

Puzzle Talk Facilitation Guide



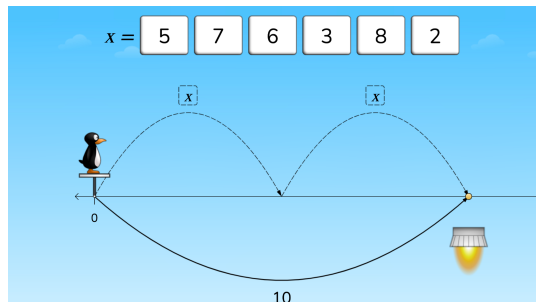
ST Math®

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: Eighth

Objective: Solving Linear Equations

Game: Rolling Equation



Teacher Prep

Description

- **Purpose:** Focus on building equivalent expressions to represent the relationship between 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 with whiteboards and markers
- **Puzzle Location:** Grade 8 > Solving Linear Equations > Rolling Equation > Level 1
- **Game in a Minute:** [View video](#)
- **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 ?
- use inverse operations (such as subtracting the addend) to solve for x ?

Puzzle Progression

Students will encounter puzzles where they determine the value of x by selecting the number that fits the relationship displayed by a visual representation on the number line. As puzzles continue, they become more challenging. Variables are represented on both the top and the bottom of the number line. Students need to determine which value satisfies both sides of the equation.



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."
 - "The top of the number line shows 3 jumps of x and the bottom of the number line shows a jump of 9."
- Ask: "What do you wonder about this puzzle?" Allow students to share out. Listen for ideas that might include the following:
 - "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

- Choose one of the ideas from the class to try. Typically a teacher might choose an incorrect answer the first time in order to allow for enhanced discussion and exploration of why Jiji was unable to cross the screen.
- Play the puzzle and ask students to observe what happens in the puzzle. *Remember to use the animation control features to replay or stop during points in the feedback to highlight important ideas.*
- Based on what they have learned from the feedback, ask students to choose another idea to try.
- Play the puzzle and ask students to observe what happens in the puzzle, using the animation control features and stopping when appropriate.
- Consider:
 - "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.
- “What does the yellow dot on the number line represent?”
- You can use the animation 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.

Analyze and Learn

- Continue with puzzles from Levels 1 and 2.
- Discuss ways to get Jiji across the screen.
 - “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 an 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?”
- You can use the animation 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.
 - 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

- Continue with puzzles from Level 3.
- As you discuss the puzzles, ask questions such as these:
 - “How are these puzzles different from the puzzles we’ve solved before?”
 - “What strategies are you using to find the value of a ?”
 - “Are you adding or multiplying or both?”
 - “What equation(s) can we write to represent this puzzle?”
- Give students an equation such as $15 = 2y + 3$ and ask them to draw a *Rolling Equations* puzzle to represent it. Challenge students with additional equations such as $2a + 7 = 5a + 1$.
- Ask students how the puzzle would change if the equation used subtraction instead of addition. Can they draw an example?