

Equations with Variables on Both Sides

Algebra 1 • Section 2.4

Name: _____

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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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