PBS Lesson Series

Math: Grade 5, Lesson 10, Fractions

Lesson Focus: Use Benchmark Fractions to Add and Subtract Fractions in Word Problems
Practice Focus: Students will focus on solving word problems involving addition and subtraction of fractions and use benchmark fractions to estimate the reasonableness of answers.
Objective: Students will use various strategies to add and subtract fractions with a focus on solving word problems use benchmark fractions to estimate the reasonableness of answers.
Key Vocabulary: fraction, numerator, denominator, common denominator, benchmark fraction
TN Standards: 5.NF.A.2
Teacher Materials:

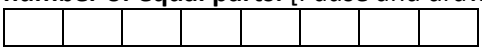
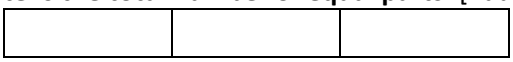
- Whiteboard and markers

Student Materials:

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

Teacher Do	Student Do
Opening (1 min) **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 tenth 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 adding and subtracting fraction word problems 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 mins) **Today we are going to think about adding and subtracting fraction word problems. A fraction is a number that names equal parts of a whole. We will also think about how to model our thinking about fractions by drawing a model or using a number line. Let's review how to find common denominators. A denominator is the number below the line in a fraction that tells the total number of equal parts.**	This warm-up will support students' understanding of adding fractions, foreshadowing the work in in the Teacher Model section.

Identify a common denominator for this pair of fractions. [Say and write] **2/3 and 1/4** **To identify a common denominator, list some multiples of each denominator.** [Pause] **What are some multiples of 3?** [Pause] **Great! 3, 6, 9, 12, 15, 18, 21, 24** **What are some multiples of 4?** [Pause] **Awesome! 4, 8, 12, 16, 20, 24** **Do you notice any multiples that 3 and 4 have in common?** [Pause] **That's right! 12 and 24 are in both lists, so either one could be used as a common denominator.** **Let's try another one. Identify a common denominator for this pair of fractions.** [Say and write] **1/3 and 1/8** **We already listed some multiples of 3. Remember: 3, 6, 9, 12, 15, 18, 21, 24** **What are some multiples of 8?** [Pause] **Awesome! 8, 16, 24, 32** **Do you notice any multiples that 3 and 8 have in common?** [Pause] **That's right! 24 is on both lists, so that could be used as a common denominator.** **Great job! The common denominator for 3 and 8 will help us solve the word problem we're going to do next.** **Common denominators help us add and subtract fractions with different denominators which we practiced in previous lessons. We will use this skill to solve word problems.**	Students will listen to the teacher think aloud modeling the thought process for a problem from the start of the problem through finding the solution. Students will follow along by writing on their own paper and responding to teacher questioning.
<u>Teacher Model</u> (10 mins) Objective #1: Teacher will explicitly instruct how to use a model to solve a fraction word problem. **Aleena has a 1-gallon watering can that is full of water. She uses 3/8 gallon to water her roses and 1/3 gallon to water her geraniums. How much water did Aleena use to water both the roses and geraniums?** **Let's think through what the question is asking.** **What is this question about?** [Pause] **Great! It is about Aleena watering her flowers. Roses and geraniums are two different types of flowers.** **What information do we know?** [Pause] **We know Aleena has a 1-gallon watering can that is full of water.**	Objective #1: Students will listen to the teacher do a think aloud working a contextual problem modeling the thought process for a problem from the start of the problem through finding the solution. Through following along with the think aloud, the students will solve word problems involving addition and subtraction of fractions.

