

Operations with Signed Integers - Addition

Part 1: Collecting Data

DIRECTIONS: Complete Experiments 1–5 using beans. Remember that every pair of a white bean and a red beans must be removed from the set. For each problem, record both the number and the color of the bean. You may use a W for white and a R for red.

Experiment 1:

How many beans would there be altogether if you combined...

1. 3 white beans and 5 white beans? _____
2. 9 white beans and 2 white beans? _____
3. 4 white beans and 6 white beans? _____
4. 8 white beans and 5 white beans? _____

Experiment 2

How many beans would there be altogether if you combined...

5. 5 red beans and 5 red beans? _____
6. 6 red beans and 3 red beans? _____
7. 9 red beans and 6 red beans? _____
8. 8 red beans and 4 red beans? _____

Experiment 3

How many beans would there be altogether if you combined...

9. 7 red beans and 3 white beans? _____
10. 7 white beans and 9 red beans? _____
11. 6 white beans and 10 red beans? _____
12. 4 red beans and 1 white bean? _____

Experiment 4

How many beans would there be altogether if you combined...

13. 5 red beans and 6 white beans?
14. 7 white beans and 2 red beans? _____
15. 10 red beans and 12 white beans?
16. 8 white beans and 5 red beans? _____

How many beans would there be altogether if you combined...

17. 5 red beans and 5 white beans? _____
18. 6 white beans and 6 red beans? _____
19. 9 red beans and 9 white beans? _____
20. 8 white beans and 8 red beans? _____

Part 2: Analyzing the Data

DIRECTIONS: Answer each question your journal.

1. What do you notice about the colors used in the problems in Experiment 1? What do you notice about the colors found in the answers?
2. What do you notice about the colors used in the problems in Experiment 2? What do you notice about the colors found in the answers?
3. What do you notice about the colors used in the problems in Experiment 3? What do you notice about the colors found in the answers?
4. What do you notice about the colors used in the problems in Experiment 4? What do you notice about the colors found in the answers?
5. What do you notice about the colors used in the problems in Experiment 5? What do you notice about the colors found in the answers?
6. How do the problems in Experiments 1 and 2 differ from those in Experiments 3, 4, and 5?
7. Describe a pattern that exists between the problems and the answers in Experiments 1 and 2.
8. Describe a pattern that exists between the problems and the answers in Experiments 3 and 4.
9. Why do you think there are no beans in any of the answers for the problems in Experiment 5?
10. Create a set of rules that would help someone find the total number of beans for each problem in Experiments 1–5.

Part 3: Using Symbols to Replace Beans

DIRECTIONS: Because writing the words "white and "red" is time consuming, symbols for white and red 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 that different sets of beans are being added together, use a plus (+) sign between the two different sets of beans. Use an equals (=) 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: Nine white beans and two white beans would be recorded as $(-9) + (-2) = -11$.

Part 4: Applying What You Know

DIRECTIONS: Use beans to find answers for each of the following.

1. $(-6) + (2) =$ _____

3. $(12) + (8) =$ _____

2. $(-3) + (-2) =$ _____

4. $4 + (7) =$ _____

- Based on your knowledge of white and red beans, create a set of rules that might help you to find sums of integers that would be too large to complete easily with actual beans. Write the rules you create in your journal.
- Using only what you know about collecting beans, determine **ONLY THE SIGN** of the answer for each of the following. Be able to connect the concept of the beans to how you determined the sign of the answer.

a. $4234+987=$ _____

c. $1562 + 222 =$ _____

b. $-981 + (599) =$ _____

d. $-96 + (873) =$ _____

7. Based on your knowledge of white and red beans, determine ONLY THE SIGN for each of the following. Then use a fraction capable calculator to compute each of the problems below. Verify the sign you predicted for the answer.

Problem	Sign You Predict	Sign Shown on Calculator
a. $(-0.4) + (-0.05)$		
b. $3.032 + (-8.123)$		
c. $-12.030 + 16.003$		
d. $0.121 + 2.1021$		
e. $\left(\frac{1}{4}\right) + \frac{5}{6}$		
f. $\left(-\frac{3}{4}\right) + \left(\frac{1}{8}\right)$		
g. $\left(-1\frac{3}{5}\right) + \left(-\frac{3}{4}\right)$		
h. $\left(-\frac{5}{8}\right) + \frac{13}{16}$		

8. Based on your knowledge of white and red beans, predict ONLY THE SIGN

of the answers for each of the problems below.

Problem	Sign You Predict
a. $-9 + 17 + (-18)$	
b. $-10 + (-11) + (-3)$	
c. $14 + 18 + 25$	
d. $-10 + 15 + (10) + (-17)$	
e. $12 + (-16) + (-32) + 4$	
f. $12 + (-4) + 18 + (-8)$	