

Make M The Subject Of The Equation(a) $5(m + Y) = 4(m - 3y)$

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Understanding how to manipulate equations to make a specific variable the subject is a fundamental skill in algebra. In this article, we will explore in detail how to make M the subject of the equation $5(m + Y) = 4(m - 3Y)$. We will break down each step, explain the underlying principles, and provide additional tips for solving similar equations. Whether you're a student preparing for exams or someone looking to improve your algebra skills, this comprehensive guide will help you grasp the concept thoroughly.

Understanding the Equation

Before diving into the solution, it's essential to understand the structure of the given equation:

$$5(m + Y) = 4(m - 3Y)$$

This is a linear equation involving two variables, m and Y. Our goal is to manipulate this equation to express M explicitly in terms of Y — that is, to make M the subject of the formula.

Note: In standard algebraic notation, variables are often lowercase, but here uppercase M is used. We will assume M represents the variable to be isolated, and Y is considered a known or independent variable.

Step-by-Step Solution: Making M the Subject

Step 1: Expand Both Sides of the Equation

The first step involves distributing the constants over the parentheses:

- Left side: $5(m + Y) = 5m + 5Y = 5m + 5Y$
- Right side: $4(m - 3Y) = 4m - 4 \cdot 3Y = 4m - 12Y$

So, after expansion, the equation becomes:

$$5m + 5Y = 4m - 12Y$$

Step 2: Collect Like Terms

To isolate m , we need to gather all terms involving m on one side and the remaining terms on the other:

- Subtract $4m$ from both sides:

$$(5m - 4m) + 5Y = -12Y$$

- Simplify:

$$m + 5Y = -12Y$$

Step 3: Isolate the Variable M

Now, subtract $5Y$ from both sides to solve for m :

$$m = -12Y - 5Y$$

- Combine like terms:

$$m = -17Y$$

Step 4: Write the Final Expression

The expression for m in terms of Y is:

$$m = -17Y$$

Thus, the variable M (assuming it's m) has been successfully made the subject of the equation.

Interpreting the Solution

The solution $m = -17Y$ indicates a linear relationship between m and Y . For any known value of Y , you can substitute into this formula to find m .

Example:

- If $Y = 2$, then:

$$m = -17 \cdot 2 = -34$$

- Conversely, if $Y = -3$, then:

$$m = -17(-3) = 51$$

This linear relation is useful in various contexts, including algebraic modeling, physics, and engineering, where variables are interdependent.

Additional Tips for Making Variables the Subject of an Equation

Understanding this process is crucial for solving more complex algebraic equations. Here are some general tips:

1. Expand Parentheses First

Always start by distributing any coefficients across parentheses to simplify the equation.

2. Collect Like Terms

Bring all terms involving the variable you want to make the subject to one side.

3. Use Addition or Subtraction to Isolate the Variable

Use inverse operations to move other terms away from the variable.

4. Divide or Multiply as Needed

When the variable is multiplied or divided by a coefficient, perform the inverse operation to isolate it.

5. Check Your Solution

Substitute your expression back into the original equation to verify correctness.

Common Mistakes to Avoid

When manipulating equations, certain pitfalls can lead to errors:

- **Forgetting to distribute:** Always distribute coefficients before combining like terms.
- **Incorrect sign handling:** Be careful when moving terms across the equality; signs change when adding or subtracting.
- **Dividing by zero:** Ensure the coefficient you divide by is not zero.
- **Overlooking variable terms:** Remember to include all instances of the variable during collection.

Practice Problems

To reinforce your understanding, try solving these similar equations:

1. Make x the subject of: $3(2x + 5) = 2(4x - 7)$
2. Solve for a in: $7a + 3b = 2a - 5b$
3. Given $p(q + 4) = 3p - 2q$, express p in terms of q .

Solutions:

(Encourage readers to attempt these problems before checking the solutions below.)