What other information that we know? [Pause] **We also know that she uses 3/8 gallon to water her roses.** **Is there any other information that we know?** [Pause] **Right! We know that she uses 1/3 gallon to water her geraniums.** **What are we trying to find out?** [Pause] **The question is asking how much water Aleena uses to water both the roses and geraniums.** **I'm going to draw a model to help me think about this problem. First, let's draw a picture of how much water Aleena uses to water her roses.** **Draw with me a rectangle split into 8 equal parts. I know that I need 8 parts because the denominator 8 tells the total number of equal parts.** [Pause and draw]  **How many of the 8 parts did Aleena use to water her roses?** [Pause] **That's right, 3, because the numerator tells the number of equal parts. Shade in 3 of the 8 parts.** **Now, let's draw a picture of how much water Aleena uses to water her geraniums.** **Draw with me a rectangle the same size as the other rectangle you drew. This time, we will split it into 3 equal parts. I know that I need 3 parts because the denominator 3 tells the total number of equal parts.** [Pause and draw]  **How many of the 3 parts did Aleena use to water her roses?** [Pause] **That's right, 1, because the numerator tells the number of equal parts. Shade in 1 of the 3 parts.** **We need to combine these amounts together to figure out how much water Aleena uses to water both the roses and geraniums. To do that, we need equal size pieces. We do not have equal size pieces right now because there are two different denominators. That means we need to find a common denominator.** **Remember in the introduction when we found a common denominator for 3 and 8?** [Pause] **That's right, we found that 24 is a common denominator.** **A whole can be divided into 24 equal parts to show both eighths and thirds.** **8 times what equals 24?** [Pause] **Right! 8 times 3 equals 24.**	Students will model the fractions on paper.

Watch and draw with me as we split each of the 8 parts of the first model into 3. [Draw] **How many equal parts are shaded now?** [Pause] **That's right, 9 out of 24 parts are shaded.** **This model now shows us that 3/8 = 9/24**  **3 times what equals 24**? [Pause] **Right! 3 times 8 equals 24.** **Watch and draw with me as we split each of the 3 parts of the second model into 8.** [Draw] **How many equal parts are shaded now?** [Pause] **That's right, 8 out of 24 parts are shaded.** **This model now shows us that 1/3 = 8/24**  **Now that we are working with same size pieces we can combine them together to find the amount of water Aleena used to water her flowers.** **Give it a try! [Pause]** **There are 9 shaded parts in the first model.** **There are 8 shaded parts in the second model.** **That is a total of 17 shaded parts.** **Since each of these parts represents 1/24, we can write a fraction equation to represent this** [Write and say]: **9/24 + 8/24 = 17/24** **Aleena used 17/24 of a gallon of water.**	
Objective #2: Teacher will explicitly instruct how to solve a fraction word problem with number lines. **We can also model this problem using number lines.** **Draw two number lines, one divided into eighths and the other into thirds to model the amounts of water Aleena is using for her flowers.** [Pause and draw]  **Start at zero and shade from zero to 3/8 to represent 3/8 gallon of water on the first number line.** [Pause and model shading.]	Objective #2: Students will listen to the teacher do a think aloud working a contextual problem modeling the thought process for a problem from the start of the problem through finding the solution. Through following along with the think aloud, the students will solve word problems involving addition and subtraction of fractions and. Students will draw the fraction number lines on paper.

Start at zero and shade from zero to 1/3 to represent 1/3 gallon of water on the second number line. [Pause and model shading.]

Think about putting the two shaded sections together on the eighths number line to show the sum 3/8 + 1/3. [Pause]
Are the number lines divided into same-size parts? [Pause]
No, they aren't. How could you divide the eighths so that you the thirds can go on the same number line? [Pause]
That's right! Divide each eighth into thirds.

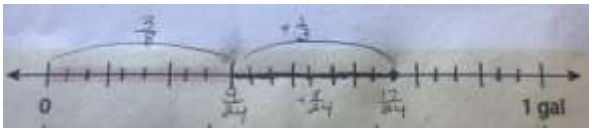
Add tick marks to the eighths number line to divide each eighth into thirds. [Draw this on your number line]

What size are the parts of the whole now? [Pause]
Good! Twenty-fourths.

How many of these parts are equivalent to 1/3? [Pause]
Right, 8 parts.

