Find The GCF Of Each Expression. Then Factor The Expression. 2 X-74 X+12 .

Find The GCF Of Each Expression. Then Factor The Expression. 2 X-74 X+12.

Understanding how to find the greatest common factor (GCF) of an algebraic expression is a fundamental skill in algebra that simplifies expressions and makes factoring more manageable. In this article, we will explore the process of identifying the GCF of an algebraic expression, specifically the quadratic expression 2X - 74X + 12, and then proceed to factor it completely. Whether you're a student preparing for exams or someone looking to sharpen your algebra skills, this detailed guide will walk you through each step with clear explanations and helpful tips.

What Is the Greatest Common Factor (GCF)?

Definition of GCF

The Greatest Common Factor (GCF), also known as the highest common factor (HCF), of two or more numbers or algebraic terms is the largest factor that divides each of them without leaving a remainder. In algebraic expressions, the GCF is the highest monomial that divides each term of the expression evenly.

Importance of Finding the GCF

- Simplifies algebraic expressions
- Facilitates easier factoring
- Helps in solving equations
- Aids in identifying common factors in polynomial expressions

Steps to Find the GCF of an Algebraic Expression

Follow these steps when finding the GCF of an algebraic expression:

1. Identify coefficients and variables in each term.
2. Find the GCF of the coefficients (numbers).
3. Identify the common variables in each term and determine the lowest power of these variables.
4. Combine the GCF of the coefficients and the common variables to find the overall GCF.

Applying GCF to the Expression 2X - 74X + 12

Let's analyze the expression step-by-step:

Expression: 2X - 74X + 12

Step 1: List the coefficients and constants

- First term coefficient: 2 (with variable X)
- Second term coefficient: -74 (with variable X)
- Third term: 12 (constant)

Step 2: Find the GCF of the coefficients 2, -74, and 12

- The absolute values are 2, 74, and 12.
- Factors of 2: 1, 2
- Factors of 74: 1, 2, 37, 74
- Factors of 12: 1, 2, 3, 4, 6, 12

The GCF of 2, 74, and 12 is 2.

Step 3: Determine common variables

- Terms 1 and 2 both contain X.
- The variable X is common in these terms.
- The third term (12) is a constant without variables, so it doesn't contribute to the variable GCF.

Step 4: Find the GCF of the variables

- Both the first two terms contain X, so the variable GCF is X.
- The constant term doesn't have variables, so the overall GCF is just 2.

Step 5: Combine the GCFs

- The overall GCF is 2.
- Since both terms 2X and -74X have X, and 12 doesn't, but we’re factoring the entire expression, the GCF of the entire expression is 2.

Factoring the Expression 2X - 74X + 12

Now that we've identified the GCF as 2, the next step is to factor it out of the entire expression:

Step 1: Factor out the GCF (2)

$$
2X - 74X + 12 = 2 (\text{expression inside parentheses})
$$

\]

Step 2: Divide each term by 2

- \(2X \div 2 = X \)
- \(-74X \div 2 = -37X \)
- \(12 \div 2 = 6 \)

Step 3: Write the factored form

\[
2 (X - 37X + 6)
\]

Step 4: Simplify the expression inside parentheses

Notice that the terms \(X - 37X \) can be combined:

\[
X - 37X = -36X
\]

So, the expression inside parentheses becomes:

\[
-36X + 6
\]

Final factored form:

\[
2 (-36X + 6)
\]

Further Factoring the Quadratic Expression Inside Parentheses

The inner expression \(-36X + 6 \) can be factored further:

Step 1: Factor out the GCF of the inner expression

- GCF of -36 and 6 is 6.

- Factor out 6:

\[

$$
-36X + 6 = 6 (-6X + 1)
$$

Step 2: Write the completely factored form

$$
2 \times 6 (-6X + 1) = 12 (-6X + 1)
$$

Final fully factored form of the original expression:

$$
\boxed{12 (-6X + 1)}
$$

Summary of the Factoring Process

To recap, here's the complete process:

1. Identify the GCF of all coefficients and constants: 2
2. Factor out the GCF from the entire expression: $2 (X - 37X + 6)$
3. Combine like terms inside parentheses: $2 (-36X + 6)$
4. Factor out the GCF from the inner expression: $6 (-6X + 1)$
5. Write the fully factored form: $12 (-6X + 1)$

Key Points to Remember When Factoring Algebraic Expressions

- Always start by finding the GCF of all terms.
- Factor out the GCF completely.
- Simplify the remaining expression inside parentheses.
- Look for special factoring patterns, such as difference of squares, perfect square trinomials, or sum/difference of cubes, if applicable.
- Always check your factored expression by expanding it to verify correctness.

