

EXPANDED LESSON

# Exploring the interrelationship between Subtraction and Addition: Solving for a Missing Addend

## **Content and Task Decisions**

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Grade Level: 2<sup>nd</sup>

**Description of Task:** Students will use base 10 blocks and a balance scale to solve a missing addend story problem. They will explain their answer to classmates by creating a visual representation of the problem with pictures, numbers, or words. Students will share and justify their answers to group and class members.

### **Indiana Mathematics Content Standard:**

Indiana State Standard 2.CA.2: Solve real-world problems involving addition and subtraction within 100 in situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all parts of the addition or subtraction problem (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). Use estimation to decide whether answers are reasonable in addition problems.

### **Indiana Mathematics Process Standard:**

P.S.1: Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" and "Is my answer reasonable?" They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

**Mathematics Content Goals:**

- Use manipulatives to explore the process for solving a missing addend problem.
- Use invented strategies to solve a missing addend problem.
- Students will explain their solutions through pictures, numerals, and words to others.
- Explore the relationship from this experience and how it relates to the algorithm for solving a missing addend problem.

**Language Objectives:**

- Students will correctly use comparative language and understand the concept represented, such as greater than, less than, equal, more, less, bigger, and smaller.

**Materials:** Each group will need

- balance scale with inserts to hold base ten blocks (insert pattern included)
- set of base ten blocks sufficient to model the problem(s)
- assortment of other math manipulatives that could assist students with solving the problem such as 100 charts and empty number lines
- materials to illustrate and document invented solutions (chart paper, markers, crayons)
- activity page for each student

# Lesson

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## Before

**Important:** Your students should be familiar with a balance scale and how to use it before this lesson. If you have not used one earlier in class find a way to incorporate it into a math or science activity prior to this lesson.

### Present the task to the class:

- Read the problem together with the class. You will for each problem as they are presented. This may be spread over two days.

- Check for understanding of the information by asking questions. You are not asking for a solution to the problem but gauging correct knowledge of the specific information and situation given in the problem.

- List “what you know” on the board that can be used as a reference during group work time.

- Have a number talk (sharing time) with students about their ideas on how to solve the problem, emphasizing different approaches that arrive at the same answer.

  - Summarize the different ideas.

- Direct students to explore the problem with their group using the balance scales and base ten blocks to check the answer.

- They will finish the activity by showing how they chose to solve the problem.

**JUST FOR FUN:** To increase student interest create a theme for the problem. Two examples are telling students they are pirates looking for remaining buried gold pieces, or creating a scenario where students pretend to be private detectives looking for missing jewels.

**Provide clear expectations:**

-Give instructions for group assignments and responsibilities to ensure cooperation.

-Explain they are to “show what you know”. Students will be writing and drawing an explanation to share with classmates that will show how they solved the problem. (Words, pictures, or equations may be used.)

-Remind students to make their presentation complete enough that someone looking at it will understand their idea.

-Instruct groups to move to the second problem when they have completed the first problem.

**During****Initially:**

-Observe student engagement and check for understanding of the task and the information given in the problem.

-Monitor students to ensure participation with their group and involvement with manipulatives.

**Ongoing:**

-Observe the students at work. Encourage and assist anyone struggling and support the cooperative efforts of the groups. Notice students who would be good candidates for sharing in the “after” part of the lesson.

-Reinforce student thinking and the need to illustrate their process and ideas so they can share with others.

-Assist students who appear “stuck” by restating the problem and given information. Suggest a manipulative that might assist them to illustrate their strategy, such as a hundreds chart or build on their idea by leading them to a logical next step. (Allow independent work time and check back later for progress.)

-Ask students to demonstrate how they arrived at their answer if you believe they don't understand or have an incorrect answer. They may catch their error or recognize and correct themselves as they share their thoughts out loud.

## After

### **Bring the class together to share and discuss the task:**

- Begin by asking each group to share individual ideas of each with each other.
- Bring the entire class together and select students with unique and different approaches to share. Record their ideas on the board with drawings, words, and equations. Student work can be displayed or projected with a document camera.
- Give discussion and explanation time for the different strategies.
- Repeat the process for the second problem.

**Strategy hints:** Use vertical and horizontal number sentences to illustrate the acceptability of both forms. You may prompt some students to use a number line to show their strategy if they are only explaining their idea verbally.

## **Assessment**

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### **Observe**

- Create a checklist of skills/strategies you wish to observe. Ideas could include: using a number line, regrouping, using “landmark” or “friendly” numbers, compensation
- Check to see if students have found their own method to solve the problem or did they group all use the same strategy.
- Monitor student use of comparative language during activity.

### **Ask**


- “How did you get your answer?” “What strategy did you use?”
- “Show me how you got your answer.” “Show me using manipulatives (or a drawing) how you got your answer.”
- “Is there a faster (or another) way to get this answer that you thought of?”
- “How do you know this number is greater/less/equal?”

Name \_\_\_\_\_

**Missing Numbers!**  
**Can you solve the mystery?**

**Mystery #1**

Mrs. Brown's class challenged Mrs. Jones's class to a reading contest. The girls in Mrs. Brown's class counted 415 books the class had read. The boys read 189 books but they don't know how many books the girls read because Mary's marker leaked on the paper. Can you help them find out how many books the girls read?


$$\begin{array}{r} \text{[cloud]} \\ + 189 \\ \hline 415 \end{array}$$

**Mystery #2**

Bobby built a cool Lego spaceship. He used 285 blocks before supper and then put in the rest when he was done eating. There were 507 blocks in his set. He can't remember how many he used after eating. Can you help him find out how many Legos he added later?

$$\begin{array}{r} 285 \\ \text{[cloud]} \\ + \text{[cloud]} \\ \hline 507 \end{array}$$