(x + 10)(3x - 5)Find The Value Of X.X =

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Understanding how to find the value of x in algebraic expressions like $(x + 10)(3x - 5)$ is fundamental for mastering algebra. Whether you're a student preparing for exams or someone interested in strengthening your math skills, breaking down such expressions and solving for x is an essential step in algebraic problem-solving. In this comprehensive guide, we will explore the process of finding the value of x when given an expression like $(x + 10)(3x - 5)$, along with tips, examples, and best practices to enhance your mathematical proficiency.

Understanding the Expression $(x + 10)(3x - 5)$

Before diving into solving for x, it’s important to understand what the expression $(x + 10)(3x - 5)$ represents.

What is a Factored Form?

An algebraic expression written as a product of two binomials, such as $(x + 10)(3x - 5)$, is called a factored form. Factoring is a method of expressing a polynomial as a product of its factors, which can make solving equations or simplifying expressions much easier.

Expanding the Expression

To work with the expression more effectively, particularly when solving for x, it helps to expand it using the distributive property (also known as FOIL for binomials):

$$
(x + 10)(3x - 5) = x \times 3x + x \times (-5) + 10 \times 3x + 10 \times (-5)
$$

Calculating each term:

- $x \times 3x = 3x^2$
- $x \times (-5) = -5x$
- $10 \times 3x = 30x$
- $10 \times (-5) = -50$

Combining these, the expanded form is:

$$
3x^2 - 5x + 30x - 50 = 3x^2 + 25x - 50
$$

This expanded form is often easier to work with when solving for x.

Methods to Find the Value of X in $(x + 10)(3x - 5)$

Depending on the context or what the problem asks for, there are different approaches to find the value of x.

1. Solving Equations Set to a Constant

Often, the problem will provide an equation like:

$$
(x + 10)(3x - 5) = \text{some constant}
$$

For example:

$$
(x + 10)(3x - 5) = 0
$$

This is called a quadratic equation, which can be solved using various methods.

2. Solving $(x + 10)(3x - 5) = 0$

When the product of two factors equals zero, the Zero Product Property states that:

$$
\text{If } AB = 0, \text{ then either } A = 0 \text{ or } B = 0
$$

Applying this to our expression:

$$
x + 10 = 0 \quad \text{or} \quad 3x - 5 = 0
$$

Solving each:

- $x + 10 = 0 \Rightarrow x = -10$
- $3x - 5 = 0 \Rightarrow 3x = 5 \Rightarrow x = \frac{5}{3}$

Thus, the solutions are:

$$
x = -10 \quad \text{or} \quad x = \frac{5}{3}
$$

---

3. Solving for x When $(x + 10)(3x - 5) = \text{a specific value}$

Suppose the expression equals a number, such as:

$$
(x + 10)(3x - 5) = k
$$

Substituting the expanded form:

$$
3x^2 + 25x - 50 = k
$$

Rearranged as:

$$
3x^2 + 25x - (50 + k) = 0
$$

This is a quadratic equation in standard form, which can be solved using the quadratic formula:

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

Where:

- $a = 3$
- $b = 25$
- $c = -(50 + k)$

Calculating discriminant:

$$
D = b^2 - 4ac = 25^2 - 4 \times 3 \times (-(50 + k))
$$

Once the discriminant is calculated, substitute into the quadratic formula to find the possible values of x.

Quadratic Equation and Its Role in Solving $(x + 10)(3x - 5)$

The quadratic equation is central when solving expressions like $(x + 10)(3x - 5) = c$, where c is a constant.

Quadratic Formula Overview

The quadratic formula provides a systematic way to find roots of any quadratic equation:

$$
ax^2 + bx + c = 0
$$

The solutions are:

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

The discriminant $D = b^2 - 4ac$ determines the nature of roots:

- If $D > 0$, two real roots.
- If $D = 0$, one real root (a repeated root).
- If $D < 0$, two complex roots.

Applying the Quadratic Formula to Our Expression

For the expanded form:

$$
3x^2 + 25x - (50 + k) = 0
$$

Identify the coefficients:

- $a = 3$
- $b = 25$
- $c = -(50 + k)$

Calculate the discriminant:

$$
D = 25^2 - 4 \times 3 \times (-(50 + k))
$$

$$
\[

D = 625 + 12(50 + k)
\]

\[
D = 625 + 600 + 12k = 1225 + 12k
\]

Depending on the value of \(k\), the discriminant varies, affecting the number and type of solutions.

