

The Sum Of Three Number Is 99. The Second Number Is 9 More Than The First The Third Number Is 4 Times

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Understanding how to solve algebraic word problems involving multiple variables is a fundamental skill in mathematics. One such intriguing problem involves finding three numbers based on given relationships and their sum. This article explores the problem statement: "The sum of three numbers is 99. The second number is 9 more than the first. The third number is 4 times the first." We will delve into how to approach such problems, formulate equations, and find solutions step-by-step. Whether you're a student looking to improve your algebra skills or a math enthusiast interested in problem-solving techniques, this comprehensive guide will help you grasp the concepts thoroughly.

Understanding the Problem Statement

Before jumping into solving the problem, it's essential to understand what is being asked and identify the key information provided:

- The sum of three numbers is 99.
- The second number is 9 more than the first number.
- The third number is 4 times the first number.

This problem involves three unknowns, typically labeled as variables, and relationships between them expressed algebraically.

Defining Variables and Setting Up Equations

The first step in solving such problems is to assign variables to the unknown quantities. Let's define:

- Let x be the first number.
- Since the second number is 9 more than the first, let the second number be $x + 9$.
- The third number is 4 times the first number, so let the third number be $4x$.

Now, based on the problem, the sum of these three numbers is 99. This gives us the primary equation:

$$[x + (x + 9) + 4x = 99]$$

Formulating the Mathematical Equation

By simplifying the above equation, we can find the value of x:

$$\begin{aligned} & x + x + 9 + 4x = 99 \\ & (1x + 1x + 4x) + 9 = 99 \\ & 6x + 9 = 99 \end{aligned}$$

Now, we will solve for x.

Solving for the First Number

Subtract 9 from both sides:

$$\begin{aligned} & 6x + 9 - 9 = 99 - 9 \\ & 6x = 90 \end{aligned}$$

Divide both sides by 6:

$$x = \frac{90}{6} = 15$$

With x = 15, we can now find the other two numbers.

Calculating the Other Two Numbers

- Second number: since it's 9 more than the first,

$$x + 9 = 15 + 9 = 24$$

- Third number: which is 4 times the first,

$$\begin{aligned} &4x = 4 \times 15 = 60 \end{aligned}$$

Summary of the three numbers:

Number	Calculation	Result
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First number	x	15
Second number	$x + 9$	24
Third number	$4x$	60

Verifying the Solution

It's crucial to verify whether these numbers satisfy the original problem conditions.

- Sum check:

$$\begin{aligned} &15 + 24 + 60 = 99 \end{aligned}$$

- Relationship checks:

- Second number is 9 more than the first?

$$\begin{aligned} &24 - 15 = 9 \quad \checkmark \end{aligned}$$

- Third number is 4 times the first?

$$\begin{aligned} &4 \times 15 = 60 \quad \checkmark \end{aligned}$$

Since all conditions are satisfied, the solution is correct.

Practical Applications of Such Problems

Solving problems involving sums and relationships between numbers is not just an academic exercise; it has real-world applications in various fields:

Financial Planning and Budgeting

- Calculating allocations where certain expenses are proportional or have fixed differences.

Engineering and Physics

- Determining quantities that relate through linear or multiplicative relationships.

Data Analysis

- Modeling datasets with known relationships among variables.

Common Mistakes and Tips for Solving Similar Problems

While solving algebraic problems involving multiple variables, some common pitfalls include:

- **Incorrect Variable Assignments:** Always clearly define variables based on problem statements.
- **Misinterpreting Relationships:** Carefully read the problem to understand whether relationships are additive, multiplicative, or involves other operations.
- **Arithmetic Errors:** Double-check calculations, especially during simplification and solving equations.
- **Ignoring Constraints:** Ensure solutions satisfy all conditions, not just the primary sum or relationships.

Tips to avoid these mistakes:

- Write down all known relationships explicitly.
- Verify each step.
- Substitute the found values back into the original conditions.

Other Similar Problems and Practice Exercises

To strengthen your understanding, try solving the following problems:

1. The sum of three numbers is 120. The second is 12 more than the first, and the third is 3 times the first. Find the three numbers.
2. Three numbers add up to 150. The second is 10 less than the first, and the third is twice the first. Determine the numbers.
3. The sum of three positive integers is 90. The second is 7 more than the first, and the third is 5 times the first. Find the numbers.

