(2x-3y)(x+5y)=0 Where X>0 And Y>0Find The Ratio X:yGive Your Answer In Its Simplest Form.

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Understanding how to solve algebraic equations is fundamental in mathematics, especially when dealing with ratios and variables. The equation $(2x - 3y)(x + 5y) = 0$ provides an excellent example of how to analyze factors, solve for variables, and determine ratios under given conditions. In this article, we will explore the steps to find the ratio of x to y, given that both variables are positive, and how to express this ratio in its simplest form.

Breaking Down the Equation: Understanding the Zero Product Property

The Zero Product Property

The key concept behind solving equations like $(2x - 3y)(x + 5y) = 0$ is the zero product property. It states that if the product of two factors equals zero, then at least one of the factors must be zero. Mathematically:

- Either $2x - 3y = 0$
- Or $x + 5y = 0$

Since the problem specifies that both x and y are greater than zero ($x > 0$, $y > 0$), we can analyze each factor separately to find the possible ratios that satisfy these conditions.

Solving for the Ratios: When Each Factor Equals Zero

Case 1: 2x - 3y = 0

Starting with the first factor:

$2x - 3y = 0$

Rearranging:

$2x = 3y$

Dividing both sides by 2:

$x = (3/2)\ y$

Since both x and y are positive, this relation holds true in the domain of interest.

To find the ratio x:y:

$x:y = (3/2)\ y : y$

Simplify:

$x:y = (3/2)\ y / y = 3/2$

Expressed as a ratio:

$x:y = 3 : 2$

Result: When $2x - 3y = 0$, the ratio x:y simplifies to 3:2.

Case 2: x + 5y = 0

Now, consider the second factor:

$x + 5y = 0$

Rearranging:

$x = -5y$

Given that both x and y are positive, this relation cannot hold, because:

$x = -5y$ implies x is negative when y is positive, which contradicts the given condition $x > 0$.

Conclusion: The second case is invalid because it violates the positivity condition of x and y.

Final Answer: The Valid Ratio of X to Y

Based on the above analysis, the only valid solution under the constraints x

> 0 and y > 0 is from the first factor:

x : y = 3 : 2

This ratio is already in its simplest form, as 3 and 2 share no common divisors other than 1.

Understanding the Significance of the Ratio in Real-World Contexts

Ratios like 3:2 have practical implications across various fields, including:

- **Recipes and Cooking:** Maintaining ingredient proportions.
- **Finance:** Comparing investment ratios or asset allocations.
- **Engineering:** Designing components with specific proportional relationships.
- **Physics:** Analyzing ratios of forces or velocities.

The ability to derive and interpret ratios from algebraic equations enables professionals and students to solve real-world problems effectively.

Additional Tips for Solving Similar Equations

1. Always Check the Conditions

In problems involving variables with constraints (like positivity), always verify whether the solutions satisfy these conditions.

2. Factor Carefully

Identify all factors of the given equation. Use the zero product property when applicable, but discard solutions that violate the constraints.

3. Simplify Ratios Properly

Express ratios in their simplest form by dividing numerator and denominator by their greatest common divisor (GCD).

4. Understand the Context

When interpreting ratios, consider real-world context to ensure the solutions make sense practically.

Summary

- The given equation *(2x - 3y)(x + 5y) = 0* can be solved using the zero product property.
- Since x > 0 and y > 0, the only valid solution is from *2x - 3y = 0*.
- Solving this yields the ratio x:y = 3:2.
- This ratio is already in its simplest form and can be applied across various fields where proportional relationships are essential.

In conclusion, when dealing with equations involving multiple factors set to zero, always analyze each factor separately, verify conditions, and simplify ratios for clarity and practical application. The ratio 3:2 derived here exemplifies how algebraic solutions underpin many real-world scenarios, emphasizing the importance of mastering these fundamental concepts.

Keywords: algebraic equations, zero product property, ratio of variables, simplifying ratios, positive variables, solving equations, mathematical ratios, algebra tips

Frequently Asked Questions

Given the equation (2x - 3y)(x + 5y) = 0 with x > 0 and y > 0, what are the possible values of x and y?

Since the product equals zero, either 2x - 3y = 0 or x + 5y = 0. But because x > 0 and y > 0, the second equation x + 5y = 0 is invalid (sum can't be zero with positive variables). Therefore, 2x - 3y = 0, which simplifies to 2x = 3y.

How do we find the ratio x:y from the equation 2x = 3y, given x > 0 and y > 0?

From 2x = 3y, dividing both sides by y gives 2x/y = 3, or x/y = 3/2. Therefore, the ratio x:y = 3:2.

What is the simplified ratio of x to y when (2x - 3y)(x + 5y) = 0 with x > 0 and y > 0?

The simplified ratio of x to y is 3:2.

Are there multiple ratios possible for x and y in the given equation under the constraints x > 0 and y > 0?

No. Since the only valid equation under the constraints is $2x - 3y = 0$, the ratio $x:y = 3:2$ is the only possibility.

If x = 3k and y = 2k for some positive constant k, how does this relate to the original equation?

