

2 Working with Real Numbers

2-1 Basic Assumptions

Objective: To use number properties to simplify expressions.

Vocabulary

Unique One and only one

Terms When a and b are added, a and b are called terms.

Factors When a and b are multiplied, a and b are called factors.

Properties of Real Numbers	Addition	Multiplication
Closure Properties The sum and product of any two real numbers are also real numbers and they are unique.	$2 + 3 = 5$ and only 5	$2 \cdot 3 = 6$ and only 6
Commutative Properties The order in which you add or multiply any two real numbers does not affect the result.	$3 + 5 = 5 + 3$	$3 \cdot 5 = 5 \cdot 3$
Associative Properties When you add or multiply any three real numbers, the grouping (or association) of the numbers does not affect the result.	$(3 + 4) + 6 = 3 + (4 + 6)$	$(3 \cdot 4)5 = 3(4 \cdot 5)$

Example 1 Simplify: a. $75 + 13 + 25 + 47$ b. $4 \cdot 7 \cdot 25 \cdot 3$

Solution Regrouping makes mental math easier.

$$\begin{aligned} \text{a. } 75 + 13 + 25 + 47 &= (75 + 25) + (13 + 47) && \text{Regroup the terms.} \\ &= 100 + 60 && \text{Simplify within the} \\ &= 160 && \text{parentheses. Add.} \end{aligned}$$

$$\begin{aligned} \text{b. } 4 \cdot 7 \cdot 25 \cdot 3 &= (4 \cdot 25)(7 \cdot 3) && \text{Regroup the factors.} \\ &= 100 \cdot 21 && \text{Simplify within the parentheses.} \\ &= 2100 && \text{Multiply.} \end{aligned}$$

Example 2 Simplify $1\frac{1}{3} + 16\frac{4}{5} + 2\frac{2}{3} + 3\frac{1}{5}$.

Solution Regroup the fractions. Simplify within the parentheses. Add.

$$\begin{aligned} 1\frac{1}{3} + 16\frac{4}{5} + 2\frac{2}{3} + 3\frac{1}{5} &= \left(1\frac{1}{3} + 2\frac{2}{3}\right) + \left(16\frac{4}{5} + 3\frac{1}{5}\right) \\ &= 4 + 20 \\ &= 24 \end{aligned}$$

2-1 Basic Assumptions (continued)**Example 3** Simplify $0.8 + 3.7 + 0.2 + 5.3$.**Solution** Regroup the decimals. Simplify within the parentheses. Add.

$$\begin{aligned} 0.8 + 3.7 + 0.2 + 5.3 &= (0.8 + 0.2) + (3.7 + 5.3) \\ &= 1 + 9 \\ &= 10 \end{aligned}$$

Simplify.

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|---|--|
| 1. $125 + 42 + 75 + 28$ | 2. $507 + 36 + 43 + 14$ |
| 3. $2 \cdot 18 \cdot 5 \cdot 4$ | 4. $40 \cdot 3 \cdot 4 \cdot 20$ |
| 5. $50 \cdot 27 \cdot 4 \cdot 2$ | 6. $4 \cdot 15 \cdot 25 \cdot 3$ |
| 7. $3\frac{1}{2} + 5\frac{2}{3} + 2\frac{1}{2} + \frac{1}{3}$ | 8. $7\frac{2}{3} + 4\frac{3}{5} + 2\frac{1}{3} + \frac{12}{5}$ |
| 9. $0.2 + 3.9 + 2.8 + 0.1$ | 10. $0.6 + 5.2 + 0.4 + 3.8$ |
| 11. $2.85 + 3.75 + 1.15 + 9.25$ | 12. $3.25 + 1.95 + 8.75 + 11.05$ |

Example 4 Simplify: a. $6 + 8m + 4 + 7n$ b. $(3w)(2x)(4y)(5z)$ **Solution** a. $6 + 8m + 4 + 7n = 8m + 7n + (6 + 4)$ Regroup the terms.
 $= 8m + 7n + 10$ Simplify.b. $(3w)(2x)(4y)(5z) = (3 \cdot 2 \cdot 4 \cdot 5)(wxyz)$ Regroup the factors.
 $= 120wxyz$ Simplify.**Simplify.**

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|-----------------------|------------------------|-------------------------|------------------------|
| 13. $2 + 5y + 8$ | 14. $9 + 5z + 11$ | 15. $4 + 3x + 5$ | 16. $3 + 2w + 4$ |
| 17. $3(20a)$ | 18. $4(5n)$ | 19. $(5x)(6y)$ | 20. $(8m)(5n)$ |
| 21. $(6x)(y)(4z)$ | 22. $(2p)(3q)(5r)$ | 23. $(3a)(7b)(c)$ | 24. $(e)(6f)(2g)$ |
| 25. $a + 2 + b + 5$ | 26. $9 + x + y + 3$ | 27. $3p + 4 + 2q + 6$ | 28. $7m + 1 + 5n + 4$ |
| 29. $4 + 6x + 2 + 3y$ | 30. $6p + 3 + 2q + 37$ | 31. $(5a)(4b)(25c)(8d)$ | 32. $(4w)(2x)(5y)(5z)$ |

Mixed Review ExercisesEvaluate if $a = 2$, $x = 4$, $y = 6$, and $z = 3$.

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|---------------------------|----------------|----------------------------------|
| 1. $\frac{3x - a}{a + z}$ | 2. $4z(y - a)$ | 3. $\frac{2a + x}{3z - (y + 2)}$ |
|---------------------------|----------------|----------------------------------|

Simplify.

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|------------------|------------------------------------|---|
| 4. $ -3 + -5 $ | 5. $\left -\frac{1}{6}\right + 0$ | 6. $ -3.2 + 3.2 $ |
| 7. $ 8 - -8 $ | 8. $ -4 - -2 $ | 9. $\left -\frac{5}{7}\right - \left \frac{3}{7}\right $ |