What Is The Completely Factored Form Of The Expression 3x-9 X-12 ? A. (x-1)(x+4) B. -3(x+1)(x-4) C. 3(x-4)(x+1)

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Understanding the Importance of Factoring in Algebra

Factoring is a fundamental skill in algebra that involves expressing a polynomial as a product of its factors. This process simplifies solving equations, analyzing functions, and understanding the roots or zeros of a polynomial. When a polynomial is factored completely, it reveals all its roots explicitly, making it easier to analyze and solve problems involving the polynomial.

Analyzing the Given Expression

The expression in question is:

3x - 9 X - 12

However, there appears to be a typo or formatting issue in the expression as presented. Based on common algebraic expressions, it is likely intended to be:

3x - 9x - 12

or perhaps:

3x - 9 - 12

or possibly a product involving these terms. To proceed accurately, let's consider the most plausible intended expression:

Expression: 3x - 9x - 12

which simplifies to:

(3x - 9x) - 12 = -6x - 12

Alternatively, if the original expression is intended as a product, such as:

(3x - 9)(x - 12)

then the problem becomes factoring this product.

Assumption: The original problem is to factor the expression:

3x - 9x - 12

which simplifies to:

-6x - 12

or, if the expression is:

3x - 9 × x - 12

which would be:

3x - 9 x - 12

which simplifies to:

3x - 9x - 12 = -6x - 12

or, if the expression is:

3(x - 3) - 12

then it simplifies to:

3x - 9 - 12 = 3x - 21

Given the options provided, which are factorizations involving binomials, the most consistent interpretation is that the expression is a quadratic expression, possibly:

3x^2 - 9x - 12

which matches the pattern of the options, especially options B and C involving quadratic factorizations.

Therefore, the most probable intended expression is:

3x^2 - 9x - 12

Factoring the Quadratic Expression 3x^2 - 9x - 12

Let's proceed under the assumption that the expression to be factored is:

3x^2 - 9x - 12

This is a quadratic expression in standard form: ax^2 + bx + c

where:
- a = 3
- b = -9
- c = -12

Step 1: Factor out the Greatest Common Factor (GCF)

First, observe if there's a common factor in all terms:

- 3x^2
- -9x
- -12

All terms are divisible by 3, so factor out 3:

3(x^2 - 3x - 4)

Now, the problem reduces to factoring the quadratic inside the parentheses:

x^2 - 3x - 4

Step 2: Factoring the Quadratic x^2 - 3x - 4

To factor x^2 - 3x - 4, look for two numbers that:

- Multiply to the constant term (-4)
- Add to the coefficient of the middle term (-3)

Find such pairs:

- (-4) and 1: (-4) 1 = -4, (-4) + 1 = -3

This pair satisfies both conditions, so:

x^2 - 3x - 4 = (x - 4)(x + 1)

Step 3: Write the Fully Factored Form

Putting it all together:

3(x - 4)(x + 1)

This is the completely factored form of the original quadratic expression.

Matching the Factored Form with Provided Options

Now, compare this result with the options:

- **Option A:** (x - 1)(x + 4)
- **Option B:** -3(x + 1)(x - 4)
- **Option C:** 3(x - 4)(x + 1)

From our derivation, the factored form matches Option C:

3(x - 4)(x + 1)

which is identical to our result.

Conclusion: The Correct Factored Form

Based on the above steps, the completely factored form of the quadratic expression 3x^2 - 9x - 12 is:

3(x - 4)(x + 1)

This matches Option C, confirming it as the correct answer.

Summary of Key Points:

- Factoring out the GCF simplifies the quadratic expression.
- Factoring quadratics involves finding two numbers that multiply to ac and add to b.
- The expression 3x^2 - 9x - 12 factors as 3(x - 4)(x + 1).
- Matching the factored form with options confirms Option C as correct.

Additional Tips for Factoring Quadratic Expressions

- Always check for the greatest common factor first before attempting to factor further.
- If the quadratic is not easily factorable, consider using the quadratic formula.
- Remember that the order of factors does not matter; (x - 4)(x + 1) is equivalent to (x + 1)(x - 4).

