**PBS Lesson Series**

**Math: Grade 7, Lesson 7, Subtracting Positive and Negative Fractions and Decimals**

**Lesson Focus:** Subtracting positive and negative fractions and decimals
**Practice Focus:** Students will focus on practicing subtracting positive and negative fractions and decimals using number lines in order to understand that subtracting a negative rational number is the same as adding its opposite.
**Objective:** Students will use strategies of subtracting positive and negative fractions and decimals to understand that subtracting a negative rational number is the same as adding it's opposite.
**Key Vocabulary:** number line, opposite numbers expression
**TN Standards:** 7.NS.A.1
**Teacher Materials**:

- Paper or white board
- Pencil/pen/marker
- Student practice packet

**Student Materials:**

- Paper, pencil, and a surface to write on

| Teacher Do | Student Do |
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| Opening (1 min)<br>**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 seventh in our series.**<br><br>**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!**<br><br>**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.**<br><br>**Today we will be learning about subtracting positive and negative fractions and decimals in mathematics! Before we get started, to participate fully in our lesson today, you will need:**<br>• **Paper, pencil, and a surface to write on**<br><br>**Ok, let's begin!** | Students will need paper, pencil, and a surface to write on. |
| Intro (3 minutes)<br>**Think about these two expressions.** | Student simplifies each expression. |

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| **-3 + (-7) and -3 – 7. How are they different? How are they the same?**<br>[Pause]<br>**They both have -3. One is adding -7 and the other is subtracting +7.**<br>**Simplify each one.**<br>[Pause]<br><br>**-3 + (-7 )= -10**<br>**-3 – 7 = -10**<br><br>**What strategy did you use to simplify? Did you use a number line?**<br>[Pause]<br><br>**Let's remember how to add integers on a number line.**<br>[Teacher draws two number lines. On both number lines mark -3]<br><br>**Okay. To model -3 + -7 we are adding the opposite of 7. What direction does that mean we move on the number line?** [Pause] **That's right! We move to the left.** [Model moving over 7 places to the left and ending at -10] **We ended at -10! That means our answer is -10!**<br><br>**Now let's model -3 -7. When we are subtracting 7 which direction do we move?** [Pause] **That's right! We move to the left 7 places.** [Model moving over 7 places to the left and ending at -10] **We ended at -10! That means our answer is -10!**<br><br>**Since they both equal -10, we can say that**<br>**-3 + (-7 ) = -3 – 7**<br><br>**In other words, adding -7 is the same as subtracting +7. Recall that -7 and +7 are opposites. This means that they are the same distance away from 0 on the number line. One important thing for you to notice is that when we add opposites we get 0 (-7 + 7 = 0).** | Student thinks about the strategy they used.<br><br>Student thinks about the fact that subtraction is the same as adding the opposite.<br>Student recalls the definition of opposite numbers.<br><br>Student answers. |
| Teacher Model (10 minutes)<br><br>Objective 1: Application of number line strategies to work with positive and negative decimal values.<br>**Let's think about this situation:** | Students apply what they know about modeling on a number line with integers to work with decimals in a real world scenario. |

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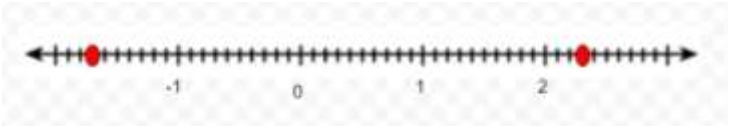
| **During December, the average daily temperature in a town was -1.7°C. The average daily temperature in the same town is 2.3°C in January. What is the difference in the daily temperature from December to January?** | Student thinks about how to solve the problem describing strategies. |
| **What strategy will you use to solve this problem?** [Pause] **That's right! I heard we should write an expression! I also heard use a number line. Let's work on both.** | Student writes an expression to represent this situation. |
| **First, let's write an expression to represent this situation.** [Pause] **What did you write? That's good. You could write 2.3 – (-1.7). Remember from yesterday that subtraction can represent distance! Is there another way that we can represent distance?** [Pause] **You got it! We could use absolute value. How would we represent distance in this problem using absolute value?** [Pause] **Awesome! We could write \|2.3\| + \|-1.7\|. \|2.3\| is the distance from 0 to 2.3 and \|-1.7\| is the distance from 0 to -1.7. Adding those together gives the total distance. Your right. That is kind of tough to see. Let's put it on a number line! Excellent suggestion.**<br><br>[Pause and draw this number line.]<br>  <br><br>**Does that help? [**Pause] **Great! How can we use the number line to find the answer?** [Pause]<br>**One strategy would be to count the distance between -1.7 and 2.3. That works, but it is not very efficient.**<br><br>**Maybe we should just work with the expression. We could simplify the absolute value expression (the distance a number is from 0).**<br><br>**\|2.3\| + \|-1.7\| = 2.3 + 1.7 = 4**<br><br>**Great Job!**<br><br>**What about if we looked at the expression as 2.3 – (-1.7)? We learned in lesson 6 that this is the same as 2.3 + 1.7.**<br><br>**In other words, when we are subtracting, we can add the opposite of the last addend. We often call this "adding the opposite".**<br><br>**So 2.3 minus negative 1.7 becomes 2.3 plus positive 1.7, because the opposite of -1.7 is + 1.7.** | |

