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Understanding how to find the total number of gumballs in a machine based on a subset percentage is a common problem in basic algebra. In this case, we are told that there are 85 lime-flavored gumballs, which constitute 17% of all the gumballs in the machine. To determine the total number of gumballs, we need to translate this percentage into a mathematical equation and solve for the total.

In this article, we will explore the process step-by-step, including the relevant formulas, methods, and real-world applications of percentage problems. Whether you're a student brushing up on math skills or someone interested in how percentages work in practical scenarios, this guide will help clarify the process.

Understanding Percentage Problems

What Is a Percentage?

A percentage is a way to express a number as a fraction of 100. It is denoted by the symbol "%". For example, 17% means 17 out of 100 parts or 0.17 in decimal form.

Why Are Percentages Useful?

Percentages are used to:

- Describe proportions and ratios
- Calculate discounts, interest, and growth
- Solve real-world problems involving parts of a whole

Converting Percentages to Decimals and Fractions

- To convert a percentage to a decimal: divide by 100.
- Example: $17\% = 17 \div 100 = 0.17$
- To convert to a fraction: write the percentage over 100 and simplify if possible.
- Example: $17\% = 17/100$

Setting Up the Problem

Given:

- Number of lime-flavored gumballs = 85
- Lime-flavored gumballs represent 17% of all gumballs

Find:

- Total number of gumballs in the machine

Formulating the Equation

Let:

- T = total number of gumballs in the machine

Since 85 gumballs are 17% of T , we can write:

$$85 = 17\% \text{ of } T$$

Expressing 17% as a decimal:

$$85 = 0.17 T$$

To find T , divide both sides by 0.17:

$$T = 85 \div 0.17$$

Calculating the Total Number of Gumballs

Performing the Division

Calculating T :

$$T = 85 \div 0.17$$

Using a calculator or long division:

- $85 \div 0.17 \approx 500$

Therefore, the total number of gumballs in the machine is approximately 500.

Answer:

There are 500 gumballs in the machine.

Verifying the Solution

It's always good practice to verify your answer by checking if 17% of the total matches the known quantity.

Calculate 17% of 500:

$$0.17 \times 500 = 85$$

Since this matches the given number of lime-flavored gumballs, our solution is correct.

Additional Examples and Practice Problems

To deepen your understanding, here are some similar problems:

Example 1:

If 30% of a collection of marbles is red and there are 60 red marbles, how many marbles are there in total?

Solution:

- Red marbles = 30% of total
- $60 = 0.30 \times T$
- $T = 60 \div 0.30 = 200$

Total marbles = 200

Example 2:

A bookstore has 120 books that are fiction, which make up 40% of all books. How many books are in the bookstore?

Solution:

- Fiction books = 40% of total
- $120 = 0.40 \times T$

- $T = 120 \div 0.40 = 300$

Total books = 300

Practical Applications of Percentage Problems

Understanding percentage calculations like in the gumball machine problem has many real-world uses:

- Inventory Management: Calculating total stock based on a known subset.
- Financial Planning: Determining total savings or investments based on partial data.
- Education and Testing: Solving percentage problems in exams and quizzes.
- Business Analytics: Analyzing sales data, market shares, and customer demographics.

Tips for Solving Percentage Word Problems

- Carefully identify what part of the problem represents the percentage and the whole.
- Convert percentages to decimals for easier calculations.
- Set up a clear algebraic equation based on the relationship.
- Use a calculator to perform division accurately.
- Always verify your answer by plugging it back into the original context.

Summary

In this article, we explored how to determine the total number of gumballs in a machine given a subset that represents a percentage of the whole. By translating the percentage into a decimal and setting up a simple algebraic equation, we found that the machine contains approximately 500 gumballs. This approach can be applied to many similar problems involving percentages, making it a valuable skill for students and professionals alike.

Conclusion

Understanding how to solve percentage problems is fundamental in mathematics and everyday life. Whether calculating the total number of gumballs in a machine, determining sales figures, or analyzing data, mastering these skills enhances problem-solving ability and numerical literacy. Remember to always verify your solutions and practice with different scenarios to build confidence and proficiency.

Frequently Asked Questions

What is the total number of gumballs in the machine if 85 lime-flavored gumballs represent 17% of the total?

The total number of gumballs is 500.

How do you find the total number of gumballs when given a percentage and part of the total?

Divide the part by the percentage (expressed as a decimal), so $\text{total} = \text{part} / (\text{percentage} / 100)$.

Why is it important to convert the percentage to a decimal when calculating the total number of gumballs?

Converting the percentage to a decimal allows for proper multiplication or division to find the total quantity.

Can you verify the total number of gumballs by calculating 17% of 500?

Yes, 17% of 500 is $0.17 \times 500 = 85$, which matches the number of lime-flavored gumballs.

What mathematical operation is used to find the total number of gumballs in this problem?

Division is used: $\text{total} = 85 \div 0.17$.

If the number of lime-flavored gumballs increased to 102, what would be the total number of gumballs assuming the same percentage?

The total would be $102 \div 0.17 \approx 600$ gumballs.

Is 85 gumballs a common way to represent a subset in percentage problems?

Yes, representing a subset as a specific number and relating it to a percentage is common in such problems.

How can understanding this problem help in real-world scenarios?

It helps in estimating totals based on partial data, useful in inventory, surveys, and resource management.

What is the key step to solving percentage-based problems like this one?

