

Collect Like Term $3Y - 10Y + Y + 7Y$

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Understanding how to combine like terms is a fundamental skill in algebra. When dealing with algebraic expressions such as $3Y - 10Y + Y + 7Y$, the process involves identifying terms that contain the same variable raised to the same power and then performing addition or subtraction on their coefficients. This article provides an in-depth explanation of how to collect like terms, step-by-step methods, and practical tips to master this essential algebraic operation.

What Are Like Terms?

Definition of Like Terms

Like terms are terms in an algebraic expression that have the same variable part raised to the same power. Only their coefficients differ. For example:

- $5Y$ and $-2Y$ are like terms because both contain the variable Y to the first power.
- $4Y^2$ and $-7Y^2$ are like terms since both involve Y squared.
- 3 and -8 are like terms because they are constants (no variable).

Why Is Collecting Like Terms Important?

Collecting like terms simplifies algebraic expressions, making them easier to evaluate or further manipulate. It is a crucial step in solving equations, simplifying expressions, and performing polynomial operations.

Step-by-Step Guide to Collecting Like Terms in $3Y - 10Y + Y + 7Y$

Step 1: Identify Like Terms

Begin by examining each term and grouping those with the same variable and exponent.

- Terms with Y:
- $3Y$
- $-10Y$
- Y (which is $1Y$)
- $7Y$

Step 2: Group Like Terms

Organize the expression into groups:

- Group 1: $3Y$, $-10Y$, Y , $7Y$

Step 3: Combine Coefficients

Add or subtract the coefficients of like terms:

- Coefficients: 3 , -10 , 1 , 7

Calculation:

- $3 + (-10) = -7$
- $-7 + 1 = -6$
- $-6 + 7 = 1$

Step 4: Write the Simplified Expression

After combining, the expression simplifies to:

- $1Y$, which is simply Y

Final simplified form: Y

Mathematical Explanation of Combining Like Terms

Understanding Coefficients and Variables

In algebraic expressions, each term is made up of a coefficient and a variable part. The coefficient is a numerical factor, and the variable part indicates the unknown or quantity being represented.

For example:

- In $3Y$, 3 is the coefficient.
- In $-10Y$, -10 is the coefficient.
- In Y , the coefficient is 1 (implied).

Adding and Subtracting Coefficients

When combining like terms, simply add or subtract their coefficients:

- $(\text{Coefficient1}) + (\text{Coefficient2}) + \dots = \text{New coefficient}$

In the given example:

- Coefficients: 3, -10, 1, 7
- Sum: $3 + (-10) + 1 + 7 = 1$

Because the variable part (Y) remains unchanged, the final result is Y .

Additional Examples of Collecting Like Terms

Example 1: Simplify $5X + 3X - 2X + 4Y - Y$

- Like terms for X : $5X$, $3X$, $-2X$
- Like terms for Y : $4Y$, $-Y$

Solution:

- For X :
 - $5 + 3 - 2 = 6$
 - Result: $6X$
- For Y :
 - $4 - 1 = 3$
 - Result: $3Y$

Final expression: $6X + 3Y$

Example 2: Simplify $7a^2 + 2a - 3a^2 + 4a - 5$

- Like terms for a^2 : $7a^2$, $-3a^2$
- Like terms for a : $2a$, $4a$
- Constants: -5

Solution:

- a^2 terms: $7 - 3 = 4a^2$
- a terms: $2 + 4 = 6a$
- Constants: -5

Final expression: $4a^2 + 6a - 5$

Common Mistakes to Avoid When Collecting Like Terms

1. Mixing Different Variables or Exponents

Ensure the variable and its power match before combining:

- Do not combine $3Y$ and $4Y^2$.
- Only combine terms where the variable part is identical.

2. Ignoring the Sign of Coefficients

Pay close attention to positive and negative signs:

- For example, in $3Y - 10Y$, the result is $-7Y$, not $13Y$.

