# Subtract The Equations.3x + 4y = 17(3x +2y = 3)-O A. 6x = 20O B. -6x = 14c. 2y = 14O D. 6y = 20

## Understanding How to Subtract Equations: Solving Systems of Linear Equations

**Subtract The Equations.3x + 4y = 17(3x + 2y = 3) - O A. 6x = 20 O B. -6x = 14 c. 2y = 14 O D. 6y = 20**

Solving systems of equations is a fundamental skill in algebra that allows us to find the values of variables that satisfy multiple equations simultaneously. One effective method for solving such systems is the subtraction method, which involves subtracting one equation from another to eliminate a variable or simplify the system. The expression provided showcases the process of subtracting two linear equations, leading to simplified results that help us determine the values of the variables involved.

## What Are Systems of Linear Equations?

### Definition and Significance

A system of linear equations consists of two or more equations with two or more variables. The goal is to find the common solution that satisfies all the equations in the system.

- Each equation represents a straight line in the coordinate plane.
- The solution is the point(s) where these lines intersect.
- Methods to solve include substitution, elimination (addition/subtraction), and graphing.

### Example of a System of Equations

Consider the system:

```
3x + 2y = 3
3x + 4y = 17
```

Our goal is to find values of x and y that satisfy both equations simultaneously.

# The Subtraction Method: Step-by-Step

## Why Use Subtraction?

The subtraction method is particularly useful when the coefficients of one variable are the same or opposites in the two equations. By subtracting one equation from the other, we can eliminate a variable and solve for the remaining one more straightforwardly.

## General Procedure

1. Align the equations vertically so that like terms are in columns.
2. Ensure that the coefficients of one variable are the same or opposites.
3. Subtract one equation from the other to eliminate that variable.
4. Solve for the remaining variable.
5. Substitute back to find the other variable.

# Applying Subtraction to the Given Equations

## Given Equations

```
3x + 4y = 17   (Equation 1)
3x + 2y = 3    (Equation 2)
```

We are asked to subtract Equation 2 from Equation 1:

```
(3x + 4y) - (3x + 2y) = 17 - 3
```

## Step-by-Step Solution

**Step 1: Subtract Equations**

- Subtract the left sides: (3x + 4y) - (3x + 2y) = 3x - 3x + 4y - 2y
- Subtract the right sides: 17 - 3 = 14

**Step 2: Simplify the Result**

```
0x + 2y = 14
```

This simplifies to:

- **2y = 14**

**Step 3: Solve for y**

- Divide both sides by 2: y = 14 / 2
- y = 7

**Step 4: Find x**

Now that we know y = 7, substitute this into one of the original equations to solve for x. Let's use Equation 2:

```
3x + 2(7) = 3
```

1. Calculate 2(7): 14
2. Rewrite: 3x + 14 = 3
3. Subtract 14 from both sides: 3x = 3 - 14 = -11
4. Divide both sides by 3: x = -11 / 3 ≈ -3.6667

# Interpreting the Results and Multiple Choice

# Options

## What Do the Given Options Represent?

The options provided are potential solutions or simplified forms related to the variables x and y after performing the subtraction:

- A. $6x = 20$
- B. $-6x = 14$
- C. $2y = 14$
- D. $6y = 20$

## Matching the Results with the Options

From the subtraction process, we obtained:

- **$2y = 14$** (Option C)

This confirms that option C correctly represents the simplified form derived from the subtraction process.

# Understanding the Other Options

## Option A: $6x = 20$

This suggests a different relation involving x, possibly from a different step or equation. To verify, you might need to solve for x using other parts of the original equations or additional steps.

## Option B: $-6x = 14$

This is equivalent to $x = -14/6 = -7/3$, which could be a solution derived under different manipulations or equations.

### Option D: 6y = 20

Dividing both sides by 6 gives $y = 10/3 \approx 3.333$, which does not match the y value obtained directly from the subtraction process.

## Key Takeaways for Solving Equations by Subtraction

1. Always align equations properly before subtracting.
2. Ensure that the coefficients of a variable are the same or opposites for effective elimination.
3. Simplify the resulting equation carefully.
4. Substitute the known variable values back into original equations to find the other variables.
5. Check your solutions by plugging them into the original equations to verify correctness.

## Additional Tips for Solving Systems of Equations

### Use Substitution When:

- One equation is already solved for one variable.
- The equations are easy to manipulate to isolate a variable.

