

The Sum Of Two Numbers Is 39 And The Difference Is 15. What Are The Numbers?Smaller Number: Larger Number:

The Sum Of Two Numbers Is 39 And The Difference Is 15. What Are The Numbers?Smaller Number:
Larger Number:

Understanding how to find two numbers based on their sum and difference is a fundamental aspect of algebra. This problem not only tests your basic math skills but also helps develop logical thinking and problem-solving abilities. In this comprehensive guide, we'll explore the process of determining the two numbers where their sum is 39 and their difference is 15. We'll break down the problem step-by-step, provide detailed explanations, and offer tips for solving similar problems efficiently.

Introduction to the Problem

The problem states:

- The sum of two numbers is 39
- The difference between the two numbers is 15

It asks us to find:

- The smaller number
- The larger number

This type of problem involves solving simultaneous equations, often referred to as systems of equations. Let's understand the key concepts involved.

Understanding the Basic Concepts

Before diving into solution strategies, it's essential to understand some basic algebraic concepts:

Variables

- Variables are symbols used to represent unknown quantities—in this case, the two numbers.
- Typically, we assign:
- x = Smaller number
- y = Larger number

System of Equations

- Two equations involving the same variables, which can be solved simultaneously.
- For this problem:
- Equation 1 (Sum): $x + y = 39$
- Equation 2 (Difference): $y - x = 15$

Formulating the Equations

Based on the problem statement, we can write:

1. Sum Equation:

$$\begin{aligned} & \backslash [\\ & x + y = 39 \\ & \backslash] \end{aligned}$$

2. Difference Equation:

$$\begin{aligned} & \backslash [\\ & y - x = 15 \\ & \backslash] \end{aligned}$$

Note: Since the problem specifies the smaller and larger numbers, the difference is positive, with the larger number minus the smaller number.

Solving the System of Equations

There are multiple methods to solve such systems:

- Substitution Method
- Elimination Method
- Graphical Method

In this guide, we'll focus on the substitution and elimination methods for clarity.

Method 1: Substitution

Step 1: Express one variable in terms of the other from one equation.

From the sum equation:

$$\begin{aligned} & \backslash [\\ & x + y = 39 \end{aligned}$$

Express y:

$$\begin{aligned} & \backslash [\\ & y = 39 - x \end{aligned}$$

Step 2: Substitute this into the second equation:

$$\begin{aligned} & \backslash [\\ & (39 - x) - x = 15 \end{aligned}$$

Simplify:

$$\begin{aligned} & \backslash [\\ & 39 - x - x = 15 \\ & \backslash] \\ & \backslash [\\ & 39 - 2x = 15 \\ & \backslash] \end{aligned}$$

Step 3: Solve for x:

$$\begin{aligned} & \backslash [\\ & -2x = 15 - 39 \\ & \backslash] \\ & \backslash [\\ & -2x = -24 \end{aligned}$$

$$\backslash]$$

$$\backslash[$$

$$x = \frac{-24}{-2} = 12$$

$$\backslash]$$

Step 4: Find y using the value of x:

$$\backslash[$$

$$y = 39 - x = 39 - 12 = 27$$

$$\backslash]$$

Result: The smaller number is 12, and the larger number is 27.

Method 2: Elimination

Step 1: Write the equations:

$$\backslash[$$

$$x + y = 39 \quad \text{(Equation 1)}$$

$$\backslash]$$

$$\backslash[$$

$$y - x = 15 \quad \text{(Equation 2)}$$

$$\backslash]$$

Step 2: Add the two equations to eliminate x:

$$\backslash[$$

$$(x + y) + (y - x) = 39 + 15$$

$$\backslash]$$

$$\backslash[$$

$$x + y + y - x = 54$$

$$\backslash]$$

$$\backslash[$$

$$2y = 54$$

$$\backslash]$$

$$\backslash[$$

$$y = \frac{54}{2} = 27$$

$$\backslash]$$

Step 3: Substitute y back into Equation 1:

$$\backslash[$$

$$x + 27 = 39$$

$$\backslash]$$

$$\backslash[$$

$$x = 39 - 27 = 12$$

$$\backslash]$$

Result: Again, the smaller number is 12, and the larger number is 27.

Verifying the Solution

It's important to verify that the numbers satisfy both conditions:

- Sum: $12 + 27 = 39$ ✓
- Difference: $27 - 12 = 15$ ✓

Both conditions are satisfied, confirming the correctness of our solution.

Understanding the Solution in Context

The problem is a classic example of solving simultaneous equations, which is a fundamental skill in algebra. Recognizing the structure of the problem—sum and difference—and translating it into equations allows for straightforward solutions.

