Tennessee Department of Education:

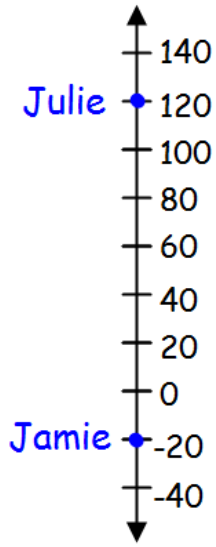
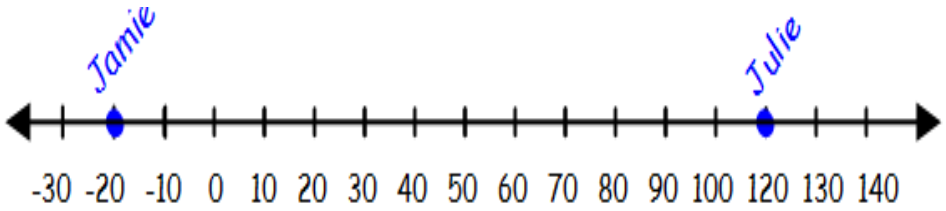
Task: Fun at the ocean	**6th Grade**
On vacation last summer, the Baker family went to the beach. Julie and her mom wanted to get a view of the coastline, so they went parasailing 120 feet above the ocean. Jamie and his dad wanted to explore the fish and the reef, so they went scuba diving twenty feet underwater. a) For a moment in time, Julie was directly above Jamie. Use a number line to show the location of Julie and Jamie at that moment. b) Using your number line, write an equation to find the distance between Julie and Jamie. c) They also observed more things while they were on vacation: a bird, a dolphin, a buoy and the bottom of the ocean. Plot each of these things on your number line where you think they may have been and explain your reasoning for each.	
Teacher Notes	
• This is an instructional task where the teacher should be pressing to hear students discover the importance of zero on a number line and what object represents zero at the beach. Hopefully, students will discover how to create a vertical number line to illustrate real world problems of elevation. We should also hear students discover that the distance between two points on a number line is additive, and which refers to the absolute value of each number. • It may be necessary for the teacher to discuss and show pictures of some of the vocabulary terms, such as parasailing and buoy. • There are numerous answers that are acceptable for Part C. Answers are acceptable, as long as the student can give a rational justification for each point they plotted on the number line. The intent is to place the buoy at sea level, the bird above sea level, the ocean floor a little below Jamie and the dolphin could be either right above sea level or below sea level depending on the student reasoning.	
Common Core State Standards	**Common Core State Standards for Mathematical Practice**
6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **6.NS.C.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **6.NS.C.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.C.7c** Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars,*	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

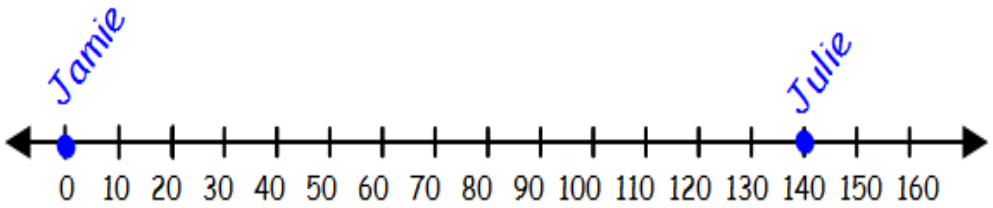
write |–30| = 30 to describe the size of the debt in dollars.	

Essential Understandings

- Real world situations can be represented using positive and negative numbers.
- Each integer can be associated with a unique point on the number line.
- Number lines can be both horizontal and vertical.
- Distances between two points or objects will always have a positive result.
- Absolute value is a measure of a number's distance from zero.

Explore Phase

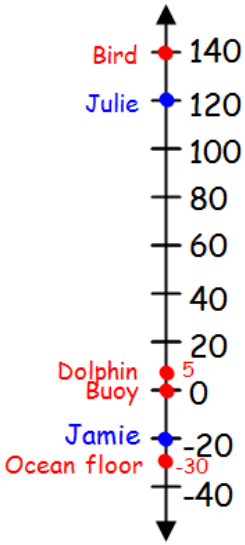
Possible Solution Paths	**Assessing and Advancing Questions**
Part A)   	**Assessing Questions:** • Why did you decide to draw a vertical number line? • Can you explain what the -20 means for Jamie? • Can you explain why you chose the increments for your number line? **Advancing Questions:** • What does the zero on your number line represent? • What do the negative numbers on your number line represent? The positive ones? **Assessing Questions:** • Why did you decide to draw a horizontal number line? • Can you explain why you plotted Jamie at negative 20? • I notice that you plotted Julie at 120. What does this represent? **Advancing Questions:** • Can you think of another way to draw a number line for this situation? • What do the negative numbers on your number line represent? The positive ones?

