

The Sum Of Two Numbers Is 80. Their difference Is 24. What Are The Two numbers?

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Understanding how to find two numbers based on their sum and difference is a fundamental problem in algebra. This type of problem not only enhances problem-solving skills but also builds a strong foundation for more complex mathematical concepts. In this article, we will explore how to determine two numbers when given their sum and difference, elucidate the steps involved, and provide practical examples to reinforce learning.

Understanding the Problem

Before diving into calculations, it's important to interpret the problem correctly. The problem states:

- The sum of two numbers is 80.
- The difference between the two numbers is 24.

Our goal is to find the two numbers that satisfy these conditions.

Key Definitions:

- Sum: The total obtained when two numbers are added together.
- Difference: The result of subtracting one number from the other.

Variables:

Let's denote the two numbers as:

- x : The first number
- y : The second number

The problem translates into the following equations:

$$\begin{aligned} x + y &= 80 && \text{(Equation 1)} \\ x - y &= 24 && \text{(Equation 2)} \end{aligned}$$

Note: The order of subtraction in Equation 2 doesn't matter as long as we're consistent. If x is larger, then $x - y = 24$; if y were larger, the difference would be negative.

Approach to Solve the Problem

There are several methods to solve such systems of equations:

- Substitution method
- Addition (elimination) method
- Graphical method

For this problem, the addition method (also known as the elimination method) is straightforward and efficient.

Using the Addition Method

Given the two equations:

$$\begin{aligned} & \text{\[} \\ & x + y = 80 \\ & \text{\]} \\ & \text{\[} \\ & x - y = 24 \\ & \text{\]} \end{aligned}$$

Adding both equations:

$$\begin{aligned} & \text{\[} \\ & (x + y) + (x - y) = 80 + 24 \\ & \text{\]} \end{aligned}$$

Simplifies to:

$$\begin{aligned} & \text{\[} \\ & 2x = 104 \\ & \text{\]} \end{aligned}$$

Dividing both sides by 2:

$$\begin{aligned} & \text{\[} \\ & x = 52 \\ & \text{\]} \end{aligned}$$

Now, substitute $(x = 52)$ back into Equation 1:

$$\begin{aligned} & \text{\[} \\ & 52 + y = 80 \\ & \text{\]} \end{aligned}$$

Subtract 52 from both sides:

$$\begin{aligned} & \text{\[} \\ & y = 80 - 52 = 28 \\ & \text{\]} \end{aligned}$$

Therefore, the two numbers are 52 and 28.

Verification of the Solution

It's always good practice to verify the solution by plugging the values back into the original equations.

- Sum check:

```
\[
52 + 28 = 80 \quad \text{(Correct)}
\]
```

- Difference check:

```
\[
52 - 28 = 24 \quad \text{(Correct)}
\]
```

Since both conditions are satisfied, the solution is confirmed.

Alternative Methods to Solve the Problem

While the addition method is effective here, other methods can also be used.

Using Substitution Method

1. From Equation 1:

```
\[
x + y = 80 \Rightarrow y = 80 - x
\]
```

2. Substitute into Equation 2:

```
\[
x - (80 - x) = 24
\]
```

3. Simplify:

```
\[
x - 80 + x = 24
\]
\[
2x - 80 = 24
\]
```

4. Solve for (x) :

```
\[
2x = 104
\]
\[
```

```
x = 52  
\]
```

5. Find (y) :

```
\[  
y = 80 - 52 = 28  
\]
```

This method arrives at the same solution.

Graphical Method

Plotting the two equations as lines on a graph and locating their intersection point will also give the solution:

- Equation 1: $(y = 80 - x)$
- Equation 2: $(y = x - 24)$

Plotting both lines reveals their intersection at $(52, 28)$.

Practical Applications and Real-World Context

Problems involving sums and differences of two numbers commonly appear in various real-world scenarios:

- Financial calculations: Determining two investments with known combined value and difference.
- Inventory management: Balancing quantities where total stock and stock difference are known.
- Distance problems: Finding two distances when their total and difference are known.

Understanding how to approach these problems enhances problem-solving skills applicable across disciplines.

Additional Practice Problems

To reinforce your understanding, try solving these similar problems:

1. Two numbers have a sum of 150 and a difference of 50. Find the numbers.
2. The sum of two numbers is 60, and their difference is 10. What are the numbers?
3. One number is 20 more than another. If their sum is 100, what are the two numbers?

