

3) Helen Has \$1.35 In Her Bank Of Nickels And Dimes. There Are 9 More Nickels Than Dimes. Find The Number

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When it comes to solving real-world problems involving money, understanding how to set up and solve equations is a vital skill. The problem of Helen's bank account, containing nickels and dimes, presents a classic example of a system of equations. It combines basic arithmetic with algebraic reasoning to find an unknown quantity—specifically, the number of nickels and dimes in her bank. In this article, we'll explore this problem in detail, breaking down the steps involved and providing strategies to solve similar types of word problems efficiently.

Understanding the Problem

Before jumping into calculations, it's essential to comprehend what the problem states:

- Helen has a total of \$1.35 in her bank, composed only of nickels and dimes.
- There are 9 more nickels than dimes.
- The goal is to find the exact number of nickels and dimes.

This problem involves two key pieces of information:

1. The total value of the coins.
2. The relationship between the counts of the two types of coins.

Breaking Down the Key Information

Total Amount in Coins

The total amount Helen has is \$1.35, which can be converted into cents for easier calculations:

- $\$1.35 = 135$ cents

Number of Coins and Relationship Between Them

Let's define variables:

- Let d = the number of dimes
- Let n = the number of nickels

From the problem, we know:

- $n = d + 9$ (since there are 9 more nickels than dimes)

Now, the total value of the coins can be expressed as:

- Value of nickels = 5 cents n
- Value of dimes = 10 cents d

Total value:

- $5n + 10d = 135$

Setting Up the Equations

Based on the above, we have a system of two equations:

1. $n = d + 9$
2. $5n + 10d = 135$

Our goal is to find the values of n and d that satisfy both equations.

Solving the System of Equations

There are several methods to solve such systems, including substitution and elimination. Here, substitution is straightforward because we already have an expression for n in terms of d .

Step 1: Substitute $n = d + 9$ into the value equation

Replace n in the second equation:

- $5(d + 9) + 10d = 135$

Step 2: Simplify the equation

Distribute:

$$- 5d + 45 + 10d = 135$$

Combine like terms:

$$- (5d + 10d) + 45 = 135$$

$$- 15d + 45 = 135$$

Step 3: Solve for d

Subtract 45 from both sides:

$$- 15d = 135 - 45$$

$$- 15d = 90$$

Divide both sides by 15:

$$- d = 90 / 15$$

$$- d = 6$$

Step 4: Find n using $n = d + 9$

Substitute $d = 6$:

$$- n = 6 + 9 = 15$$

Verifying the Solution

To ensure our solution is correct, check if the total value matches:

$$- \text{Value of dimes: } 10 \text{ cents } 6 = 60 \text{ cents}$$

$$- \text{Value of nickels: } 5 \text{ cents } 15 = 75 \text{ cents}$$

Total:

$$- 60 + 75 = 135 \text{ cents} = \$1.35$$

Since it matches the total amount, the solution is correct.

Answer: The Number of Nickels and Dimes

- Number of dimes = 6
- Number of nickels = 15

Understanding the Importance of Setting Up Equations

This problem demonstrates the power of algebra in solving money-related word problems. By translating words into mathematical expressions, we can systematically find unknown quantities. Establishing variables and writing equations based on the problem statement is a crucial first step.

Strategies for Solving Similar Money Word Problems

When tackling problems involving coins and totals, consider the following strategies:

- **Identify Variables:** Assign variables to unknown quantities (e.g., number of coins).
- **Translate Words into Equations:** Express total value and relationships between variables mathematically.
- **Use Substitution or Elimination:** Solve the system of equations step by step.
- **Verify Your Solution:** Check if the answer makes sense and satisfies the original problem.

Common Types of Money Word Problems

Money word problems often involve:

- Calculating total value based on counts of different coins

- Finding the number of coins given total value and relationships
- Comparing amounts or determining the worth of specific coin combinations

Understanding how to set up equations correctly is key to solving these problems effectively.

Additional Tips for Mastering Coin Word Problems

- Always convert dollar amounts to cents to avoid decimal confusion.
- Clearly define variables before writing equations.
- Pay attention to relationships between variables (e.g., "more than," "less than") to set up accurate equations.
- Practice with various problems to become comfortable with different scenarios.

Conclusion

The problem involving Helen's coins illustrates the importance of algebra in everyday math problems. By carefully translating word clues into equations and solving systematically, you can determine the exact number of coins in any similar scenario. Whether you're a student working on homework or someone managing daily finances, mastering these skills enhances problem-solving confidence and mathematical understanding.

Remember, practice makes perfect. Try creating your own coin problems or find real-world situations where algebra can simplify your calculations. With patience and practice, you'll become adept at unraveling even the trickiest money puzzles.

Frequently Asked Questions

How can I set up equations to find the number of nickels and dimes Helen has if she has \$1.35 in total?

Let N be the number of nickels and D be the number of dimes. The total value equation is $5N + 10D = 135$ cents. Since there are 9 more nickels than dimes, $N = D + 9$. Substitute N into the first equation to solve for D .

What is the step-by-step method to solve for the number of nickels Helen has?

First, express N as $D + 9$. Plug into the value equation: $5(D + 9) + 10D = 135$. Simplify to $5D + 45 + 10D = 135$, combine like terms: $15D + 45 = 135$. Subtract 45: $15D = 90$. Divide by 15: $D = 6$. Then, N

$= D + 9 = 15$. So, Helen has 15 nickels and 6 dimes.

