# Combine The Like Terms To Create An Equivalent Expression: 4 Q ( 8 Q ) + 10

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Understanding algebraic expressions is fundamental to mastering higher-level mathematics. One key skill in algebra is simplifying expressions by combining like terms. This process not only makes expressions easier to work with but also helps in solving equations efficiently. In this article, we will explore how to combine like terms to create an equivalent expression, focusing on the specific example: 4 Q ( 8 Q ) + 10. We will break down each step, explain the underlying concepts, and provide helpful tips to enhance your algebraic skills.

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## What Are Like Terms?

Before diving into the specific example, it's essential to understand what like terms are.

### Definition of Like Terms

Like terms are terms in an algebraic expression that have the same variable raised to the same power. The coefficients (numeric parts) can be different, but the variable part must be identical for the terms to be considered like terms.

Examples of like terms:
- $3x$ and $7x$
- $5y^2$ and $-2y^2$
- 10 and $-4$ (constants are like terms with each other)

Examples of unlike terms:
- $3x$ and $4y$
- $2x$ and $2x^2$
- 5 and $3x$

Key Point: Only terms with the same variable and same exponent can be combined.

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## Understanding the Given Expression: 4 Q ( 8 Q ) + 10

Let's examine the expression: 4 Q ( 8 Q ) + 10

This expression contains:
- A product involving a coefficient and variable: 4 Q
- A multiplication within parentheses: (8 Q)
- An addition with a constant: + 10

The goal is to simplify this expression by combining like terms, which involves expanding and then combining the terms with the same variables.

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# Step-by-Step Process to Simplify the Expression

## Step 1: Expand the Expression

The first step is to interpret and expand the product 4 Q ( 8 Q ).

- Recognize that 4 Q ( 8 Q ) is a multiplication of two algebraic terms.

The multiplication can be written as:

$$ 4 Q \times 8 Q $$

- Multiply the coefficients: 4 × 8 = 32
- Multiply the variables: Q × Q = $Q^2$ (since the same variable multiplied by itself raises the power by 1)

Thus,

$$ 4 Q \times 8 Q = 32 Q^2 $$

Result after expansion:

$$ 32 Q^2 + 10 $$

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## Step 2: Identify Like Terms

Now, the expression simplifies to:

$$ 32 Q^2 + 10 $$

- The term 32 $Q^2$ involves the variable Q raised to the power 2.
- The constant 10 is a standalone number.

Since these two terms do not have the same variable parts, they are not like terms and cannot be combined further.

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## Step 3: Write the Simplified Equivalent Expression

The simplified form of the original expression is:

$$ 32 Q^2 + 10 $$

This is already in its simplest form, with no like terms to combine.

But why is this important?

Understanding how to expand and identify like terms allows you to manipulate algebraic expressions efficiently, which is crucial in solving equations, simplifying expressions, and modeling real-world problems.

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# Additional Tips for Combining Like Terms

- Always look for common variables and exponents before attempting to combine terms.
- Remember, constants are like terms with constants; variables with the same base and exponent are like terms.
- When multiplying coefficients and variables, follow the rules of arithmetic and exponents.
- When in doubt, expand the expression fully to see the terms clearly.

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# Practice Exercises for Mastery

To reinforce your understanding, try simplifying these expressions:

1. $3x + 5x - 2 + 7$

Solution: Combine like terms:

- $3x + 5x = 8x$
- $-2 + 7 = 5$

Answer: $8x + 5$

2. $(2\ y)\ (3\ y) + 4\ y^2$

Solution: Expand:

- $2\ y \times 3\ y = 6\ y^2$
- The term $4\ y^2$ remains the same

Now, combine like terms:

- $6\ y^2 + 4\ y^2 = 10\ y^2$

Answer: $10\ y^2$

3. (6 a + 2) + (3 a − 7)

Solution: Combine like terms:

- 6 a + 3 a = 9 a
- 2 − 7 = −5

Answer: 9 a − 5

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## Real-World Applications of Combining Like Terms

Understanding how to combine like terms extends beyond pure mathematics. It plays a vital role in various fields:

- Physics: Simplifying equations of motion
- Economics: Modeling cost functions
- Engineering: Analyzing electrical circuits
- Computer Science: Simplifying algebraic expressions in algorithms

By mastering this skill, professionals can develop clearer models, optimize solutions, and communicate more effectively.

