

Find The Numbers Whose Sum Is 9, If three Times The First Number Increased by Two Times The Second Number equals

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Understanding the Problem: Finding Two Numbers Based on Given Conditions

Mathematics often presents us with intriguing problems that require critical thinking and algebraic skills to solve. One such problem involves identifying two numbers based on their sum and a specific relationship involving multiples of these numbers. The problem statement is: Find the numbers whose sum is 9, if three times the first number increased by two times the second number equals a certain value.

While the problem's wording may seem complex at first glance, breaking it down simplifies the process. Essentially, we are asked to find two numbers, say x and y , satisfying two conditions:

1. Their sum is 9:

$$x + y = 9$$

2. A linear relation involving multiples of these numbers:

$$3x + 2y = \text{some value}$$

In this article, we'll explore how to interpret this problem, formulate the equations, and solve for the unknown numbers using algebraic methods.

Breaking Down the Problem: Clarifying the Conditions

Before diving into calculations, it's essential to understand the problem thoroughly. The key points are:

- The sum of the two numbers x and y is 9:

$$x + y = 9$$

- The relationship involving multiples of the numbers:

$$3x + 2y = \text{\texttt{\text{a specific value}}}$$

However, the problem statement appears incomplete or ambiguous regarding the second condition's exact value. Assuming the phrase "equals" is followed by a specific number, for example, equals 20, the complete problem becomes:

Find the numbers whose sum is 9, if three times the first number increased by two times the second number equals 20.

With this assumption, the problem simplifies to solving the following system:

$$\begin{cases} x + y = 9 \\ 3x + 2y = 20 \end{cases}$$

If the value is different, the same approach applies; just substitute the given value accordingly.

Formulating the Equations

To solve for x and y , we set up the equations based on the conditions:

- Equation 1 (Sum of the numbers):

$$x + y = 9$$

- Equation 2 (Relation involving multiples):

$$3x + 2y = 20$$

These two equations form a system of linear equations, which can be solved using substitution, elimination, or graphical methods.

Solving the System of Equations

Let's explore how to find the values of x and y using the substitution method, which is straightforward.

Step 1: Express one variable in terms of the other

From Equation 1:

$$\begin{aligned} & \backslash[\\ x + y = 9 & \rightarrow y = 9 - x \\ & \backslash] \end{aligned}$$

Step 2: Substitute into the second equation

Replace y in Equation 2:

$$\begin{aligned} & \backslash[\\ 3x + 2(9 - x) &= 20 \\ & \backslash] \end{aligned}$$

Simplify:

$$\begin{aligned} & \backslash[\\ 3x + 18 - 2x &= 20 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ (3x - 2x) + 18 &= 20 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ x + 18 &= 20 \\ & \backslash] \end{aligned}$$

Step 3: Solve for x

$$\begin{aligned} & \backslash[\\ x = 20 - 18 &= 2 \\ & \backslash] \end{aligned}$$

Step 4: Find y

Recall:

$$\begin{aligned} & \backslash[\\ y = 9 - x &= 9 - 2 = 7 \\ & \backslash] \end{aligned}$$

Solution:

$$\boxed{\begin{aligned} x &= 2, \quad y = 7 \end{aligned}}$$

The two numbers are 2 and 7.

Verifying the Solution

Always verify the solutions by plugging them back into the original equations:

- Sum check:

$$2 + 7 = 9 \quad \checkmark$$

- Relation check:

$$3(2) + 2(7) = 6 + 14 = 20 \quad \checkmark$$

Both conditions are satisfied, confirming our solution is correct.

Alternative: Different Values for the Second Condition

If the problem's second condition has a different value, for example, 25, you would set up the system as:

$$\begin{cases} x + y = 9 \\ 3x + 2y = 25 \end{cases}$$

Repeating the same steps:

- Express y:

$$y = 9 - x$$

- Substitute into the second equation:

$$\begin{aligned} & 3x + 2(9 - x) = 25 \end{aligned}$$

$$\begin{aligned} & 3x + 18 - 2x = 25 \end{aligned}$$

$$\begin{aligned} & x + 18 = 25 \end{aligned}$$

$$\begin{aligned} & x = 25 - 18 = 7 \end{aligned}$$

- Find y:

$$\begin{aligned} & y = 9 - 7 = 2 \end{aligned}$$

Solution:

$$\begin{aligned} & x = 7, \quad y = 2 \end{aligned}$$

Verify:

$$\begin{aligned} & 7 + 2 = 9 \quad \checkmark \end{aligned}$$

$$\begin{aligned} & 3(7) + 2(2) = 21 + 4 = 25 \quad \checkmark \end{aligned}$$

Thus, the numbers are 7 and 2.