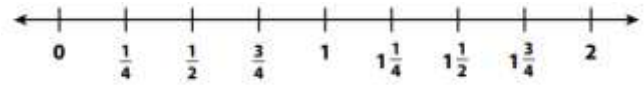
Now shade a segment of length 1/3 on the eighths number line to show the sum 3/8 + 1/3. [Pause]

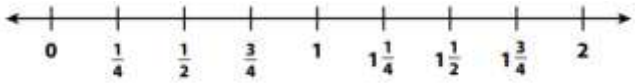
[Point to the number line and you talk]
The first shaded portion shows 3/8 or the equivalent fraction 9/24.
The next shaded portion shows 1/3 or the equivalent fraction 8/24.
Together, the shaded portion is 17/24.
This number line shows the fraction equation 3/8 + 1/3 = 9 /24 + 8/24 = 17/24.



Tying the learning together:
There are three questions that you can ask yourself to help make sense of a word problem:
What is this question about?
What information do we know?
What are we trying to find out?

You can also draw a model or use number lines to help solve addition and subtraction fraction word problems. Now we're going to look at benchmark fractions.

Guided Practice (10 mins) Objective #3: Use benchmark fractions to estimate the reasonableness of answers. [I do] **A benchmark fraction is a common fraction that you can easily compare to other fractions. The number line below shows the location of some benchmark fractions between 0 and 2. You can use these fractions to estimate sums and differences and check the reasonableness of your answers to a problem.**  **Between which two benchmark fractions is 1/3? How do you know?** [Pause] **1/3 is between 1/4 and 1/3. I know this because 1/4, 1/3, and 1/2 are all unit fractions, so you can order the fractions from least to greatest in reverse order of their denominators.** **Between which two benchmark fractions is 3/8? How do you know?** [Pause] **2/8 is between 1/4 and 1/2. I know this because I used common denominators and equivalent fractions. 3/8 is between 2/8 and 4/8, and the benchmarks 1/4 and 1/2 are equivalent to 2/8 and 4/8.**	Students work alongside the teacher as the teacher thinks aloud.
[We do] **Use your answers from the questions that we just explored to find a low estimate for the sum 3/8 + 1/3 and a high estimate for the sum 3/8 + 1/3.** [Pause] **For the low estimate, use the lower of the two benchmark fractions we just found for each fraction.** **For the high estimate, use the higher of the two benchmark fractions we just found for each fraction.** [Pause to allow students time to think through the questions and solve the problem.] **A low estimate might be 1/4 + 1/4 = 1/2** **A high estimate might be 1/2 + 1/2 = 1** **The sum should be between the sum of the lesser benchmarks and the sum of the greater benchmarks.** **We can use these estimates to think about if our answer to the watering flowers problem is reasonable. Our solution was 17/24. Does 17/24 fall between 1/2 and 1 on the number line?** [Pause] **You're right, it does! That means we found a reasonable answer to the problem.**	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 it's your turn to try finding benchmark fractions on your own. Between which two benchmark fractions is 5/8? How do you know?**  [Pause to allow students time to think and work.] **Great job, students! Here is the solution:** **Between 1/2 and 3/4; A possible explanation is that 5/8 is between 4/8 and 6/8, and the benchmarks 1/2 and 3/4 are equivalent to 4/8 and 6/8.** Additional Problems (if Needed): Between which two benchmark fractions is 5/6? How do you know? Between which two benchmark fractions is 7/12? How do you know? Between which two benchmark fractions is 3/10? How do you know?  Hai has a 1-gallon jug of water. He drinks 1/8 gallon of water before lunch and 2/3 gallon of water after lunch. How much water did Hai drink all day? Draw a model or number line to show your thinking. Show your work and check your answer.	Students are working almost exclusively independently with the teacher providing answers at the end.
Independent Practice (1 min) **Great work, everyone! Today, we practiced adding and subtracting fraction word problems. I hope you're feeling confident about solving word problems with adding and subtracting fractions! You sure did a great job! 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 min) **I enjoyed learning about adding and subtracting fraction word problems 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!**	

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