Substituting $x = 3k$ and $y = 2k$ into $2x - 3y$ gives $2(3k) - 3(2k) = 6k - 6k = 0$, confirming the ratio and the validity of the solution.

What is the importance of considering the positivity constraints (x > 0, y > 0) in solving the equation?

The positivity constraints eliminate solutions where x or y could be negative or zero, ensuring only ratios with positive values are considered, which is crucial for the problem's context.

Can the ratio x:y be expressed in any other form besides 3:2 given the equation (2x - 3y)(x + 5y) = 0 with x > 0 and y > 0?

No. Since only $2x - 3y = 0$ yields positive solutions, the ratio remains $x:y = 3:2$ in simplest form.

Additional Resources

Understanding the Equation $(2x - 3y)(x + 5y) = 0$ Where $X > 0$ and $Y > 0$: Find the Ratio X : Y in Simplest Form

In the realm of algebra, the equation $(2x - 3y)(x + 5y) = 0$ presents an interesting opportunity to explore the relationships between variables, especially under the constraints $X > 0$ and $Y > 0$. This type of problem requires understanding how the zero product property functions, interpreting the conditions posed, and ultimately determining the ratio X : Y in its simplest form. Such exercises are fundamental in algebra because they lay the groundwork for solving more complex equations involving multiple variables and conditions.

Understanding the Zero Product Property

Before diving into the specifics of the problem, it’s essential to revisit a key principle: the zero product property. This rule states that:

> If the product of two factors is zero, then at least one of the factors must be zero.

Mathematically, for any real numbers a and b:

- $ab = 0 \Rightarrow a = 0 \text{ or } b = 0$.

Applying this to our equation:

$$
(2x - 3y)(x + 5y) = 0,
$$

we infer that:

- Either $2x - 3y = 0$,
- Or $x + 5y = 0$.

Since both X and Y are constrained to be positive ($X > 0, Y > 0$), the second case ($x + 5y = 0$) would lead to a negative value for x, which contradicts the condition $X > 0$. Therefore, only the first factor's equation $2x - 3y = 0$ is valid under the given conditions.

Step 1: Deriving the Relationship Between X and Y

Given:

$$
2x - 3y = 0,
$$

we can solve for x:

$$
2x = 3y,
$$
$$
x = \frac{3}{2} y.
$$

This relationship indicates that x is directly proportional to y, with a ratio of 3:2. Since both x and y are positive, this proportionality makes sense within the constraints.

Step 2: Expressing the Ratio $X : Y$

From the relation above:

$$
x = \frac{3}{2} y,
$$

we can express the ratio:

$$
X : Y = x : y = \frac{3}{2} y : y.
$$

Dividing both sides by y (which is positive and hence valid):

$$
X : Y = \frac{3}{2} : 1,
$$

which simplifies to:

$$
X : Y = 3 : 2.
$$

Therefore, the ratio of X to Y in its simplest form is 3:2.

Step 3: Verifying the Solution

It's always good practice to verify that the solution satisfies the original conditions:

- $X > 0$,
- $Y > 0$,
- The original equation.

Given $x = \frac{3}{2} y$, and both x and y are positive, $x = \frac{3}{2} y > 0$ if $y > 0$.

Substituting into the original factors:

- $2x - 3y$:

$$
2 \times \frac{3}{2} y - 3 y = 3 y - 3 y = 0,
$$

which satisfies the zero factor condition.

- $x + 5 y$:

$$
\frac{3}{2} y + 5 y = \left(\frac{3}{2} + 5 \right) y = \left(\frac{3}{2} + \frac{10}{2} \right) y = \frac{13}{2} y,
$$

which is positive for $y > 0$. Since only the first factor equals zero, the overall product equals zero, satisfying the original equation.

Additional Considerations and Broader Context

While the problem at hand leads straightforwardly to the ratio 3:2, understanding the underlying principles can be beneficial for tackling similar equations:

1. Handling Multiple Conditions

In problems where both factors could be zero, and the variables are constrained (like being positive), it’s crucial to analyze which cases are valid based on the conditions.

2. Simplifying Ratios

Expressing variables in terms of each other and then simplifying ratios helps in understanding proportional relationships, which are common in geometry, physics, and economic models.

3. Application in Real-World Problems

Ratios such as $3:2$ appear in various contexts—mixing solutions, scaling models, or distributing quantities—highlighting the importance of such algebraic manipulations.

Summary and Final Answer

In conclusion, analyzing the equation $(2x - 3y)(x + 5y) = 0$ under the conditions $X > 0$ and $Y > 0$ reveals that $2x - 3y = 0$ is the valid factor. From this, we determine:

$$
x = \frac{3}{2} y,
$$

which simplifies to the ratio:

$$
X : Y = \boxed{3 : 2}.
$$

This ratio is already in its simplest form, providing a clear proportional relationship between X and Y. Understanding how to derive such ratios is a foundational skill in algebra, essential for solving a wide array of mathematical and applied problems.

Final Thoughts

Mastering problems like this enhances your ability to interpret equations, analyze constraints, and derive meaningful relationships between variables. Whether you're preparing for exams, working on real-world applications, or simply sharpening your algebra skills, grasping the process of solving for ratios and understanding the implications of zero product equations is invaluable.

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