This problem also highlights:

- The importance of defining variables clearly.
- Multiple methods leading to the same solution.
- The necessity of verifying solutions to avoid mistakes.

Additional Tips for Similar Problems

To enhance your problem-solving skills, consider these tips:

1. Always define variables clearly

- Assign variables to the unknown quantities.
- Use consistent notation.

2. Write down what is given explicitly as equations

- Sum, difference, product, or quotient conditions.

3. Choose the most suitable method

- Substitution for easy isolation.
- Elimination for straightforward addition/subtraction.

4. Verify your solutions

- Substitute back into original equations.
- Confirm both conditions are satisfied.

5. Practice with varied problems

- Problems involving ratios, averages, or percentages.
- Real-world scenarios like profit/loss calculations, distance, and time.

Common Variations of the Problem

Understanding how to adapt your approach to different versions of similar problems is valuable. Here are some common variations:

1. Find two numbers where their sum, difference, product, or quotient is **known**.

2. Problems involving three or more numbers with similar relationships.

3. Word problems involving real-world contexts, such as ages, distances, or financial calculations.

Summary of the Solution

To summarize:

- The two numbers with a sum of 39 and a difference of 15 are 12 and 27.
- The smaller number is 12.
- The larger number is 27.
- Both numbers satisfy the original conditions, confirmed through substitution and verification.

Final Thoughts

Mastering the process of solving for two numbers based on sum and difference enhances your algebraic problem-solving skills. Remember to:

- Clearly define your variables.
- Write accurate equations based on the problem statement.
- Choose the most efficient solving method.
- Always verify your solutions.

Practicing similar problems will improve your confidence and ability to tackle more complex equations. Whether you're a student preparing for exams or someone interested in sharpening your math skills, understanding these fundamental techniques is essential.

Frequently Asked Questions (FAQs)

Q1: What if the sum and difference are negative?

- The process remains the same; just pay attention to the signs and interpret the results accordingly.

Q2: Can the numbers be the same?

- Only if the difference is zero. In this case, since the difference is 15, the numbers cannot be the same.

Q3: How do I handle problems with more complex relationships?

- Break down the problem into simpler equations, and consider substitution or elimination methods, or graphing if necessary.

Q4: Is there a quick way to check my answer?

- Yes, substitute your numbers into the original conditions (sum and difference) to verify.

In conclusion, solving for two numbers when given their sum and difference involves setting up the appropriate equations and applying algebraic methods. With practice, you'll be able to solve such problems swiftly and accurately, enhancing your overall mathematical proficiency.

Frequently Asked Questions

What are the two numbers if their sum is 39 and their difference is 15?

The smaller number is 12 and the larger number is 27.

How do you find two numbers given their sum and difference?

Set up two equations based on the sum and difference, then solve simultaneously—for example, if sum is 39 and difference is 15, you can add and subtract these equations to find each number.

Can you explain the step-by-step method to find the two numbers in this problem?

Yes. Let the smaller number be x and the larger be y . Then, $x + y = 39$ and $y - x = 15$. Adding these two equations gives $2y = 54$, so $y = 27$. Substituting y back into the first equation, $x + 27 = 39$, gives $x = 12$.

What are the two numbers if the smaller is 12 and the larger is 27?

The two numbers are 12 and 27.

Is there more than one pair of numbers with a sum of 39 and difference of 15?

No, the pair of numbers is unique: 12 and 27.

How can these types of problems be generalized for other sums and differences?

You can set up similar equations based on the given sum and difference, then solve for the two numbers using algebraic methods applicable to any such problem.

What is the importance of understanding these types of algebraic problems?

They help develop problem-solving skills, understanding of equations, and algebraic reasoning, which are fundamental in mathematics.

Can the same method be applied if the numbers are negative?

Yes, the same algebraic approach applies; however, you need to consider the possibility of negative solutions based on the context of the problem.

Additional Resources

The Sum Of Two Numbers Is 39 And The Difference Is 15. What Are The Numbers? Smaller Number: Larger Number: is a classic problem in algebra that challenges students and math enthusiasts to apply fundamental concepts of equations, variables, and problem-solving strategies. Such problems not only reinforce basic algebraic skills but also promote critical thinking and logical reasoning. Whether you're a student preparing for exams, a teacher designing lesson plans, or a curious individual interested in mathematical puzzles, understanding how to approach and solve this problem is essential. In this article,

we'll explore a comprehensive guide to solving this problem, breaking down each step in detail, and providing additional insights into related concepts.

