

Connecting Addition and Subtraction

Strand:	Computation and Estimation
Topic:	Use the relationship between addition and subtraction to aid in developing fluency with addition and subtraction within 10.
Primary SOL:	1.7b The student will demonstrate fluency with addition and subtraction within 10.
Related SOL:	1.6, 1.7a, 1.15

Materials

- Cubes/counters
- Part-Part-Whole Mat (attached)
- Whiteboards/markers
- Paper/pencil

Vocabulary

add, addition, combine or joined, difference, equals (=) sign, minus, minus (–) sign, number sentence, parts, plus (+) sign, put together, related fact, subtract, subtraction, sum, take apart, whole

Student/Teacher Actions: What should students be doing? What should teachers be doing?

Note: Addition and subtraction are connected. Addition determines the whole in terms of parts, and subtraction determines missing parts. Students relate addition and subtraction as inverse operations through the comparison of student strategies and analysis of part-whole relationships. It is integral that students understand the meaning of operations and how they connect to one another. Students should begin with addition and subtraction facts to 5 and gradually work their way up to 10.

1. Pose the following problem to students:

Pam and Lisa were collecting pencils at the end of the school day. Pam found 7 pencils and Lisa found 2. How many pencils did they collect?

Ask students the following questions to get them reflecting about the problem: “*What is the problem about?*” “*What do we know from the problem?*” “*What are we trying to figure out?*” “*Will there be more or fewer pencils at the end of the story problem?*” “*How do you know?*” During this discussion with students, ask whether the numbers in the problem describe the total or whole or describe the parts. “*How do you know?*” “*How can we represent this with a model or drawing?*” Have a discussion with students about the problem.

2. Ask students to solve the problem using counters and/or drawings and the part-part-whole mat. Have them show their work so someone else could tell how the problem was solved. Encourage students to use pictures, numbers, and/or words to show their thinking. Have manipulatives available and/or whiteboards/markers for them to act out

what is happening in the problem. Observe students while they are working to see what strategies they are using. *Are they working randomly? Are they counting up or back? Are they using number combinations that they know? Do they use addition/subtraction notation accurately? Does their work model how they solved the problem, or did they write down something that was easy to record?*

3. Gather students together to discuss how they approached the problem. Ask students to share strategies for solving the problem with the group while you record their thinking on chart paper/board. Have them include how they modeled the story problem with manipulatives or their drawings. Here are some possible questions to encourage student reflection: *“How did you get your answer?” “Can you describe how you solved the problem to us?” “Can you explain what you have done so far?” “Why did you decide to do this?” “What do you think about what (student) said? Do you agree? Why or why not?” “Does anyone have the same answer but a different way of explaining it?” “Does your answer make sense?”*
4. If students used numbers to show how they solved the problem, have them share the number sentences they used to represent how they solved the problem. Establish with students that when putting parts together to make a whole, we use plus (+) sign. This means that we are joining the parts to show a total amount or quantity. The equals (=) symbol means that both sides of the equations are the same. For example, $7 + 2 = 9$ or $= 7 + 2$. The parts 7 and 2 make a total of 9. Seven and 2 are the parts and 9 is the whole amount. These will be highlighted during the discussion focusing on part-whole relationships after students solve the second problem to help enhance student understanding of the relationship between addition and subtraction.
5. Pose a second problem for students to solve and represent their thinking using pictures, numbers, and words.

Lisa and Pam put the 9 pencils in a container. Then Amy came by and took 2 of them for the students at her table. How many pencils were left in the container?

Repeat the problem-solving process used with the first problem (steps 1 through 3) for this one. *Do students recognize that the two problems are related?* Use your observations and examples of student work as you begin discussion about how students solved the problems. The focus of this lesson is making connections between the operations of addition and subtraction, so observe the numbers and/or number sentences that students use to solve these problems. Comparing student strategies will lead to fruitful discussion about the relationship between the two story problems and the operations used to solve them.

