

According To The Graph, What Is The Factorization Of $x^2 - 5x + 6$? OA.

$(x-3)(x+2)$ OB. $(x+3)(x-2)$ OC.

$(x+3)(x+2)$ OD.

Understanding the Factorization of the Expression: $x^2 - 5x + 6$

According To The Graph, What Is The Factorization Of $x^2 - 5x + 6$? OA.

$(x-3)(x+2)$ OB. $(x+3)(x-2)$ OC. $(x+3)(x+2)$. This question is fundamental in algebra, especially when dealing with quadratic expressions. Factoring quadratic equations is not only essential for simplifying expressions but also plays a crucial role in solving equations, graphing functions, and understanding the roots of the equations. In this article, we will explore how to factor the expression $x^2 - 5x + 6$, analyze the options provided, and develop a clear understanding of the factorization process.

Breaking Down the Expression: $x^2 - 5x + 6$

Simplify the Expression

Before attempting to factor the quadratic, it is helpful to simplify the given expression. Notice that the expression is:

- $x^2 - 5x + 6$

Combining like terms, we get:

- $x^2 - 5x + 6 = -4x + 6$

However, this appears to be a linear expression, not quadratic. But often, in algebra, the notation might be slightly different or the problem could involve a quadratic form. To clarify, if the original expression was intended to be $x^2 - 5x + 6$, then it is a quadratic expression suitable for factoring. Let's assume that the expression in question is:

- $x^2 - 5x + 6$

This is a common quadratic form, and factoring it is a classic problem in algebra.

Factoring Quadratic Expressions

Standard Form and Its Components

A quadratic expression generally takes the form:

$$x^2 + bx + c$$

Where:

- x^2 is the quadratic term
- b is the coefficient of the linear term
- c is the constant term

In our case, the quadratic expression is:

$$x^2 - 5x + 6$$

Methods of Factoring

There are several methods to factor quadratics, including:

1. Factoring by grouping
2. Using the quadratic formula
3. Factoring directly (when possible)

For simple quadratics with integer roots, factoring directly is often the fastest approach.

Factoring $x^2 - 5x + 6$

Step-by-Step Process

1. Identify two numbers that multiply to the constant term (6) and add up to the coefficient of x (-5).
2. Find the pair of numbers: **-2** and **-3**.
3. Check:
$$-2 \cdot -3 = 6$$
$$-2 + -3 = -5$$
4. Write the factors as binomials:

$$(x - 2)(x - 3)$$

Thus, the factorization of $x^2 - 5x + 6$ is $(x - 2)(x - 3)$.

Comparing the Provided Options

Option A: $(x - 3)(x + 2)$

Option B: $(x + 3)(x - 2)$

Option C: $(x + 3)(x + 2)$

Option D: $(x + 3)(x + 2)$

Let's analyze each option to determine which one correctly represents the factorization of $x^2 - 5x + 6$.

Analyzing the Options

Option A: $(x - 3)(x + 2)$

- Expand: $x \cdot x + x \cdot 2 - 3 \cdot x - 3 \cdot 2$
- Result: $x^2 + 2x - 3x - 6 = x^2 - x - 6$

This simplifies to $x^2 - x - 6$, which does not match our quadratic.

Option B: $(x + 3)(x - 2)$

- Expand: $x \cdot x - 2x + 3x - 6$
- Result: $x^2 + x - 6$

This simplifies to $x^2 + x - 6$, not matching our quadratic.

Option C: $(x + 3)(x + 2)$

- Expand: $x \cdot x + 2x + 3x + 6$
- Result: $x^2 + 5x + 6$

This simplifies to $x^2 + 5x + 6$, which is different from our quadratic.

Option D: $(x + 3)(x + 2)$

Same as Option C; it results in $x^2 + 5x + 6$.

Identifying the Correct Factorization

From our earlier calculation, the factorization of $x^2 - 5x + 6$ is $(x - 2)(x - 3)$. Notice that none of the provided options exactly match this factorization. However, the closest options are:

- Option A: $(x - 3)(x + 2)$
- Option B: $(x + 3)(x - 2)$

But as shown earlier, these expand to different quadratics and do not match our target quadratic.

Conclusion: Which Option Is Correct?

Based on the expansion and comparison, none of the options perfectly match the factorization of $x^2 - 5x + 6$. The correct factorization is $(x - 2)(x - 3)$. If the options are limited to the given choices, then perhaps the question is asking for the closest or a similar factorization, or there might be a typo in the options.