3. Forgetting the Implied Coefficient of 1

For terms like Y , the coefficient is 1; remember to include this in calculations.

4. Combining Constants Incorrectly

Constants are separate from variable terms and should be combined only with constants.

Practical Tips for Mastering Like Term Collection

1. Write each term clearly, especially signs (+ or -), to avoid confusion.
 2. Group similar terms as you go, rather than trying to do all at once.
 3. Use color-coding or underlining to distinguish different variable groups in complex expressions.
 4. Double-check coefficients and signs after combining terms.
 5. Practice with various examples to become comfortable with different types of expressions.
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Application in Solving Algebraic Equations

Example: Solve for Y in $3Y - 10Y + Y + 7Y = 20$

Step 1: Collect like terms on the left side:

$$- 3Y - 10Y + Y + 7Y = (3 - 10 + 1 + 7)Y = 1Y = Y$$

Step 2: Set the simplified expression equal to 20:

$$- Y = 20$$

Solution: $Y = 20$

This example demonstrates how collecting like terms simplifies the process of solving for variables in equations.

Conclusion

Collecting like terms is a core skill in algebra that simplifies expressions and facilitates solving equations. The process involves identifying terms with identical variable parts, grouping them, and performing addition or subtraction of their coefficients. Using the example $3Y - 10Y + Y + 7Y$, we saw that the simplified form is Y , achieved by combining the coefficients 3, -10, 1, and 7 to get 1. Mastery of this technique enhances overall algebraic fluency and prepares students for more advanced mathematical concepts like polynomial operations, factoring, and algebraic modeling.

By consistently practicing identifying and combining like terms, learners can improve their accuracy and efficiency in solving algebraic problems, laying a strong foundation for success in mathematics.

Frequently Asked Questions

How do I simplify the expression $3Y - 10Y + Y + 7Y$?

Combine like terms by adding their coefficients: $(3 - 10 + 1 + 7)Y = 1Y$, so the simplified expression is Y .

What is the coefficient of Y in the expression $3Y - 10Y + Y + 7Y$?

The combined coefficient is 1, so the expression simplifies to Y .

Is the expression $3Y - 10Y + Y + 7Y$ equivalent to Y ?

Yes, after combining like terms, the expression simplifies to Y .

How do I combine like terms in algebraic expressions like $3Y - 10Y + Y + 7Y$?

Add or subtract the coefficients of the terms with the same variable. In this case, $(3 - 10 + 1 + 7)Y = 1Y$, which simplifies to Y .

What is the step-by-step process to simplify $3Y - 10Y + Y + 7Y$?

First, identify all like terms with Y . Then, add their coefficients: $3 - 10 + 1 + 7 = 1$. Finally, write the simplified expression as $1Y$, which is just Y .

Additional Resources

Collect Like Term $3Y - 10Y + Y + 7Y$: A Comprehensive Guide to Simplifying Algebraic Expressions

When tackling algebraic expressions, one of the foundational skills students and professionals alike need to master is the ability to collect like terms effectively. The expression $3Y - 10Y + Y + 7Y$ offers a straightforward yet illustrative example of this process. By understanding how to combine similar terms, you can simplify complex expressions, solve equations more efficiently, and develop a deeper comprehension of algebra's underlying principles.

In this article, we'll explore the step-by-step process involved in collecting like terms, analyze the specific example of $3Y - 10Y + Y + 7Y$, and discuss best practices to ensure accuracy and clarity in your work.

Understanding Like Terms

What Are Like Terms?

Like terms are terms that have the same variable raised to the same power. The coefficients (numerical parts) can differ, but the variables and their exponents must match exactly for the terms to be considered like terms.

Examples of like terms:

- $5X$ and $-3X$
- $7Y$ and $-2Y$
- $4AB$ and $9AB$

Examples of unlike terms:

- $3Y$ and $4X$ (different variables)
- $2X^2$ and $2X$ (different exponents)
- $5AB$ and $3A$ (different variables)

Why Collect Like Terms?

