Select The Two Binomials That Are Factors Of This Trinomial.x2 - X-20O A. X-5B. X + 4O C. X-2OD. X+ 2SUBMIT

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Understanding how to factor quadratic trinomials is a fundamental skill in algebra that helps simplify expressions and solve equations efficiently. When presented with a quadratic trinomial, such as $x^2 - x - 20$, the goal is to find two binomials that multiply together to produce that trinomial. These binomials are known as the factors of the quadratic. Identifying these factors requires a solid grasp of factoring techniques, such as factoring by grouping, the use of the quadratic formula, or simply finding two numbers that satisfy specific conditions. In this article, we will explore how to determine the two binomials that are factors of a given quadratic trinomial, specifically focusing on the example $x^2 - x - 20$, and analyze the options provided: A. $x - 5$, B. $x + 4$, C. $x - 20$, D. $x + 2$. We will also discuss general strategies for factoring quadratic expressions, common mistakes to avoid, and practical tips for mastering this essential algebra skill.

Understanding Quadratic Trinomials and Their Factors

What Is a Quadratic Trinomial?

A quadratic trinomial is a polynomial of degree two, generally expressed in the form:

- $ax^2 + bx + c$

where a, b, and c are constants, and $a \neq 0$. The quadratic $x^2 - x - 20$ is a specific example with $a=1$, $b=-1$, and $c=-20$.

What Does It Mean to Factor a Quadratic?

Factoring a quadratic involves expressing it as a product of two binomials:

- $(mx + n)(px + q)$

such that when expanded, they reproduce the original quadratic. For example:
$$x^2 - x - 20 = (x + 4)(x - 5)$$
since:
$$(x + 4)(x - 5) = x^2 - 5x + 4x - 20 = x^2 - x - 20$$

Step-by-Step Guide to Factoring the Quadratic $x^2 - x - 20$

Step 1: Identify coefficients

- $a = 1$
- $b = -1$
- $c = -20$

Step 2: Find two numbers that multiply to $a \times c = 1 \times -20 = -20$ and add to $b = -1$

- List factors of -20:
- 1 and -20
- -1 and 20
- 2 and -10
- -2 and 10
- 4 and -5
- -4 and 5

- Find which pair sums to -1:
- $4 + (-5) = -1$ ✓

Step 3: Write the factors based on these numbers

- Since the two numbers are 4 and -5, the factors are:
$$(x + 4)(x - 5)$$

Step 4: Verify by expanding

$$(x + 4)(x - 5) = x^2 - 5x + 4x - 20 = x^2 - x - 20$$
which confirms the factorization is correct.

Analyzing the Multiple-Choice Options for

Factors

The options provided are:

A. $x - 5$
B. $x + 4$
C. $x - 20$
D. $x + 2$

Let's analyze each option in the context of the quadratic $x^2 - x - 20$.

Option A: $x - 5$

- This is a binomial factor; it could be part of the factorization if paired with another binomial.
- From our factorization, $(x + 4)(x - 5)$, so $x - 5$ is indeed a factor.

Option B: $x + 4$

- Similarly, from our factorization, $(x + 4)(x - 5)$, so $x + 4$ is also a factor.

Option C: $x - 20$

- To verify if $x - 20$ is a factor, check if $x^2 - x - 20$ is divisible by $x - 20$:
- Using synthetic division or the Remainder Theorem:
- Plug in $x=20$:
$$20^2 - 20 - 20 = 400 - 20 - 20 = 360 \neq 0$$
- Since the remainder is not zero, $x - 20$ is not a factor.

Option D: $x + 2$

- Check if $x + 2$ is a factor:
- Plug in $x = -2$:
$$(-2)^2 - (-2) - 20 = 4 + 2 - 20 = -14 \neq 0$$
- Not a factor.

Conclusion: The Correct Factors of $x^2 - x - 20$

Based on the analysis:
- The two factors are $(x + 4)$ and $(x - 5)$.

Therefore, the correct options are:

- **Option A:** $x - 5$
- **Option B:** $x + 4$

Additional Tips for Factoring Quadratic Trinomials

Tip 1: Always look for a greatest common factor (GCF)

Before attempting to factor, check if there's a common factor among all terms to simplify the quadratic.

Tip 2: Use the quadratic formula as a backup

If factoring by inspection is difficult, the quadratic formula:

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

can find roots, which can then be expressed as factors.

Tip 3: Practice with different types of quadratics

Some quadratics are perfect squares, difference of squares, or involve more complex factoring techniques.

Common Mistakes to Avoid

- Forgetting to check for GCF before factoring.
- Confusing the signs of the numbers.
- Miscalculating the factors that multiply to $a \times c$ and add to b.
- Assuming linear factors without verifying the roots.

Final Thoughts

Factoring quadratic trinomials is a vital skill that enhances problem-solving efficiency in algebra. Recognizing the two binomials that multiply to form the original quadratic involves understanding the relationships between the coefficients and roots of the quadratic. In the case of $x^2 - x - 20$, the factors are $(x + 4)$ and $(x - 5)$, corresponding to the options B and A, respectively. Mastery of these techniques provides a solid foundation for tackling more complex algebraic expressions and equations, making it an essential area of focus for students and educators alike.

By practicing these methods and understanding the underlying principles, learners can confidently identify factors of quadratic expressions, simplify algebraic operations, and solve equations efficiently. Remember, the key is to methodically analyze the coefficients, find the pair of numbers satisfying the product-sum conditions, and verify your results through expansion or substitution.

