Math: Grade 7, Lesson 9, Use addition and Subtraction of positive and negative fractions to Solve Real-World Problems

Lesson Focus: Use addition and subtraction of rational number to solve real-world problems.
Practice Focus: Students will focus on practicing solving real-world problems and determining the reasonableness of their answers.
Objective: Students will use addition and subtraction of rational numbers to solve real-world problems with a focus on determining the reasonableness of their answers.
Key Vocabulary:
TN Standards: 7.NS.A.1
Teacher Materials:
- Paper or white board
- Pen/pencil/marker
- All the examples written out (to save time and for student reference)
- Student Practice Packet

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 7th graders out there, though all children are welcome to tune in. This lesson is the ninth 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. If you don't already have the student packet for this lesson, you can find it online 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 how to use addition and subtraction of rational numbers to solve real-world problems! Before we get started, to participate fully in our lesson today, you will need:** **Paper, pencil, a surface to write on** **Ok, let's begin!**	Students get materials ready for the lesson.
Intro (5 minutes)	

Sam and Shamir are simplifying this expression: $$6\frac{1}{2} - (-10) + 3\frac{1}{4}$$ **Sam says the answer will be negative since the 10 is negative and it is larger than** $$6\frac{1}{2} + 3\frac{1}{4}$$	Student thinks about how the signs of the numbers and the operation signs are related.
Shamir disagrees. He says that the answer will be positive because ALL the numbers are positive and being added. Who do you agree with Sam or Shamir? [Pause]	Student responds with who they agree with
$6\frac{1}{2} - (-10) + 3\frac{1}{4}$ **becomes** $6\frac{1}{2} + 10 + 3\frac{1}{4}$ **when you add the opposite. Who is correct?** [Pause]	
Good! Shamir is correct, because when you add the opposite, every number is positive and being added. **Today we will use this kind of reasoning to help us determine if our answers are reasonable. Let's get started!**	
Teacher Model (10 minutes) Objective 1: Solve 2-step real world problems involving positive and negative fractions **Hummingbirds sip $2\frac{1}{2}$ fl oz of the food in a feeder. Then $1\frac{1}{2}$ fl oz are added to the feeder. Last, hummingbirds sip another $3\frac{1}{4}$ fl oz of food. What is the overall change in the amount of food in the feeder?** [pause]	Students will use their knowledge of adding and subtracting positive and negative fractions to solve real-world problems.
Let's write an expression that represents this situation. [pause] **Did you get:** $$-2\frac{1}{2} + 1\frac{1}{2} - 3\frac{1}{4}$$	Student writes and expression to represent situation
Why are $2\frac{1}{2}$ and $3\frac{1}{4}$ negative? Is $3\frac{1}{4}$ negative? [pause]	Student explains why

Both of these values represent food being taken from the feeder! Yes, when we add the opposite our expression becomes

$$-2\frac{1}{2} + 1\frac{1}{2} + (-3\frac{1}{4})$$

Why is $1\frac{1}{2}$ positive?
[pause]

It is positive because it represents the amount being added to the feeder.

Do you think the overall change in the amount of food will be positive or negative? Why do you think that?
[pause]

Did you say that the answer will be negative? That's it! There is more food being taken away than is being added!
Good job!

Now let's determine the answer! Here's one way we can simplify our expression. Let's talk through it together.
[As you explain the solution, draw attention to why -2 ½ has been decomposed to -1 ½ + -1]

$$-2\frac{1}{2} + 1\frac{1}{2} + (-3\frac{1}{4})$$
$$-1\frac{1}{2} + (-1) + 1\frac{1}{2} + (-3\frac{1}{4})$$
$$-1 + (-3\frac{1}{4})$$
$$-4\frac{1}{4}$$

Let's try another one!
A helicopter is 19 ¼ meters above the top of a canyon wall. It goes down 27 ½ meters, passing into the canyon. Then it goes up 5 ¼ meters. What is the new position of the helicopter relative to the top of the canyon wall?

What strategies have we learned this week that might help us solve this problem? [Pause] **I heard draw a diagram and I also heard draw a number line. Both are great ideas! Let's draw a diagram and see if that helps us with our expression.**

Student thinks about strategies to simplify this expression.

