

Operations with Signed Integers - Subtraction

Part 1: Conducting the Experiments

DIRECTIONS: In this activity, you will be using manipulatives to discover rules for subtracting signed numbers. Often, in order to subtract, you must use an equivalent representation of the number. For example, the number six can be represented as...

$$6 \quad 6 + 3 + (-3) \quad 7 + (-1) \quad 6 + (-4) + 4 \quad -4 + 10$$

Each of these expressions represent 6, but some are in simpler forms than others. Which expressions in this example incorporate the use of the zero rule of addition? Circle them.

For each problem in Experiments 1-6, record the results of the problem in the space provided. Your answer should include the number of beans remaining after the operation is performed, along with the color of the beans. You may use a W for white and a R for red.

Experiment 1

1. Remove 2 white beans from 5 white beans. _____
2. Remove 1 white bean from 2 white beans. _____
3. Remove 4 white beans from 6 white beans. _____
4. Remove 10 white beans from 15 white beans. _____

Experiment 2

5. Remove 5 red beans from 10 red beans. _____
6. Remove 3 red beans from 9 red beans. _____
7. Remove 9 red beans from 16 red beans. _____
8. Remove 7 red beans from 11 red beans. _____

Experiment 3

9. Remove 5 white beans from 2 white beans._____
10. Remove 6 white beans from 2 white beans._____
11. Remove 4 white beans from 1 white bean._____
12. Remove 10 white beans from 9 white beans._____

Experiment 4

13. Remove 10 red beans from 5 red beans._____
14. Remove 9 red beans from 7 red beans._____
15. Remove 6 red beans from 3 red beans._____
16. Remove 7 red beans from 1 red bean._____

Experiment 5

17. Remove 7 red beans from 3 white beans._____
18. Remove 5 red beans from 9 white beans._____
19. Remove 6 red beans from 10 white beans._____
20. Remove 4 red beans from 1 white bean._____

Experiment 6

21. Remove 6 white beans from 5 red beans._____
22. Remove 7 white beans from 8 red beans._____
23. Remove 10 white beans from 5 red beans._____
24. Remove 8 white beans from 4 red beans._____

Part 2: Analyzing Data

DIRECTIONS: Compare your results with those of the other members of your group. Discuss any problems for which your answers differ. Make sure all the members of your group agree on the answer to each problem and on the process of finding the answer. Then respond to the following questions in your journal.

1. Describe general strategies that were employed to solve the problems in Experiments 3–6.
2. How did the solutions in Experiments 3-6 differ from those in Experiments 1 and 2?
3. How are the problems in Experiments 1–6 similar to the addition problems you solved in Activity 7?
4. What rule could you create that would help you subtract signed numbers easily?

Part 3: Using Symbols to Replace Beans

DIRECTIONS: Because writing the words “white” and “red” is time consuming, symbols for the colors can be used. So that all students in your class will use the same symbols, a white bean will be represented by placing a negative (–) sign in front of a number. The symbol for red beans will be a positive (+) sign or no sign at all.

Example 1: Three white beans will be recorded as (-3).

Example 2: Four red beans will be recorded as (+4) or (4).

To show different sets of beans that are being subtracted, a minus (–) sign is placed between the two sets of beans. Use an equal (=) sign to separate a problem from its answer.

In the space to the right of each problem in Experiments 1–5, use symbols (+, –, =) to represent each problem and its answer.

Example 3: Remove 2 white beans from 5 white beans.

$$(-5) - (-2) = -3$$

Part 4: Applying What You Know

DIRECTIONS: Use the rule you created for subtraction in Part 2 to complete the problems below.

- | | |
|-------------------------|---------------------------|
| 1. $(-7) - (3) =$ _____ | 6. $-10 - (-11) =$ _____ |
| 2. $(3) - (-7) =$ _____ | 7. $4 - (-2) =$ _____ |
| 3. $(4) - (5) =$ _____ | 8. $(-3) - (5) =$ _____ |
| 4. $5 - 4 =$ _____ | 9. $(-13) - (10) =$ _____ |
| 5. $-9 - (-3) =$ _____ | 10. $9 - (-6) =$ _____ |

11. Use a calculator to check your answers to problems 1–10. Discuss errors with other members of your group to discover strategies that will yield correct answers. Record your answers to the following questions in your journal: If you made any errors, what kind did you make? What strategies can you use to avoid making the same kind of mistake in the future?