Frequently Asked Questions

What are the two binomials that factor the trinomial $x^2 - x - 20$?

The binomials are $(x - 5)$ and $(x + 4)$.

How do you determine the factors of the quadratic $x^2 - x - 20$?

Find two numbers that multiply to -20 and add to -1; in this case, -5 and 4.

Which options correctly represent the factors of $x^2 - x - 20$?

Options A $(x - 5)$ and B $(x + 4)$ are the correct factors.

Is $(x - 2)$ a factor of $x^2 - x - 20$?

No, because $(x - 2)$ does not satisfy the quadratic when multiplied out.

Why is $(x + 4)$ a factor of the trinomial $x^2 - x - 20$?

Because $(x + 4)$ is one of the binomials that, when multiplied with $(x - 5)$, gives the original trinomial.

Can $(x + 2)$ be a factor of $x^2 - x - 20$?

No, because multiplying $(x + 2)$ by any binomial does not yield $x^2 - x - 20$.

What is the factored form of $x^2 - x - 20$?

The factored form is $(x - 5)(x + 4)$.

What is the significance of identifying the correct factors of a quadratic trinomial?

It helps in solving the quadratic equation, graphing the parabola, and understanding its roots.

Additional Resources

Select the Two Binomials That Are Factors Of This Trinomial: $x^2 - x - 20$
Understanding how to factor a quadratic trinomial is a fundamental skill in algebra that helps students solve equations, understand polynomial relationships, and prepare for more advanced math topics. When faced with a quadratic expression like $x^2 - x - 20$, the goal is to break it down into two binomials whose product equals the original trinomial. This process involves recognizing patterns, applying factoring techniques, and confirming the correctness of your factors. In this guide, we'll walk through the steps to select the correct binomials from the options provided, clarify the principles behind factoring, and provide a clear methodology to identify the correct factors confidently.

What Does It Mean to Factor a Trinomial?

Factoring a quadratic trinomial involves expressing it as a product of two binomials. For quadratics of the form _ax² + bx + c_, the goal is to find binomials of the form _(mx + n)(px + q)_ such that when multiplied out, they produce the original quadratic.

For the specific case of $x^2 - x - 20$, the leading coefficient _a_ is 1, simplifying our task to finding two numbers that multiply to -20 (the constant term) and add to -1 (the coefficient of the middle term).

Step-by-Step Approach to Factoring $x^2 - x - 20$

1. Identify the coefficients:
- _a_ = 1
- _b_ = -1
- _c_ = -20

2. Find two numbers that multiply to _a c_ = 1 (-20) = -20
- These numbers are factors of -20.

3. Find two numbers that add to _b_ = -1
- The pair of factors of -20 that sum to -1.

4. List the factor pairs of -20:
- (-1, 20) → sum = 19
- (1, -20) → sum = -19
- (-2, 10) → sum = 8
- (2, -10) → sum = -8
- (-4, 5) → sum = 1
- (4, -5) → sum = -1

5. Identify the pair that sums to -1:
- The pair (4, -5) sums to -1.

6. Write the factors:
- Since the pair is (4, -5), and _a_ = 1, the binomials are:
_(x + 4)(x - 5)_

7. Verify by expansion:
- Expand _(x + 4)(x - 5)_:
$x x = x^2$
$x (-5) = -5x$
$4 x = 4x$
$4 (-5) = -20$
- Summing these: $x^2 - 5x + 4x - 20 = x^2 - x - 20$, which confirms the factorization is correct.

Connecting the Process to the Multiple Choice Options

Now that we've determined the factors are (x + 4) and (x - 5), let's analyze the options given:

- A. x - 5
- B. x + 4
- C. x - 20
- D. x + 2

Recall, the factors should be (x + 4) and (x - 5). Therefore, the correct options are:

- B. x + 4
- A. x - 5

How to Confirm the Correct Factors

Even after identifying the potential factors, it’s good practice to verify by multiplying them:

- Multiply $(x + 4)(x - 5)$:
$x \cdot x = x^2$
$x \cdot (-5) = -5x$
$4 \cdot x = 4x$
$4 \cdot (-5) = -20$

Adding these up: $x^2 - 5x + 4x - 20 = x^2 - x - 20$, which matches our original trinomial.

This confirmation affirms that the factors $(x + 4)$ and $(x - 5)$ are correct.

Summary of the Key Steps in Factoring $x^2 - x - 20$

1. Identify coefficients and constants.
2. List factor pairs of the constant term (-20).
3. Find the pair that sums to the middle coefficient (-1).
4. Write the binomials based on those factors.
5. Verify by expanding the binomials.

Additional Tips and Common Pitfalls

- Always check your work by expanding the factors to ensure they produce the original quadratic.
- Remember the signs: for negative constants, the factors will have opposite signs.
- Factorization is unique up to the order of the factors, but the signs must match the sum and product conditions.
- For quadratics where _a_ $\neq 1$, additional techniques like splitting the middle term or using the quadratic formula may be necessary.

Final Thoughts

Factoring quadratics like $x^2 - x - 20$ is a foundational skill that enhances algebraic fluency and problem-solving confidence. Recognizing the key steps—finding the correct pair of factors that multiply to the constant term and sum to the middle coefficient—allows students to efficiently identify the correct binomials from multiple choices. By practicing these steps and verifying through expansion, learners can quickly master the process and approach similar problems with clarity.

In conclusion, the two binomials that are factors of the trinomial $x^2 - x - 20$ are $(x + 4)$ and $(x - 5)$, matching options B and A respectively.

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