Applying the Method to Broader Problems

The approach demonstrated can be extended to various problems involving:

- Finding numbers based on their sum and linear relationships
- Solving systems of equations with different coefficients and constants
- Analyzing word problems involving algebraic variables

This method is valuable in fields like algebra, physics, economics, and engineering, where relationships between quantities are modeled with equations.

Common Mistakes to Avoid

When solving such problems, be mindful of:

- Incorrect substitution: Always double-check your substitutions.
- Arithmetic errors: Carefully perform calculations, especially with negatives and fractions.
- Misinterpretation of the problem: Ensure you understand what the equations represent.
- Forgetting to verify the solution: Always substitute back into original equations.

Conclusion: Mastering the Art of Solving Word Problems with Algebra

Finding two numbers based on their sum and a linear relationship is a fundamental skill in algebra. The key steps involve translating word problems into equations, choosing an appropriate method (substitution or elimination), solving systematically, and verifying solutions. Whether the problem involves simple sums or more complex relationships, these techniques provide a solid foundation for tackling a wide range of mathematical challenges.

By practicing these methods with different values and conditions, learners can enhance their problem-solving skills and build confidence in algebraic reasoning. Remember, clarity in setting up equations and careful calculations are the cornerstones of success in such problems.

Keywords: algebra, system of equations, word problems, solving for two numbers, linear equations, substitution method, elimination method, algebraic solutions, math problems.

Frequently Asked Questions

What is the main goal when solving the problem 'Find the numbers whose sum is 9, if three times the first number increased by two times the second number equals'?

The main goal is to find the two numbers that satisfy both the sum condition and the given algebraic equation involving multiples of these numbers.

Which algebraic methods can be used to solve the problem

involving two variables with conditions on their sum and a linear combination?

Methods such as substitution, elimination, or setting up a system of equations can be used to find the values of the two numbers.

How do you set up the equations for this problem?

Let the first number be x and the second be y . Then, you set up equations: $x + y = 9$ and $3x + 2y = k$ (where k is given or to be determined).

Are there multiple solutions to the problem, and if so, how are they found?

Yes, multiple solutions may exist depending on the constraints. They are found by solving the system of equations and checking which solutions satisfy all conditions.

What are common mistakes to avoid when solving for the numbers in this problem?

Common mistakes include mixing up the variables, incorrectly applying the algebraic operations, or forgetting to verify that the solutions satisfy both original conditions.

Can this problem be extended or modified for more complex scenarios?

Yes, it can be extended by adding more variables, considering different relationships between the numbers, or applying additional constraints for more complex problem-solving.

Additional Resources

Find The Numbers Whose Sum Is 9, If Three Times The First Number Increased By Two Times The Second Number Equals

Introduction

Mathematics is often regarded as the universal language, offering tools and frameworks to solve complex problems systematically. Among the foundational concepts are algebraic equations, which serve as powerful tools to decode real-world scenarios. One classic problem involves identifying two numbers based on given conditions about their sum and their linear relationships. The problem statement — "Find the numbers whose sum is 9, if three times the first number increased by two times the second number equals" — exemplifies such an algebraic puzzle.

This problem, while seemingly straightforward, encapsulates essential algebraic principles, including forming equations, solving simultaneous equations, and interpreting solutions within context. As we

delve into this topic, our goal is to understand not only how to find these numbers but also to appreciate the underlying mathematical structures and reasoning processes involved.

Understanding the Problem Statement

Breaking Down the Problem

The core of the problem involves two unknown numbers, which we can denote as:

- x: the first number
- y: the second number

The problem provides two key conditions:

1. Sum condition: The sum of these two numbers is 9:

$$\begin{aligned} &\backslash[\\ &x + y = 9 \\ &\backslash] \end{aligned}$$

2. Linear relation condition: Three times the first number increased by two times the second number equals a certain value. The problem, as stated, appears incomplete, but a typical interpretation (based on common algebraic problems of this nature) is that the sum is equal to this linear expression, or perhaps the problem intends to say:

> Find the numbers where "three times the first number plus two times the second number" equals a certain value, possibly the sum (which is 9).

If we assume the intended condition is:

$$\begin{aligned} &\backslash[\\ &3x + 2y = \text{\texttt{a certain value}} \\ &\backslash] \end{aligned}$$

and that value is the sum, 9, then the second condition is:

$$\begin{aligned} &\backslash[\\ &3x + 2y = 9 \\ &\backslash] \end{aligned}$$

Alternatively, in some versions of similar problems, the second condition might be:

$$\begin{aligned} &\backslash[\\ &3x + 2y = \text{\texttt{a specified constant}} \\ &\backslash] \end{aligned}$$

For the purpose of this analysis, we will assume the problem states:

"Find the two numbers such that their sum is 9, and three times the first number plus two times the

second number also equals 9."

Restating the Conditions

Thus, the two conditions are:

1. $x + y = 9$ (sum condition)
2. $3x + 2y = 9$ (linear relation)

This setup allows us to determine the specific values of x and y that satisfy both equations simultaneously.

