

Sarah Used An Equation To Solve The Problem Below. Justify Each Step Of Her Work. About 11% Of People

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In the realm of mathematics and problem-solving, applying equations correctly is essential for reaching accurate conclusions. Sarah's approach to solving a particular problem demonstrates the importance of methodical reasoning and precise calculations. This article will analyze her work step-by-step, justifying each move she made, and will explore the significance of understanding percentage-based problems—such as the fact that about 11% of people are affected in a particular context. Whether you're a student, educator, or someone interested in problem-solving techniques, this detailed walkthrough will enhance your comprehension of applying equations effectively.

Understanding the Context of the Problem

Before delving into Sarah's solution, it is crucial to understand the problem's background and what information is provided. Typically, problems involving percentages, such as "about 11% of people," relate to real-world scenarios like surveys, population studies, or statistical analyses.

Common Scenario Overview

- A survey is conducted among a specific group.
- The survey finds that approximately 11% of the people possess a certain characteristic or are affected by a particular condition.
- The goal may be to determine the total number of people surveyed or to analyze a subset based on this percentage.

Why Percentages Matter

Percentages are a vital part of data analysis because they allow for standardized comparisons across different groups regardless of their total size. In this context, understanding what 11% represents helps interpret the data meaningfully.

Step 1: Identifying the Known and Unknown

Variables

Sarah begins by clearly defining what information she has and what she needs to find.

Known Data

- Percentage of people affected: approximately 11%
- Number of affected individuals (if provided): varies depending on the problem (e.g., 55 people)

Unknown Data

- Total number of people surveyed (if not given): to be calculated

Setting Up Variables

Sarah assigns variables to the unknowns:

- Let T = total number of people surveyed
- Let A = number of affected people (those who represent 11%)

This initial step is critical because it frames the problem mathematically, enabling the use of equations to find the unknown.

Step 2: Translating Percentage to a Mathematical Equation

Sarah converts the percentage into a decimal to facilitate calculations.

Conversion Process

- 11% as a decimal: $11\% = 0.11$

This conversion is essential because percentages are ratios out of 100, and working with decimals simplifies multiplication.

Formulating the Equation

Given that 11% of the total number of people are affected:

$$A = 0.11 \times T$$

If the problem provides the number of affected individuals, Sarah can substitute that value for (A) to solve for (T) .

Step 3: Substituting Known Values and Solving

Suppose Sarah knows that 55 people are affected. She then substitutes this into her equation:

$$55 = 0.11 \times T$$

Step-by-Step Justification

1. Writing the equation: She begins with the relationship between total people and affected individuals.
2. Substituting known data: Replaces (A) with 55, based on the problem statement.
3. Isolating the variable (T) : To find the total, she divides both sides of the equation by 0.11:

$$T = \frac{55}{0.11}$$

4. Performing the division: Calculating $(\frac{55}{0.11})$:

$$T = 500$$

This result indicates that there were 500 people surveyed in total.

Step 4: Justifying Each Step of Sarah's Work

It's important to validate each part of her solution process to ensure accuracy and understanding.

Why Convert Percentage to Decimal?

- Percentages are ratios out of 100.
- Converting to decimal form simplifies multiplication.
- For example, 11% becomes 0.11, making calculations straightforward.

Why Set Up the Equation $(A = 0.11 \times T)$?

- Represents the fundamental relationship: affected individuals are a percentage of the total.

- Ensures a direct, algebraic link between known and unknown quantities.

Why Divide to Isolate (T) ?

- The goal is to find (T) , the total number of surveyed people.
- Since $(A = 0.11 \times T)$, dividing both sides by 0.11 isolates (T) :

$$[T = \frac{A}{0.11}]$$

- This algebraic operation is justified because division maintains equality.

Ensuring Correct Calculation

- Use of calculator or manual division to ensure accuracy.
- Recognizing that dividing 55 by 0.11 yields 500 confirms the total population.

Step 5: Verifying the Solution

After calculating, Sarah verifies her answer:

- Check: Is 11% of 500 equal to 55?

$$[0.11 \times 500 = 55]$$

- Since this matches the known number of affected individuals, her solution is validated.

