Simplifying Expressions by Combining Like Terms

Apply the skill to decisions and designs

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QUICK REVIEW

Like terms have identical variable parts. Add their coefficients; keep constants separate. $3x + 5 + 2x - 8 = (3 + 2)x + (5 - 8) = 5x - 3$. The terms x and x^2 are not like terms.

Worked example

Example: simplify $7x + (4)x + (9) + (-3)$.

1. Variable terms: $(7 + (4))x = 11x$.
2. Constants: $9 + (-3) = 6$.
3. Together: $11x + 6$.
Answer: $11x + 6$.

Practice Problems

Show your thinking.

1. Material order: a cost in dollars is modeled by $2x + (3)x + (3) + (5)$. Rewrite it to expose its coefficient and fixed amount, then find the cost at $x = 2$.

2. Two design formulas: decide whether $3x + (2)x + (-2) + (5)$ and $5x + 3$ are equivalent for every x. Give algebra and a numerical check.

3. Packing total: rewrite $4x + (-1)x + (5) + (3)$, then evaluate the rewritten expression at $x = 2$.

4. Cost components: an equivalent form of $5x + (3)x + (2) + (-2)$ has coefficient q on x and constant r. Find (q, r) and then write the resulting expression.

5. Invoice check: a calculator reports 24 for $2x + (5)x + (7) + (3)$ when $x = 2$. Verify by rewriting first; report any error.

6. Unknown adjustment: $3x + (4)x + (4) + (-1) = 7x + k$. Find k, then write the simplified expression.

7. Locker-code rule: a cost in dollars is modeled by $7x + (-3)x + (-5) + (9)$. Rewrite it to expose its coefficient and fixed amount, then find the cost at $x = 2$.

8. Token-count rule: decide whether $-4x + (9)x + (6) + (-2)$ and $5x + 4$ are equivalent for every x. Give algebra and a numerical check.

9. Tile-pack rule: rewrite $5x + (-2)x + (-8) + (3)$, then evaluate the rewritten expression at $x = 2$.

10. Meter-offset rule: an equivalent form of $8x + (-5)x + (1) + (-7)$ has coefficient q on x and constant r. Find (q, r) and then write the resulting expression.

Answer Key

1. $5x + 8$; cost \$18.00.
2. Yes; they are equivalent.
3. $3x + 8$; value 14.
4. $(q, r) = (8, 0)$; $8x$.
5. No error; $7x + 10$ evaluates to 24.
6. $k = 3$; $7x + 3$.
7. $4x + 4$; cost \$12.00.
8. Yes; they are equivalent.
9. $3x - 5$; value 1.
10. $(q, r) = (3, -6)$; $3x - 6$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Variable terms: $(2 + (3))x = 5x$.
2. Constants: $3 + (5) = 8$.
3. Together: $5x + 8$.
4. The cost at $x = 2$ is $5(2) + (8) = 18$ dollars.

Problem 2

1. Variable terms: $(3 + (2))x = 5x$.
2. Constants: $-2 + (5) = 3$.
3. Together: $5x + 3$.
4. Numerical check at $x = 2$: both equal $5(2) + (3) = 13$.

Problem 3

1. Variable terms: $(4 + (-1))x = 3x$.
2. Constants: $5 + (3) = 8$.
3. Together: $3x + 8$.
4. At $x = 2$: $3(2) + (8) = 14$.

Problem 4

1. Variable terms: $(5 + (3))x = 8x$.
2. Constants: $2 + (-2) = 0$.
3. Together: $8x$.

Problem 5

1. Variable terms: $(2 + (5))x = 7x$.
2. Constants: $7 + (3) = 10$.
3. Together: $7x + 10$.
4. Check: $7(2) + (10) = 24$.

Problem 6

1. Variable terms: $(3 + (4))x = 7x$.
2. Constants: $4 + (-1) = 3$.
3. Together: $7x + 3$.
4. The variable terms match, so the missing constant is $k = 3$.

Problem 7

1. Variable terms: $(7 + (-3))x = 4x$.
2. Constants: $-5 + (9) = 4$.
3. Together: $4x + 4$.
4. The cost at $x = 2$ is $4(2) + (4) = 12$ dollars.

Problem 8

1. Variable terms: $(-4 + (9))x = 5x$.
2. Constants: $6 + (-2) = 4$.
3. Together: $5x + 4$.
4. Numerical check at $x = 2$: both equal $5(2) + (4) = 14$.

Problem 9

1. Variable terms: $(5 + (-2))x = 3x$.
2. Constants: $-8 + (3) = -5$.
3. Together: $3x - 5$.
4. At $x = 2$: $3(2) + (-5) = 1$.

Problem 10

1. Variable terms: $(8 + (-5))x = 3x$.
2. Constants: $1 + (-7) = -6$.
3. Together: $3x - 6$.

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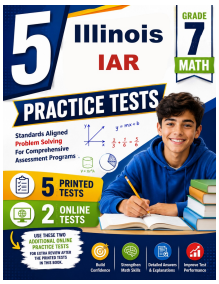

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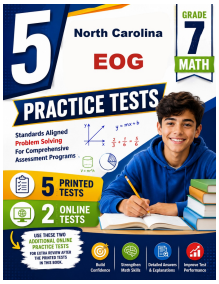

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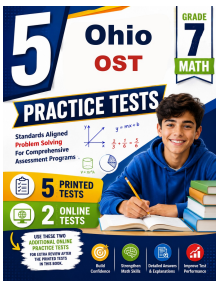

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