

Fully Factorise $35m + 28m$

Fully Factorise $35m + 28m$: A Comprehensive Guide to Factorisation of Algebraic Expressions

Understanding how to fully factorise algebraic expressions is a fundamental skill in mathematics, especially in algebra, simplifying expressions, solving equations, and understanding polynomial functions. One common expression that students encounter is the sum of terms involving variables and coefficients, such as $35m + 28m$. Fully factorising such an expression helps in simplifying calculations, solving equations efficiently, and gaining a deeper grasp of algebraic manipulation.

In this article, we will explore the process of fully factorising $35m + 28m$ in a detailed, step-by-step manner. We will discuss key concepts, methods, and rules involved in the factorisation process, providing insights suitable for students, educators, and anyone interested in mastering algebraic techniques.

Understanding the Expression $35m + 28m$

Before diving into factorisation, let's understand what the expression $35m + 28m$ represents.

- Terms Involved: The expression has two terms, both involving the variable m .
- Coefficients: The coefficients are 35 and 28, which are the numerical multipliers of m .
- Variable: The variable m is common to both terms.

Expressed simply, $35m + 28m$ combines like terms, which can be further simplified by combining their coefficients before applying factorisation techniques.

Step 1: Combine Like Terms

Since both terms involve the same variable m , we can combine them:

$$35m + 28m = (35 + 28)m = 63m$$

Result after combining:

- Fully simplified form: $63m$

While this step simplifies the expression, the core concept of factorisation involves expressing the original sum in a form where a common factor can be factored out, which is

especially useful in more complex expressions.

Step 2: Find the Greatest Common Factor (GCF)

To fully factorise the expression $35m + 28m$, we need to identify the greatest common factor (GCF) of the coefficients 35 and 28.

Calculating the GCF of 35 and 28

- Prime factorisation of 35:
- $35 = 5 \times 7$
- Prime factorisation of 28:
- $28 = 2^2 \times 7$

Identify common prime factors:

- Both have a 7 in common.

Therefore,

- GCF of 35 and 28 = 7

Step 3: Factor out the GCF

Now, factor out the GCF (which is 7) from the original expression:

$$35m + 28m = 7(5m) + 7(4m)$$

Factor out 7:

- $35m + 28m = 7(5m + 4m)$

Notice that inside the parentheses, we have $5m + 4m$, which can be simplified further.

Step 4: Simplify Inside the Parentheses

Combine like terms inside the parentheses:

$$5m + 4m = (5 + 4)m = 9m$$

Therefore, the fully factorised form of the original expression is:

$$7 \times 9m = 63m$$

Final Result: Fully Factorised Expression

The fully factorised form of the original expression $35m + 28m$ is:

$$7(5m + 4m) = 63m$$

or, after combining inside the parentheses:

$$7 \times 9m = 63m$$

While the simplified expression is $63m$, the process of factorisation is crucial in algebra for breaking down expressions into simpler, manageable factors, especially when dealing with more complex polynomials.

Why is Fully Factorising Important?

Understanding and performing full factorisation has several key benefits:

- Simplifies algebraic expressions: Making them easier to manipulate or evaluate.
- Facilitates solving equations: Factoring is often a necessary step in solving polynomial equations.
- Aids in polynomial division: Simplifies divisions and finding roots.
- Helps identify common factors: Useful for simplifying fractions involving algebraic expressions.
- Builds foundational algebra skills: Essential for higher-level mathematics, including calculus and algebraic geometry.

Common Techniques for Fully Factorising

Algebraic Expressions

While the example discussed is straightforward, more complex expressions require various techniques:

1. Extracting the Greatest Common Factor (GCF)

- Used when all terms share a common numerical or algebraic factor.
- Example: $(12a + 18b = 6(2a + 3b))$

2. Factoring by Grouping

- Useful for four-term expressions where terms can be grouped to factor common binomials.
- Example: $(ax + ay + bx + by = (a + b)(x + y))$

3. Factoring Quadratic Expressions

- For quadratic expressions of the form $(ax^2 + bx + c)$, techniques include:
- Factoring trinomials
- Using the quadratic formula when necessary

4. Difference of Squares

- Recognises expressions like $(a^2 - b^2 = (a - b)(a + b))$

5. Sum or Difference of Cubes

- Recognises expressions like $(a^3 + b^3 = (a + b)(a^2 - ab + b^2))$

Additional Examples of Fully Factorising Algebraic Expressions

To deepen understanding, let's explore some additional examples:

