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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.

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

Solution 2

1. Add positive numbers.
   $6 + 13 = 19$
2. Add negative numbers.
   $-8 + (-9) = -17$
3. Add the results.
   $19 + (-17) = 2$

Add.

1. $6 + 2 = 8$
2. $-4 + (-7) = -11$
3. $-7 + 6 = -1$
4. $-3 + 8 = 5$
5. $23 + 64 = 87$
6. $-56 + 31 = -25$
7. $-37 + (-56) = -93$
8. $-35 + 120 = 85$
9. $126 + (-35) + (-37) + (-17) = 37$
10. $-145 + 309 + (-47) + (-82) = 35$
11. $136 + (-58) + (-47) + (-23) = 8$
12. $-162 + 323 + (-47) + (-82) = 32$

Add.

13. $(-8 + 5) + 2$ **−1**
14. $(-12 + 15) + 6$ **9**
15. $(-4 + 8) + (-3)$ **1**
16. $(-2 + 6) + (-4)$ **0**
17. $-5 + (-3) + 5$ **−3**
18. $-4 + (-14) + 4$ **−14**

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2–3 Rules for Addition *(continued)*

Add.

19. $16 + 5 + (-8)$ **13**
20. $-6 + (-24) + 6$ **−24**
21. $(-3 + 3) + 7 + (-11)$ **−4**
22. $(-3 + 3) + 17 + (-7)$ **10**
23. $-2 + (-4) + (-8)$ **−14**
24. $-7 + (-5) + (-6)$ **−18**
25. $-3 + (-9) + 7 + (-5)$ **−10**
26. $-15 + 10 + (-3) + (-2)$ **−10**

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. $-2 + x + (-6) + 3$ **$x + (-5)$**
28. $3 + (-8) + (-y) + (-11)$ **$-y + (-16)$**
29. $-5 + 2a + 3 + (-3)$ **$2a + (-5)$**
30. $-5 + 2a + 8 + 7$ **$2a + 10$**
31. $17 + 8b + (-15) + (-10)$ **$8b + (-8)$**
32. $-[6 + (-1)] + (-c) + 2$ **$-c + (-3)$**
33. $-(-7) + 3y + (-6) + 4$ **$3y + 5$**
34. $3x + [7 + (-2) + (-3)]$ **$3x + 2$**

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. $y + z + (-2)$ **0**
36. $-18 + x + y$ **−15**
37. $-11 + (-x) + (-y)$ **−14**
38. $-z + (-7) + y$ **1**
39. $1 + (-y) + x$ **−6**
40. $-x + (-y) + (-15)$ **−18**

Mixed Review Exercises

Simplify.

1. $3 + 8 \div 2$ **7**
2. $7 \cdot 5 \cdot 3 \cdot 2$ **210**
3. $(9 - 6 \div 3) \cdot 2$ **14**
4. $|-9| - 7$ **2**
5. $|-1.6| + 1.6$ **3.2**
6. $|-11| - |-5|$ **6**
7. $\frac{9 \cdot 6 + 9 \cdot 4}{6 + 3}$ **10**
8. $3\frac{1}{5} + 7\frac{1}{2} + 8\frac{4}{5}$ **$19\frac{1}{2}$**
9. $2.7 + 1.0 + 3.3$ **7**
10. $[12 + (-2)] + 5$ **15**
11. $(-7 + 2) + (-3)$ **−8**
12. $-2 + (-8) + 7 + (-1)$ **−4**