Final Thoughts

Understanding how to factor quadratic expressions thoroughly is an essential skill in algebra that enables students and mathematicians to solve equations efficiently and analyze the behavior of functions. Recognizing patterns, such as the difference of squares or the sum and product of factors, is key. In this particular case, recognizing the quadratic form and systematically factoring out the GCF leads directly to the correct factored form, which is Option C: 3(x - 4)(x + 1).

Frequently Asked Questions

What is the completely factored form of the expression 3x - 9x - 12?

The correct factored form is option C: 3(x - 4)(x + 1).

How do you factor the expression 3x - 9x - 12?

First, combine like terms: 3x - 9x = -6x, so the expression becomes -6x - 12. Factoring out -6 gives -6(x + 2). However, based on the options provided, the intended original expression is likely 3x - 9 + (-12), which factors to 3(x - 4)(x + 1).

Which option correctly represents the factored form of 3x - 9x - 12?

Option C: 3(x - 4)(x + 1) is the correct factored form.

Why is option B not the correct factorization?

Option B is -3(x + 1)(x - 4), which differs by a negative sign and a factor of 1, not matching the original expression's structure after factoring.

Can you verify the factored form 3(x - 4)(x + 1) by expanding it?

Yes. Expanding 3(x - 4)(x + 1): 3 [x^2 + x - 4x - 4] = 3 [x^2 - 3x - 4] = 3x^2 - 9x - 12, which matches the original expression if it were quadratic. However, since the original expression is linear, the options seem to relate to a quadratic form.

Is the expression 3x - 9x - 12 linear or quadratic?

The expression appears linear, but the provided options suggest it might be part of a quadratic expression or a typo. Clarification is needed.

What is the importance of factoring in algebra?

Factoring helps simplify expressions, solve equations, and understand the roots or solutions of polynomial equations.

What common factor can be taken out from 3x - 9x - 12?

The common factor is 3, but after combining like terms, the expression simplifies to -6x - 12, which can be factored further as -6(x + 2).

Based on the options, which is the best choice for the factored form?

Option C: 3(x - 4)(x + 1) is the best choice among the given options.

What is the key step to verify the correct factored form?

Multiply out the factors to see if the original expression is obtained, confirming the correctness of the factorization.

Additional Resources

What Is The Completely Factored Form Of The Expression 3x - 9x - 12? A. (x-1)(x+4) B. -3(x+1)(x-4) C. 3(x-4)(x+1)

In the realm of algebra, understanding how to transform expressions into their factored forms is a fundamental skill that unlocks many higher-level concepts. Whether you're solving equations, simplifying expressions, or preparing for calculus, knowing how to factor expressions correctly is essential. Today, we delve into a specific algebraic challenge: determining the completely factored form of the expression 3x - 9x - 12, and selecting

the correct option among three given choices. This exploration not only clarifies the process of factoring but also emphasizes the importance of methodical problem-solving in algebra.

Understanding the Given Expression

Before jumping into the factoring process, it’s crucial to clearly understand the expression at hand:

Expression: 3x - 9x - 12

At first glance, this expression appears straightforward but contains a subtlety. Notice that it involves like terms—terms with the variable x—and a constant term:

- 3x and -9x are like terms, both containing the variable x.
- -12 is a constant term, independent of x.

Combining the like terms simplifies our initial expression, making the factoring process more transparent.

Step 1: Simplify the Expression

Combining like terms involves adding or subtracting the coefficients of the terms with the same variable:

- 3x - 9x = -6x

So, the original expression simplifies to:

Simplified Expression: -6x - 12

This simplified form is more manageable for factoring because it reduces the complexity of the original expression.

Factoring the Simplified Expression

Now, the task is to find the completely factored form of -6x - 12. Factoring involves expressing the polynomial as a product of its factors, ideally with the greatest common factor (GCF) extracted first.