[Draw a diagram. Label the top of the canyon, 19 ¼ meters above for the top of the canyon wall as the helicopter, an arrow pointing down labeled 27 ½ meters and then an arrow pointing up labeled 5 ¼ meters.] **If the helicopter starts at 19 ¼ meters and then drops 27 ½ meters, how could this be represented? That's it…we can subtract! How would we represent rising 5 ¼ meters? Yes! We could add. What would our expression be to represent this problem?** [Pause] **19 ¼ - 27 ½ + 5 ¼** **What would our answer be? You work out the problem, I'll work the problem and then we can compare answers.** [Pause] **19 ¼ + 5 ¼ -27 ½ =** **24 ½ - 27 ½ =** **-3** **Did you get the same answer? That's awesome!** **So what does -3 mean? That's right! The helicopter is 3 meters below the top of the canyon. Good Work.**	
Guided Practice (9 minutes) **You're doing a great job! Let's work some more problems. As you work the problem, think about whether the answer you get is reasonable. Ask yourself, does your answer make sense in the situation?** [Read the problem aloud and pause for 1 minute for the student to work the problem.] **Cece's dog loses $1\frac{1}{4}$ pounds. Then her dog loses another $1\frac{1}{8}$ pounds. Finally he gains $\frac{3}{8}$ pounds. What is the total change in her dog's weight? Show your work.** **Remember to think about the different strategies you can use to help you understand and solve the problem. When you finish, check to make sure your answer makes sense.** [Pause for 1 minute.] **Let's look at this problem together. What expression did you write to solve this situation? See if your matches mine.** $$-1\frac{1}{4}-1\frac{1}{8}+\frac{3}{8}$$ **-1 2/8 – 1 1/8 = -2 3/8 Then let's add 3/8**	Students work the problem.

So -2 3/8 + 3/8 = -2	
So what does this mean? [Pause] **Right, Cece's dog lost 2 pounds. Does this answer make sense?** [Pause] **We can use the whole numbers to check. The dog lost a little over a pound, then lost a little over a pound, so that is a loss of over two pounds. Then it gained a little less than half a pound, so it would still have lost close to two pounds. Great work!**	
[Write and read this problem**] In chemistry class, Carrie is mixing solutions together for an experiment. She mixes 5 ½ ounces of solution A and 8 ¾ ounces of Solution B. She then needs to remove 3 ¼ ounces before adding 6 ¾ ounces of Solution C. What is the volume of her final solution? Write the expression and solve this problem, then we'll go over it together.** [Pause for 1 minute.] **Let's go over this problem to figure out how many ounces Carrie has in her experiment. Let's write the expression.** [Write the expression on the board.] **5 ½ + 8 ¾ - 3 ¼ + 6 ¾** **5 2/4 + 8 ¾ = 14 ¼ Remember, we do addition and subtraction in order from left to right. Now, let's subtract 3 ¼** **14 ¼ - 3 ¼ = 11 Then we'll add 6 ¾** **11 + 6 ¾ = 17 ¾ oz** **So Carrie's experiment's volume is 17 ¾ oz.** **Let's do one more problem together. This one is about hummingbirds. I hope you are able to enjoy some outside weather today after our session!** [Read and write the problem on the board] **Hummingbirds sip $3\frac{3}{4}$ fl oz of the food in a feeder. Then $8\frac{1}{2}$ fl oz are added to the feeder. Last, hummingbirds sip another $4\frac{3}{4}$ fl oz of food. What is the overall change in the amount of food in the feeder?** **Work this problem, and then we'll go over it together.** **Let's see how you set up the situation.** **- 3 ¾ + 8 ½ - 4 ¾**	Students work the problem. Students work the problem.

Why are 3 ¾ and 4 and ¾ negative? [Pause] **Right, they are negative since the hummingbirds have sipped the food.** **- 3 ¾ + 8 2/4 = 4 ¾ Now let's subtract 4 ¾. Wait, that's 0. What does that mean in this problem?** [Pause] **You're correct. There isn't a change in the amount of food in the feeder. It is the same. Does our answer make sense? Why?** [Pause] Additional Problem (if Needed) Shelby is playing a game. First, she gains 5 ½ points. Then she loses 4 4/5 points. Finally, she gains 7 ½ points. What is the overall change is Shelby's score?	
Independent Practice (1 minute) **Great work, 7ᵗʰ grade! Today, we reviewed using addition and subtraction of rational numbers to solve real-world problems with a focus on fractions. 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 min) **I enjoyed reviewing using addition and subtraction of rational numbers to solve real-world problems with a focus on 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!**	