In standard algebra, the factorization of $x^2 - 5x + 6$ is definitively $(x - 2)(x - 3)$.

Additional Insights on Factoring Quadratics

Using the Quadratic Formula

When factoring is difficult or the roots are not integers, the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

can be used to find the roots, which then help in factoring the quadratic into binomials.

Why Factor Quadratics?

- To solve quadratic equations efficiently
- To analyze functions graphically
- To simplify algebraic expressions

Summary: The Correct Factorization

In conclusion, the quadratic expression $x^2 - 5x + 6$ factors into $(x - 2)(x - 3)$. Although this option isn't explicitly listed among the choices, understanding the process of factoring and expanding options allows students and mathematicians to identify the correct roots and factors effectively.

Final Thoughts

Mastering quadratic factorization is a key skill in algebra and broader mathematics. Whether through factoring directly, completing the square, or using the quadratic formula, students should practice identifying roots and expressing quadratic expressions as products of binomials. This knowledge not only helps in solving equations but also enhances

Frequently Asked Questions

According to the graph, what is the factorization of the quadratic expression $x^2 - 5x + 6$?

The correct factorization is $(x - 2)(x - 3)$, which simplifies to $x^2 - 5x + 6$.

Which option correctly represents the factorization of $x^2 - 5x + 6$ as shown in the graph?

Option B: $(x + 3)(x - 2)$ is correct because it multiplies out to $x^2 - 5x + 6$.

Based on the graph, what are the roots of the quadratic $x^2 - 5x + 6$, and how do they relate to its factorization?

The roots are $x = 2$ and $x = 3$, corresponding to the factors $(x - 2)$ and $(x - 3)$.

Why does the factorization $(x + 3)(x + 2)$ not match the quadratic shown in the graph?

Because $(x + 3)(x + 2)$ expands to $x^2 + 5x + 6$, which does not match the middle term of $-5x$ in the original quadratic.

What is the significance of identifying the correct factorization of $x^2 - 5x + 6$ from the graph?

Identifying the correct factorization helps in solving the quadratic equation and understanding its roots and intercepts.

Additional Resources

According To The Graph, What Is The Factorization Of $x^2 - 5x + 6$? OA. $(x-3)(x+2)$ OB. $(x+3)(x-2)$ OC. $(x+3)(x+2)$ OD.

Introduction: Deciphering the Roots of Quadratic Expressions

Mathematics often presents complex-looking expressions that, upon closer examination, reveal elegant structures and solutions. One of the fundamental concepts in algebra is factorization, which involves breaking down a quadratic expression into the product of its binomial factors. These factors are instrumental in understanding the roots or zeros of the function, graphing quadratic equations, and solving various real-world problems.

In this article, we explore the specific quadratic expression $x^2 - 5x + 6$, interpret what it signifies, and determine its factorization by analyzing its graphical representation. The multiple-choice options provided— $(x-3)(x+2)$, $(x+3)(x-2)$, and $(x+3)(x+2)$ —are potential factorizations, and our goal is to identify the correct one through a detailed exploration.

Clarifying the Expression: From " $x^2 - 5x + 6$ " to Standard Quadratic Form

Before delving into graph analysis, it's crucial to interpret the given expression correctly. The phrase " $x^2 - 5x + 6$ " appears to be a quadratic expression, but it needs to be written in standard form to proceed effectively.

- Simplify the expression:

$$x^2 - 5x + 6 = (x^2 - 5x) + 6 = -4x + 6$$

This simplification results in a linear expression, not quadratic, which suggests a possible typo or misstatement in the initial question. Given that the options involve quadratic factors, it's more plausible that the intended expression was:

$$- x^2 - 5x + 6$$

This quadratic form aligns with standard problem sets and options provided.

Assumption: The intended expression is $x^2 - 5x + 6$.

Graphical Interpretation of the Quadratic Function

Quadratic functions are graphically represented as parabola curves. The shape of the parabola—opening upwards or downwards—depends on the leading coefficient. For $x^2 - 5x + 6$, the coefficient of x^2 is positive (1), so the parabola opens upwards.

Key features of the graph:

- Vertex: The highest or lowest point of the parabola.
- Roots (Zeros): The x-values where the parabola intersects the x-axis.

- Y-intercept: The point where the graph crosses the y-axis.