6. After students have time to solve the problem, pull them back together to discuss the second problem, as well as make connections between both problems they have solved during this lesson. As students explain their strategies, model them with manipulatives or drawings for the class. *“How can the first problem help you solve the second problem?” “How is (student’s) strategy similar to (student’s) strategy? How are they different?” “What happens when we join two quantities or take one from another?” “How can we find what is left when we take one quantity from another?”*

7. If students used numbers to show how they solved the problem, have them share the numbers and/or number sentences they used to represent how they solved the problem. Establish with students that when they are taking a part away or finding a missing part, they use the minus (–) sign. This symbol means that you know the total/whole amount and you are taking away a part to find the other part of the total/whole. Ask students to reflect on the following question: “*Why can we represent problem situations with both addition and subtraction?*”
8. Have students reflect on the lesson by choosing an assessment activity from below.

Assessment

- **Questions**

- How can we use a part-part-whole mat to show that addition and subtraction are related?
- Give each student eight counters and have them separate them into two parts on the part-part-whole mat. Write related addition and subtraction number sentences that represent how you separated the counters. Draw a picture to show the two parts of the set.
- How could you write an addition sentence that would mean the same as $8 - 5 = \underline{\quad}$?

- **Journal/writing prompts**

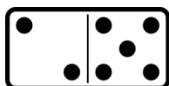
- Show students 10 linking cubes joined together, four red and six green. Have students identify what the total or whole is and what the parts are that make 10. Have them record both addition and subtraction number sentences for this model and write about how the number sentences are related.
- How can the numbers 6, 3, and 9 be placed in a part-part-whole mat? Use pictures, numbers, and words to explain your thinking.
- Erin had three markers. Tony gave her some more. Now Erin has eight markers. How many markers did Tony give her? Use pictures, numbers, and/or words to explain your thinking. Encourage students to write an addition and a subtraction sentence for this story problem and explain how they could use either addition or subtraction to solve this problem.

- **Other Assessments**

- Create a related addition and subtraction story problem using the related facts – 10, 2, and 8. Prove how your story problems are related.
- How can the “think addition” strategy help you understand how addition and subtraction are related? Explain your thinking.

Extensions and Connections (for all students)

- **Domino Related Facts:**



Cover one part of the 2|5 domino and show it to students. Say, *There are seven dots on this domino. How many dots are covered? How do you know?* Encourage a variety of responses before uncovering the hidden part. Have students record the number sentences that represent the related facts for this domino. *“How can you use the “think addition” strategy to help you figure out how many dots are covered?” “Compare and contrast addition and subtraction number sentences for this domino.” “How are these three numbers related?”* Repeat the activity for another domino, which has a total of eight dots, etc.

- **Think Addition Activity:** Give each student a fixed number of counters on a part-part-whole mat. Count the cubes/counters with students to determine the total number. Have Player 1 separate the counters into two parts while Player 2 covers his/her eyes. Player 1 hides one of the two parts with a cup or sheet of paper so only one part is showing. Player 2 has to figure out the covered part by thinking addition. *What goes with the part you see to make the whole?* For example, if there are nine counters and four counters are visible, the student needs to think 4 and ? make a total of 9.
- Ask students to create a different two-number combination for the sum of seven using the part-whole mat and counters. When students have completed this task, ask the student to show his/her combination to the group. Discuss the relationship between seven, the whole or total, to the parts that make this total (3 and 4, 5 and 2, etc.) Have students record both the addition and subtraction number sentences represented by the counters.