How do I verify that the solution to the coin problem is correct?

Calculate the total value using the found quantities: 15 nickels $= 15 \times 5\text{¢} = 75\text{¢}$, and 6 dimes $= 6 \times 10\text{¢} = 60\text{¢}$. Sum: $75\text{¢} + 60\text{¢} = 135\text{¢}$, which matches the total amount. The counts are consistent with the problem's conditions.

Can this problem be solved using algebraic substitution, and if so, how?

Yes. Set $N = D + 9$, then substitute into the total value equation: $5(D + 9) + 10D = 135$. Simplify and solve for D , then find N . This method helps find the exact number of each coin efficiently.

What real-world skills does solving this coin problem develop?

It enhances algebraic thinking, problem-solving, and application of systems of equations. It also builds skills in translating word problems into mathematical models, useful for financial literacy and everyday decision-making.

Additional Resources

Mathematics Problem Solving

Introduction

Mathematics has long been regarded as the language of logic and problem-solving, integral not just in academic settings but also in everyday life. One such intriguing problem that combines basic arithmetic with algebraic reasoning involves determining the number of coins based on their total value and relative quantities. Today, we delve into a classic coin problem: Helen has \$1.35 in her bank of nickels and dimes. There are 9 more nickels than dimes. Find the number of nickels and dimes Helen possesses.

This problem exemplifies the application of algebraic techniques to real-world scenarios, and understanding it thoroughly requires breaking down the problem into manageable parts, developing equations, and solving systematically.

Understanding the Problem

The Context

Helen's bank contains only two types of coins:

- Nickels (each worth 5 cents)
- Dimes (each worth 10 cents)

The Given Data

- Total amount of money: \$1.35
- Relationship between coins: There are 9 more nickels than dimes.

The Objective

Determine the number of nickels and dimes Helen has.

Breaking Down the Problem

Step 1: Convert Total Money into Cents

Since coin values are given in cents, convert the total amount:

$$\begin{aligned} & \backslash \\ & \$1.35 = 135 \text{ cents} \\ & \backslash \end{aligned}$$

Step 2: Define Variables

Let:

- (D) = number of dimes
- (N) = number of nickels

From the problem, we know:

$$\begin{aligned} & \backslash \\ & N = D + 9 \\ & \backslash \end{aligned}$$

Step 3: Formulate the Equation for Total Value

The total value from the coins is:

$$\begin{aligned} & \backslash \\ & (5 \text{ cents}) \times N + (10 \text{ cents}) \times D = 135 \\ & \backslash \end{aligned}$$

Substitute $(N = D + 9)$:

$$\begin{aligned} & \backslash \\ & 5(D + 9) + 10D = 135 \\ & \backslash \end{aligned}$$

Developing the Mathematical Model

Step 4: Simplify the Equation

Expand:

$$\begin{aligned} & \backslash \\ 5D + 45 + 10D &= 135 \\ & \backslash \end{aligned}$$

Combine like terms:

$$\begin{aligned} & \backslash \\ 15D + 45 &= 135 \\ & \backslash \end{aligned}$$

Step 5: Solve for (D)

Isolate (D) :

$$\begin{aligned} & \backslash \\ 15D &= 135 - 45 \\ & \backslash \\ & \backslash \\ 15D &= 90 \\ & \backslash \\ & \backslash \\ D &= \frac{90}{15} = 6 \\ & \backslash \end{aligned}$$

Step 6: Find (N)

Recall:

$$\begin{aligned} & \backslash \\ N = D + 9 &= 6 + 9 = 15 \\ & \backslash \end{aligned}$$

Verification of the Solution

Step 7: Check the Total Value

Calculate the total value with these counts:

- Nickels: 15
- Dimes: 6

Total value:

$$(5 \times 15) + (10 \times 6) = 75 + 60 = 135 \text{ cents}$$

which matches the total amount of \$1.35, confirming the solution's correctness.

Final Answer

- Number of dimes: 6
- Number of nickels: 15

Additional Insights and Variations

Alternative Methods

While algebra provides a straightforward solution, other methods can also be employed:

- Guess and Check: Test plausible values based on the total amount.
- Systematic Listing: List possible combinations that satisfy the coin counts and total value.
- Using a System of Equations: Set up multiple equations to cross-verify.

Real-World Applications

Understanding such problems enhances skills in:

- Budgeting and financial planning
- Coin counting and cash handling
- Developing logical reasoning and algebraic thinking

Common Mistakes to Avoid

- Incorrectly converting units: Always convert dollars to cents for consistency.
- Misapplying relationships: Remember the key relation $(N = D + 9)$.
- Forgetting to verify solutions: Always double-check calculations to ensure the total matches.

Conclusion

This problem serves as an excellent example of how basic algebra can be applied to solve practical, real-world puzzles involving money and quantities. Grasping the underlying principles allows learners to approach similar problems with confidence and precision, reinforcing essential problem-solving skills.

By carefully defining variables, translating words into equations, and performing systematic calculations, we determined that Helen has 6 dimes and 15 nickels in her bank. Such exercises not only sharpen mathematical acumen but also build a foundation for more complex quantitative reasoning in various disciplines.

Whether for academic pursuits or everyday financial literacy, mastering these techniques equips individuals to decode and solve a wide array of numerical challenges efficiently.

Remember: The key to solving these types of problems lies in methodical analysis, clear variable definitions, and thorough verification—skills that are invaluable both inside and outside the classroom.

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