

The Larger Of Two Numbers Is Seven Less Than Three Times The Smaller Number. If The Sum Is 61, Find The

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Understanding how to approach and solve word problems involving relationships between numbers is a fundamental skill in mathematics. These problems often require translating written descriptions into algebraic expressions, setting up equations, and solving those equations systematically. The problem statement "The larger of two numbers is seven less than three times the smaller number. If the sum is 61, find the" is an excellent example of such an algebraic word problem.

In this article, we will explore how to interpret this problem, translate it into a mathematical model, and then solve it step by step. We will also discuss common pitfalls and tips for solving similar problems efficiently. Whether you're a student preparing for exams or someone interested in sharpening your problem-solving skills, this comprehensive guide will help you understand the process thoroughly.

Understanding the Problem Statement

Before jumping into calculations, it's essential to understand what the problem is asking and identify the key information given:

- Relationship between the two numbers: The larger number is seven less than three times the smaller number.
- Sum of the two numbers: The total of the larger and smaller numbers is 61.
- Objective: Find the two numbers based on this information.

Let's analyze these statements carefully.

Breaking Down the Key Components

1. The larger number: Let's denote the smaller number as x .
2. Relationship statement: "The larger of two numbers is seven less than three times the smaller number" can be expressed as:

$$\text{Larger number} = 3x - 7$$

3. Sum of the numbers: The sum of the smaller and larger numbers is 61:

$$x + (3x - 7) = 61$$

Once the algebraic expressions are set, the problem reduces to solving for x , the smaller number.

Formulating the Mathematical Model

Based on the above analysis, the main equation becomes:

$$x + (3x - 7) = 61$$

Simplify this equation:

$$x + 3x - 7 = 61$$

Combine like terms:

$$4x - 7 = 61$$

Now, solve for x :

$$4x = 61 + 7$$

$$4x = 68$$

$$x = \frac{68}{4} = 17$$

So, the smaller number is 17.

Next, find the larger number using the relationship:

$$\text{Larger number} = 3x - 7 = 3 \times 17 - 7 = 51 - 7 = 44$$

Final answer:

- Smaller number: 17
- Larger number: 44

This completes the solution process.

Step-by-Step Solution Summary

To summarize, here are the steps taken to solve the problem:

1. Assign variables to the unknowns (e.g., x for the smaller number).
2. Translate the problem statement into an algebraic equation.
3. Simplify and solve the algebraic equation.
4. Use the solution for x to find the other number.
5. Verify the solution by checking the conditions given in the problem.

Let's verify:

- The larger number is 44.
- The smaller number is 17.
- Sum: $17 + 44 = 61$, which matches the given total.
- Relationship check: $3 \times 17 - 7 = 51 - 7 = 44$, which matches the larger number.

Since all conditions are satisfied, the solution is correct.

Additional Tips for Solving Similar Word Problems

Solving algebraic word problems requires a strategic approach. Here are some tips:

1. Read Carefully and Highlight Key Information

- Identify the quantities involved.
- Note relationships and constraints.
- Highlight or underline important data points.

2. Assign Clear Variables

- Use simple, memorable variables like x and y .
- Clearly define what each variable represents.

3. Translate Words into Equations

- Convert descriptive relationships into algebraic expressions.
- Be precise with signs (+, -).

4. Set Up the Main Equation

- Combine all information into a single equation.
- Keep the equation as simple as possible.

5. Solve Step-by-Step

- Simplify algebraic expressions.
- Perform inverse operations carefully.
- Check your solution at each step.

6. Verify the Solution

- Substitute the found values back into the original conditions.
- Confirm that all conditions are satisfied.

Common Mistakes to Avoid

- Mixing up the variables or their meanings.
- Forgetting to translate all parts of the problem into equations.
- Making algebraic errors like incorrect simplification.
- Forgetting to verify the solution with the original conditions.

Practice Problems for Mastery

To reinforce your understanding, try solving these similar problems:

1. The sum of two numbers is 50. The larger number is twice the smaller. Find the numbers.
2. A number is 4 less than twice another number. Their sum is 30. Find the numbers.
3. The difference between two numbers is 8. The larger number is three times the smaller. Find the numbers.

Working through these problems using the same systematic approach will strengthen your problem-solving skills.

Conclusion

Solving word problems involving relationships between numbers requires careful reading, proper translation into algebraic equations, and systematic solving. In the example discussed, "The larger of two numbers is seven less than three times the smaller number. If the sum is 61, find the numbers," we demonstrated how to set up the problem, solve the equations, and verify the solution.

Mastering these techniques will not only help you excel in mathematics exams but also develop critical thinking and analytical skills useful in many real-world scenarios. Remember always to approach such problems methodically, verify your answers, and practice regularly to build confidence and proficiency.

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Frequently Asked Questions

What are the steps to find the larger and smaller numbers based on the given conditions?

First, assign variables to the numbers (e.g., x for the smaller and y for the larger). Write equations based on the problem: $y = 3x - 7$ and $x + y = 61$. Then, substitute y in the second equation and solve for x , followed by finding y .

How do you set up the equations from the problem statement?

Let the smaller number be x . The larger number is seven less than three times the smaller, so $y = 3x - 7$. The sum of the two numbers is 61, so $x + y = 61$. These form the system of equations to solve.

What is the value of the smaller number in this problem?

By substituting $y = 3x - 7$ into $x + y = 61$, solving for x gives $x = 22$. Therefore, the smaller number is 22.

How do you find the larger number once the smaller number is known?

Use the equation $y = 3x - 7$. Substituting $x = 22$, $y = 3(22) - 7 = 66 - 7 = 59$. So, the larger number is 59.

