

# Equations with Variables on Both Sides

Algebra 1 • Section 2.4

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 12

## Quick Review and Helpful Hints

Algebra becomes easier when every symbol has a job. Read the operation first, keep signs attached to their terms, and check that each step still means the same thing as the original expression.

▷ **Example:** Simplify  $2(x + 6) + 3x$ .

**Work:** Distribute first:  $2(x + 6) = 2x + 12$ . Then combine like terms:  $2x + 12 + 3x = 5x + 12$ .

★ **Answer:**  $5x + 12$

## ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Simplify  $5(x + 2)$ . \_\_\_\_\_

6. How many terms are in  $4x^2 - 3x + 11$ ? \_\_\_\_\_

2. Simplify  $-3(2y - 4)$ . \_\_\_\_\_

7. Simplify  $6p + 0$  and name the property. \_\_\_\_\_

3. Name the property:  $8 + n = n + 8$ . \_\_\_\_\_

8. Simplify  $9 \cdot \frac{1}{9}$  and name the property. \_\_\_\_\_

4. Name the property:  $(2a) \cdot 5 = 2 \cdot (a \cdot 5)$ . \_\_\_\_\_

9. Simplify  $4(q + 7) + 2q$ . \_\_\_\_\_

5. Identify the coefficient and constant in  $7m - 9$ . \_\_\_\_\_

10. Are  $2(x + 6)$  and  $2x + 6$  equivalent? \_\_\_\_\_

## ◆ Word Problems

11. A notebook costs  $n$  dollars and a pen costs \$4 less. Write the cost of 3 notebooks and 2 pens. \_\_\_\_\_

12. A rectangle has length  $2x + 5$  and width  $x + 3$ . Write the perimeter. \_\_\_\_\_



## Answer Keys

- |   |   |
|---|---|
| 1. $5x + 10$                              | 7. $6p$ ; Identity Property of Addition |
| 2. $-6y + 12$                             | 8. 1; Multiplicative Inverse            |
| 3. Commutative Property of Addition       | 9. $6q + 28$                            |
| 4. Associative Property of Multiplication | 10. No                                  |
| 5. Coefficient 7; constant $-9$           | 11. $5n - 8$                            |
| 6. 3 terms                                | 12. $6x + 16$                           |

### Step-by-Step Explanations

- The 5 outside has to greet both terms inside, not skip one — so it multiplies  $x$  and the 2, leaving  $5x + 10$ .
- Carry that negative sign carefully:  $-3$  hits  $2y$  to make  $-6y$ , and  $-3$  times  $-4$  flips positive to  $+12$ .
- Nothing changed except the order of the two addends. Swapping order freely in addition is exactly what 'commutative' describes.
- Same factors, same order — only the parentheses moved. Re-grouping who multiplies first is the associative property.
- The coefficient is the number stuck to the variable, here 7. The constant stands alone with no variable, and that's the  $-9$ .
- Terms are the chunks separated by plus and minus signs. Count them:  $4x^2$ , then  $-3x$ , then 11 — three pieces.
- Adding zero leaves a value exactly as it was, so  $6p$  stays  $6p$ . That's why zero is called the additive identity.
- A number and its reciprocal are built to cancel each other, multiplying back to 1 — that pairing is the multiplicative inverse.
- Spread the 4 across the parentheses to get  $4q + 28$ , then let the  $q$ -terms join:  $4q + 2q = 6q$ , so  $6q + 28$ .
- Distribute the first one fully and you get  $2x + 12$  — the 2 has to reach the 6 too. Since  $12 \neq 6$ , they're not the same.
- A pen is  $n - 4$ , so two pens come to  $2n - 8$ . Add the  $3n$  for the notebooks and the like terms merge into  $5n - 8$ .
- Perimeter loops around two lengths and two widths:  $2(2x + 5) + 2(x + 3)$ . Distribute and combine to land on  $6x + 16$ .



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