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## Conclusion

In summary, the expression 4 Q ( 8 Q ) + 10 provides a straightforward example of applying algebraic principles to simplify and create an equivalent expression. The process involves expanding the product, recognizing like terms, and combining constants or variables with matching bases and exponents.

The key takeaways include:
- Recognize and expand products involving variables.
- Identify like terms based on variables and exponents.
- Simplify expressions by combining coefficients of like terms.
- Understand the importance of these skills in advanced mathematics and real-world problem-solving.

By practicing these steps and understanding the underlying concepts, you can confidently manipulate algebraic expressions, paving the way for success in mathematics and related disciplines.

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Remember: Practice makes perfect. Regularly work through similar exercises to strengthen your ability to combine like terms and simplify expressions efficiently.

# Frequently Asked Questions

## What is the first step to combine the like terms in the expression 4Q(8Q) + 10?

The first step is to multiply 4Q by 8Q to simplify the expression.

## How do you simplify 4Q(8Q) in the expression?

Multiply 4Q by 8Q to get $4 \times 8 \times Q \times Q$, which equals $32Q^2$.

## What is the simplified form of 4Q(8Q) + 10?

The simplified form is $32Q^2 + 10$.

## Are $32Q^2$ and 10 like terms?

No, they are not like terms because they have different variables and exponents.

## What does it mean to combine like terms in an expression?

It means to add or subtract terms that have the same variable raised to the same power.

## Can $32Q^2$ and 10 be combined into a single term?

No, since they are unlike terms, they cannot be combined into a single term.

## What is an equivalent expression after combining like terms in 4Q(8Q) + 10?

The equivalent expression is $32Q^2 + 10$.

## Is the expression 4Q(8Q) + 10 equivalent to $32Q^2 + 10$?

Yes, after simplifying, both expressions are equivalent.

## Why is it important to identify like terms before combining them?

Because only like terms can be combined, identifying them ensures correct simplification.

## Can the constant 10 be combined with the term $32Q^2$?

No, because they are unlike terms; one is a constant, and the other involves a variable.

# Additional Resources

Combine Like Terms To Create An Equivalent Expression: 4 Q ( 8 Q ) + 10

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Introduction

Mathematics, often regarded as the universal language, relies heavily on algebraic manipulation to simplify complex expressions and uncover underlying relationships. One fundamental skill in algebra is the ability to combine like terms, a process that streamlines expressions and paves the way for solving equations efficiently. Today, we will explore this concept through a detailed examination of the expression:

4 Q ( 8 Q ) + 10

This example embodies core algebraic principles and offers a practical demonstration of the importance of combining like terms to create an equivalent, simplified expression.

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Understanding the Expression

Before diving into the process, let's clearly interpret the components of the expression:

- 4 Q ( 8 Q ): A product involving a coefficient, a variable, a multiplication operation, and another coefficient-variable pair inside parentheses.
- + 10: A constant term added at the end.

Our goal is to simplify this expression as much as possible by combining like terms, thereby creating an equivalent expression that is easier to analyze or solve.

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The Significance of Like Terms

Like terms are terms that share the same variables raised to the same powers, regardless of their coefficients. They can be combined through addition or subtraction to simplify an algebraic expression.

In the expression 4 Q ( 8 Q ) + 10, the key is to identify the parts that are similar and can be combined.

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Step-by-Step Breakdown

Let's examine each component carefully.