Step 2: Find the Greatest Common Factor (GCF)

The coefficients of the terms are -6 and -12. The GCF of these numbers is 6, and since both terms are negative, factoring out -6 is often clearer for revealing the factors.

- GCF of 6 and 12 is 6.

Because the expression involves a negative sign, factoring out -6 simplifies the process and often leads to a neater expression.

Step 3: Factor out the GCF

Extracting -6 from each term:

- -6x ÷ -6 = x
- -12 ÷ -6 = 2

Therefore, the factored form is:

-6(x + 2)

At this stage, the expression is fully factored because the remaining binomial (x + 2) cannot be factored further over the integers.

Matching the Factored Form with Given Options

Now, compare the obtained factored form with the options provided:

- Option A: (x - 1)(x + 4)
- Option B: -3(x + 1)(x - 4)
- Option C: 3(x - 4)(x + 1)

Our factored form is -6(x + 2), which does not immediately resemble any of these options. However, these options suggest factorizations of quadratic expressions, not linear ones, indicating that the multiple-choice options are designed to test understanding beyond the initial expression.

Important clarification: The question as posed, "What is the completely factored form of the expression 3x - 9x - 12?" seems to be a simplified linear expression, but the options suggest that the question might be about factoring a quadratic expression that results from an initial misstatement or typo.

Note: Often, multiple-choice questions involve quadratic expressions. Let’s consider if the original expression was intended to be a quadratic. For example, suppose the original expression was:

$3x^2 - 9x - 12$

In that case, the process of factoring changes, and the options provided make sense as factored forms of quadratic expressions.

Re-examining the Expression as a Quadratic

Given the options, it’s plausible the original problem was a quadratic expression: $3x^2 - 9x - 12$. Let's analyze that scenario.

Step 4: Factoring a Quadratic Expression

Suppose the expression is:

$3x^2 - 9x - 12$

First, factor out the GCF:

- The GCF of 3, 9, and 12 is 3.

Expressed as:

$3(x^2 - 3x - 4)$

Now, focus on factoring the quadratic inside the parentheses: $x^2 - 3x - 4$

Find two numbers that multiply to -4 and add to -3:

- Factors of -4: (-4, 1), (4, -1), (-2, 2)

- Sum of these pairs:

- (-4) + 1 = -3

- 4 + (-1) = 3

- (-2) + 2 = 0

So, the pair (-4, 1) satisfies the conditions.

Therefore, the quadratic factors as:

$x^2 - 3x - 4 = (x - 4)(x + 1)$

Putting it all together:

$3(x - 4)(x + 1)$

This matches Option C.

Conclusion: Correct Factoring and Final Answer

Based on the detailed analysis, if the original expression was intended as $3x^2 - 9x - 12$, then the complete factored form is:

$3(x - 4)(x + 1)$

which corresponds to Option C.

Summary of Key Steps in Factoring Quadratic Expressions:

1. Identify the GCF: Extract the greatest common factor from all terms.
2. Factor the quadratic inside the parentheses: Find two numbers that multiply to the constant term and add to the coefficient of the middle term.
3. Express as a product of binomials: Write the quadratic as the product of two binomials.
4. Multiply back to verify: Always check your work by expanding the factors to ensure correctness.

Final Thoughts and Recommendations

Factoring is a fundamental algebraic skill that has applications in solving equations, graphing functions, and more. Whether working with linear or quadratic expressions, the key is to methodically identify common factors and apply the appropriate factoring techniques—be it extracting GCFs, factoring quadratics, or recognizing special products.

In educational settings, multiple-choice questions often test your understanding of these concepts. Carefully analyze the problem, consider context clues (such as options involving quadratic factors), and verify your work at each step.

For students and enthusiasts, mastering factoring techniques enhances problem-solving confidence and prepares you for more advanced topics like

polynomial division, solving higher-degree equations, and calculus.

In conclusion, if the expression in question is $3x^2 - 9x - 12$, the completely factored form is:

$3(x - 4)(x + 1)$

matching Option C.

Understanding the process, practicing regularly, and paying close attention to detail are the best strategies to excel in algebraic factoring.

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