Formulating the Mathematical Equations

Equations Derived from the Problem

Based on the assumptions above, the problem reduces to solving the system:

$$\begin{cases} x + y = 9 & \text{(Equation 1)} \\ 3x + 2y = 9 & \text{(Equation 2)} \end{cases}$$

The goal is to find the values of x and y that satisfy both equations.

Significance of These Equations

These equations are linear and form a system of simultaneous equations. Solving such systems allows us to find the exact pair of numbers that meet the criteria. This approach is a fundamental aspect of algebra, illustrating how multiple conditions can be managed and solved within a consistent framework.

Solving the System of Equations

Substitution Method

One effective approach is substitution, where we express one variable in terms of the other and then substitute into the second equation.

Step 1: From Equation 1:

$$x + y = 9 \Rightarrow y = 9 - x$$

Step 2: Substitute $(y = 9 - x)$ into Equation 2:

$$\begin{aligned} & 3x + 2(9 - x) = 9 \end{aligned}$$

Step 3: Simplify and solve for (x) :

$$\begin{aligned} & 3x + 18 - 2x = 9 \end{aligned}$$

$$\begin{aligned} & (3x - 2x) + 18 = 9 \end{aligned}$$

$$\begin{aligned} & x + 18 = 9 \end{aligned}$$

$$\begin{aligned} & x = 9 - 18 \end{aligned}$$

$$\begin{aligned} & x = -9 \end{aligned}$$

Step 4: Find (y) :

$$\begin{aligned} & y = 9 - x = 9 - (-9) = 9 + 9 = 18 \end{aligned}$$

Solution Summary

The pair of numbers satisfying both conditions are:

$$\boxed{\begin{aligned} & x = -9, \quad y = 18 \end{aligned}}$$

Verification:

- Sum check: $(-9 + 18 = 9)$ ✓

- Linear relation check: $(3(-9) + 2(18) = -27 + 36 = 9)$ ✓

Both conditions are satisfied, confirming the solution.

Alternative Methods and Considerations

Graphical Approach

Graphically, the solutions correspond to the intersection point of two lines:

- $y = 9 - x$
- $y = \frac{9 - 3x}{2}$

Plotting these lines reveals the intersection at $(-9, 18)$.

Other Possible Interpretations

If the problem's wording suggests different relations, solutions could vary. For instance, if the second condition was intended differently, such as:

$$3x + 2y = \text{another constant}$$

or the problem involved inequalities or additional constraints, the solution process would adapt accordingly.

Implications of the Solution

The solution indicates that one of the numbers is negative, and the other is positive, which is acceptable in algebraic contexts but might seem counterintuitive in real-world applications where only positive numbers are meaningful.

Limitations and Assumptions

Our analysis assumes the linear relations are as interpreted; variations in the problem statement could lead to different solutions. For instance, if the second relation was "three times the first number increased by two times the second number equals a different constant," the solution set would need reevaluation.

Contextual Significance and Applications

Real-World Relevance

Problems involving finding numbers based on sum and linear relationships are pervasive in various fields:

- Finance: Calculating investments or loans with certain constraints.
- Physics: Determining quantities like force or velocity under specific conditions.
- Statistics: Solving for variables within data constraints.

Educational Value

Such problems are instrumental in teaching students how to:

- Formulate equations from word problems
- Solve systems of equations systematically
- Interpret solutions within context
- Recognize the importance of assumptions and their impact on solutions

Broader Mathematical Concepts

This problem exemplifies key algebraic concepts:

- Linear equations
- Systems of equations
- Substitution and elimination methods
- Graphical solutions

Understanding these concepts fosters critical thinking and problem-solving skills applicable in advanced mathematics and beyond.

Conclusion

The problem of finding two numbers with a sum of 9, under the condition that three times the first plus two times the second equals 9, underscores the power and elegance of algebraic methods. Through systematic formulation and solving of simultaneous equations, we discovered the specific pair: $x = -9$ and $y = 18$.

While the solution may initially seem counterintuitive—especially considering the negative value—it accurately reflects the conditions derived from the problem statement. This exercise highlights the importance of precise problem interpretation, the utility of algebraic techniques, and the broader applicability of such methods across disciplines.

Mathematics, in its essence, is about uncovering relationships and solving problems with clarity and rigor. Problems like this serve as excellent gateways into the world of algebra, fostering analytical thinking that is vital across scientific, technological, and everyday contexts.

Final Remarks

In conclusion, algebraic problem-solving is both an art and a science. By carefully translating words into equations, employing appropriate methods, and critically analyzing solutions, one develops a deeper appreciation for the logical structure underpinning mathematical reasoning. Whether tackling simple puzzles or complex real-world problems, mastering these foundational skills opens pathways to understanding and innovation.

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