1. Simplify the Product: 4 Q ( 8 Q )

The term 4 Q ( 8 Q ) involves a multiplication of two quantities: 4 Q and 8 Q.

- $4\ Q$: A coefficient 4 multiplied by the variable Q.
- $8\ Q$: A coefficient 8 multiplied by the same variable Q.

Since both are multiplied together, the expression becomes:

$(4\ Q)\ (8\ Q)$

Applying the associative property of multiplication:

$= 4\ 8\ Q\ Q$

Calculating the numerical part:

$4\ 8 = 32$

And recognizing that:

$Q\ Q = Q^2$

Thus, the entire product simplifies to:

$32\ Q^2$

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2. Rewrite the Expression

Now, the original expression:

$4\ Q\ (\ 8\ Q\ )\ +\ 10$

becomes:

$32\ Q^2\ +\ 10$

This is a quadratic term ($32\ Q^2$) plus a constant term (10). These are different types of terms—quadratic vs. constant—and cannot be combined further.

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Recognizing Like Terms

In the simplified expression $32\ Q^2\ +\ 10$, we observe:

- $32\ Q^2$: A quadratic term involving $Q^2$.
- 10: A constant term.

Since these terms are of different degrees, they are not like terms and cannot be combined directly.

Question: Are there any like terms in the original expression?
Answer: The only potential like terms would be those sharing the same variable and power, but after simplification, no such terms remain. The expression is already in its simplest form.

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Final Equivalent Expression

Thus, the simplified, equivalent expression resulting from combining like terms in 4 Q ( 8 Q ) + 10 is:

$32\ Q^2 + 10$

This form clearly separates the quadratic component from the constant, making it easier for further algebraic operations, such as solving equations or graphing.

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## Broader Implications and Applications

Understanding how to combine like terms, as demonstrated here, is foundational in algebra and advanced mathematics. It allows students and mathematicians to:

- Simplify complex expressions efficiently.
- Solve equations quickly by reducing expressions to standard forms.
- Recognize patterns and relationships in algebraic structures.
- Prepare expressions for factoring, graphing, or substitution.

In practical contexts, this skill is essential in fields like engineering, physics, computer science, and economics, where modeling and solving equations are routine tasks.

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## Additional Examples and Practice

To deepen understanding, consider these similar exercises:

1. Simplify: 3 A ( 2 A ) + 5
- Solution: 3 A 2 A = 6 $A^2$ → Final: 6 $A^2$ + 5

2. Simplify: 6 M ( 4 M ) + 12
- Solution: 6 M 4 M = 24 $M^2$ → Final: 24 $M^2$ + 12

3. Simplify: 5 x ( 3 x ) + 7
- Solution: 5 x 3 x = 15 $x^2$ → Final: 15 $x^2$ + 7

These examples reinforce the process of multiplying coefficients, combining like variables, and recognizing when terms can or cannot be combined.

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## Tips for Mastering Like Terms

- Always identify variables and their exponents: Like terms must have identical variables raised to the same power.
- Apply the distributive property carefully: When multiplying coefficients and variables, distribute correctly.
- Simplify step-by-step: Break down complex expressions into manageable parts.
- Maintain clarity: Write each step explicitly to avoid mistakes.

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## Conclusion

The process of combining like terms transforms a potentially complex algebraic expression into a more manageable, equivalent form. In the specific case of $4Q(8Q) + 10$, the key steps involved recognizing the multiplication of coefficients and variables, simplifying to $32Q^2$, and understanding that constants remain separate from variables of different degrees.

Mastering this skill enhances problem-solving efficiency, deepens comprehension of algebraic structures, and lays the groundwork for tackling more advanced mathematical concepts. Whether you're simplifying expressions, solving equations, or preparing for calculus, the ability to combine like terms confidently is an invaluable tool in your mathematical toolkit.

By practicing these techniques regularly, students and professionals alike can develop a keen sense of algebraic manipulation, leading to greater success and confidence in mathematical endeavors.

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