Example 1: Fully Factorise $48x + 18y$

- Find the GCF of 48 and 18:
- $48 = 2^4 \times 3$
- $18 = 2 \times 3^2$
- $\text{GCF} = 2 \times 3 = 6$
- Factor out 6:
- $48x + 18y = 6(8x + 3y)$
- Fully factorised form: $6(8x + 3y)$

Example 2: Fully Factorise $(x^2 + 9x + 20)$

- Recognise it as a quadratic trinomial.
- Find two numbers that multiply to 20 and add to 9:
- 5 and 4
- Rewrite and factor:
- $(x + 5)(x + 4)$
- Fully factorised form: $(x + 5)(x + 4)$

Conclusion: The Importance of Fully Factorising $35m + 28m$

The process of fully factorising algebraic expressions like $35m + 28m$ involves understanding the structure of the expression, finding common factors, and simplifying systematically. While in this specific case the expression reduces to a simple multiple of m , the process highlights critical algebraic skills such as identifying GCF, combining like terms, and understanding the structure of algebraic expressions.

Mastering these techniques enhances problem-solving abilities, prepares students for more advanced topics, and improves overall mathematical literacy. Whether dealing with simple linear expressions or complex polynomials, the principles of full factorisation remain a cornerstone of algebra.

Remember:

- Always look for the greatest common factor before attempting other methods.
- Simplify expressions inside parentheses after factoring out common factors.
- Practice with various types of expressions to strengthen your factorisation skills.

By applying these concepts diligently, you will be able to fully factorise a wide range of algebraic expressions, including the simple sum $35m + 28m$, with confidence and precision.

Frequently Asked Questions

How do I fully factorise the expression $35m + 28m$?

First, identify the common factors in both terms. Both $35m$ and $28m$ share a common factor of $7m$. Factoring out $7m$ gives $7m(5 + 4)$, so the fully factorised form is $7m(5 + 4)$.

What is the greatest common factor (GCF) of $35m$ and $28m$?

The GCF of $35m$ and $28m$ is $7m$, since 7 divides both coefficients and both terms contain m .

Can the expression $35m + 28m$ be factored further after extracting the GCF?

No, after factoring out the GCF $7m$, the remaining sum $(5 + 4)$ cannot be factored further since 5 and 4 have no common factors other than 1 .

How do I factorise an expression like $35m + 28m$ in algebra?

Identify the common factors in both terms and factor them out. In this case, factor out $7m$ to get $7m(5 + 4)$.

Is $7m$ the only factor in the expression $35m + 28m$?

Yes, $7m$ is the greatest common factor, and factoring it out simplifies the expression to $7m(5 + 4)$.

What are the steps to fully factorise an algebraic expression like $35m + 28m$?

Step 1: Find the GCF of the coefficients (35 and 28), which is 7 . Step 2: Find the common variable factor, which is m . Step 3: Factor out $7m$ from each term to get $7m(5 + 4)$.

Why is it important to fully factorise algebraic expressions?

Fully factorising expressions simplifies them, making it easier to solve equations, find roots, or perform further algebraic operations.

Can you give an example of a fully factorised form of $35m + 28m$?

Yes, the fully factorised form is $7m(5 + 4)$.

Additional Resources

Fully Factorise $35m + 28m$

In the realm of algebra, the process of factorisation is fundamental, enabling mathematicians and students alike to simplify expressions, solve equations, and uncover underlying relationships between variables. The expression $35m + 28m$ may appear straightforward at first glance, but a detailed exploration of how to fully factorise it reveals important concepts about common factors, the distributive property, and the importance of prime factorisation. This article delves into the step-by-step process of fully factorising $35m + 28m$, providing clarity through detailed explanations, contextual insights, and practical applications.

Understanding the Expression: $35m + 28m$

Before embarking on the factorisation process, it is essential to understand the structure of the expression. The sum $35m + 28m$ involves two terms that are similar, both involving the variable m multiplied by different coefficients: 35 and 28.

Key observations:

- Both terms contain the variable m , which suggests that m is a common factor.
- The coefficients 35 and 28 are integers, which can be further broken down into their prime factors.
- The expression is linear in form, involving a simple sum of like terms.

The primary goal in factorising such an expression is to identify the greatest common factor (GCF) that can be factored out, simplifying the expression to its most reduced form.

Step-by-Step Guide to Fully Factorise $35m + 28m$

Step 1: Factor out the common variable

Since both terms contain m , it is natural to factor m out:

$$35m + 28m = m(35 + 28)$$

This step uses the distributive property in reverse, recognizing that:

$$a b + a c = a (b + c)$$

which simplifies the original expression by extracting the common factor m .