Step 1: Plotting the Function

Plotting the quadratic $y = x^2 - 5x + 6$ involves identifying its roots or zeros, which correspond to the x-values where y equals zero.

Calculating the roots:

- Use the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For $a = 1$, $b = -5$, $c = 6$:

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(6)}}{2}$$

$$x = \frac{5 \pm \sqrt{25 - 24}}{2}$$

$$x = \frac{5 \pm \sqrt{1}}{2}$$

$$x = \frac{5 \pm 1}{2}$$

Find the roots:

$$- x = \frac{5 + 1}{2} = \frac{6}{2} = 3$$

$$- x = \frac{5 - 1}{2} = \frac{4}{2} = 2$$

Graphically, this parabola crosses the x-axis at $x = 2$ and $x = 3$.

Step 2: Connecting Roots to Factorization

A quadratic expression factors into binomials corresponding to its roots:

$$- x^2 - 5x + 6 = (x - \text{root1})(x - \text{root2}) = (x - 2)(x - 3)$$

Note that the order of factors does not affect the product, so:

$$- x^2 - 5x + 6 = (x - 2)(x - 3)$$

Step 3: Comparing with Multiple-Choice Options

Given the options:

$$- (x-3)(x+2)$$

$$- (x+3)(x-2)$$

$$- (x+3)(x+2)$$

And based on our factorization, the correct factors are $(x - 2)(x - 3)$, which is equivalent to $(x - 3)(x - 2)$ due to the commutative property of multiplication.

Analysis:

- Option A: $(x - 3)(x + 2)$
- Roots: 3 and -2
- Option B: $(x + 3)(x - 2)$
- Roots: -3 and 2
- Option C: $(x + 3)(x + 2)$
- Roots: -3 and -2

Since our roots are 2 and 3, the factors $(x - 2)(x - 3)$ align with the roots, which correspond to the zeros of the graph.

Conclusion: The correct factorization is $(x - 2)(x - 3)$, which is not explicitly listed among the options. However, the closest match considering the roots is $(x - 3)(x + 2)$ if the question intended to test understanding of roots and factors, or may suggest a typo in options.

Clarifying the Multiple-Choice Options

Given the options, the most accurate answer based on the roots is:

- $(x - 3)(x + 2)$

which has roots at $x = 3$ and $x = -2$. But since the actual roots are 2 and 3, none of the options perfectly match. Assuming the question intends to test the recognition of roots from the graph, the key takeaway is:

- The roots are 2 and 3.
- The corresponding factors are $(x - 2)$ and $(x - 3)$.

Practical Applications of Factorization and Graph Analysis

Understanding how to factor quadratic expressions based on their graphs is invaluable across various fields:

- Physics: Calculating points where motion or forces reach specific values.
- Engineering: Designing systems with specific resonance or stability points.
- Economics: Modeling profit or loss functions to find optimal production levels.
- Computer Science: Graphing algorithms and understanding quadratic time complexities.

In educational contexts, mastering this process enhances problem-solving skills and deepens comprehension of algebraic structures.

Summary: The Path from Graph to Factorization

- Identify the quadratic expression and write it in standard form.
- Calculate the roots using the quadratic formula or factorization techniques.

- Interpret the roots to determine the factors.
- Compare the factors with multiple-choice options.
- Relate the roots to the graph's x-intercepts for visual confirmation.

In our case: The quadratic $x^2 - 5x + 6$ has roots at $x = 2$ and $x = 3$, leading to the factorization $(x - 2)(x - 3)$.

Final Note: Clarifying the Original Question

Given the initial confusion around the expression " $x - 5x + 6$," it's essential to verify the problem statement. If indeed the expression was intended to be quadratic, then our analysis holds. If not, then the question might need correction.

In conclusion: Based on the graph analysis, the factorization corresponding to the quadratic $x^2 - 5x + 6$ is $(x - 2)(x - 3)$, aligning with the roots at 2 and 3, and simplifying the understanding of quadratic functions in algebra.

References and Further Reading

- Algebra and Trigonometry, Robert F. Blitzer
- Precalculus, James Stewart, Lothar Redlin, and Saleem Watson
- Khan Academy's Quadratic Equations Section
- Desmos Graphing Calculator for visualizing quadratic functions

Understanding the interplay between graphs and algebraic factorizations is a cornerstone of mathematics education, and mastery of this concept opens doors to advanced topics in calculus, physics, and engineering.

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