Related Facts

Strand: Computation and Estimation

Topic: Recognizing fact families

Primary SOL: 2.5   The student will

          a) recognize and use the relationships between addition and subtraction to solve single-step practical problems, with whole numbers to 20.

Related SOL: 2.6 c

Materials

- Markers (blue, red, black, purple)
- Chart paper, marker board, or electronic whiteboard
- Linking cubes in different colors
- One-inch graph paper
- Crayons, pencils

Vocabulary

adding, addition, sum, fact family, subtraction, subtracting, minus, difference, inverse operation

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

1. Ask students to brainstorm different ways to find out how many students are in the class. Let students share several strategies.

2. Have all of the boys stand up, count them with the class, and record that number in blue on chart paper. Then, have all of the girls stand up, count them with the class, and record that number in red on the chart paper. Ask, *"What could be done with those two numbers to find the total number of students in the class?"* When someone says, "add," allow a student to demonstrate the symbol and its placement in the addition problem. Ask, *"What else is missing from the number sentence?"* Allow another student to place the equal symbol in the correct location, using the black marker. Have students add the two numbers to find the total number of students in the class, and let another student write the total in purple. Have students check the answer by using some of the other strategies that were mentioned at the beginning of the activity.

3. Ask, "What would happen if we write the number of girls first?" Select different students to rewrite the problem with the number of girls written in red first, the number of boys written in blue second, the addition and equal symbols written in black, and the total written in purple.

    $$12 + 13 = 25$$
    $$13 + 12 = 25$$

4. Ask whether students have noticed anything interesting. Then, draw arrows to accentuate the parts that are the same.

$$12 + 13 = 25$$

$$13 + 12 = 25$$

5. Ask what would happen if we started with the total and subtracted the boys, leaving only the girls in the class. Allow students to develop the problem. Record it on the board, using the designated colors. Have students model it to check the answer. Do the same with taking away the girls. Ask students if they see a pattern. Then, draw arrows to accentuate it.

$$25 - 13 = 12$$

$$25 - 12 = 13$$

6. Guide students in recognizing and articulating the following key points:
   - Four number sentences are created:
     - Two number sentences are addition.
     - Two number sentences are subtraction.
   - The same three numbers are used in all four number sentences.

7. Have students re-create this sequence with linking cubes to reinforce these key points, using no more than 20 cubes per student—10 of one color and 10 of another. For example, tell students to connect three cubes of one color and then add four cubes of a second color to create a train. Have students record their related facts on graph paper, as shown below. Students should use the 20 cubes to show different combinations to represent the number sentences.

Blue	Blue	Blue	Red	Red	Red	Red

$$3 \quad + \quad 4 \quad = \quad 7$$
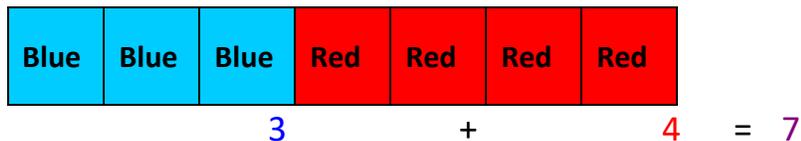
Flip the cube train over, end to end, and record the number sentence.

Red	Red	Red	Red	Blue	Blue	Blue

$$4 \quad + \quad 3 \quad = \quad 7$$
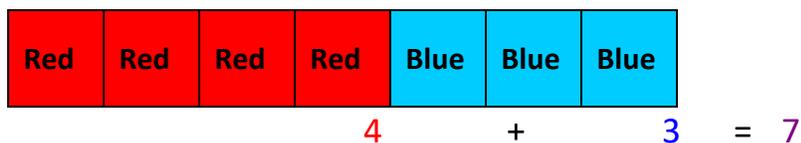
Start with the whole (7), and break off the 4 red, leaving the 3 blue. Record the number sentence:

$$7 - 4 \quad = \quad 3$$

Start with the whole (7), and break off the 3 blue, leaving the 4 red. Record the number sentence:

$$7 - 3 \quad = \quad 4$$

You may want to have students draw arrows to reinforce the concept of the same three numbers being used and the changes to their locations.

8. Allow students time to create their own related facts, using the cubes and recording what they create.

9. Share this single-step story problem with students: Tara had 10 red pens. She gave Jim 8 of her red pens. How many red pens does Tara have now? Use real pens to represent this problem. Be sure to show the relationship between the addition and subtraction by rewriting another single-step addition problem.

10. Now have students get in pairs and come up with a scenario to create their own word problem. Have students write two single-step word problems using their scenario.

11. Independently, have students create a word problem and answer two to three questions below.

12. Review the outcome for today and ask students to journal one of the journal prompts.

Assessment

- **Questions**
    - How can you use addition to help you solve subtraction problems?
    - How are addition and subtraction related to each other?
    - Addition and subtraction are inverse operations. What does the phrase "inverse operation" mean?
    - For any given three digits, how many related facts are possible? What are some examples?

- **Journal/writing prompts**
    - Tonya is trying to solve the problem 18 − 6 = ___. How can related facts help Tonya solve this problem?
    - Rick is at the beach. He finds 9 shells and puts them into his bucket. His little brother gives him some more shells so that now he has 17 shells. How many shells did Rick's brother give him? Draw a picture, and explain your answer.
    - When given a set of any three digits, it is possible to create four related facts— two addition and two subtraction—as in the following:

        2 + 3 = 5   5 − 2 = 3
        3 + 2 = 5   5 − 3 = 2

        But some digit combinations only have two related facts—one addition and one subtraction—like the following:

        2 + 2 = 4   4 − 2 = 2

        Why do some digit combinations have four related facts while others have only two related facts?

- **Other Assessments**
    - Circulate as students are creating and recording their own related facts, and observe the strategies and rationales the students use. Ask questions to determine whether students are absorbing the key points noted above. Note

who is having difficulty, and give help, as needed. Collect the papers as an assessment.

- o Give students one fact (e.g., 2 + 6 = 8), and have them individually find the related facts as an exit pass. Collect the exit passes as an assessment.

Extensions and Connections (for all students)

- Give students opportunities to determine the missing number in a number sentence (e.g., 5 + __ = 9, or 9 − __ = 4).
- Give students a number, such as 10. Have students choose color cubes in two different colors that will combine to make a total of 10. Allow students time to draw and label the related facts for the cubes they chose. When students have finished, display and compare all of the related facts they created for 10 cubes. Analyze the results to see whether any other fact families can be made.
- Have students create word problems and illustrations to go along with a particular set of related facts. Each student can be responsible for one related fact, and the finished pages can be laminated and turned into a class book. The answers can be hidden underneath a flap to make a variation of a pop-up book.

Strategies for Differentiation

- For an extra challenge, pose the following problem: You have a bag with five cubes in it. Some of the cubes are red, and some are blue. Show three of the possible combinations of red and blue cubes that could be in the bag, and list all of the related facts for each combination.
- Students who may be struggling with the concept should work with sums and differences to 10.
- Have students use linking cubes on an interactive whiteboard.
- Provide a template for students to use to fill in the related facts (e.g., ___ + ___ = ___). Lines of the template may be color-coded like the examples in the activity.
- Redirection and corrective feedback should be given throughout lesson.
- Have sentence starters for word problems.
- Pair students strategically.
- Use picture clues.
- Use numberless word problems.

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

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