A Number Is 5 More Than 3 Times Another Number. The Sum Of The Two Numbers Is 33. As An Equation, This

A Number Is 5 More Than 3 Times Another Number. The Sum Of The Two Numbers Is 33. As An Equation, This problem involves forming and solving algebraic equations to find the two numbers based on the given conditions. This type of problem is common in algebra and helps develop critical thinking and problem-solving skills. In this article, we'll explore how to translate word problems into algebraic equations, solve them step-by-step, and understand the practical applications of such problems.

Understanding the Word Problem

Before jumping into equations, it's essential to understand the problem statement clearly:

- First condition: One number (let's call it x) is 5 more than 3 times another number (let's call it y). Mathematically, this can be written as:

$$
x = 3y + 5
$$

- Second condition: The sum of the two numbers is 33:

$$
x + y = 33
$$

Our goal is to find the values of x and y that satisfy both conditions.

Forming the Equations

Based on the problem description, we can formulate two equations:

Equation 1: Relationship between x and y

$$
x = 3y + 5
$$

This equation states that x is 5 more than three times y.

Equation 2: Sum of the two numbers

$$
x + y = 33
$$

This indicates that the total of x and y is 33.

Solving the System of Equations

Having formulated the equations, the next step is to solve for the unknowns. There are various methods for solving systems of equations, such as substitution, elimination, or graphing. For this problem, substitution is the most straightforward.

Step 1: Substitute the expression for x into the second equation

Since from Equation 1, $x = 3y + 5$, substitute this into the second equation:

$$
(3y + 5) + y = 33
$$

Step 2: Simplify and solve for y

Combine like terms:

$$
3y + y + 5 = 33
$$
$$
4y + 5 = 33
$$

Subtract 5 from both sides:

$$
4y = 33 - 5
$$
$$
4y = 28
$$

Divide both sides by 4:

$$
y = \frac{28}{4} = 7
$$

So, the second number (y) is 7.

Step 3: Find x

Use the value of y in Equation 1:

$$
x = 3(7) + 5 = 21 + 5 = 26
$$

Thus, the first number (x) is 26.

Verification of the Solution

It's important to verify whether the solution satisfies both original conditions.

- Check the first condition: Is x 5 more than 3 times y?

$$
3 \times 7 + 5 = 21 + 5 = 26
$$

Yes, x equals 26, which matches the calculated value.

- Check the second condition: Is the sum of x and y 33?

$$
26 + 7 = 33
$$

Yes, the sum is correct.

Therefore, the solution is:

$$
x = 26, \quad y = 7
$$

Practical Applications of Such Algebraic Problems

Understanding how to formulate and solve equations based on word problems has numerous real-world applications. These include:

- **Financial Planning:** Calculating savings, investments, or loan payments based on given conditions.
- **Business and Economics:** Determining profit margins, costs, and revenues from textual data.
- **Engineering:** Solving for unknown parameters in design problems.
- **Statistics:** Interpreting data and forming models to predict outcomes.

Additional Example: Variations of the Problem

To deepen understanding, consider how similar problems can be structured and solved.

Example 1: Different sum or relationships

Suppose the sum of the two numbers is 50, and one number is 4 more than twice the other.

- Define x and y as before.
- Conditions:

$$
x = 2y + 4
$$
$$
x + y = 50
$$

Solution:

Substitute x into the second equation:

$$
(2y + 4) + y = 50 \Rightarrow 3y + 4 = 50
$$
\[

$$
3y = 46 \Rightarrow y = \frac{46}{3} \approx 15.33
$$

Then:

$$
x = 2 \times \frac{46}{3} + 4 = \frac{92}{3} + 4 = \frac{92}{3} + \frac{12}{3} = \frac{104}{3} \approx 34.67
$$

This example demonstrates that solutions can be fractional when the problem parameters are different.

Example 2: Introducing inequalities

Suppose you're asked to find numbers where one is 5 more than three times the other, and their sum exceeds 30.

- Conditions:

$$
x = 3y + 5
$$
$$
x + y > 30
$$

- Solving for specific values involves similar steps but considering inequalities.

Tips for Solving Algebraic Word Problems

When approaching problems like this, keep in mind the following tips:

1. **Identify variables:** Assign symbols to unknown quantities.

2. **Translate words into equations:** Carefully interpret the language and convert it into algebraic expressions.

3. **Choose an appropriate method:** Use substitution, elimination, or graphing based on the problem.

4. **Verify solutions:** Always check whether your answers satisfy the original conditions.

5. **Practice with varied problems:** Exposure to different scenarios improves problem-solving

skills.