### Use Elimination When:

- The coefficients of a variable are the same or opposites.
- You want to eliminate a variable quickly to solve for the other.

### Graphical Method

Plot both equations on a coordinate plane. The point of intersection is the solution.

## Conclusion: Mastering Subtraction in Solving Equations

Subtracting equations is a powerful technique in algebra that simplifies the process of solving systems. By carefully aligning equations, eliminating variables through subtraction, and solving step-by-step, students can efficiently find solutions to complex systems. Remember, understanding the principles behind each step enhances problem-solving skills and builds a strong foundation for tackling more advanced algebraic challenges.

## Final Notes

In the context of the provided problem, recognizing that **2y = 14** directly matches option C emphasizes the importance of simplifying equations correctly. Always verify your final solutions by substituting back into the original equations to ensure accuracy. Whether you're solving for x, y, or both, mastering the subtraction method will make your algebraic journey smoother and more confident.

## Frequently Asked Questions

### What is the first step to subtract the equations 3x + 4y = 17 and 3x + 2y = 3?

Subtract the second equation from the first to eliminate common terms, resulting in (3x + 4y) - (3x + 2y) = 17 - 3.

### When subtracting the equations 3x + 4y = 17 and 3x + 2y = 3, what does the resulting equation simplify to?

It simplifies to 2y = 14 because 3x - 3x = 0 and 4y - 2y = 2y, with 17 - 3 = 14.

### How can you solve for y after subtracting the equations 3x + 4y = 17 and 3x + 2y = 3?

Divide both sides of 2y = 14 by 2 to find y: y = 14 / 2 = 7.

### What are the possible multiple-choice answers for the value of y based on the subtraction of the equations?

C. 2y = 14

### Why is the option '6x = 20' not correct after subtracting the equations 3x + 4y = 17 and 3x + 2y = 3?

Because subtracting the equations eliminates x, resulting in an equation solely in y, making '6x = 20' incorrect in this context.

### How do you verify the solution y = 7 in the original equations?

Substitute y = 7 into either original equation and check if the resulting x value satisfies both equations.

### What is the correct answer choice for the value of y after subtracting the equations 3x + 4y = 17 and 3x + 2y = 3?

C. 2y = 14

## Additional Resources

Subtract The Equations: An In-Depth Analysis of Solving Simultaneous Equations

In the realm of algebra, the technique of subtracting equations, often referred to as the elimination method, is a fundamental tool used to solve systems of simultaneous linear equations. The problem at hand, which involves the equations 3x + 4y = 17 and 3x + 2y = 3, presents an excellent opportunity to explore this method in detail. By carefully analyzing the process of subtracting these equations, we can uncover the values of the variables involved and understand the underlying principles governing such operations. This article aims to provide a comprehensive review of the subtraction method applied to these equations, elucidate the step-by-step procedures, interpret the resulting options, and discuss their implications in solving algebraic systems.

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## Understanding the Equations and Their Structure

## Presentation of the Equations

The system consists of two linear equations:

1. $3x + 4y = 17$
2. $3x + 2y = 3$

These equations are written in standard form, where each contains variables x and y multiplied by coefficients, and constants on the right side. The coefficients of x are identical (both 3), which has direct implications for the subtraction method.

## Significance of Coefficients and Constants

- The coefficients of the variable x are both 3, indicating that if we subtract the second equation from the first, the x terms will cancel out, simplifying the process.
- The constants 17 and 3 differ significantly, offering a straightforward path to determine the value of y after eliminating x.

Understanding these structures is vital because the elimination method relies heavily on the coefficients of the variables.

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# The Subtraction Method: Step-by-Step Explanation

## Step 1: Write the Equations Clearly

As already provided:

- Equation 1: $3x + 4y = 17$
- Equation 2: $3x + 2y = 3$

## Step 2: Decide Which Equations to Subtract

Since the coefficients of x are identical, subtracting the second from the first is logical:

$(3x + 4y) - (3x + 2y) = 17 - 3$

## Step 3: Perform the Subtraction

Carrying out the subtraction:

- $3x - 3x = 0$
- $4y - 2y = 2y$
- $17 - 3 = 14$

Resulting in:

$2y = 14$

This is a simplified equation with only one variable, y, making it straightforward to solve.