Solutions:

1. Sum = 150, Difference = 50

$$\begin{aligned} & \text{\[} \\ & x + y = 150 \\ & \text{\]} \\ & \text{\[} \\ & x - y = 50 \\ & \text{\]} \end{aligned}$$

Add:

$$\begin{aligned} & \text{\[} \\ & 2x = 200 \text{ \Rightarrow } x=100 \\ & \text{\]} \end{aligned}$$

Substitute into the first:

$$\begin{aligned} & \text{\[} \\ & 100 + y = 150 \text{ \Rightarrow } y = 50 \\ & \text{\]} \end{aligned}$$

2. Sum = 60, Difference = 10

$$\begin{aligned} & \text{\[} \\ & x + y = 60 \\ & \text{\]} \\ & \text{\[} \\ & x - y = 10 \\ & \text{\]} \end{aligned}$$

Add:

$$\begin{aligned} & \text{\[} \\ & 2x = 70 \text{ \Rightarrow } x = 35 \\ & \text{\]} \end{aligned}$$

Substitute:

$$\begin{aligned} & \text{\[} \\ & 35 + y = 60 \text{ \Rightarrow } y = 25 \\ & \text{\]} \end{aligned}$$

3. One number is 20 more than another, and their sum is 100.

Let:

$$\begin{aligned} & \text{\[} \\ & y = x + 20 \\ & \text{\]} \end{aligned}$$

Then:

$$\begin{aligned} & \text{\[} \\ & x + (x+20) = 100 \\ & \text{\]} \end{aligned}$$

```
\[
2x + 20=100
\]
```

```
\[
2x=80 \rightarrow x=40
\]
```

```
\[
y=40+20=60
\]
```

Conclusion

Solving for two numbers when given their sum and difference is a classic algebraic problem that reinforces the understanding of systems of equations. By applying methods such as addition or substitution, the solution becomes straightforward. The key steps involve translating word problems into algebraic equations, solving systematically, and verifying the results. These skills are foundational for more advanced mathematics and are widely applicable in everyday problem-solving.

Remember, always verify your solutions to ensure accuracy. Practice with different problems to build confidence and develop a deeper understanding of algebraic concepts. Whether in academic settings or real-world applications, mastering these techniques will serve you well.

Frequently Asked Questions

How do you find two numbers if their sum is 80 and their difference is 24?

You can set up two equations: $x + y = 80$ and $x - y = 24$. Adding these equations gives $2x = 104$, so $x = 52$. Substituting back, $y = 80 - 52 = 28$. Therefore, the two numbers are 52 and 28.

What are the two numbers whose sum is 80 and difference is 24?

The two numbers are 52 and 28. Their sum is $52 + 28 = 80$, and their difference is $52 - 28 = 24$.

Can you solve for two numbers if their sum is 80 and difference is 24 using algebra?

Yes. Let the numbers be x and y . Then, $x + y = 80$ and $x - y = 24$. Adding the equations gives $2x = 104$, so $x = 52$. Substituting x into the first equation gives $y = 28$.

What is the method to find two numbers given their sum and difference?

Use algebra: set up equations for sum and difference, then solve simultaneously. For example, $\text{sum} = x + y$, $\text{difference} = x - y$. Adding these gives $2x$, allowing you to find one number and then the other.

Are the numbers 52 and 28 the only solutions for the given conditions?

Yes. The equations lead to a unique pair of numbers: 52 and 28, since the sum and difference are fixed.

How can I verify that 52 and 28 satisfy the conditions of the problem?

Check by adding: $52 + 28 = 80$, which matches the sum. Then subtract: $52 - 28 = 24$, matching the difference. Both conditions are satisfied.

What real-life situations could involve finding two numbers with a given sum and difference?

Situations like dividing resources into parts with a specific total and difference, or comparing two quantities where the total and disparity are known, require solving for two numbers using similar methods.

Additional Resources

The Sum Of Two Numbers Is 80. Their Difference Is 24. What Are The Two Numbers?

This intriguing problem presents a classic algebraic challenge that many students and math enthusiasts encounter. It involves understanding how to translate a word problem into a set of equations and then solving for the unknowns. This type of problem not only enhances algebraic reasoning but also reinforces critical thinking skills. In this article, we will explore the problem thoroughly, break down the steps to solve it, discuss different methods, and analyze its educational significance.