Conclusion

Solving algebraic problems based on word descriptions, such as "A number is 5 more than 3 times another number, and their sum is 33," enhances critical thinking and mathematical reasoning. By translating words into equations, simplifying, and solving systematically, you can efficiently find the unknowns. These skills are vital not only in academics but also in everyday life, where problem-solving and analytical thinking are required. Continue practicing similar problems to strengthen your understanding of algebra and develop confidence in tackling various mathematical challenges.

Frequently Asked Questions

What is the algebraic equation representing the problem where one number is 5 more than 3 times another, and their sum is 33?

Let the other number be x. Then, the first number is 3x + 5. The sum is (3x + 5) + x = 33, so the equation is 4x + 5 = 33.

How do you set up equations for the problem where one number is 5 more than 3 times another, and their sum is 33?

Assign a variable to the unknown, for example, x. Then, the second number is 3x + 5. The sum is x + (3x + 5) = 33, which simplifies to 4x + 5 = 33.

What is the value of the first number if it is 5 more than 3 times another number, and both sum to 33?

First, set the second number as x, so the first number is 3x + 5. The sum is 4x + 5 = 33. Solving for x: 4x = 28, so x = 7. The first number is 3(7) + 5 = 26.

How do you solve for the two numbers in the problem where the sum is 33 and one number is 5 more than 3 times the other?

Set the second number as x; then the first number is 3x + 5. The equation is x + (3x + 5) = 33. Simplify to 4x + 5 = 33, then solve for x: 4x = 28, so x = 7. The first number is 3(7) + 5 = 26.

What are the two numbers in the problem where their sum is 33 and one is 5 more than 3 times the other?

The second number is x = 7, and the first number is 3x + 5 = 26.

Can you verify the solution by substituting the numbers back into the original problem?

Yes. The numbers are 26 and 7. Check: 26 is 5 more than 3 times 7 (37 + 5 = 21 + 5 = 26). Their sum is 26 + 7 = 33, which confirms the solution.

What is the general form of the equation for problems involving 'a number is k more than m times another number' and their sum?

Let the unknown number be x. The other number is m x + k. The sum is x + (m x + k) = total, leading to x + m x + k = total.

How do you find the two numbers if the sum is given and one is expressed as a multiple plus a constant of the other?

Express the unknown as x, write the second as m x + k, set up the equation x + m x + k = total, and then solve for x. Use the value to find the other number.

What is the importance of setting variables in solving word problems involving relationships between numbers?

Setting variables helps translate word problems into algebraic equations, making it easier to systematically solve for unknown quantities.

Additional Resources

A Number Is 5 More Than 3 Times Another Number. The Sum Of The Two Numbers Is 33. As An Equation, This

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Introduction

Mathematics often presents us with intriguing problems that challenge our reasoning and problem-solving skills. Among these, algebraic word problems stand out for their ability to translate real-world scenarios into mathematical equations. One such problem states: "A number is 5 more than 3 times another number. The sum of the two numbers is 33." This seemingly straightforward statement encapsulates a classic algebraic challenge, demanding a systematic approach to decipher the underlying relationships and arrive at the solution.

This article explores this problem in depth, dissecting its components, translating the narrative into precise mathematical expressions, solving the equations, and analyzing the implications. Through this journey, we'll not only solve the problem but also understand the fundamental principles of algebra that make such problems solvable and insightful.

The Core of the Problem: Understanding the Scenario

Before delving into equations, it's crucial to interpret the word problem accurately. The statement involves two unknown numbers, which we'll denote as variables for clarity:

- Let x represent the first number.
- Let y represent the second number.

The problem provides two key pieces of information:

1. A number is 5 more than 3 times another number.
2. The sum of the two numbers is 33.

These clues set the foundation for constructing equations that describe the relationship between x and y.

Analyzing the First Statement

The phrase "A number is 5 more than 3 times another number" suggests a relationship where one number depends on the other through multiplication and addition. Depending on which number the statement refers to, the interpretation could vary.

- If x is the number that is 5 more than 3 times y, then:

$$
x = 3y + 5
$$

- Conversely, if y is the number that is 5 more than 3 times x, then:

$$
y = 3x + 5
$$

In most algebraic problems, the common convention is to assign the first statement to one variable and interpret it accordingly. For clarity, and based on typical problem-solving strategies, we'll assume:

> x is the number that is 5 more than 3 times y.

This leads us to the first equation:

$$
x = 3y + 5
$$

\]

Analyzing the Second Statement

The second piece of information, "The sum of the two numbers is 33", translates directly into:

\[
x + y = 33
\]

This is a straightforward linear equation involving both variables.

Formulating the Mathematical Model

With these interpretations, we now have a system of two equations:

\[
\begin{cases}
x = 3y + 5 \quad \text{(Equation 1)} \\
x + y = 33 \quad \text{(Equation 2)}
\end{cases}
\]

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

Solving the System of Equations

The process of solving involves substitution or elimination. Given that x is already expressed explicitly in terms of y in Equation 1, substitution is a straightforward method.