Practical Examples and Step-by-Step Solutions

Let's explore some specific examples to solidify understanding.

Example 1: Find \(x\) when \((x + 10)(3x - 5) = 0\)

Solution:

Set each factor to zero:

- \(x + 10 = 0 \Rightarrow x = -10\)
- \(3x - 5 = 0 \Rightarrow 3x = 5 \Rightarrow x = \frac{5}{3}\)

Answer:

\[
x = -10 \quad \text{or} \quad x = \frac{5}{3}
\]

Example 2: Find \(x\) when \((x + 10)(3x - 5) = 15\)

Solution:

Expand the expression:

\[
3x^2 + 25x - 50 = 15
\]

Bring all to one side:

\[

$$
3x^2 + 25x - 50 - 15 = 0
$$
$$
3x^2 + 25x - 65 = 0
$$

Apply quadratic formula:

$$
x = \frac{-25 \pm \sqrt{25^2 - 4 \times 3 \times (-65)}}{2 \times 3}
$$

Calculate discriminant:

$$
D = 625 + 780 = 1405
$$

Since $D > 0$, there are two real solutions:

$$
x = \frac{-25 \pm \sqrt{1405}}{6}
$$

Approximate $\sqrt{1405} \approx 37.48$:

$$
x = \frac{-25 \pm 37.48}{6}
$$

Calculate both:

- $x = \frac{-25 + 37.48}{6} = \frac{12.48}{6} \approx 2.08$
- $x = \frac{-25 - 37.48}{6} = \frac{-62.48}{6} \approx -10.41$

Answer:

$$
x \approx 2.08 \quad \text{or} \quad x \approx -10.41
$$

Applications of Solving $(x + 10)(3x - 5)$

Understanding how to find x in this context has numerous practical applications in various fields.

1. Algebraic Problem Solving

Frequently Asked Questions

How do you expand the expression (x + 10)(3x - 5)?

You use the distributive property (FOIL): (x)(3x) + (x)(-5) + (10)(3x) + (10)(-5), which simplifies to $3x^2 - 5x + 30x - 50$, and then combine like terms to get $3x^2 + 25x - 50$.

What is the next step to find the value of x when given the expression (x + 10)(3x - 5)?

You need to know if the expression is set equal to zero or another number, then solve the resulting quadratic equation $3x^2 + 25x - 50 = 0$.

How can I solve for x in the quadratic equation $3x^2 + 25x - 50 = 0$?

Use the quadratic formula $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$, where a=3, b=25, and c=-50.

What is the value of x if the expression (x + 10)(3x - 5) equals zero?

Set each factor equal to zero: x + 10 = 0 gives x = -10; 3x - 5 = 0 gives x = 5/3. So, x = -10 or x = 5/3.

How do I find the specific value of x for the expression (x + 10)(3x - 5) given a particular result?

First, expand the expression, then set it equal to the given result, and solve the resulting quadratic equation for x.

Can the expression (x + 10)(3x - 5) be negative, positive, or zero? How do I determine that?

Yes, depending on the value of x. It is zero when x = -10 or x = 5/3. For other x values, the sign depends on the factors' signs; analyze intervals around these points to determine positivity or negativity.

What is the significance of solving (x + 10)(3x - 5) = 0 in algebra?

It helps find the x-values where the expression equals zero, which are often the roots or solutions of the quadratic equation, essential in graphing and solving equations.

Additional Resources

(x + 10)(3x - 5) Find The Value Of X. X =

Unraveling the Mathematical Mystery: A Deep Dive into the

Expression (x + 10)(3x - 5)

In the realm of algebra, expressions like (x + 10)(3x - 5) are more than mere symbols; they are gateways to understanding relationships, solving real-world problems, and developing critical thinking skills. This article aims to thoroughly investigate the process of finding the value of x in the given expression, dissecting each step with precision, clarity, and analytical rigor.

Introduction: The Significance of Algebraic Expressions

Algebra forms the backbone of many scientific disciplines, engineering, economics, and everyday problem-solving. The fundamental task often involves simplifying expressions, solving equations, and finding unknown variables. The expression (x + 10)(3x - 5) exemplifies a typical quadratic expression that requires expansion and solving for x.