Step 2: Simplify the sum inside the parentheses

Next, focus on the sum inside the parentheses:

$$35 + 28 = 63$$

So, the expression becomes:

$$m(63)$$

Step 3: Determine if 63 can be further factorised

At this point, the expression is:

$$m 63$$

But the question remains: can 63 be broken down further? To answer this, examine the prime factorisation of 63.

Prime Factorisation of 63

Prime factorisation involves breaking down a composite number into its prime factors. Let's perform this for 63:

- 63 is divisible by 3:

$$63 \div 3 = 21$$

- 21 is also divisible by 3:

$$21 \div 3 = 7$$

- 7 is a prime number.

Therefore, the prime factorisation of 63 is:

$$63 = 3 \times 3 \times 7 = 3^2 \times 7$$

This factorisation indicates that 63 can be expressed as the product of its prime factors, which is crucial in understanding its divisibility properties and potential for further factorisation.

Fully Factorising the Expression: Final Form

Given the prime factorisation of 63, the fully factorised form of the original expression is:

$$35m + 28m = m \times 3^2 \times 7$$

or explicitly:

$$35m + 28m = 3^2 \times 7 \times m$$

This is considered fully factorised because:

- All common factors have been extracted.
- The coefficients are expressed as products of their prime factors.
- No further common factors can be taken out from the entire expression.

Summary of the factorisation process:

1. Recognise the common variable m .
2. Factor out m :

$$35m + 28m = m(35 + 28)$$

3. Simplify the sum:

$$m(63)$$

4. Prime factorise 63:

$$63 = 3^2 \times 7$$

5. Write the final fully factorised form:

$$m \times 3^2 \times 7$$

Why Fully Factorise? Practical Applications and Significance

Understanding the importance of fully factorising algebraic expressions like $35m + 28m$ extends beyond mere mathematical curiosity. It plays a vital role in various applications, including:

- Solving equations: Factoring simplifies the process of solving for variables.
- Simplifying expressions: Fully factorised forms make it easier to identify common factors, cancel terms, or combine expressions.
- Finding least common multiples (LCM) and greatest common divisors (GCD): Prime factorisation is crucial in these calculations.
- Polynomial factorisation: Similar principles apply when dealing with higher-degree polynomials, making foundational knowledge essential.
- Mathematical proofs and derivations: Fully factored expressions are often necessary in proofs involving divisibility, modular arithmetic, or algebraic identities.

Furthermore, understanding prime factorisation deepens comprehension of number theory and reveals properties of integers that are fundamental in cryptography, coding theory, and computational mathematics.

Common Mistakes and Misconceptions in Factorisation

While the process outlined seems straightforward, several common pitfalls can hinder correct factorisation:

- Overlooking common variables: Always ensure that all terms are considered for common factors, including variables and coefficients.
- Ignoring prime factorisation: Merely dividing coefficients by common factors without prime decomposition can lead to incomplete factorisation.
- Assuming the expression is fully factored without prime decomposition: For example, representing 63 as 9×7 is acceptable, but prime factorisation ($3^2 \times 7$) is more fundamental.
- Forgetting to include the variable in the factorisation: In expressions involving multiple variables or powers, this step is crucial.

Being vigilant about these aspects ensures accurate and complete factorisation, which is a cornerstone of algebraic manipulation.

Extensions and Related Concepts

The process used to factorise $35m + 28m$ can be extended to more complex expressions:

- Factoring quadratic expressions: For example, expressions like $ax^2 + bx + c$.
- Factoring by grouping: When multiple terms share common factors in pairs.
- Difference of squares and sum of cubes: Recognising special product formulas.
- Common monomial factors in polynomials: Extending the concept of common factors to multiple terms.

Additionally, understanding the GCF and prime factorisation supports the study of divisibility rules, modular arithmetic, and number theory concepts, which are essential in advanced mathematics and computer science.

Conclusion

The seemingly simple expression $35m + 28m$ offers an exemplary case study in the importance of methodical factorisation. By systematically extracting the common factor m and prime decomposing the coefficients, we arrive at a fully factorised form: $m \times 3^2 \times 7$. This process not only simplifies the expression but also exemplifies core algebraic principles that underpin much of higher mathematics. Recognising common factors, prime factorisation, and the distributive property are essential skills that facilitate problem-solving, proof construction, and exploring mathematical relationships. As algebra continues to be a foundational pillar across scientific disciplines, mastering these techniques equips students and professionals alike with the tools necessary for advanced analysis and discovery.

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