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2–3 Rules for Addition

Objective: To add real numbers using rules for addition.

Vocabulary

Opposite signs A positive and a negative number are said to have opposite signs.

Rules for Addition	Examples
If two numbers have the *same sign*, add their absolute values and put their common sign before the result.	$2 + 5 = 7$ $-2 + (-5) = -7$
If two numbers have *opposite signs*, subtract the lesser absolute value from the greater and put the sign of the number having the greater absolute value before the result.	$6 + (-4) = 6 - 4 = 2$ $(-6) + 4 = -(6 - 4) = -2$
If two numbers are *opposites*, then their sum is zero.	$3 + (-3) = 0$

Example 1 Add $6 + (-8) + 13 + (-9)$.

Solution 1 Add the numbers in order from left to right.

$$\underbrace{6 + (-8)} + 13 + (-9)$$
$$\underbrace{-2 \quad + 13} + (-9)$$
$$\underbrace{11 \qquad + (-9)}$$
$$2$$

Solution 2

1. Add positive numbers.

$$\begin{array}{r} 6 \\ \underline{13} \\ 19 \end{array}$$

2. Add negative numbers.

$$\begin{array}{r} -8 \\ \underline{-9} \\ -17 \end{array}$$

3. Add the results.

$$\begin{array}{r} 19 \\ \underline{-17} \\ 2 \end{array}$$

Add.

1. $\begin{array}{r} 6 \\ \underline{2} \end{array}$ **2.** $\begin{array}{r} -4 \\ \underline{-7} \end{array}$ **3.** $\begin{array}{r} -7 \\ \underline{6} \end{array}$ **4.** $\begin{array}{r} -3 \\ \underline{8} \end{array}$ **5.** $\begin{array}{r} 23 \\ \underline{64} \end{array}$ **6.** $\begin{array}{r} -56 \\ \underline{31} \end{array}$

7. $\begin{array}{r} -37 \\ \underline{-56} \end{array}$ **8.** $\begin{array}{r} -35 \\ \underline{120} \end{array}$ **9.** $\begin{array}{r} 126 \\ -35 \\ -37 \\ \underline{-17} \end{array}$ **10.** $\begin{array}{r} -145 \\ 309 \\ -47 \\ \underline{-82} \end{array}$ **11.** $\begin{array}{r} 136 \\ -58 \\ -47 \\ \underline{-23} \end{array}$ **12.** $\begin{array}{r} -162 \\ 323 \\ -47 \\ \underline{-82} \end{array}$

Add.

13. $(-8 + 5) + 2$ **14.** $(-12 + 15) + 6$ **15.** $(-4 + 8) + (-3)$

16. $(-2 + 6) + (-4)$ **17.** $-5 + (-3) + 5$ **18.** $-4 + (-14) + 4$

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2–3 Rules for Addition *(continued)*

Add.

19. $16 + 5 + (-8)$

20. $-6 + (-24) + 6$

21. $(-3 + 3) + 7 + (-11)$

22. $(-3 + 3) + 17 + (-7)$

23. $-2 + (-4) + (-8)$

24. $-7 + (-5) + (-6)$

25. $-3 + (-9) + 7 + (-5)$

26. $-15 + 10 + (-3) + (-2)$

Example 2 Simplify $3 + (-5) + (-x) + 7$.

Solution

$$3 + (-5) + (-x) + 7 = -x + \underbrace{3 + 7} + (-5) \quad \text{Regroup the terms.}$$

$$= -x + \underbrace{10 + (-5)} \quad \text{Simplify.}$$

$$= -x + 5$$

Simplify.

27. $-2 + x + (-6) + 3$

28. $3 + (-8) + (-y) + (-11)$

29. $-5 + 2a + 3 + (-3)$

30. $-5 + 2a + 8 + 7$

31. $17 + 8b + (-15) + (-10)$

32. $-[6 + (-1)] + (-c) + 2$

33. $-(-7) + 3y + (-6) + 4$

34. $3x + [7 + (-2) + (-3)]$

Example 3 Evaluate $x + y + (-2)$ if $x = -2$, and $y = 5$.

Solution

$$x + y + (-2) = \underbrace{(-2) + 5} + (-2) \quad \text{Substitute } -2 \text{ for } x \text{ and } 5 \text{ for } y.$$

$$= \underbrace{3 + (-2)} \quad \text{Add from left to right.}$$

$$= 1 \quad \text{Simplify.}$$

Evaluate each expression if $x = -2$, $y = 5$, and $z = -3$.

35. $y + z + (-2)$

36. $-18 + x + y$

37. $-11 + (-x) + (-y)$

38. $-z + (-7) + y$

39. $1 + (-y) + x$

40. $-x + (-y) + (-15)$

Mixed Review Exercises

Simplify.

1. $3 + 8 \div 2$

2. $7 \cdot 5 \cdot 3 \cdot 2$

3. $(9 - 6 \div 3) \cdot 2$

4. $|-9| - 7$

5. $|-1.6| + 1.6$

6. $|-11| - |-5|$

7. $\dfrac{9 \cdot 6 + 9 \cdot 4}{6 + 3}$

8. $3\frac{1}{5} + 7\frac{1}{2} + 8\frac{4}{5}$

9. $2.7 + 1.0 + 3.3$

10. $[12 + (-2)] + 5$

11. $(-7 + 2) + (-3)$

12. $-2 + (-8) + 7 + (-1)$