Domain: The Number System Standard Code: 6.NS.5 and 6. NS.7c Teacher Name: Bullock and Emmons

Adapted from: Smith, Margaret Schwan, Victoria Bill, and Elizabeth K. Hughes. "Thinking Through a Lesson Protocol: Successfully Implementing High-Level Tasks." *Mathematics Teaching in the Middle School 14* (October 2008): 132-138.

PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK	
What are your mathematical goals for the lesson? (i.e., what do you want students to know and understand about mathematics as a result of this lesson?)	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. Understand 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 real-world situation.
• What are your expectations for students as they work on and complete this task? • What resources or tools will students have to use in their work that will give them entry into, and help them reason through, the task? • How will the students work—independently, in small groups, or in pairs—to explore this task? • How will students record and report their work?	Write in their math journal. Share with their group their ideas. Graph paper, pencils, highlighters, post-it easel pad paper, rulers, scissors, string, tape Small groups Summarize strategies on post-it easel pad paper to present to whole group
How will you introduce students to the activity so as to provide access to *all* students while maintaining the cognitive demands of the task?	Tie in to the book "Peak" by Rowland Smith. This is a story about climbing Mt. Everest. The hikers have to hike up and down in order to get their bodies used to the amount of oxygen at the various levels of elevation. A group of hikers began their trip at the desert floor, 126 feet below sea level. The group camped for the night at a mountain resort 2350 feet above sea level. The next day they climbed another 2584 feet before camping. During the night, a bear stole all their food. So, the hikers walked back to the resort to resupply. The mountain is 6097 feet above sea level. What is the total distance they traveled to reach the top? What will be their total distance when they descend back to their starting point? How many miles did they travel?

PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK	
As students work independently or in small groups, what questions will you ask to— • help a group get started or make progress on the task? • focus students' thinking on the key mathematical ideas in the task? • assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations? • advance students' understanding of the mathematical ideas?	What are you being asked to find? What is distance? Can distance be negative? How do we measure distances going up and down the mountain? What strategies do you think you could use to solve this problem? Is there another way? What do negative and positive numbers mean in this task? Can you have a negative distance? Explain to me your thought process. Why do you think this is the most efficient strategy? How does our strategy compare to your neighbor's strategy? What is the same? What is different?
How will you ensure that students remain engaged in the task? • What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance is solving the task? • What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?	Look at smaller pieces. How far will they travel from the desert to sea level? What does it mean to be at sea level? How do we use positive and negative numbers? Come up with your own scenario to share with another group. Try to solve each other's problems.

PART 3: SHARING AND DISCUSSING THE TASK	
How will you orchestrate the class discussion so that you accomplish your mathematical goals? • Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why? • What specific questions will you ask so that students will— 1. make sense of the mathematical ideas that you want them to learn? 2. expand on, debate, and question the solutions being shared? 3. make connections among the different strategies that are presented? 4. look for patterns? 5. begin to form generalizations?	Choose someone to explain what the positive and negative numbers mean. Share different ideas. Have someone talk about what sea level means. Have someone talk about what it means to go up and down the mountain in terms of distance. Get a variety of strategies. Have someone share about converting to miles. Have someone share their own scenario and solve as class. What generalizations can we make about distance? What does this have to do with the concept of absolute value? What do positive and negative numbers represent in this real-world scenario?
What will you see or hear that lets you know that *all* students in the class understand the mathematical ideas that you intended for them to learn?	Negative numbers represent below sea-level and going down the mountain. Positive numbers represent above sea level and going up the mountain. Distances are always positive. We need to take the absolute value of the negative numbers to add.