Step 1: Substituting Equation 1 into Equation 2

Replace x in the second equation with 3y + 5:

\[
(3y + 5) + y = 33
\]

Simplify:

\[
3y + 5 + y = 33
\]
\[
4y + 5 = 33
\]

Step 2: Isolate y

Subtract 5 from both sides:

$$
4y = 33 - 5
$$
$$
4y = 28
$$

Divide both sides by 4:

$$
y = \frac{28}{4} = 7
$$

Step 3: Find x

Now substitute y = 7 back into Equation 1:

$$
x = 3(7) + 5 = 21 + 5 = 26
$$

Final Solution

The two numbers are:

- x = 26
- y = 7

Verification of the Solution

To ensure the solution is consistent with the original problem, verify both conditions:

1. Is x 5 more than 3 times y?

Calculate:

$$
3 \times 7 = 21
$$
$$
21 + 5 = 26
$$

Yes, x = 26 matches this condition.

2. Is the sum of the two numbers 33?

$$
26 + 7 = 33
$$

Yes, the sum is correct.

This confirmation affirms that the solution is correct and consistent.

Alternative Interpretations and Generalizations

While the above solution assumes x is the number that is 5 more than 3 times y, alternative interpretations can be considered:

- If the problem is rephrased such that y is the number that is 5 more than 3 times x, then the equation becomes:

$$
y = 3x + 5
$$

The system then becomes:

$$
\begin{cases}
y = 3x + 5 \\
x + y = 33
\end{cases}
$$

Solving similarly:

$$
x + (3x + 5) = 33 \Rightarrow 4x + 5 = 33 \Rightarrow 4x = 28 \Rightarrow x = 7
$$

Then,

$$
y = 3(7) + 5 = 21 + 5 = 26
$$

The solution swaps the roles of x and y, but the pair (x, y) = (7, 26) satisfies the conditions. The key insight here is that the problem's symmetry allows for both interpretations, emphasizing the importance of understanding context.

Broader Implications and Applications

This problem exemplifies fundamental algebraic principles that extend beyond simple exercises:

- Translating word problems into equations: The ability to interpret language and formalize relationships is crucial in fields like engineering, economics, and data analysis.

- System of equations: Many real-world issues involve multiple variables interconnected through various constraints, requiring simultaneous solutions.

- Variable assignment and interpretation: Recognizing which variable corresponds to which quantity is essential, especially when multiple interpretations are possible.

- Verification: Always verifying solutions against original conditions ensures correctness and deepens understanding.

Challenges and Common Mistakes

Several pitfalls often arise when tackling such problems:

- Misinterpreting the language: Failing to correctly translate words into the right equations can lead to incorrect solutions.

- Assuming variable roles without clarity: Ambiguity in which number is which can cause confusion; explicitly defining variables helps prevent this.

- Arithmetic errors: Simple calculations may trip up students; careful step-by-step solutions help mitigate mistakes.

- Overlooking alternative solutions: Recognizing symmetrical or alternative interpretations broadens understanding.

Extending the Problem: Variations and Complexity

To deepen understanding, consider variations:

- Different relationships: What if the number is 7 more than twice the other number?

- Additional constraints: Suppose one number is even, or both numbers are positive integers.

- Multiple solutions: Explore cases where multiple pairs satisfy the conditions.

- Nonlinear relationships: Introducing quadratic or exponential relationships increases complexity and provides richer problem-solving experiences.

Educational Significance

Problems like this serve as excellent teaching tools because they:

- Reinforce translation skills from language to mathematics.

- Build foundational algebraic skills applicable in advanced mathematics.

- Encourage critical thinking about variable roles and relationships.

- Demonstrate the importance of verification and multiple solution pathways.

Practical Applications in Real Life

Understanding such algebraic relationships is not just academic; they have practical applications:

- Financial planning: Calculating investments based on interest rates and contributions.

- Physics problems: Relating velocity, acceleration, and time.

- Business modeling: Determining profit margins or resource allocations.

- Engineering: Designing systems with interconnected parameters.

Conclusion

The problem of "A number is 5 more than 3 times another number, and their sum is 33" encapsulates core algebraic concepts through a simple yet profound narrative. By translating words into equations, solving systematically, and verifying results, learners develop critical analytical skills. Beyond the immediate solution, such problems foster a deeper appreciation for the logical structure underlying mathematics and its vast applicability across disciplines.

Mastering these techniques enables students and professionals alike to approach complex scenarios with confidence, transforming real-world situations into solvable mathematical models. As this exploration demonstrates, even straightforward word problems can serve as gateways to understanding fundamental principles that underpin much of the quantitative reasoning essential in today's data-driven world.

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