## Step 4: Solve for the Remaining Variable

Dividing both sides by 2:

$y = 14 / 2 = 7$

Thus, y equals 7.

## Step 5: Find the Variable x

Substitute $y = 7$ into either original equation; using the second for simplicity:

$3x + 2(7) = 3$

$3x + 14 = 3$

Subtract 14 from both sides:

$3x = 3 - 14 = -11$

Divide both sides by 3:

$x = -11 / 3 \approx -3.6667$

Result: $x = -11/3$, $y = 7$

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# Interpreting the Multiple Choice Options

The problem presents four options, each representing an equation involving either x or y:

- A. $6x = 20$
- B. $-6x = 14$
- C. $2y = 14$
- D. $6y = 20$

Let's analyze each to understand their relevance and correctness in context.

## Option C: $2y = 14$

This directly matches the result obtained from subtracting the equations:

$2y = 14$

which simplifies to $y = 7$. Since this is precisely the equation derived during the subtraction process, it is correct and aligns with the solution.

## Option B: $-6x = 14$

Let's see if this matches the value of x found earlier:

$x = -11/3$

Multiply both sides by 3 to clear the fraction:

$3x = -11$

Now, multiply both sides by 2:

$6x = -22$

which does not match $-6x = 14$. Therefore, this option is inconsistent with the solution.

## Option A: $6x = 20$

Dividing both sides by 6 gives:

$x = 20 / 6 = 10/3 \approx 3.333$

which does not match the x value obtained earlier. So, this option is incorrect.

## Option D: 6y = 20

Dividing both sides by 6:

y = 20 / 6 ≈ 3.333

which does not match the y value of 7. So, this option is invalid in context.

Summary: The only matching option based on the subtraction method and solution is Option C: 2y = 14.

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# Implications of the Subtraction Method in Solving Systems

## Advantages of the Subtraction (Elimination) Method

- Efficiency: When coefficients of a variable are the same or opposites, subtraction simplifies the process to a single-variable equation.
- Clarity: It reduces the system to manageable, straightforward calculations.
- Versatility: It can be combined with other methods like substitution for complex systems.

## Limitations and Considerations

- Coefficient Matching: The method works most seamlessly when coefficients are identical or negatives of each other.
- Multiple Solutions or No Solution: Certain systems may be inconsistent or have infinitely many solutions, which requires further analysis.
- Variable Elimination Order: Choosing which equations to subtract or add can impact simplicity.

## Application in Real-World Contexts

Systems of equations and their solutions are fundamental in various fields:

- Engineering: Circuit analysis often involves solving simultaneous equations.
- Economics: Equilibrium models require solving multiple constraints.
- Physics: Motion and force systems are modeled with equations requiring elimination techniques.

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# Extended Analysis: Beyond the Basic Subtraction

## Alternative Methods for the Same System

While subtraction is straightforward here, other methods exist:

- Substitution: Solve one equation for a variable and substitute into the other.
- Graphical Solution: Plotting both equations to find the intersection point.
- Matrix Methods: Using determinants or matrices for larger systems.

## Verifying the Solution

Substituting $x = -11/3$ and $y = 7$ into the original equations:

- For $3x + 4y$:

$3(-11/3) + 4(7) = -11 + 28 = 17$ ✓

- For $3x + 2y$:

$3(-11/3) + 2(7) = -11 + 14 = 3$ ✓

Both satisfy their respective equations, confirming the correctness of the solution.

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# Conclusion: The Significance of Subtracting Equations in Algebra

The operation of subtracting equations is more than just a procedural step; it embodies a strategic approach to simplifying complex systems of linear equations. In the specific case of the equations $3x + 4y = 17$ and $3x + 2y = 3$, subtraction reveals an immediate relationship between the variables, leading to a direct solution for y and subsequently x. The analysis of the options provided further underscores the importance of understanding the underlying algebraic manipulations, as only one aligns perfectly with the derived result.

This technique exemplifies the power of algebraic methods in solving real-world problems, highlighting the necessity for students and practitioners to master such fundamental operations. Whether in academic settings or practical applications, the ability to subtract equations confidently and accurately remains a cornerstone of mathematical problem-solving.

In summary, the process of subtracting equations not only simplifies systems but also enhances conceptual understanding, fostering analytical thinking and precision. The case study discussed herein demonstrates its efficacy and relevance, reinforcing its place as a vital tool in the mathematician's toolkit.

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