

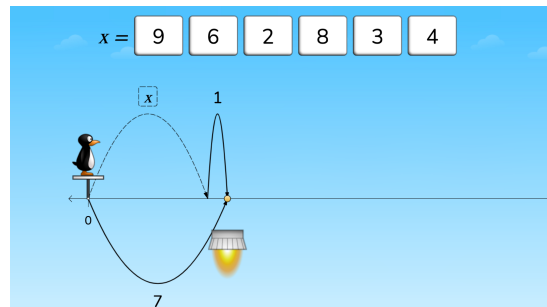


This is a guide to provide support for facilitating student thinking as teachers engage students in academic discourse around math concepts and strategies using ST Math puzzles. This talk can be done over multiple days. **Pre-work can be given to encourage students to think about the concept prior to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

Grade Level: Seventh

Objective: Solving One-Step Equations

Game: Rolling Equations



Teacher Prep

Description

- **Purpose:** Focus on building equivalent expressions for both the top and bottom of the number line. 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 whiteboards and markers.
- **Puzzle Location:** Grade 7 > Solving One-Step Equations (G7) > Rolling Equations > Level 1
- **Duration:** Multiple days
- **Time:** May vary 10 - 20 minutes each session

Look Fors

How does the student:

- represent the puzzle using an equation?
- represent equality between the two expressions as they work to prove the value for x and/or y ?
- use inverse operations (such as subtracting the addend) to solve for x and y ?

Puzzle Progression

This game includes six levels. In Level 1, students find x by selecting the number that fits the relationship displayed by a visual representation on the number line. In Level 2, students are solving for both x and y where $x + y =$ the given number. In Level 3, students encounter multiple instances of the variable. For example, $x + x + x =$ the given number. Level 4 introduces a variable on each side of the equation. For example, $x + 6 = y$, where students solve for both x and y . Levels 4 and 5 continue with variables on both sides of the equation and become increasingly complex.



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, "What do you notice about this puzzle?"
- Allow a few students to share out. Listen for ideas that might include:
 - "There is a number line with a yellow dot marked at 7."
 - "The top of the number line shows a jump of x and a jump of 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?"
 - "How could we prove the distance that is marked as x ?"

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 drawing a number line or writing an equation.
- 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.
- Engage students in a discussion by asking questions like:
 - "What is an equation we could write to represent this situation?"
 - For example, students might notice that the point marked on the number line is represented by equivalent expressions with $x + 5$ on the top and 7 on the bottom.



- “How could we prove the value of x ?”
 - For example, by removing 5 from both $x + 5$ and 7, students could prove that x and 2 are equivalent.
- 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.
- Continue with puzzles from Levels 1 and 2. Level 1 puzzles contain one-step equations using addition or multiplication. Level 2 puzzles contain two-step equations.
- Discuss different representations in the puzzle.
 - “How can we tell whether this puzzle will involve addition or multiplication?”
 - For example, if the number line shows a constant and a single variable, students can represent the expression as addition. If the number line shows multiples of the same variable, students can represent the expression as multiplication.
 - “Looking at the numbers that are provided, choose a number that will NOT work. If we use that number, what do we expect to happen in the puzzle?”
 - For example, have students predict where the number line will be marked. Play the puzzle to see whether their prediction is correct.
 - “What operation(s) are involved in this puzzle? What equation(s) can we write to represent it?”
 - “Is there more than one solution that will work for finding $y + x$?”
- 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.

Connect and Extend

Level 3

- Continue with puzzles from Level 3.
 - “How are these puzzles different from the puzzles we’ve solved before?”
 - “What equation(s) can we write to represent this puzzle?”
 - “Is there more than one strategy that will work for finding the value of x ?”