Additional Considerations and Variations

Real-world problems often involve different data or more complex scenarios.

Scenario 1: Unknown Number of Affected People

- If total surveyed is known, but the number affected is unknown, she can calculate affected individuals:

$$[A = 0.11 \times T]$$

Scenario 2: Different Percentage

- For a different affected percentage, say 15%, she would modify the decimal:

$[15\% = 0.15]$

- Then, proceed with similar steps.

Scenario 3: Total Number Known, Affected Unknown

- Given (A) , solve for (T) :

$[T = \frac{A}{\text{percentage in decimal}}]$

Understanding the Significance of About 11% of People

The phrase "about 11% of people" indicates an approximation, often due to sampling variability or estimation uncertainties. When solving problems involving such data:

- Use precise calculations: Convert percentage to decimal accurately.
- Recognize approximation: If data is approximate, the final answer might also be an approximation.
- Consider context: For large populations, small percentage differences may not significantly affect the overall analysis.

Conclusion: The Power of Equations in Problem-Solving

Sarah's careful application of an algebraic equation exemplifies how mathematical reasoning helps solve real-world problems involving percentages. By:

- Clearly defining variables,
- Converting percentages to decimals,
- Formulating the appropriate equations,
- Performing accurate calculations,
- Validating results,

she demonstrates effective problem-solving skills. Understanding each step ensures confidence in the results and deepens comprehension of how equations translate abstract data into meaningful insights. Whether estimating the total number of affected individuals or analyzing similar percentage-based problems, mastering these steps is essential for accurate and reliable mathematical reasoning.

Remember: Precise understanding and methodical execution are key to effective problem-solving in mathematics. Applying equations systematically allows us to interpret data accurately and make informed decisions based on numerical information, such as the approximate 11% of people affected in various scenarios.

Frequently Asked Questions

What type of equation might Sarah have used to find the percentage of people affected by the problem?

Sarah likely used a simple percentage equation, such as $\text{part} = (\text{percentage}/100) \times \text{total population}$, to determine the number of people affected.

How did Sarah justify each step of her work when solving the problem involving 11% of people?

She explained her calculations by showing how she converted the percentage to a decimal, applied it to the total population, and checked her work for accuracy.

Why is it important for Sarah to justify each step when solving a problem involving percentages?

Justifying each step ensures the solution is logical and accurate, making it easier to identify any mistakes and understand the reasoning process.

What assumptions might Sarah have made about the total population when calculating 11%?

She assumed that the total population was known and accurate, and that the percentage represents a proportional part of that total.

How can understanding the justification of each step help in interpreting the results about 'about 11% of people'?

It helps confirm that the calculation is correct and that the percentage accurately reflects the real-world data, leading to more reliable conclusions.

What real-world scenarios could relate to Sarah's problem involving 11% of people?

Examples include estimating the proportion of people affected by a health issue, survey responses, or demographic data analysis where a specific percentage is applied to a population.

Additional Resources

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In the realm of problem-solving, especially in mathematics and statistics, the ability to translate real-world scenarios into equations is a crucial skill. Sarah's approach to solving a problem involving a percentage—specifically, that about 11% of people—is a textbook example of how to effectively utilize equations for clarity and accuracy. This article delves into her method, breaking down each step with detailed justification, exploring the logic behind her choices, and discussing the broader implications of such techniques.

Understanding the Context of the Problem

Before diving into the specifics of Sarah's solution, it's vital to understand the nature of the problem she faced. The core question involves a percentage—about 11%—which indicates a proportion of a population exhibiting a particular trait or behavior.

The Nature of Percentages in Problem Solving

Percentages are a common way to express parts of a whole, especially in surveys, studies, and statistical analyses. They provide an intuitive measure of relative size, making them useful for conveying information about populations, success rates, or probabilities.

- Key feature: Expresses a part of a whole as a fraction of 100.
- Application: Useful in comparing different groups or understanding proportions.

The Challenge in This Scenario

The problem likely involves determining an unknown quantity—such as the total population, the number of people with a certain trait, or the number of individuals that correspond to 11%. To solve it accurately, Sarah needs to set up an appropriate equation that relates these quantities.