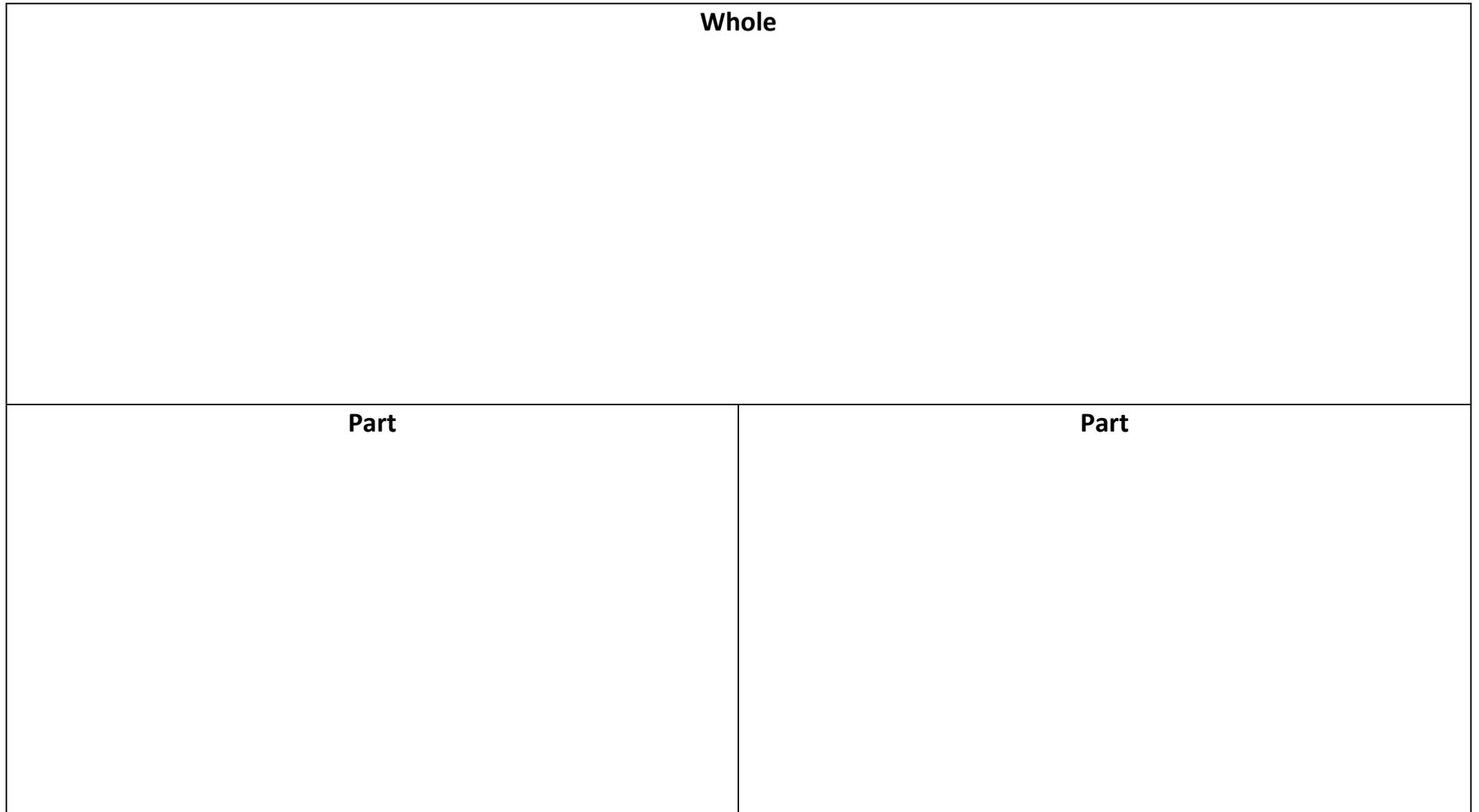
Strategies for Differentiation

- Adjust the total number to meet the needs of your students.
- For struggling students, continue to use paired addition and subtraction story problems to provide context for modeling the connection between addition and subtraction.
- When modeling part-part-whole situations, provide equation frames that encourage students to write both an addition and a subtraction sentence. (____ + ____ = 9 and 9 - ____ = ____)
- Provide students with cards with various related number sentences on them. Have students match up to another student(s) to create a fact family. For example, $3 + 2 = 5$ could match to $2 + 3 = 5$, $5 - 2 = 3$, and $5 - 3 = 2$.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

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Part-Part-Whole Mat 1



Part-Part-Whole Mat 2