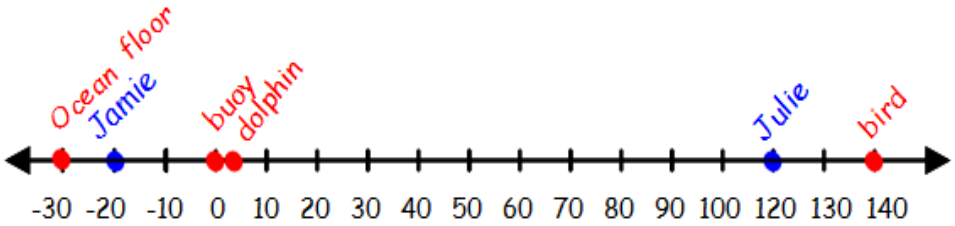
	**Assessing Questions:** • What is a number line? • How does your number line relate to the question? • I notice that you plotted Julie at 140. Why did you decide to plot Julie there? **Advancing Questions:** • Can you show me where sea level would be represented on your number line? • If Jamie is scuba diving here, where might the ocean floor be on your number line? What number will you use to represent the ocean floor?
Part B) |-20| + |120| = 140 20 + 120 = 140 120 – (-20) = 140	**Assessing Questions:** • Can you explain to me how you came up with your equation? • Why did you add? Why did you subtract? • Why did you choose to use absolute value? • What does the 140 represent? **Advancing Questions:** • How does your equation relate to your number line? • Does your answer make sense? Explain why. • You represented Jamie with -20. Can we really have a negative distance? What does the negative represent? • Can you write a different equation that represents the same problem?

Part C) Refer to *teacher notes* section above.

Possible student responses for the points plotted on each of the number lines:

I thought the bird would be flying even higher in the sky than Julie. I imagined seeing a dolphin as it jumped out of the water. The buoy would be floating on the surface of the water. Since Jamie was looking at the reef on the bottom of the ocean, I thought the ocean floor would be just a little bit lower than where he was scuba diving.





Assessing Questions:

- What were some of the things you had to consider when you plotted these things seen at the ocean?
- What does the zero on your number line represent at the beach?
- Why did you label some of your new plots with numbers, yet some of them you didn't? Was this necessary? Why?

Advancing Questions:

- What is the distance between your highest and lowest points on your number line?
- Could any of these items have been placed in their opposite position on the number line? Explain.

Assessing Questions:

- What were some of the things you had to consider when you plotted these things seen at the ocean?
- What does the zero on your number line represent at the beach?
- Why did you decide not to identify the point for the dolphin?

Advancing Questions:

- What is the distance between your highest and lowest points on your number line?
- Could any of these items have been placed in their opposite position on the number line? Explain.
- Did you attend to precision?

Assessing Questions:

- Which item did you plot first? Why?
- How did you decide to plot the buoy at 20?
- Why did you decide to not identify the points for the

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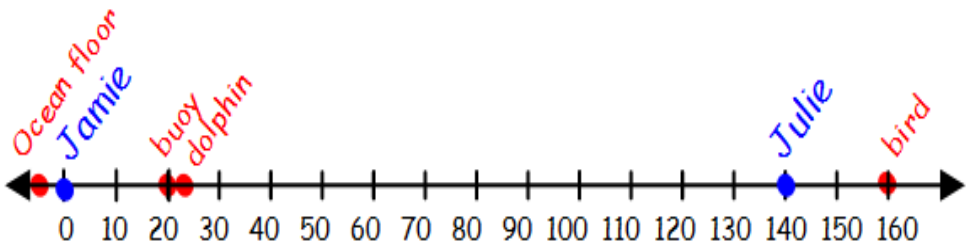
<td> 
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<td>ocean floor and the dolphin with an integer?

Advancing Questions:
• What integer would represent the ocean floor on your number line?
• What is the distance between your highest and lowest points on your number line?</td>
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<tr>
<td colspan="2">Possible Student Misconceptions</td>
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<td>Students may not relate to a beach setting or be familiar with vocabulary terms in the task such as parasailing and buoy.

Students may have the misconception that Jamie and Julie are the extremes in this problem and not rationalize that the ocean floor would be plotted on the number line.</td>
<td>Assessing Questions:
• Have you ever been to or seen in pictures or on TV people at the beach?
• Are there any words in the problem that you don’t know, or need some help clarifying?

Advancing Questions:
• What are some of the things you have seen people doing at the beach?
• Can you draw a picture that shows Julie and Jamie doing their activities at the beach?

Assessing Questions:
• What is Jamie doing in this problem?
• What are some of the things Jamie is going to see while scuba diving? Where are those things in relation to where Jamie is?
• Can you draw me a picture to help illustrate the problem?
Advancing Questions:
• Where would Jamie see the ocean floor? Where will you represent that on your number line?</td>
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<tr>
<td>Entry/Extensions</td>
<td>Assessing and Advancing Questions</td>
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<td>If students can’t get started….</td>
<td>Assessing Questions:
• What can you tell me about the problem?
• What is a number line?</td>
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- Can you draw me a picture to help illustrate the problem?

Advancing Questions:

- On your picture you have this line for the top of the water. Where do you think that water line should be represented on your number line? Explain why.

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<tr><td>If students finish early….</td><td>

- Using your work, write a generalization for finding the distance between two points on a number line.
- Which point on your line could have been represented as either a positive or negative number? Why?
- Think of some other objects that may be seen at the beach and place them on your number line. Explain your reasoning for each.
- Draw your number line in the opposite direction and use it to plot the same locations. Compare the two solution paths, and be ready to share with the class which one is easier for you to understand, and why.

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<tr><td colspan="2">Discuss/Analyze</td></tr>
<tr><td colspan="2">Whole Group Questions</td></tr>
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- Can someone explain which number line (horizontal or vertical) seemed to work best for this situation?
- Were there any key words in the problem that may have suggested using a vertical number line? Which ones?
- What is the only object that everyone plotted in the same location in relation to Julie and Jamie? Why is that?
- Can anyone generalize how to find the distance between any two points on a number line?
- What does absolute value of a number mean?

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