Identify the part and the percentage, then divide the part by the percentage (as a decimal) to find the total.

Additional Resources

The number of lime-flavored gumballs in a gumball machine is 85. If this is 17% of the number of gumballs in the machine, how many gumballs are in the machine?

This question may seem straightforward at first glance, but it opens the door to exploring fundamental concepts in percentages, algebra, and problem-solving strategies. Understanding how to interpret percentages and convert them into actual quantities is a vital skill across numerous fields – from finance and marketing to data analysis and everyday decision-making. In this article, we will dissect this problem step-by-step, providing clarity on the mathematical principles involved while illustrating how such problems are approached in a real-world context.

Understanding the Problem: Breaking Down the Question

Before jumping into calculations, it's essential to understand what the question is asking:

- Given: The number of lime-flavored gumballs is 85.
- Given: These 85 gumballs represent 17% of the total number of gumballs in the machine.
- Question: How many gumballs are there in total?

This problem involves a classic percentage-to-whole relationship, where part of a quantity (lime-flavored gumballs) is known, and the proportion of that part relative to the whole is given as a percentage.

The Core Concept: Percentages and Their Role in Quantitative Problems

Percentages are a way of expressing ratios or proportions out of 100. When we

say that a certain part of a total accounts for 17%, it means:

$$\text{Part} / \text{Whole} = \text{Percentage} / 100$$

In this case:

$$\text{Number of lime-flavored gumballs} / \text{Total gumballs} = 17 / 100$$

This formula is the foundation for translating percentage information into actual quantities.

Setting up the Equation: Translating Words into Mathematics

Let's define:

- T = total number of gumballs in the machine

Given that, the problem states:

> The number of lime-flavored gumballs (85) is 17% of the total.

Expressed mathematically:

$$\begin{aligned} & \backslash[\\ & 85 = 17\% \times T \\ & \backslash] \end{aligned}$$

Since percentages are more manageable when converted to decimal form, we rewrite 17% as 0.17:

$$\begin{aligned} & \backslash[\\ & 85 = 0.17 \times T \\ & \backslash] \end{aligned}$$

Our goal is to solve for T, the total number of gumballs.

Solving the Equation: Step-by-Step

The algebraic solution involves isolating T:

$$\begin{aligned} & \backslash[\\ & T = \frac{85}{0.17} \\ & \backslash] \end{aligned}$$

Calculating the division:

$$\backslash[$$

$$T = \frac{85}{0.17}$$

To perform this division, you can either use a calculator or do it manually:

- Using a calculator:

$$\left(\frac{85}{0.17} \approx 500\right)$$

- Manual calculation:

Multiply numerator and denominator by 100 to clear the decimal:

$$T = \frac{85 \times 100}{0.17 \times 100} = \frac{8500}{17}$$

Now, divide 8500 by 17:

$$17 \times 500 = 8500$$

So,

$$T = 500$$

Conclusion: The total number of gumballs in the machine is 500.

Verifying the Result: Ensuring Consistency

To verify, check whether 17% of 500 equals 85:

$$0.17 \times 500 = 85$$

Yes, the calculation confirms the problem statement. This verification step is crucial in real-world problem-solving to avoid errors or misinterpretations.

Broader Implications: Applying the Concept to Real-World Problems

While this problem may seem simple, it underscores a critical skill – translating percentage-based data into actual quantities. This skill is vital in various domains:

- Business: Determining the total sales when given a percentage contribution of a product.
- Finance: Calculating total investment based on partial holdings.
- Statistics: Estimating total population from sample percentages.
- Everyday life: Figuring out total cost or quantity when given a percentage of a part.

Understanding how to manipulate percentages and set up algebraic equations enables more informed decision-making and precise calculations.

Common Pitfalls and How to Avoid Them

When dealing with percentage problems, beginners often make mistakes such as:

- Confusing percentage with decimal form (e.g., using 17 instead of 0.17).
- Forgetting to convert percentages into decimal before calculations.
- Misinterpreting the part-whole relationship, leading to incorrect equations.
- Making calculation errors, especially with division or multiplication.

Tips to avoid these pitfalls include:

- Always convert percentages to decimals before calculation.
- Clearly define variables to keep track of what each represents.
- Double-check calculations, especially in division.
- Verify results by plugging the answer back into the original question.

Extending the Problem: Variations and Applications

The problem of determining total quantities from known parts and percentages can be extended in numerous ways:

- Multiple flavors: If other flavors are present in known proportions, how do you determine their quantities?
- Changing percentages: How does increasing or decreasing the percentage affect the total?
- Non-uniform distribution: What if the percentage varies across different sections of the machine?

Such extensions demonstrate how the core principle remains applicable across diverse scenarios, from inventory management to survey analysis.

Final Thought: Mastering Basic Percentages for Complex Situations

The calculation of the total number of gumballs based on part and percentage

is a fundamental example of algebraic reasoning applied to everyday problems. Mastery of these techniques forms a foundation for tackling more complex quantitative challenges. Whether you're managing inventory, analyzing data, or making informed decisions, understanding how to convert percentages into real-world quantities is a valuable skill.

In conclusion, by setting up the problem correctly, converting percentages to decimals, and solving the resulting algebraic equation, we find that the gumball machine contains 500 gumballs in total. This straightforward example highlights the importance of clear reasoning, proper conversion, and verification – principles that are essential across countless applications in science, business, and daily life.

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