

7. A Coin Bank Contains \$12.45 In Quarters And Dimes. If There Are 16 More Dimes Than Quarters, how Many

7. A Coin Bank Contains \$12.45 In Quarters And Dimes. If There Are 16 More Dimes Than Quarters, how Many coins are in the bank? This classic word problem combines basic algebra with real-world applications, making it an excellent way to practice problem-solving skills involving coins, equations, and logical reasoning. Whether you're a student preparing for a math test or someone interested in understanding how to approach similar puzzles, breaking down the problem systematically can lead you to the correct answer. In this article, we will explore how to interpret the data, set up equations, and solve for the number of quarters and dimes in the coin bank.

Understanding the Problem

Before jumping into calculations, it's essential to clearly understand what the problem states and what it asks us to find.

Key Details in the Problem

- The total amount of money in the coin bank is \$12.45.
- All coins are either quarters or dimes.
- There are 16 more dimes than quarters.

What Are We Asked to Find?

- The number of quarters and dimes in the coin bank.

Defining Variables and Setting Up Equations

To solve the problem systematically, define variables for the unknown quantities.

Assigning Variables

- Let q = the number of quarters.
- Let d = the number of dimes.

Translating the Word Problem into Equations

Based on the details, we can establish two primary equations:

1. Money value equation: The total value of quarters and dimes equals \$12.45.
2. Quantity relationship: There are 16 more dimes than quarters, i.e., $d = q + 16$.

The first equation relates to the monetary amounts:

- Each quarter is worth \$0.25.
- Each dime is worth \$0.10.
- Total amount: \$12.45.

Thus:

$$0.25q + 0.10d = 12.45$$

The second equation, based on the given relationship:

$$d = q + 16$$

Solving the System of Equations

With the equations set up, the next step is to solve for the variables.

Substitute and Simplify

Since $d = q + 16$, substitute this into the monetary equation:

$$0.25q + 0.10(q + 16) = 12.45$$

Distribute the 0.10:

$$0.25q + 0.10q + 1.60 = 12.45$$

Combine like terms:

$$(0.25q + 0.10q) + 1.60 = 12.45$$

$$0.35q + 1.60 = 12.45$$

Subtract 1.60 from both sides:

$$0.35q = 12.45 - 1.60$$

$$0.35q = 10.85$$

Solve for q :

$$q = \frac{10.85}{0.35}$$

$$q = 31$$

Now, find d :

$$d = q + 16 = 31 + 16 = 47$$

Verifying the Solution

Always verify your solution with the original problem to ensure accuracy.

Calculate Total Value

- Quarters: 31
- Dimes: 47

Total value:

$$(31 \times 0.25) + (47 \times 0.10)$$
$$= 7.75 + 4.70$$
$$= 12.45$$

Since this matches the total amount in the problem, our solution is correct.

Summary of the Results

- Number of quarters: 31
- Number of dimes: 47

Practical Tips for Solving Similar Coin Problems

Understanding how to approach coin-related word problems can help in various contexts, from classroom exercises to real-life money management.

Break Down the Problem

- Identify what is given and what is asked.
- Translate words into mathematical expressions.
- Define variables clearly.

Set Up Equations Carefully

- Use the values of coins to form equations.
- Pay attention to relationships between quantities.

Solve Step-by-Step

- Substitute known relationships to reduce the number of variables.
- Check your solutions by plugging back into the original equations.

Additional Practice Problems

To reinforce your understanding, try solving these similar problems:

- In a jar, there are 10 fewer nickels than dimes. If the total value of all coins is \$4.00, how many nickels and dimes are there?
- A piggy bank contains \$5.25 in nickels and quarters. If there are twice as many quarters as nickels, how many of each coin are in the bank?
- There are 50 coins in total, consisting of pennies and nickels. If the total amount is \$2.00, how many pennies and nickels are there?

Practicing these problems will enhance your ability to set up and solve algebraic equations based on real-world situations involving coins.

Conclusion

Solving coin-related word problems like "7. A Coin Bank Contains \$12.45 In Quarters And Dimes. If There Are 16 More Dimes Than Quarters, how Many" involves a clear understanding of the problem, defining variables, setting up equations, and systematically solving them. In this case, we found that the coin bank contains 31 quarters and 47 dimes. Applying these techniques to similar problems can boost your confidence and improve your algebraic reasoning skills. Remember, breaking down the problem, verifying your solutions, and practicing regularly are key to mastering such math challenges.

Frequently Asked Questions

How do you set up equations to find the number of quarters and dimes in a coin bank with \$12.45 total and 16 more dimes than quarters?

Let Q be the number of quarters and D the number of dimes. The total value equation is $0.25Q + 0.10D = 12.45$, and the relationship $D = Q + 16$. Substitute D into the first equation to solve for Q , then find D .

What is the first step to find the number of quarters and dimes in the coin bank problem?

Express D in terms of Q using $D = Q + 16$, then substitute into the total value equation to solve for Q .

How do you convert the total dollar amount into equations involving coin counts?

Convert dollar amounts into cents: \$12.45 becomes 1245 cents. The equations become $25Q + 10D = 1245$ cents, with $D = Q + 16$.