The Expression Under Scrutiny: (x + 10)(3x - 5)

At first glance, the expression appears straightforward: it's a product of two binomials. To find the value of x, we need additional information, such as an equality (e.g., setting the expression equal to a specific number). Since the problem statement reads "Find the value of x," the most logical assumption is that the expression equals zero, i.e.,

(x + 10)(3x - 5) = 0

This assumption aligns with standard algebraic practices, where setting a product equal to zero allows us to leverage the Zero Product Property.

Step 1: Clarifying the Problem

The Zero Product Property

The Zero Product Property states that if:

A B = 0

then either:

- A = 0, or
- B = 0

Applying this principle to our expression, we set each factor equal to zero:

1. x + 10 = 0
2. 3x - 5 = 0

Rationale Behind This Approach

Because the original expression is a product of two factors, the solutions for x are found by solving these individual simple equations. This method is fundamental in algebra and provides a straightforward path to the solutions.

Step 2: Solving for x in Each Equation

Equation 1: x + 10 = 0

Subtract 10 from both sides:

x = -10

Equation 2: 3x - 5 = 0

Add 5 to both sides:

3x = 5

Divide both sides by 3:

x = 5/3

Final Results

Based on the above calculations, the solutions are:

- x = -10
- x = 5/3

These are the two values of x that satisfy the original expression when set equal to zero.

Deep Dive: Verifying the Solutions

It is essential to validate our solutions by substituting them back into the original expression to ensure consistency, especially if the context involves an equation set equal to a specific value other than zero.

Case 1: Check x = -10

Substitute into (x + 10)(3x - 5):

(-10 + 10) (3 -10 - 5) = (0) (-30 - 5) = 0 (-35) = 0

The result is zero, confirming that x = -10 is a valid solution.

Case 2: Check x = 5/3

Substitute into (x + 10)(3x - 5):

(5/3 + 10) (3 5/3 - 5) = (5/3 + 30/3) (5 - 5) = (35/3) (0) = 0

Again, the result is zero, confirming the second solution's validity.

Broader Context and Applications

Real-World Relevance

Understanding how to solve such equations has practical implications:

- Engineering: Calculating load capacities, electrical circuits.
- Economics: Optimizing profit and cost functions.

- Science: Analyzing relationships between variables.

Educational Importance

Mastering these fundamental algebraic techniques fosters problem-solving skills, logical reasoning, and prepares students for more advanced topics like calculus and differential equations.

Additional Considerations: When the Expression Equals a Non-Zero Value

Suppose the problem was to find x when:

$(x + 10)(3x - 5) = k$

where k is a constant other than zero. In such cases:

- Expand the expression into a quadratic form.
- Rearrange to standard quadratic equation: $ax^2 + bx + c = 0$.
- Use methods like factoring, completing the square, or quadratic formula to solve.

Step 3: Expanding the Expression (for completeness)

While the immediate solution involved the zero product property, expanding the expression provides further insights.

\[

(x + 10)(3x - 5) = 3x^2 - 5x + 30x - 50 = 3x^2 + 25x - 50
\]

Thus, the quadratic form of the expression is:

\[
3x^2 + 25x - 50
\]

If the problem specifies a value for the entire expression, say, equal to k, then solving involves:

\[
3x^2 + 25x - 50 = k
\]

which can be rearranged to:

\[
3x^2 + 25x - (50 + k) = 0
\]

and solved using the quadratic formula:

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

where \(a = 3\), \(b = 25\), \(c = -(50 + k)\).

Conclusion: The Takeaways

- The initial assumption that the product equals zero allowed for straightforward solutions.
- The solutions are x = -10 and x = 5/3.
- Verification confirms these solutions satisfy the original expression.
- The process exemplifies fundamental algebraic techniques applicable across various fields.
- Further exploration of different values or equations involving this expression can deepen understanding.

Final Reflection: The Significance of Methodical Problem-Solving

This investigation underscores the importance of careful analysis, assumption validation, and systematic methods in solving algebraic problems. Whether dealing with simple binomials or complex quadratic equations, the foundational principles remain consistent and essential for mathematical literacy and real-world problem-solving.

In summary, by applying the Zero Product Property and thorough verification, we have conclusively determined that the solutions to the expression (x + 10)(3x - 5) are x = -10 and x = 5/3. This process exemplifies the elegance and rigor of algebra, reinforcing its vital role in analytical thinking across disciplines.

X 10 3x 5 Find The Value Of X X

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