Conclusion

Mastering the skill of making a variable the subject of an equation is essential for solving algebraic problems efficiently. As demonstrated with the equation $5(m + Y) = 4(m - 3Y)$, the process involves expanding parentheses, collecting like terms, and applying inverse operations. By following systematic steps and practicing regularly, you can confidently manipulate algebraic equations to isolate any variable you need.

Whether you're tackling complex equations in mathematics, physics, or engineering, these foundational skills will serve you well. Remember to verify your solutions and avoid common mistakes to ensure accuracy. Keep practicing, and algebra will become an easier and more

manageable subject.

Frequently Asked Questions

How do I make M the subject of the equation $5(m + Y) = 4(m - 3Y)$?

First, expand both sides: $5m + 5Y = 4m - 12Y$. Then, bring all M terms to one side: $5m - 4m = -12Y - 5Y$, which simplifies to $m = -17Y$.

What are the steps to solve for M in the equation $5(m + Y) = 4(m - 3Y)$?

Expand both sides to get $5m + 5Y = 4m - 12Y$. Subtract $4m$ from both sides: $5m - 4m + 5Y = -12Y$. Simplify to $m + 5Y = -12Y$. Then, subtract $5Y$ from both sides: $m = -17Y$.

Can you show the detailed solution to make M the subject of $5(m + Y) = 4(m - 3Y)$?

Yes. Expand: $5m + 5Y = 4m - 12Y$. Subtract $4m$ from both sides: $5m - 4m + 5Y = -12Y$, which simplifies to $m + 5Y = -12Y$. Finally, subtract $5Y$ from both sides: $m = -17Y$.

What is the value of M in terms of Y for the equation $5(m + Y) = 4(m - 3Y)$?

The value of M in terms of Y is $M = -17Y$.

Is the process of making M the subject the same for similar equations? How does it apply here?

Yes, generally you expand, collect M terms on one side, and then solve. In this case, expanding both sides and isolating M leads to $M = -17Y$.

Are there any common mistakes to avoid when making M the subject in this equation?

Yes, common mistakes include not expanding correctly, mixing up signs during subtraction, or neglecting to isolate M properly. Carefully expanding and simplifying helps avoid these errors.

Can I verify the solution $M = -17Y$ by substituting back into the original equation?

Yes, substitute $M = -17Y$ into the original equation: $5(-17Y + Y) = 4(-17Y - 3Y)$. Simplify both sides to verify equality: Left side: $5(-16Y) = -80Y$; Right side: $4(-20Y) = -80Y$. Both sides are equal, confirming

the solution.

What is the importance of making M the subject in algebraic equations?

Making M the subject helps to solve for unknowns, analyze relationships between variables, and simplifies solving equations in various mathematical and real-world contexts.

Additional Resources

Make M the Subject of the Equation: $5(m + Y) = 4(m - 3y)$

In algebra, the ability to make M the subject of the equation is a fundamental skill that allows us to manipulate formulas and solve for specific variables efficiently. When dealing with equations like $5(m + Y) = 4(m - 3y)$, understanding how to isolate M helps simplify complex expressions and provides clarity in problem-solving scenarios. This guide will walk you through a detailed, step-by-step process on how to make M the subject of the equation, ensuring you grasp each stage of the algebraic manipulation involved.

Understanding the Given Equation

Before diving into the steps, let's carefully examine the equation:

$$5(m + Y) = 4(m - 3y)$$

This equation involves two variables, M and Y, and contains coefficients that need to be expanded and simplified. Our goal is to isolate M on one side of the equation, transforming the expression into a form like $M = \dots$ with all other terms on the opposite side.

Step 1: Expand Both Sides

The first step involves expanding the brackets on both sides of the equation using the distributive property.