What is the solution for the number of quarters in the coin bank problem?

Solve the equations to find $Q = 33$ quarters and $D = 49$ dimes.

How many dimes are in the coin bank if there are 16 more dimes than quarters and total value is \$12.45?

There are 49 dimes in the coin bank.

Additional Resources

A Coin Bank Contains \$12.45 In Quarters And Dimes. If There Are 16 More Dimes Than Quarters, How Many? is a classic problem that blends basic arithmetic with real-world applications, making it an engaging way to understand systems of equations and algebraic reasoning. Whether you're a student brushing up on your math skills or a curious mind exploring practical problem-solving, this problem provides an excellent opportunity to apply concepts like substitution, linear equations, and logical reasoning. In this comprehensive guide, we'll walk through the steps to solve this problem systematically, breaking down each part of the process so that you not only arrive at the correct answer but also develop a deeper understanding of how to approach similar challenges.

Understanding the Problem

Before diving into calculations, it's essential to clearly understand what the problem is asking and what information is provided.

Restating the problem:

- The coin bank contains \$12.45 in total, made up of quarters and dimes.
- There are 16 more dimes than quarters.
- The goal is to determine how many quarters and dimes are in the coin bank.

Key details:

- The total amount of money: \$12.45
- Relationship between coins: $\text{Dimes} = \text{Quarters} + 16$

Breaking Down the Information

To solve the problem effectively, it helps to define variables representing the unknown quantities.

Defining variables:

- Let q = number of quarters
- Let d = number of dimes

Known relationships:

- $d = q + 16$ (since there are 16 more dimes than quarters)

Monetary values:

- Each quarter is worth \$0.25
- Each dime is worth \$0.10

Setting Up the Equations

Using the variables and given relationships, we can set up equations that model the problem.

Equation for total amount:

The total value of the coins is the sum of the value of quarters and dimes:

$$\backslash[0.25q + 0.10d = 12.45 \backslash]$$

Equation for the relationship between coins:

From the problem:

$$\backslash[d = q + 16 \backslash]$$

Solving the System of Equations

Now, we have a system of two equations:

1. $\backslash(0.25q + 0.10d = 12.45 \backslash)$
2. $\backslash(d = q + 16 \backslash)$

Step 1: Substitute $\backslash(d \backslash)$ from the second equation into the first:

$$\backslash[0.25q + 0.10(q + 16) = 12.45 \backslash]$$

Step 2: Simplify the equation:

$$\backslash[0.25q + 0.10q + 0.10 \times 16 = 12.45 \backslash]$$

$$\backslash[0.25q + 0.10q + 1.60 = 12.45 \backslash]$$

$$\backslash[(0.25q + 0.10q) = 12.45 - 1.60 \backslash]$$

$$\backslash[0.35q = 10.85 \backslash]$$

Step 3: Solve for $\backslash(q \backslash)$:

$$\backslash[q = \frac{10.85}{0.35} \backslash]$$

$$\backslash[q = 31 \backslash]$$

Step 4: Find $\backslash(d \backslash)$:

Using $\backslash(d = q + 16 \backslash)$:

$$\backslash[d = 31 + 16 = 47 \backslash]$$

Verifying the Solution

It's always good to verify your solution by plugging the values back into the original total amount equation.

Calculate total value:

$$\backslash[\text{Value of quarters} = 31 \times 0.25 = \$7.75 \backslash]$$

$$\backslash[\text{Value of dimes} = 47 \times 0.10 = \$4.70 \backslash]$$

$$\backslash[\text{Total} = \$7.75 + \$4.70 = \$12.45 \backslash]$$

The total matches the problem statement, confirming our solution is correct.

Summary of Results

Number of Quarters	Number of Dimes
31	47

Final answer:

- There are 31 quarters and 47 dimes in the coin bank.

Additional Insights and Variations

This problem demonstrates how to translate a word problem into algebraic equations, a skill that is widely applicable. Here are some additional insights and potential variations:

1. Adjusting the total amount:

- If the total amount changes, the same approach applies: set up the equations accordingly and solve.

2. Varying the relationship:

- If the problem states a different relationship between coins (e.g., "twice as many dimes as quarters"), modify the second equation accordingly.

3. Considering other coin types:

- Incorporate nickels, pennies, or other denominations to complicate the problem, requiring more variables and more complex systems of equations.

Practical Tips for Solving Similar Problems

- Define variables clearly: Assign meaningful symbols to unknown quantities.
- Translate words into equations: Convert problem statements into algebraic expressions.
- Use substitution or elimination: Choose the method that simplifies calculations.
- Verify your solutions: Plug back into original equations to confirm correctness.
- Check units: Make sure monetary units are consistent and correctly applied.

Conclusion

The problem of determining how many quarters and dimes are in a coin bank containing \$12.45, given that there are 16 more dimes than quarters, illustrates fundamental algebraic problem-solving techniques. By systematically translating the problem into equations, substituting, and solving, we find that the coin bank contains 31 quarters and 47 dimes. Mastering this approach enhances your ability to tackle a wide array of real-world problems involving ratios, totals, and relationships. Whether you're preparing for exams or just enjoy logical puzzles, the skills practiced here are valuable tools in your mathematical toolkit.

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