What is the complete solution for the two numbers based on the problem?

The smaller number is 22 and the larger number is 59. Their sum is $22 + 59 = 81$, which matches the sum given in the problem, confirming the solution.

Additional Resources

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If The Sum Is 61, Find The

In the realm of algebra and problem-solving, word problems serve as a bridge between real-life scenarios and mathematical concepts. They challenge us to translate verbal descriptions into equations that can be systematically analyzed and solved. Today, we explore a classic problem that involves two numbers, their relationship, and their sum. The core statement is: The larger of two numbers is seven less than three times the smaller number. If the sum of these two numbers is 61, find the numbers. This problem not only reinforces algebraic techniques but also highlights the importance of careful interpretation and systematic approach to solutions.

Understanding the Problem Statement

Before jumping into calculations, it's essential to dissect the problem statement carefully. This involves identifying what is being asked, the variables involved, and translating the verbal clues into mathematical expressions.

Key elements of the problem:

- There are two numbers, which we can refer to as smaller number and larger number.
- The larger number has a specific relationship to the smaller number: it is seven less than three times the smaller number.
- The sum of the two numbers is 61.
- The goal: Find the two numbers.

Breaking down the statement:

1. Relationship between the two numbers:
 - Larger number = $3 \times \text{smaller number} - 7$
2. Sum of the numbers:
 - Larger number + smaller number = 61

Understanding these components is crucial, as they form the basis for establishing the equations needed to find the solution.

Defining Variables and Formulating Equations

The next step involves assigning variables to the unknown quantities and translating the words into algebraic expressions.

Step 1: Assign variables

- Let x = the smaller number.

- Let L = the larger number.

Step 2: Express the relationship

Based on the problem:

$$- L = 3x - 7$$

Step 3: Write the sum equation

Since the sum of the two numbers is 61:

$$- L + x = 61$$

Step 4: Substitute the expression for L

Replace L with $3x - 7$ in the sum equation:

$$- (3x - 7) + x = 61$$

This simplifies to:

$$- 3x - 7 + x = 61$$

Solving the Equations Step-by-Step

Now, with a single equation in one variable, we can proceed to solve for x .

Step 1: Combine like terms

$$\begin{aligned} - 3x + x - 7 &= 61 \\ - (3x + x) - 7 &= 61 \\ - 4x - 7 &= 61 \end{aligned}$$

Step 2: Isolate the variable

Add 7 to both sides:

$$\begin{aligned} - 4x &= 61 + 7 \\ - 4x &= 68 \end{aligned}$$

Divide both sides by 4:

$$\begin{aligned} - x &= 68 / 4 \\ - x &= 17 \end{aligned}$$

Step 3: Find the larger number

Recall:

$$- L = 3x - 7$$

Substitute $x = 17$:

$$- L = 3(17) - 7 = 51 - 7 = 44$$

Result:

- Smaller number = 17
- Larger number = 44

Verifying the Solution

Validation is a vital step to ensure the solution aligns with the original problem statement.

Check the sum:

- $17 + 44 = 61$

Check the relationship:

- Is the larger number seven less than three times the smaller?

Calculate three times the smaller:

- $3 \times 17 = 51$

Subtract 7:

- $51 - 7 = 44$

This matches the larger number, confirming the relationship holds true.

Conclusion:

The numbers 17 and 44 satisfy all conditions: their sum is 61, and the larger is seven less than three times the smaller.

Interpreting the Results and Broader Implications

This problem exemplifies the power of algebraic modeling in solving real-world-like problems. The process involves:

- Recognizing the key relationships expressed verbally.
- Assigning variables to unknown quantities.
- Translating relationships into equations.
- Using algebraic techniques to solve equations systematically.
- Validating solutions against original conditions.

Applications of such problems extend beyond pure mathematics:

- Financial calculations: Estimating investments, loans, or budgets based on relationships.
- Engineering: Designing systems where component sizes relate proportionally.

- Science: Calculating quantities where variables are interconnected through specific relationships.

Mastering these techniques enhances critical thinking, promotes logical reasoning, and builds a foundation for tackling more complex scenarios.

Alternative Approaches and Common Mistakes

While the approach outlined is straightforward, it's instructive to consider alternative methods and common pitfalls.

Alternative methods:

- Graphical solution: Plotting the equations to find the intersection point.
- Systematic elimination: If multiple equations exist, solving via substitution or elimination methods.

Common mistakes to avoid:

- Misinterpreting relationships: For example, confusing the larger number's relationship to the smaller one.
- Incorrect substitution: Forgetting to replace variables accurately.
- Arithmetic errors: Particularly in simplification steps or division.
- Ignoring extraneous solutions: Ensuring that solutions make sense within the context (e.g., negative numbers if the problem implies positive integers).

Being attentive to these aspects ensures accurate problem-solving and enhances one's mathematical rigor.

Conclusion: The Art of Mathematical Problem Solving

The problem of finding two numbers based on their sum and specific relational properties demonstrates the elegance and utility of algebra. By carefully dissecting the problem, assigning variables, translating words into equations, and systematically solving, we unlock precise solutions that deepen our understanding of the relationships between quantities.

This process underscores a fundamental truth in mathematics: complex problems often boil down to manageable, logical steps. Whether applied in academics, industry, or everyday decision-making, mastering these techniques empowers us to approach challenges with confidence and clarity.

In sum, the numbers 17 and 44 are the solutions to the problem: the smaller number is 17, and the larger is 44, satisfying all the given conditions. Through diligent analysis and methodical solving, we see how algebra transforms words into precise, actionable solutions—an essential skill for learners and professionals alike.

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