Practice Tip: For each problem, define variables, set up equations based on relationships, and solve systematically.

Conclusion

Solving algebraic problems involving multiple numbers and their relationships requires a clear understanding of variables, setting up correct equations, and methodical solving. The problem where the sum of three numbers is 99, with the second being 9 more than the first and the third being four times the first, exemplifies how to approach such tasks. By defining variables, forming equations, simplifying, and verifying solutions, you can accurately find the unknowns. Mastery of these techniques enhances your problem-solving skills and prepares you for more complex mathematical challenges, whether in academics or real-world applications.

Additional Resources for Learning Algebra

- Online Algebra Courses: Websites like Khan Academy and Coursera offer free courses on algebra fundamentals.
- Math Practice Websites: Platforms such as IXL and Mathway provide practice problems and step-by-step solutions.
- Algebra Textbooks: Standard textbooks like "Elementary Algebra" by Harold R. Jacobs provide comprehensive explanations and exercises.

By practicing such problems regularly and understanding the underlying concepts, you will develop confidence and proficiency in algebra.

Remember: Mathematics is about logical thinking and systematic problem-solving. Keep practicing, and you'll find that complex problems become manageable with patience and methodical approaches.

Frequently Asked Questions

What are the three numbers if their sum is 99, the second is 9 more than the first, and the third is 4 times the first?

Let the first number be x . Then, the second is $x + 9$, and the third is $4x$. The sum equation is $x + (x + 9) + 4x = 99$. Simplifying: $6x + 9 = 99$, so $6x = 90$, thus $x = 15$. The second number is $15 + 9 = 24$, and the third is $4 \times 15 = 60$. So, the numbers are 15, 24, and 60.

How do you set up an algebraic equation based on the problem where the sum of three numbers is 99, with specific relationships between them?

Assign a variable to the first number (e.g., x). Then, express the second as $x + 9$ and the third as $4x$. The equation becomes $x + (x + 9) + 4x = 99$, which can be simplified and solved for x to find all three numbers.

If the total of three numbers is 99, and the second number is 9 more than the first, how do you find the third number?

First, determine the first number (x) using the given relationships and sum. Once x is found, the third number is 4 times the first, so $4x$. Substitute the value of x to find the third number.

Can you explain why the third number is 4 times the first in this problem?

The problem states 'The Third Number Is 4 Times' the first. This means if the first number is x , then the third number equals 4 times x , or $4x$, establishing a direct proportional relationship.

What is the importance of setting variables when solving this type of problem?

Using variables helps translate word problems into algebraic equations, making it easier to solve for unknowns systematically and accurately.

How do you verify the solution once you find the three numbers in this problem?

Substitute the found numbers back into the original conditions: check if their sum is 99, if the second is 9 more than the first, and if the third is 4 times the first. If all conditions hold true, the solution is correct.

What common mistake should be avoided when solving for the three numbers in this problem?

A common mistake is incorrectly setting up the equations or mixing up the relationships; always double-check that the expressions for the second and third numbers correctly reflect the problem's conditions before solving.

Additional Resources

The Sum Of Three Numbers Is 99. The Second Number Is 9 More Than The First. The Third Number Is 4 Times — this problem statement encapsulates a classic algebraic scenario that challenges learners to develop their understanding of variables, equations, and problem-solving strategies. Such a problem not only tests mathematical skills but also encourages logical reasoning, making it an essential component of foundational mathematics education. In this comprehensive review, we will delve into the problem's structure, explore various approaches to solving it, discuss its pedagogical value, and analyze its broader implications in both educational and real-world contexts.

Understanding the Problem: A Breakdown

The problem provides three key pieces of information:

1. The sum of three numbers is 99.
2. The second number is 9 more than the first.
3. The third number is 4 times the first.

This setup introduces variables, typically denoted as x , y , and z , to represent the three numbers. The goal is to determine the specific values of these numbers based on the given conditions.

Formulating the Equations

To approach such problems systematically, mathematicians and students convert verbal

statements into algebraic equations:

- Let the first number be x .
- The second number then is $x + 9$.
- The third number is $4x$.