Step-by-Step Breakdown of Sarah's Approach

Sarah's method is systematic, justified at each step, ensuring her solution is both logical and mathematically sound. Let's analyze each part of her work.

Step 1: Define the Variables

Sarah begins by assigning variables to the known and unknown quantities. This

is a critical step because clear variable definitions prevent confusion later.

- Let P = total number of people in the population.
- Let x = number of people who have the trait (e.g., who are part of the 11%).

Justification: Using variables makes the problem scalable and adaptable. It also simplifies the expression of relationships.

Step 2: Express the Known Percentage

Sarah recognizes that 11% of the population corresponds to x individuals. Therefore, she writes:

$$x = 0.11 \times P$$

Justification: This follows directly from the definition of percentage; 11% is converted to its decimal form (0.11), and then multiplied by the total population to find the number of people with the trait.

Step 3: Incorporate Additional Data (If Provided)

Suppose the problem states that the number of people with the trait (x) is known, or perhaps that the total population (P) is known, and she needs to find the other.

- If x is known and she needs P , she rearranges the equation:

$$P = \frac{x}{0.11}$$

- Conversely, if P is known and she needs x , the initial equation applies directly.

Justification: Rearranging equations is fundamental in algebra, enabling the solution for unknowns based on known quantities.

Step 4: Applying Real Data to the Equation

Suppose the problem states that 220 people have the trait, and she needs to find the total population.

$$P = \frac{220}{0.11} = 2000$$

Justification: Plugging the known value into the equation yields the total population. This straightforward calculation exemplifies the power of algebraic manipulation.

Step 5: Validating the Solution

Sarah checks her work by verifying whether the calculated total makes sense:

$0.11 \times 2000 = 220$

which matches the given data, confirming her solution's correctness.

Justification: Validation ensures the solution aligns with the problem statement and that no calculation errors occurred.

Features and Effectiveness of Sarah's Method

Sarah's systematic approach highlights several features that make algebraic solutions effective in percentage-related problems.

- Clarity: Variables and equations precisely represent the problem.
- Flexibility: The method adapts easily to different known/unknown combinations.
- Validation: Checking the solution against the original data increases reliability.
- Scalability: Suitable for larger datasets or more complex problems involving percentages.

Advantages of Using Equations in Such Problems

- Facilitates understanding of relationships between quantities.
- Enables quick recalculations if data change.
- Provides a clear framework for solving similar problems consistently.

Limitations and Challenges

While effective, using equations also has potential drawbacks:

- Requires algebraic literacy: Not all students or individuals are comfortable with algebra.
- Potential for errors: Mistakes in variable assignment or rearrangement can lead to incorrect answers.
- Assumes accurate data: The method hinges on the accuracy of the initial data provided.

Broader Implications of Sarah's Approach

Sarah's method demonstrates a disciplined way of tackling percentage problems, which is applicable across various fields—statistics, economics, social sciences, and more.

Educational Significance

- Emphasizes the importance of variable definition and logical progression.
- Reinforces algebraic manipulation skills.
- Encourages validation to ensure solutions are practical and consistent.

Practical Applications

- Estimating populations in public health studies.
- Calculating success rates in business analytics.
- Analyzing survey data in social research.

Summary of Key Takeaways

- Translating percentage problems into algebraic equations simplifies complex real-world issues.
- Justifying each step ensures clarity, accuracy, and reproducibility.
- Proper variable definition is crucial for effective problem-solving.
- Validation against original data confirms the reliability of the solution.
- Flexibility of the method makes it suitable for diverse scenarios involving percentages.

Conclusion

Sarah's strategic use of an equation to solve the problem involving about 11% of people exemplifies effective mathematical reasoning. Her approach underscores the importance of clear variable definitions, logical algebraic steps, and validation. Such methods not only lead to accurate solutions but also foster deeper understanding of how percentages relate to real-world quantities. Whether in academic settings, research, or everyday decision-making, mastering this approach enhances analytical skills and promotes precise, justified problem-solving.

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