Understanding the Problem

Before diving into the solution, it's crucial to comprehend what the problem is asking. The problem states:

> The sum of two numbers is 39, and the difference is 15. What are the smaller and larger numbers?

Key points to note:

- Two numbers: Let's denote them as variables.
- Sum is 39: The total when added equals 39.
- Difference is 15: When subtracted, the result is 15.
- Identify the smaller and larger numbers: The problem specifies which is which.

This is a straightforward algebraic problem involving two equations with two unknowns, which makes it an ideal candidate for the application of systems of equations.

Step 1: Assign Variables

Let's assign variables to the two numbers:

- Let x be the smaller number.
- Let y be the larger number.

Since we're asked to find the smaller and larger numbers explicitly, these variables will help us model the problem mathematically.

Step 2: Write the Equations

Based on the problem, we derive two equations:

1. Sum Equation:

$$x + y = 39$$

2. Difference Equation:

$$y - x = 15$$

Note:

- The sum equation comes directly from "The sum of two numbers is 39."
- The difference equation is derived from "The difference is 15," assuming that the larger number minus the smaller number equals 15.

Step 3: Solve the System of Equations

Now, we have a system:

$$\begin{cases} x + y = 39 \\ y - x = 15 \end{cases}$$

Method 1: Addition Method

Add the two equations to eliminate one variable:

$$(x + y) + (y - x) = 39 + 15$$

Simplify:

$$x + y + y - x = 54$$

$$(x - x) + (y + y) = 54$$

$$0 + 2y = 54$$

$$2y = 54$$

$$\backslash[$$

$$y = \frac{54}{2} = 27$$

$$\backslash]$$

Now, substitute $y = 27$ into the first equation:

$$\backslash[$$

$$x + 27 = 39$$

$$\backslash]$$

$$\backslash[$$

$$x = 39 - 27 = 12$$

$$\backslash]$$

Method 2: Substitution Method (for completeness)

From the second equation:

$$\backslash[$$

$$y = x + 15$$

$$\backslash]$$

Substitute into the first equation:

$$\backslash[$$

$$x + (x + 15) = 39$$

$$\backslash]$$

$$\backslash[$$

$$2x + 15 = 39$$

$$\backslash]$$

$$\backslash[$$

$$2x = 39 - 15 = 24$$

$$\backslash]$$

$$\backslash[$$

$$x = \frac{24}{2} = 12$$

$$\backslash]$$

Then:

$$\backslash[$$

$$y = 12 + 15 = 27$$

\]

Both methods lead to the same solution: $x = 12$, $y = 27$.

Step 4: Verify the Solution

It's always good practice to verify the solution:

- Sum: $12 + 27 = 39$ ✓

- Difference: $27 - 12 = 15$ ✓

The solution is correct.

Final Answer: Smaller Number: 12, Larger Number: 27

Additional Insights and Related Concepts

Understanding the Constraints

The problem assumes that the smaller number is less than the larger number, which is logical given the difference of 15. If the problem were symmetric or ambiguous, we could consider both possibilities (e.g., larger minus smaller), but the standard approach is as shown.

Alternative Scenarios

- If the difference was given as the absolute value: The problem would be similar, but it's good to recognize that the difference could be considered in absolute terms, which can sometimes lead to multiple solutions if not specified.

Extending the Problem

- What if the sum or difference were different?

Changing the numbers involves similar algebraic steps. For example, if the sum was 50 and the difference 10, you'd set up the same equations and solve accordingly.

- What if the problem involved more than two numbers?

More complex systems, involving additional equations, might require matrix methods or substitution.

Practical Applications

Problems like these are foundational in real-world situations such as budgeting, inventory management, and resource allocation, where understanding relationships between quantities is essential.

Summary

The problem "The sum of two numbers is 39 and the difference is 15. What are the numbers?" can be systematically solved using algebraic methods:

- Assign variables to the unknowns.
- Write equations based on the problem statement.
- Use substitution or elimination (addition) to solve the system.
- Verify the solution.

By following these steps, we find the smaller number to be 12 and the larger number to be 27. Mastery of such problems enhances problem-solving skills and builds a strong foundation for more advanced mathematical concepts.

Final Thoughts

Mathematical problems involving sums and differences are some of the most accessible and instructive puzzles. They teach essential skills such as translating words into equations, choosing the appropriate solving method, and verifying answers. Whether you're tackling homework, preparing for exams, or simply enjoying math puzzles, understanding these foundational techniques will serve you well across countless applications.

Remember, the key to solving such problems is clarity, systematic approach, and verification. With practice, identifying the correct setup and solution becomes intuitive, transforming complex-looking problems into manageable, solvable equations.

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