GENERAL

solving equations combining like terms worksheet

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Solving Equations: Combining Like Terms Worksheet

When students first encounter algebra, the idea of manipulating symbols to find unknown values can feel intimidating. One of the foundational skills that unlocks the world of algebraic equations is the ability to combine like terms. This simple yet powerful technique is the key to simplifying expressions, balancing equations, and ultimately solving for the unknown variable. In this article, we'll explore the concept of combining like terms, walk through step by step strategies, and provide a comprehensive worksheet that teachers and parents can use to reinforce these skills. Whether you're a classroom instructor, a homeschooling parent, or a student looking for extra practice, this guide will give you the tools you need to master the art of solving equations.

Why Combining Like Terms Matters

Algebra is all about relationships between numbers and variables. The process of simplifying an equation by combining like terms allows students to:

- Reduce clutter: A complex expression with many terms can be turned into a neat, manageable form.
- Identify the variable's coefficient: Understanding how many times a variable appears helps in isolating it.
- Apply the distributive property accurately: Combining like terms is often the next step after expanding parentheses.
- Build confidence: Mastery of basic algebraic operations lays the groundwork for higher level math.

When students can confidently combine like terms, they can focus on the bigger picture: solving equations, interpreting results, and applying algebraic thinking to real world problems.

What Are Like Terms?

Like terms are algebraic expressions that share the same variable part and the same exponent. The coefficients can differ. For example, in the expression $3x + 5x – 2x$, the terms $3x$, $5x$, and $–2x$ are all like terms because they all contain the variable x raised to the first power.

When terms have different variables or exponents, they are not like terms. For instance, $3x$ and $4x^2$ cannot be combined because the exponents differ.

Step by Step Guide to Combining Like Terms

1. Identify all like terms. Look at each term in the expression and group them by variable and exponent.
2. Separate constants. Constants (numbers without variables) are treated as like terms with a variable part of 1.
3. Combine coefficients. Add or subtract the coefficients of the like terms.
4. Rewrite the simplified expression. Replace the grouped terms with the new combined coefficient.
5. Check your work. Verify that each term is correctly simplified and that no like terms remain.

Let's apply this process to a practical example:

Example: Simplify the expression $4x + 2y – 3x + 5 – 2y + 7x$.

- Group like terms: (4x – 3x + 7x) for x, (2y – 2y) for y, and constants 5.
- Combine coefficients: (4 – 3 + 7) = 8 for x, (2 – 2) = 0 for y, and constants remain 5.
- Rewrite: 8x + 5 (the y terms cancel out).

Common Mistakes to Watch For

- Mixing up signs: When subtracting, remember to change the sign of each term inside the parentheses.
- Forgetting to combine constants: Constants are like terms with no variable part; they must be added or subtracted just like any other term.
- Misidentifying like terms: A term with x^2 cannot be combined with a term that has x or x^3.
- Leaving parentheses: Always distribute before combining like terms.

Solving Equations After Simplifying

Once the expression on each side of an equation is simplified, the next step is to isolate the variable. This typically involves:

- Moving all terms containing the variable to one side of the equation.
- Moving all constant terms to the opposite side.
- Dividing or multiplying both sides by the coefficient of the variable to solve for it.

Consider the equation $4x + 5 = 3x – 2$. Simplify both sides (they're already simplified), then move $3x$ to the left: $4x – 3x + 5 = –2$, resulting in $x + 5 = –2$. Subtract 5 from both sides: $x = –7$.

Worksheet: Practice Problems for Combining Like Terms

Below is a set of carefully curated practice problems that focus on combining like terms. Each problem is followed by a step by step solution. Teachers can use this worksheet as a handout, and students can copy the problems into their notebooks for independent practice.

Problem Set 1: Basic Combining

1. Combine: 3x + 7 – 2x + 4
2. Combine: 5y – 3y + 2 – 8 + y
3. Combine: 12a – 4b + 9a + 2b – 3a
4. Combine: 7 – 2x + 4x – 5
5. Combine: 9p – 3p + 6p – 2p + 5p

Problem Set 2: Including Parentheses and Negatives

1. Combine: (3x + 4) – (2x – 5)
2. Combine: –(5y – 2) + 3y + 7
3. Combine: (6a – 3b) + (–2a + 5b) – (a – 4b)
4. Combine: –(8 – 3x) + (2x + 1)
5. Combine: 5 – (3 + 2y) + (y – 4)

Problem Set 3: Multi Variable Expressions

1. Combine: 4x + 3y – 2x + 5y – 7
2. Combine: 6m – 4n + 2m + 3n – 5
3. Combine: –3p + 2q – p + 4q + 9
4. Combine: 10a + 5b – 3a + 2b – 8
5. Combine: –7x + 3y + 2x – 4y + 12

Problem Set 4: Equations to Solve

1. Solve: 3x + 5 = 2x + 9
2. Solve: 4y – 7 = 2y + 3
3. Solve: 5a + 3 = 2a – 4
4. Solve: 6b – 8 = 3b + 10

5. Solve: 9c + 2 = 4c – 5

Solution Key

Below you'll find the detailed solutions for each problem. Feel free to use these to check your work or to guide students through the reasoning process.

1. 3x + 7 – 2x + 4 !' Combine like terms: (3x – 2x) + (7 + 4) = x + 11.
2. 5y – 3y + 2 – 8 + y !' (5y – 3y + y) + (2 – 8) = 3y – 6.
3. 12a – 4b + 9a + 2b – 3a !' (12a + 9a – 3a) + (–4b + 2b) = 18a – 2b.
4. 7 – 2x + 4x – 5 !' (–2x + 4x) + (7 – 5) = 2x + 2.
5. 9p – 3p + 6p – 2p + 5p !' (9p – 3p + 6p – 2p + 5p) = 15p.

1. (3x + 4) – (2x – 5) !' 3x + 4 – 2x + 5 = (3x – 2x) + (4 + 5) = x + 9.
2. –(5y – 2) + 3y + 7 !' –5y + 2 + 3y + 7 = (–5y + 3y) + (2 + 7) = –2y + 9.
3. (6a – 3b) + (–2a + 5b) – (a – 4b) !' 6a – 3b – 2a + 5b – a + 4b = (6a – 2a – a) + (–3b + 5b + 4b) = 3a + 6b.
4. –(8 – 3x) + (2x + 1) !' –8 + 3x + 2x + 1 = (3x + 2x) + (–8 + 1) = 5x – 7.
5. 5 – (3 + 2y) + (y – 4) !' 5 – 3 – 2y + y – 4 = (5 – 3 – 4) + (–2y + y) = –2 – y.

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