The sum condition translates into:

$$x + (x + 9) + 4x = 99$$

Simplifying:

$$\begin{aligned} x + x + 9 + 4x &= 99 \\ (x + x + 4x) + 9 &= 99 \\ 6x + 9 &= 99 \end{aligned}$$

From this, solving for x :

$$\begin{aligned} 6x &= 99 - 9 \\ 6x &= 90 \\ x &= 15 \end{aligned}$$

Once x is known, the other two numbers follow directly:

- Second number: $15 + 9 = 24$
- Third number: $4 \times 15 = 60$

Thus, the three numbers are 15, 24, and 60.

Approaches to Solving the Problem

While the algebraic method outlined above is straightforward for most, several alternative approaches exist, each with its own merits and limitations.

1. Algebraic Method

This is the most direct method, involving:

- Assigning variables
- Writing equations based on conditions
- Solving for variables

Pros:

- Clear and systematic
- Easily scalable to more complex problems

- Reinforces understanding of algebraic principles

Cons:

- Requires familiarity with algebra
- Might be intimidating for beginners

2. Logical or Guess-and-Check Method

Students could attempt to guess values based on the total sum and conditions, adjusting guesses iteratively:

- Start with a plausible value for the first number
- Calculate the second and third based on conditions
- Check if their sum is 99
- Adjust guesses accordingly

Pros:

- Useful for quick estimations
- Develops intuition

Cons:

- Not efficient for larger or more complex problems
- Can be time-consuming and prone to errors

3. Graphical Method

Plotting the equations or inequalities on a coordinate plane to find the intersection points:

- Graph the equations derived from the problem
- Find where the conditions intersect

Pros:

- Visual understanding of relationships
- Useful in systems of equations

Cons:

- Less precise unless using graphing technology
- Overkill for simple problems

Educational Significance and Pedagogical Value

Problems like this serve as excellent teaching tools for several reasons:

Developing Algebraic Thinking

By translating verbal descriptions into algebraic equations, students practice critical skills that underpin higher mathematics. This problem encourages:

- Understanding of variables
- Formulating equations from word problems
- Solving linear equations

Enhancing Problem-Solving Skills

Students learn to approach problems systematically, check their work, and verify solutions. Such exercises foster logical reasoning and analytical skills.

Building Confidence

Early success with straightforward problems boosts confidence, motivating students to tackle more complex tasks.

Application in Real-World Contexts

Problems involving sums, relationships between quantities, and multiple variables mirror real-life scenarios such as budgeting, resource allocation, and planning.

Broader Implications and Applications

While at first glance, the problem appears purely academic, its principles extend far beyond the classroom.

Financial Planning

Understanding relationships among quantities helps in budgeting and investment decisions, where total amounts depend on individual contributions and multipliers.

Engineering and Science

Designing systems often involves balancing multiple variables to meet specific criteria, akin to solving for unknowns based on given constraints.

Data Analysis

Interpreting data sets and establishing relationships among variables require similar algebraic reasoning.

Limitations and Challenges

Despite its usefulness, the problem presents certain limitations:

- Simplistic Assumptions: Assumes the numbers are integers, which may not always be the case in real-world scenarios.
- Limited Context: Lacks real-life context, which might reduce engagement for some learners.
- Potential for Misinterpretation: Ambiguity in wording can sometimes lead to misunderstandings if not clarified.

Features and Enhancements for Better Learning

To maximize educational impact, educators can incorporate the following features:

- Visualization Tools: Using graphs and diagrams to illustrate relationships
- Interactive Activities: Hands-on exercises where students manipulate variables
- Real-Life Scenarios: Framing problems within contexts like shopping, construction, or resource management
- Progressive Complexity: Starting with simpler problems and gradually increasing difficulty

Conclusion

The problem statement — The sum of three numbers is 99. The second number is 9 more than the first. The third number is 4 times — exemplifies core mathematical principles that are foundational for both education and practical applications. Its straightforward algebraic solution demonstrates how verbal descriptions can be effectively translated into

equations, fostering critical thinking and problem-solving skills. While simple in structure, such problems serve as gateways to understanding more complex systems, highlighting the importance of algebra in everyday life.

By exploring various approaches, understanding its pedagogical value, and recognizing its broader applications, educators and learners can appreciate the significance of this classic problem. It encourages logical reasoning, analytical thinking, and the ability to interpret real-world data — skills that are invaluable across numerous disciplines and professions. Ultimately, mastering such problems builds a solid foundation for more advanced mathematical challenges, promoting a lifelong appreciation for the power and utility of algebra.

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