solange buying different size nuts.
What information do we know? [Pause]
We know that Solange has a nut that is 5/8 inch wide. We also know that she buys two more nuts. One nut is 1/4 wider and the other is 1/4 narrower than the one she has.
What are we trying to find out? [Pause]
We are trying to find out the widths of the two nuts she buys.

First, we need to find common denominators so that we can work with fractions that refer to same size pieces.
Draw a model to represent the 5/8 inch wide nut. [Pause]
Great! We would split the whole into 8 equal size pieces and shade 5 of those pieces.

The other nuts are ¼ inch bigger or smaller than the 5/8 inch nut. How could we show 1/4 inch as a fraction out of 8 equal parts? [Pause]
Right, we have 4 pieces but we need 8 pieces. We can divide each of the 4 pieces into 2. [Pause and draw]



This tells us that 1/4 = 2/8

Now let's use our drawing to solve the problem. What are the lengths of the two nuts Solange buys? [Pause]
To show the nut that is 1/4 inch narrower, or smaller, cross off 2/8 of the model. [Pause and draw]

We can see there are 3/8 left shaded, so the narrower nut has a width of 3/8 inch.
To show the nut that is 1/4 inch wider, or bigger, shade in 2/8 more of the model. [Pause and draw]

We can see there are 7/8 shaded, so the wider nut has a width of 7/8 inch.

[We do] **Now try to solve the same problem using common multiples and writing fraction equations.** **List some multiples of 8: [Pause]** **Great! 8, 16, 24** **List some multiples of 4: [Pause]** **Good job! 4, 8, 12, 16** **What is the smallest multiple the denominators have in common? [Pause]** **Right! 8! We already found an equivalent fraction for 1/4 using 8 as a denominator in our models. 1/4 is equivalent to 2/8. Try to write equations using 5/8 and 2/8 to represent the operations we modeled.** [Pause to allow students time to think through the question and solve the problem.] **How did you do? When we crossed off in the first model, this can be represented with subtraction: 5/8 – 2/8 = 3/8.** **When we shaded more in the second model, this can be represented with addition: 5/8 + 2/8 = 7/8**	Students will respond to teacher questions with less scaffolding than the previous example. Students will have more time to think and respond on their own prior to the teacher providing solutions.
[You do] **Now you are going to try a problem on your own. Remember to make sense of the problem before solving! You can also use a model or a common multiples to find equivalent fractions. Listen as I read aloud:** **Emil's backpack weighs 9/10 of a pound. He removes a book that weighs 3/5 of a pound. How much does Emil's backpack weigh now?** [Pause to allow students time to think and work.] **Great job, students! Here is the solution:** **3/5 can be written as the equivalent fraction 6/10. The weight of the backpack 9/10 minus the weight of the book 6/10 equals 3/10, which is the weight of the backpack without the book in it.** **<u>Additional Problems (if Needed):</u>** 1/4 - 1/6 Answer: 3/12 – 2/12 = 1/12 3/4 - 1/3 Answer: 9/12 – 4/12 = 5/12 1/2 - 2/5 Answer: 5/10 – 4/10 = 1/10	Students are working almost exclusively independently with the teacher providing answers at the end.

Independent Practice (<1 minute) **Great work, boys and girls! Today, we reviewed finding a common denominator to subtract fractions with unlike denominators. I hope you're seeing some connections to adding fractions with unlike denominators! 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.] **Remember to always do your best!**	
Closing (<1 minute) **I enjoyed reviewing subtracting fractions with unlike denominators 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!**	