Understanding the Problem

Before diving into calculations, it is essential to interpret the problem carefully. The statement gives us two key pieces of information:

- The sum of two numbers is 80.
- The difference of the same two numbers is 24.

The goal is to find the two numbers that satisfy these conditions.

This problem is a classic example of solving a system of equations, where each piece of information corresponds to an equation involving two variables. Typically, these variables are labeled as x and y , representing the two unknown numbers.

Setting Up the Equations

Given the problem, we can formulate the following equations:

1. Sum Equation:

$$x + y = 80$$

2. Difference Equation:

$$x - y = 24$$

It's important to note that the order of x and y in the second equation is arbitrary; it could be $y - x$, but choosing $x - y$ simplifies calculations if x is the larger number.

Interpreting the Equations

- The first equation indicates that when the two numbers are added, the total is 80.
- The second equation states that when the smaller number is subtracted from the larger, the result is 24.

The next step is to solve for the values of x and y .

Methods to Solve the System of Equations

There are several approaches to solving this system:

- Substitution Method
- Addition (Elimination) Method
- Graphical Method

For clarity and efficiency, the addition method is often preferred when the equations are already aligned for elimination.

Solution Using the Addition (Elimination) Method

Given:

$$x + y = 80 \text{ (Equation 1)}$$

$$x - y = 24 \text{ (Equation 2)}$$

Adding the two equations:

$$(x + y) + (x - y) = 80 + 24$$

Simplifies to:

$$x + y + x - y = 104$$

Which simplifies further to:

$$2x = 104$$

Dividing both sides by 2:

$$x = 52$$

Now, substitute $x = 52$ into Equation 1:

$$52 + y = 80$$

Subtract 52 from both sides:

$$y = 80 - 52 = 28$$

Result:

The two numbers are 52 and 28.

Verification of the Solution

It's always vital to verify the solution:

- Sum: $52 + 28 = 80 \rightarrow$ Correct.
- Difference: $52 - 28 = 24 \rightarrow$ Correct.

Thus, the solution is consistent with the problem statement.

Alternative Method: Substitution

Suppose you prefer substitution:

From Equation 2:

$$x - y = 24 \rightarrow x = y + 24$$

Substitute into Equation 1:

$$(y + 24) + y = 80$$

Simplify:

$$2y + 24 = 80$$

Subtract 24 from both sides:

$$2y = 56$$

Divide both sides by 2:

$$y = 28$$

$$\text{Then, } x = y + 24 = 28 + 24 = 52$$

Again, the same solution is obtained, confirming its correctness.

Educational Significance

Problems like this serve multiple educational purposes:

- Reinforce algebraic skills: Translating words into equations strengthens understanding of algebra.
- Enhance problem-solving strategies: Learning different methods builds flexibility.
- Develop critical thinking: Verifying solutions ensures accuracy and comprehension.
- Apply real-world reasoning: Such problems mimic real-life situations involving two quantities with known relationships.

Features of the Problem

- Simplicity: The problem involves straightforward algebra, suitable for beginners.
- Versatility: Can be extended to more complex problems involving multiple variables.
- Educational tool: Useful in teaching systems of equations and problem-solving methods.

Pros and Cons of the Approach

Pros:

- Clear and direct, suitable for learners at various levels.
- Demonstrates multiple solution methods, reinforcing understanding.
- Validates solutions through substitution and verification.

Cons:

- Assumes familiarity with basic algebra; may be challenging for absolute beginners.
- Simplistic nature may limit its application to more complex scenarios.
- Requires careful attention to signs and operations to avoid errors.

Extensions and Variations

Once comfortable with this problem, learners can explore:

- Changing the sum and difference values to create new problems.
- Including additional constraints or variables.
- Using graphical methods to represent the equations visually.
- Applying similar techniques to real-world problems, such as budgeting, distances, or measurements.

Conclusion

The Sum Of Two Numbers Is 80. Their Difference Is 24. What Are The Two Numbers? This classic problem elegantly demonstrates how to formulate and solve a system of linear equations. Through methods like addition or substitution, we find that the two numbers are 52 and 28. Such problems not only sharpen algebraic skills but also cultivate logical reasoning and problem-solving abilities that are essential across many fields. Whether used in classroom teaching, self-study, or competitive exams, these types of problems serve as foundational exercises that build confidence and competence in mathematical thinking. By understanding the principles behind the solution, learners can confidently approach more complex scenarios involving multiple equations and variables.

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