How to Expand

- For $5(m + Y)$, multiply 5 by each term inside the brackets:

$$5m + 5Y = 5m + 5Y$$

- For $4(m - 3y)$, multiply 4 by each term inside the brackets:

$$4m - 12y = 4m - 12y$$

Expanded Equation

Now, the equation becomes:

$$5m + 5Y = 4m - 12y$$

Step 2: Group Like Terms to Isolate M

Our next goal is to gather all terms containing M on one side and the remaining terms on the other side.

Subtract 4m from both sides

$$\text{- Left side: } 5m - 4m + 5Y = 4m - 4m - 12y$$

$$\text{- Simplifies to: } (5m - 4m) + 5Y = -12y$$

Resulting in:

$$m + 5Y = -12y$$

Subtract 5Y from both sides

$$\text{- Left side: } m + 5Y - 5Y = -12y - 5Y$$

$$\text{- Simplifies to: } m = -12y - 5Y$$

Step 3: Express M Explicitly

At this point, M (which was initially in uppercase as M, but in the equation, the variable appears as m) is isolated:

$$M = -12y - 5Y$$

Note: The variables y and Y are both present, and it's essential to clarify whether they are the same or different variables. Assuming they are different, this is the simplest form for M in terms of y and Y.

Step 4: Clarify Variable Notation

In many algebraic contexts, variables like m and M or y and Y can either represent the same or different quantities.

- If m and M are the same variable:

The solution above suffices, and $M = -12y - 5Y$.

- If m and M are different variables:

The variable M is already isolated, and the equation is expressed explicitly in terms of y and Y.

For the purpose of this guide, we will assume that m is the variable we want to make the subject, and Y/y are parameters or other variables.

Step 5: Final Expression for M

Thus, the final expression making M the subject is:

$$M = -12y - 5Y$$

Alternatively, if you prefer to write it explicitly as:

$$M = -(12y + 5Y)$$

which emphasizes the negative sign outside the sum.

Additional Tips and Insights

1. Always expand brackets first

This simplifies the equation considerably before moving variables around.

2. Keep track of signs

When subtracting or adding terms, pay attention to signs to avoid algebraic errors.

3. Isolate variable step-by-step

Don't try to jump directly to the solution; instead, proceed systematically.

4. Check your work by substituting back

Once you have M expressed explicitly, substitute it back into the original equation to verify correctness.

Practical Applications of Making M the Subject

Understanding how to manipulate equations to make a particular variable the subject is vital across various fields:

- Physics: Calculating acceleration, force, or other physical quantities.
- Economics: Solving for cost, revenue, or profit functions.
- Engineering: Rearranging formulas for design parameters.
- Statistics: Solving for estimators or parameters in models.

Common Mistakes to Avoid

- Forgetting to expand brackets: Skipping this step can complicate the equation unnecessarily.
- Mixing signs: Always double-check signs when moving terms across the equals sign.
- Misidentifying variables: Clarify which variables are constants and which are the variables of interest.

- Overlooking the order of operations: Maintain the correct order when manipulating expressions.

Summary of the Process

Here's a quick recap of the steps involved in making M the subject of the equation $5(m + Y) = 4(m - 3y)$:

1. Expand both sides using the distributive property:

$$5m + 5Y = 4m - 12y$$

2. Subtract 4m from both sides to gather M terms on one side:

$$(5m - 4m) + 5Y = -12y$$

$$\rightarrow m + 5Y = -12y$$

3. Subtract 5Y from both sides:

$$m = -12y - 5Y$$

4. Rewrite as the explicit formula for M:

$$M = -12y - 5Y$$

Final Remarks

Mastering the skill of making a variable the subject of an equation, especially in complex expressions involving multiple terms, is essential for problem-solving in algebra. It builds a strong foundation for tackling advanced topics in mathematics and related disciplines. Practice with various equations to develop confidence and ensure accuracy in your algebraic manipulations.

If you encounter similar equations or more complicated expressions, remember to follow a systematic approach: expand, gather like terms, isolate the variable, and verify your solution. With consistent practice, making M or any other variable the subject will become second nature, enabling you to handle a broad range of mathematical challenges with ease.

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