

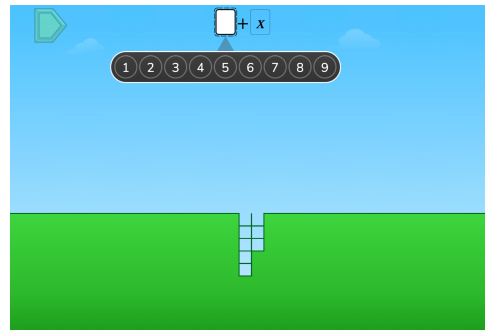


This is a guide to provide support for facilitating student thinking as teachers engage students in academic discourse around math concepts and strategies using ST Math puzzles. This talk can be done over multiple days. **Pre-work can be given to encourage students to think about the concept prior to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

Grade Level: Sixth

Objective: Modeling with Expressions (G6)

Game: Wall Factory



Teacher Prep

Description

- **Purpose:** Focus on building an expression from a visual model. 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 6 > Modeling with Expressions (G6) > Wall Factory > Level 2
- **Duration:** Multiple days
- **Time:** May vary 10 - 20 minutes each session

Look Fors

How does the student:

- represent the puzzle with an expression?
- choose numbers to use in the expression?
- use mathematical vocabulary and mathematical symbols to describe the puzzle?

Puzzle Progression

There are 5 levels in this game. Puzzles include a model and an expression with up to four unknowns. A keypad is used to complete an expression to represent the model. Puzzles begin with addition expressions and progress to multiplication expressions. Puzzles at the highest levels include expressions with multiplication, addition, and parentheses (order of operations).



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 2.
- 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 blank with the numbers 1-9 beneath it."
 - "There are empty squares in the ground."
- 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?"
 - "What number would match the number of empty squares in the ground?"

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.
- 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.
 - Draw students' attention to the connection between the number and the quantity of empty squares in the ground.

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 questions like:
 - "How is this puzzle different from the puzzle we just solved?"
 - There are multiple rows/columns of empty squares.
 - Listen for students' vocabulary, such as "2 rows of 4".



- “In this puzzle, what could the variable represent?”
- 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 2-3

- Display another puzzle in Level 2.
- Discuss different ways to represent and solve the puzzle.
 - “Does the order of the numbers matter?”
 - For example, does 5×1 give the same result as 1×5 ? You can replay the puzzle and enter the numbers in a different order. This is an opportunity to reinforce the commutative property of multiplication.
 - “How would the expression change if we had another row of empty squares?”
 - For example, if the model shows 2×4 , ask students to write the expression that would represent 3 rows of 4.
- 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.
 - “What is a number that will be too small? What will happen if we try it?”
 - “What is a number that will be too big? What will happen if we try it?”
- Continue with puzzles from Level 3.
 - “How are these puzzles different from the puzzles we've solved before?”
 - “What could the variables represent?”
 - “What numbers could we use in the expression to represent this puzzle?”
 - “How many different expressions could be written to represent this puzzle?”

Connect and Extend