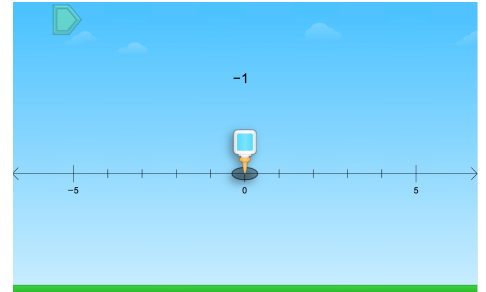


This is a guide to provide support for facilitating student thinking as teachers engage students in academic discourse around math concepts and strategies using ST Math puzzles. This talk can be done over multiple days. **Pre-work can be given to encourage students to think about the concept prior to the Puzzle Talk.** Read the [Puzzle Talks Overview](#) to learn more.

Grade Level: Sixth

Objective: Negative Numbers

Game: Negative Number Line Trap



Teacher Prep

Description

- **Purpose:** Focus on how the negative symbol impacts value. Use guiding questions for each step in the [Problem Solving Process](#) to support student thinking and the development of problem solving skills.
- **Materials Needed:** Provide students with red & yellow two-sided counters, whiteboards, and markers.
- **Puzzle Location:** Grade 6 > Negative Numbers > Negative Number Line Trap > Level 1
- **Duration:** Multiple days
- **Time:** May vary 10 - 20 minutes each session

Look Fors

How does the student:

- Identify where to place the glue dot on the number line?
- determine which direction to move when placing the dot? (For example, knowing that value decreases as you move to the left on the number line.)
- identify the value of positive and negative numbers?

Puzzle Progression

There are six levels in this game. Puzzles include a number line and a positive or negative integer. The number line begins -5 to 5, then progresses to -10 to 10, -15 to 15, all the way up to -50 to 50. In addition to the progression of the number line, the integer progresses from a single digit (7) to using parenthesis $-(7)$ to $-(-(7))$ to $-(-(-(25)))$.



Facilitation Suggestions (This is what a student-led discussion might look like.)

This would occur over multiple days

Notice and Wonder

- Display the first puzzle from Level 1.
- Ask students, "What do you notice?"
- Allow a few students to share their thinking with the whole class. Listen for ideas that might include:
 - "There is a number line." (Students might also give the range of the number line or identify how it is partitioned.)
 - "There is a bottle of glue."
 - "The number -5 is in the sky." (If students are not yet familiar with negative numbers, they might describe it as "minus 5".)
- Ask, "What do you wonder about this puzzle?" Allow students to share out. Listen for ideas that might include:
 - "What could we click on this puzzle?"
 - "Where could we move the glue bottle to make a dot on the number line?"

Predict and Justify

- Ask students to think individually about how they could solve the puzzle, then turn and share with a partner before sharing as a class.
- Students should provide mathematical reasoning for the idea they want to try. They can use their whiteboard to represent the puzzle, such as sketching a number line and marking the position of the number.
- List these ideas for the class to consider.

Test and Observe

- Select one of the students' strategies.
- Solve the puzzle and have students describe what happened.

Analyze and Learn

- Ask students how what happened compared to what they thought would happen.
 - If the answer was incorrect, discuss what was learned and what they think is best to try next. Have students share why that is the best way to solve the puzzle.
 - If the answer was correct, how can they take what they learned and apply it to the next puzzle?
- Show the next puzzle and have students discuss their strategies for solving it and why.



- Ask students, “In this puzzle, there is a 5 on each side of the number line. How are they alike? How are they different?”
- Select a student’s strategy to try and observe the feedback.
 - You can use the puzzle controls to pause the puzzle while students check if their answer matches the puzzle on the screen. Discuss how this might provide evidence for why the solution will work or not work.

Levels 2-6

- Display the first puzzle in Level 2.
- If students need additional practice identifying points in the number line, continue with puzzles from Level 1. To continue the exploration of negative numbers, use puzzles from Level 3 that include a number line ranging from -15 to 15.
- Discuss different ways to represent and solve the puzzle.
 - “How do we determine where to place the glue dot?”
 - For example, are we placing the dot to the left of zero? Or to the right of zero?
 - “Does the way the number is written help us know on which side of zero to place the dot?”
 - For example, the negative sign in front of a number means that the number has a value less than zero so the dot is placed to the left of zero. Positive numbers typically do not have a symbol in front of them. Positive numbers are placed to the right of zero.
- You can use the puzzle controls to replay and examine what happens in the puzzle.
 - If the puzzle was correct, discuss why the strategy used was successful.
 - If the puzzle was incorrect, analyze what happened and consider how to adjust the strategy to try again.
- Continue with puzzles from Levels 4, 5, and 6. These puzzles have multiple leading negative signs.
 - “How are these puzzles different from the puzzles we’ve solved before?”
 - “What do the symbols in front of the number mean?”
 - “Is there a pattern in how the negative signs influence the value of the number?”
 - For example, in $-(-(-2))$, the two negative signs will return the number to its original placement.
 - *When there are multiple negative signs, students can use the two-colored counters to flip the counter each time to represent how the sign changes the number. For example, $-(-(-2))$ would start on the*

Connect and Extend



red side, flip to the yellow side, and end on the red side because there are 3 negative signs.