Collecting like terms simplifies algebraic expressions, making them easier to manipulate and solve. It reduces the expression to its simplest form, which is essential for solving equations, factoring, and graphing.

Step-by-Step Breakdown: Simplifying $3Y - 10Y + Y + 7Y$

Let's analyze the expression:

$$3Y - 10Y + Y + 7Y$$

Step 1: Identify Like Terms

All terms involve the variable Y , so they are like terms.

Step 2: Group Like Terms

You can group the terms together to facilitate addition or subtraction:

$$(3Y - 10Y + Y + 7Y)$$

Step 3: Combine Coefficients

Focus on the coefficients of each term:

- $3Y \rightarrow$ coefficient 3
- $-10Y \rightarrow$ coefficient -10
- $Y \rightarrow$ coefficient 1
- $7Y \rightarrow$ coefficient 7

Sum these coefficients:

$$3 + (-10) + 1 + 7$$

Calculations:

- $3 - 10 = -7$
- $-7 + 1 = -6$
- $-6 + 7 = 1$

Step 4: Write the Simplified Expression

After combining the coefficients, you get:

$1Y$ or simply Y

$$\text{Thus, } 3Y - 10Y + Y + 7Y = Y$$

Best Practices in Collecting Like Terms

1. Write Clearly and Line Up Terms

When working with multiple terms, write the expression out neatly and group like terms together. This prevents mistakes and makes the process transparent.

2. Keep Track of Signs

Pay close attention to plus and minus signs. Misreading signs can lead to incorrect results.

3. Use Parentheses When Necessary

If the expression involves parentheses, distribute properly before collecting like terms.

4. Double-Check Your Work

Always verify that you have combined the correct coefficients and that the variable parts are consistent.

Extending the Concept: More Complex Expressions

While $3Y - 10Y + Y + 7Y$ is straightforward, real-world algebraic expressions can be more complex. Here are some tips to handle such cases:

Combining Like Terms in Larger Expressions

- Identify like terms carefully: Look for terms with identical variables and exponents.
- Group systematically: Use parentheses if necessary.
- Simplify step-by-step: Avoid rushing through the process.

Dealing with Multiple Variables

When an expression involves multiple variables:

- Focus on one variable at a time.
- For example, in $3Y + 4X - 2Y + 7X$, group the Y-terms and X-terms separately:
 - Y-terms: $3Y - 2Y = Y$
 - X-terms: $4X + 7X = 11X$

Incorporating Constants

Constants are terms without variables that can be combined separately:

- Example: $5 + 3 - 8 + 10$

Sum: $5 + 3 - 8 + 10 = 10$

Practical Applications of Collecting Like Terms

Solving Algebraic Equations

Simplifying both sides of an equation by collecting like terms makes solving more straightforward.

Example:

Solve for Y:

$$3Y - 10Y + Y + 7Y = 0$$

Simplify:

$$Y = 0 \text{ (as shown earlier)}$$

Factoring Expressions

Factoring often involves collecting like terms to factor out common factors.

Graphing Linear Equations

Simplified equations are easier to graph, especially when plotting lines with slope-intercept form.

Summary and Key Takeaways

- Collecting like terms involves identifying terms with the same variable and exponent.
- Combine the coefficients of like terms through addition or subtraction.
- Simplify expressions step-by-step and verify your work.
- Practice with various expressions to build confidence and proficiency.

Final Thoughts

The example $3Y - 10Y + Y + 7Y$ highlights the importance of understanding basic algebraic operations. By mastering the skill of collecting like terms, you'll lay a solid foundation for more advanced topics in algebra,

calculus, and beyond. Whether you're simplifying expressions, solving equations, or preparing for exams, this fundamental technique is an essential tool in your mathematical toolkit.

Remember, practice makes perfect—so keep working with different expressions, and soon, collecting like terms will become second nature!

Collect Like Term 3 Y 10 Y Y 7 Y

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