

# What's the Problem?

Grades 2 - 5

## Overview

Students will connect number sentences to problem situations and use addition, subtraction, multiplication, and division to solve the problems.

## Math Concepts





- addition, subtraction
- multiplication, division (Grades 3 - 5)
- number sentences (equations)
- inequalities (Grades 3 - 5)


## Materials

- TI-15
- counters
- pencil
- student activity (page 37)

## Introduction

1. On a sentence strip or on the overhead, display a number sentence such as " $8 + 2 = ?$ " Have students brainstorm situations and related questions that this number sentence could be representing. For example, "If I bought eight postcards on my vacation and I had two postcards already at home, how many postcards do I have now?"
2. If necessary, have students act out the situation with counters and determine that the value of "?" is 10.
3. Demonstrate how to display this equation on the calculator, and how to tell the calculator what the value of ? is.
4. Now display an equation such as  $? - 10 = 5$ . Have students brainstorm situations and related questions that this number sentence could be representing. For example, "I had some money in my pocket, and I spent 10 cents of it. I only have 5 cents left. How much money did I have in my pocket to begin with?" Have students practice the keystrokes necessary to display this equation and test the value they determine for "?".
5. Over a period of time, continue to introduce students to different types of number sentences to explore. For example,  $? - 8 < 5$  (which has 13 whole number solutions) and  $? \times ? = 24$  (which has 8 solutions of whole number factor pairs) and  $? \times 4 = 2$  (which has no whole number solution).

 To display this equation on the calculator, put the calculator in Problem Solving mode by pressing the  key. Then enter the equation  $8 + 2 = ?$  and press . The calculator display (1 SOL) tells how many whole number solutions there are to the equation. To test your solution to the equation, enter the value of **10** and press . The calculator will display **YES**.

 If an incorrect value is tested for ?, the calculator will display **NO** and provide a hint. For example, if a student tests 5 for the equation  $? - 10 = 5$ , the calculator displays **NO**, then shows  $5 - 10 < 5$ , and then returns to the original equation.

# What's the Problem? (Continued)

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## Collecting and Organizing Data

As an ongoing activity, have students work in pairs and use the *What's The Problem?* Student Activity sheet to create problem-solving cards. Have one partner create an addition, subtraction, multiplication, or division number sentence, using the “?” and record it in the top box and on the calculator. If possible, the other partner creates a situation and question to go with the number sentence and records it in the bottom box. The two boxes can be glued or taped to opposite sides of an index card.

Have students work together with the calculator to explore how many whole number solutions the equation has and test what the solutions are. Provide ideas for exploration by asking questions such as:

- *What actions could be happening in your story to go with addition (subtraction, multiplication, or division)?*
- *How could you use these counters to act out this number sentence?*
- *What could this number in the number sentence represent in your story?*
- *What could the question mark in the number sentence represent in your story?*
- *Can you make a story for a number sentence that begins with a question mark?*

## Analyzing Data and Drawing Conclusions

To focus students' thinking on the relationships between their stories and the numbers and operations in their number sentences, ask questions such as:

- *How would using a different number here change your story?*
- *How would using a greater than or less than symbol instead of an equal sign in the number sentence change your story?*
- *How would using a different operation in your number sentence change your story?*

# What's the Problem? (Continued)

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## Continuing the Investigation

- Have partners create stories and trade them. Each partner can then write a number sentence to go with the other partner's story.
- Have students sort the number sentences they have made into categories: e.g., those with 0 whole number solutions, those with one whole number solution, those with two whole number solutions, those with infinite whole number solutions.
- Have students try to find an equation or inequality with exactly 0 whole number solutions, exactly 1 whole number solution, exactly 2 whole number solutions, more than 5 whole number solutions, etc.

# What's the Problem?

Name \_\_\_\_\_

Date \_\_\_\_\_



Write a number sentence using an operation and the “?”

Write a story that describes a situation and asks a question that can be represented by the number sentence.