Additional Tips for Effective Factoring

- Practice identifying GCF quickly by listing factors of coefficients.

- Remember variable rules: the GCF of variables is the lowest power of each variable present in all terms.
- Use factoring formulas when encountering special patterns:
- $a^2 - b^2 = (a + b)(a - b)$
- $a^2 + 2ab + b^2 = (a + b)^2$
- $a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$
- Always check for possible common factors after initial factoring.

Conclusion

Factoring algebraic expressions by first finding the GCF simplifies the process and leads to more manageable forms for solving equations or further analysis. In our example, the expression $2X - 74X + 12$ was effectively broken down into the fully factored form $12 (-6X + 1)$. Mastery of these techniques enhances your algebra skills and prepares you for tackling more complex polynomial expressions.

By practicing these steps regularly and understanding the principles behind GCF and factoring, you'll develop confidence in handling a wide variety of algebraic problems. Remember, patience and practice are key to becoming proficient in algebraic factoring!

Frequently Asked Questions

What is the first step in finding the GCF of the expression 2x - 74x + 12?

The first step is to identify the greatest common factor (GCF) of all the coefficients, which are 2, -74, and 12.

How do you find the GCF of the coefficients 2, -74, and 12?

Find the common factors of 2, 74, and 12; the GCF of these numbers is 2.

What is the GCF of the expression 2x - 74x + 12?

The GCF of the coefficients is 2, so the GCF of the expression is 2.

How do you factor out the GCF from the expression 2x - 74x + 12?

Divide each term by the GCF (2) and factor it out: 2(x - 37x/2 + 6). Simplify the middle term if needed.

What is the simplified factored form of 2x - 74x + 12?

Factor out 2: 2(x - 37x + 6). Since x - 37x simplifies to -36x, the expression becomes 2(-36x + 6).

Is the expression 2x - 74x + 12 a quadratic? Why or why not?

No, because the highest degree of the variable is 1; it's a linear expression, not quadratic.

Can the expression 2x - 74x + 12 be factored further after extracting the GCF?

Yes, after factoring out 2, the remaining expression is -36x + 6, which can be factored further by taking out 6: 6(-6x + 1).

What is the fully factored form of the expression 2x - 74x + 12?

The fully factored form is 2 6 (-6x + 1) = 12(-6x + 1).

Are there any common factors in the terms -36x and 6 after factoring out 2?

Yes, both terms have a common factor of 6, which can be factored out to simplify the expression further.

What is the importance of finding the GCF before factoring an expression?

Finding the GCF simplifies the expression and makes factoring easier by extracting the largest common factor from all terms.

Additional Resources

Find The GCF Of Each Expression. Then Factor The Expression. 2 X - 74 X + 12

In the realm of algebra, understanding how to efficiently factor expressions is a fundamental skill that paves the way for solving more complex equations and analyzing mathematical relationships. One of the core steps in factoring involves identifying the Greatest Common Factor (GCF) among the terms in an expression. This process simplifies the expression, making it more manageable and revealing its underlying structure. Today, we delve into a specific algebraic expression: 2X - 74X + 12, guiding you through the process of finding its GCF and ultimately factoring it completely.

Understanding the Importance of the Greatest Common Factor (GCF)

Before tackling the specific expression at hand, it’s crucial to comprehend what the Greatest Common Factor entails and why it plays a pivotal role in algebraic factoring.

What is the GCF?

The Greatest Common Factor of a set of numbers or terms is the largest factor that divides all of them evenly. In simpler terms, it’s the biggest number or algebraic term that all the given terms share as a factor.

Why is the GCF Important?

- Simplification: Factoring out the GCF simplifies the expression, making it easier to work with in further algebraic operations.
- Foundation for Factoring: Many algebraic factoring techniques start with extracting the GCF, which often reduces the problem to a simpler binomial or trinomial.
- Solving Equations: Recognizing the GCF helps in solving equations more efficiently by reducing the complexity.

Step-by-Step Approach to Find the GCF of the Expression 2X - 74X + 12

Let’s now focus on the expression: 2X - 74X + 12. The goal is to identify the GCF among these terms and then factor the expression accordingly.