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| **So 2.3 – (-1.7) = 2.3 + 1.7 = 4.**<br>**Let's answer the question. The average daily temperature in January is 4°C.**<br><br>Objective 2: Application of number line strategies to work with positive and negative fractional values.<br><br>**Let's use what we have learned to solve this problem:**<br>**On Monday, the low tide at Cook Inlet, Alaska, is – 1 $\frac{1}{2}$ feet.**<br>**On Tuesday, the low tide is -1 $\frac{1}{3}$ feet. How does the low tide on Tuesday compare to the low tide on Monday?**<br><br>**This one is a little different. What strategy might help us set up the expression?** [Pause] **What a great idea! Let's use a number line to help figure out the expression!**<br>[Draw a number line and label – 1 ½ and **-1 $\frac{1}{3}$** .] **Hmmm…Both numbers are on the same side of 0. What operation can find the distance? Subtraction!**<br><br>**Let's try writing an expression now.** [Pause]<br>**What does your expression look like?**<br>[Pause] **That's good! We could write – 1 $\frac{1}{3}$ – (-1 $\frac{1}{2}$ ) to find the difference in the two amounts. Why is – 1 $\frac{1}{3}$ first? Oh because it's the bigger amount. We know that because it is closer to 0. Good job!**<br><br>**We know that we can add the opposite and change this to**<br><br>**– 1 $\frac{1}{3}$ +1 $\frac{1}{2}$**<br><br>**Now we must find a common denominator. Can you do this for me?**<br>[Pause]<br>**– 1 $\frac{2}{6}$ + 1 $\frac{3}{6}$**<br>**We can decompose 1 $\frac{3}{6}$ to make this problem easier to think about.**<br>**– 1 $\frac{2}{6}$ + 1 $\frac{2}{6}$ + $\frac{1}{6}$**<br>**Since – 1 $\frac{2}{6}$ and 1 $\frac{2}{6}$ are opposites, then add to 0.**<br>**0 + $\frac{1}{6}$ = $\frac{1}{6}$**<br><br>**This means that the low tide on Tuesday is $\frac{1}{6}$ feet higher.** | Students apply what they know about modeling on a number line with integers to work with decimals in a real world scenario. |

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| Guided Practice (10 minutes)<br>**Let's continue with a couple of more problems. I want you to help me with this one. Make sure that you follow the process of creating a number line to represent the situation, then write an expression before you answer the situation.**<br><br>Problem 1: **A path from a dry lake bed starts at an elevation of -12 $\frac{1}{2}$ feet relative to sea level. The path ends at an elevation of 60 $\frac{1}{3}$ feet above sea level. What number represents the change in elevation from the start to the end of the path?**<br>**Write an expression that represents this situation.**<br><br>**Ok! Let's think about what we've been working on. We want to first think of a strategy that might help us set up the expression [**Pause]. **You're right! A number line. Go ahead and draw the number line that represents this situation and I will wait for you.** [Pause to allow students time to draw the number line, then draw a number line on the board and label points at -12$\frac{1}{2}$ and 60 $\frac{1}{3}$. ]. **You're number line looks great! Now, use the process that we just walked through to write your expression for this situation.** [Pause]<br><br>**I see that you got 60$\frac{1}{3}$ – (-12$\frac{1}{2}$) to find the difference in the two elevations. Why did you put the 60$\frac{1}{3}$ first? I agree! It is the bigger amount.**<br>**I am going to let you finish this one up and we will check our answers to see what the change of elevation is.** [Pause to let students work and then show students to subtraction and solution.]<br><br>**Let's check your answer.**<br>**60$\frac{1}{3}$ – (-12$\frac{1}{2}$) = 60$\frac{1}{3}$ + 12$\frac{1}{2}$ (Since we learned earlier that when we are subtracting, we can add the opposite of the last addend. We often call this "adding the opposite".)**<br>**I heard you say that you used 6 as your common denominator. Let's make sure you rewrote your mixed numbers properly.**<br>**60$\frac{2}{6}$ + 12$\frac{3}{6}$ = 72$\frac{5}{6}$.**<br>**Don't forget, we must always come back to make sure we answer the question. What is the problem asking?** [Pause]<br>**So, the change of elevation is 72$\frac{5}{6}$ ft.**<br><br>**Now, here is one more for you to try on your own.** | |

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| Problem 2:<br>**In the previous problem, we also know that the lowest point of the dry lake bed has an elevation of -18$\frac{3}{4}$ ft. What is the change in elevation from the start of the path to the lowest point in the dry lake bed? Show your work.**<br>[Pause and allow students time to work all the way through. After that, put the solution path below. Draw a number line with -12 $\frac{1}{2}$ and -18$\frac{3}{4}$ labeled. Show students the expression and solution.]<br>**-18$\frac{3}{4}$ – (-12 $\frac{1}{2}$) = -18$\frac{3}{4}$ + 12 $\frac{1}{2}$ = -18$\frac{3}{4}$ + 12 $\frac{2}{4}$ = -6$\frac{1}{4}$ .**<br>**The change in elevation is -6$\frac{1}{4}$ ft.**<br><br>**Additional Practice (if needed)**<br>**1.) When Daria gets to school, the temperature is 5.7°F. The temperature changes by 29.5°F by the time she goes to bed. What is the temperature when Daria goes to bed? Show your work.** | |
| Independent Practice (1 minute)<br>**Great work! Today, we practiced subtracting fractions and decimals. I hope you're seeing some connections to subtracting integers and subtracting fractions and decimals! 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.**<br><br>[Teacher shows student practice page under document camera or camera zooms in on student practice page.]<br><br>**Good luck and do your best!** | |
| Closing(1 min)<br>**I enjoyed reviewing subtracting fractions and decimals 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!** | |