Step 1: Break Down Each Term

- First term: 2X
- Second term: -74X
- Third term: +12

Note that the first two terms are like terms because they both contain the variable X. The third term is a constant.

Step 2: Find the GCF of the Numeric Coefficients

Focus on the numerical parts:

- 2
- 74
- 12

Identify the GCF of these numbers:

- Factors of 2: 1, 2
- Factors of 74: 1, 2, 37, 74
- Factors of 12: 1, 2, 3, 4, 6, 12

The common factors are 1 and 2. The greatest is 2.

Step 3: Find the GCF of the Variable Parts

- For 2X: the variable part is X.
- For -74X: the variable part is X.
- For 12: no variable part.

Since the third term is a constant, the GCF must include only the numerical part for now, but because the first two terms have X, the overall GCF must include X.

Step 4: Determine the Overall GCF

The GCF must be a factor common to all terms, including the constant term. Since the constant term is 12, and the GCF of the numerical coefficients is 2, but 12 is divisible by 2, the GCF of all three terms considering both coefficients and variables is 2.

However, since the third term is a constant 12, and the first two have an X, we need to consider factoring out 2 and possibly X.

But because the third term does not contain X, we cannot factor out X across the entire expression. Therefore, the GCF is 2.

Summary:

- The GCF of the numerical coefficients is 2.
- The GCF of the variable parts is X for the first two terms.
- Since the third term does not contain X, the GCF across all terms is 2.

Factoring the Expression Step-by-Step

With the GCF identified as 2, we can now proceed to factor the original expression.

Step 1: Factor out the GCF

Express the original expression as:

2 (...)

Dividing each term by 2:

- 2X ÷ 2 = X
- -74X ÷ 2 = -37X
- 12 ÷ 2 = 6

Thus, the factored form is:

2 (X - 37X + 6)

But notice that X - 37X simplifies further:

X - 37X = -36X

So, the expression inside the parentheses is:

-36X + 6

Step 2: Rewrite the Factored Expression

The fully factored form is:

2 (-36X + 6)

Step 3: Factor the Inner Expression

Now, focus on -36X + 6. Find the GCF of -36X and 6.

- The numerical GCF of 36 and 6 is 6.
- Both terms are divisible by 6.

Factor out 6:

-36X + 6 = 6 (-6X + 1)

Note: Since we factored out a positive 6, the negative sign remains with the first term inside the parentheses.

Step 4: Write the Fully Factored Expression

Putting it all together:

2 (-36X + 6) = 2 6 (-6X + 1) = 12 (-6X + 1)

Final Factored Form of the Expression

The original algebraic expression 2X - 74X + 12 can be factored completely as:

12 (-6X + 1)

Practical Implications and Applications

Factoring expressions like this is not just an academic exercise; it has real-world applications across various fields.

- Solving Equations: Once factored, equations become easier to solve. For instance, setting 12 (-6X + 1) = 0 leads directly to -6X + 1 = 0, simplifying the solution process.
- Simplifying Algebraic Fractions: Factoring helps in simplifying complex fractions, reducing them to their simplest form.
- Analyzing Polynomial Behavior: Factoring reveals roots or zeros of polynomials, critical in calculus and other advanced mathematical analyses.

Summary of Key Steps in Factoring Expressions

1. Identify all terms in the expression, noting variables and constants.
2. Find the GCF of the coefficients and variables (if applicable).
3. Factor out the GCF from the entire expression.
4. Simplify the remaining expression inside the parentheses.
5. Factor further if possible, especially if the inside expression is quadratic or higher degree.

Final Thoughts

Mastering the process of finding the GCF and factoring algebraic expressions is essential for students and professionals alike. It enhances problem-solving efficiency and deepens understanding of algebraic structures. The example of 2X - 74X + 12 illustrates the systematic approach needed to tackle similar algebraic challenges. With practice, recognizing common factors and applying factoring techniques becomes second nature, empowering learners to navigate more complex mathematical terrains confidently.

Whether you're preparing for exams or applying algebra in real-world scenarios, honing these skills will serve as a solid foundation for your mathematical journey.

Find The Gcf Of Each Expression Then Factor The Expression 2 X 74 X 12

Find The Gcf Of Each Expression Then Factor The Expression 2 X 74 X 12

Related Articles

- An Even Parity System Requires An _____ Number Of '1'-bits For Parity.
- Write A Story To Illustrate The Saying Don't Judge A Book By Its Cover
- A Car Was Travelling At A Speed Of 90km/h. What Was Its Speed In M/s?

Back to Home