What Number Should Be The Exponent On The 10 So That The Two Numbers Are Equivalent? 75.6 - 10% = 0.00756

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Understanding the relationship between numbers, exponents, and percentages is fundamental in mathematics, especially in fields like science, engineering, finance, and data analysis. This article explores the intriguing question: what exponent should be applied to 10 so that it becomes equivalent to a specific number, particularly in the context of the example where 75.6 decreased by 10% equals 0.00756? We will delve into the concepts of exponents, scientific notation, percentage calculations, and how to determine the appropriate exponent to match given numerical relationships.

Decoding the Problem Statement

Before we can determine the exponent, it’s essential to understand the problem thoroughly.

Interpreting the Given Data

- The initial number: 75.6
- The percentage decrease: 10%
- The resulting number after decrease: 0.00756
- Question: What exponent should be applied to 10 to produce a number equivalent to 0.00756?

At first glance, the problem seems to involve two separate calculations:

1. Calculating 75.6 after a 10% decrease
2. Understanding what power of 10 results in 0.00756

However, the key is to recognize that the problem is asking about the relationship between the number 10 raised to some exponent and the final value 0.00756.

Understanding Percentages and Their Impact

Calculating 10% of 75.6

To interpret the initial data, let's evaluate how 75.6 changes after a 10% decrease:

- 10% of 75.6:
$75.6 \times 0.10 = 7.56$

- Number after decrease:
$75.6 - 7.56 = 68.04$

So, after decreasing 75.6 by 10%, the new number is 68.04.

But the problem states that after some operation involving 10 and an exponent, the number becomes 0.00756, which is vastly smaller.

Relating 75.6 - 10% to 0.00756

Given that 75.6 minus 10% results in 68.04, but the target is 0.00756, it suggests the problem may involve expressing 75.6 or the percentage reduction in terms of powers of 10, perhaps through scientific notation.

Scientific Notation and Exponents

Understanding scientific notation is crucial when dealing with very large or very small numbers.

What Is Scientific Notation?

- Scientific notation expresses numbers as a product of a coefficient and a power of 10.
- Example: 0.00756 can be written as 7.56×10^{-3}.

Converting 0.00756 to Scientific Notation

- $0.00756 = 7.56 \times 10^{-3}$

This form makes it easier to analyze and compare with powers of 10.

Determining the Exponent for 10 to Reach 0.00756

The core question: What exponent n satisfies the equation:

$10^{n} = 0.00756$

Solving for the Exponent

- Take the logarithm (base 10) of both sides:

$\log_{10}(10^n) = \log_{10}(0.00756)$

- Simplify:

$n = \log_{10}(0.00756)$

Now, compute $\log_{10}(0.00756)$:

- Recall that:

$\log_{10}(0.00756) = \log_{10}(7.56 \times 10^{-3}) = \log_{10}(7.56) + \log_{10}(10^{-3})$

- Calculate each term:

$\log_{10}(7.56) \approx 0.878$

$\log_{10}(10^{-3}) = -3$

- Add the results:

$n \approx 0.878 + (-3) = -2.122$

Therefore,

$n \approx -2.122$

Conclusion

The exponent on 10 that yields a value approximately equal to 0.00756 is about -2.122.

Interpreting the Result in Context

This calculation indicates that:

- 10 raised to the power of approximately -2.122 equals 0.00756.
- In scientific notation, this is close to 7.56×10^{-3}, matching the earlier conversion.

Implications of the Exponent

Understanding this exponent helps in:

- Expressing small numbers in scientific notation
- Comparing quantities across different scales
- Performing calculations involving exponential decay or growth

Additional Insights: Percentage and Exponential Relationships

Connecting Percentages to Exponents

While percentages are often used for straightforward calculations, they can be related to exponents when dealing with exponential decay or growth processes.

For example:

- A 10% decrease per period can be modeled as multiplying by 0.9 each time.
- After n periods:
Final value = Initial value × $(0.9)^n$

If you want to find n such that the final value reaches a certain small number, you can solve:

$(0.9)^n$ = target / initial

Similarly, for exponential decay involving powers of 10, the same principles apply.

Practical Applications

- Calculating radioactive decay
- Financial compound interest calculations
- Signal attenuation in communications

Summary of Key Concepts

- To find the exponent n such that $10^n \approx 0.00756$, compute $n = \log_{10}(0.00756) \approx -2.122$.
- The number 0.00756 can be expressed as 7.56×10^{-3}.
- Percentage reductions can be modeled using exponential functions, especially in decay scenarios.

Final Thoughts

Understanding how to determine the exponent on 10 to match a specific number is a fundamental skill in mathematics and science. It involves logarithms, scientific notation, and an understanding of exponential relationships. Whether you're analyzing decay rates, financial growth, or converting small measurements, mastering these concepts will enhance your ability to work with a wide range of numerical data.

Additional Resources for Further Learning

- " logarithm properties and their applications"
- "Scientific notation in scientific and engineering contexts"
- "Exponential functions and their applications in real-world problems"

By mastering these principles, you'll be better equipped to handle complex calculations involving exponents, percentages, and scientific notation in various professional and academic settings.

Frequently Asked Questions

How do I find the exponent on 10 to make 75.6 - 10% equal to 0.00756?

First, calculate 75.6 minus 10% of 75.6, which is 75.6 × 0.10 = 7.56, so 75.6 - 7.56 = 68.04. To find the exponent n such that 10^n = 0.00756, take the base-10 logarithm: n = log10(0.00756) ≈ -2.122.

What is the relationship between the number 0.00756 and the exponent on 10?

The number 0.00756 can be expressed as 10 raised to an exponent, specifically approximately 10^(-2.122).

Why is the exponent on 10 negative in the equation 10^n = 0.00756?

Because 0.00756 is less than 1, its base-10 logarithm is negative, indicating the exponent n is negative.

How can I verify the exponent value that makes 10^n equal to 0.00756?

You can verify by calculating 10^(-2.122) which approximately equals 0.00756, confirming the exponent value.

Is the calculation of 75.6 - 10% related to finding the exponent on 10 in this problem?

Yes. After subtracting 10%, the resulting number (68.04) can be related to 10^n by taking the logarithm to find the exponent n matching 0.00756.

What does the number 68.04 represent in relation to 0.00756 and the exponent on 10?

68.04 is the result of subtracting 10% from 75.6, but to relate it to 0.00756, we focus on the value 0.00756 itself, which corresponds to 10^(-2.122).

Can I use the same method to find the exponent for other decimal numbers?

Yes. For any decimal number, you can find the exponent on 10 by calculating its base-10 logarithm: n = log10(number).

What is the significance of the exponent being approximately -2.122 in this context?

It indicates that 0.00756 is roughly 10 raised to the power of -2.122, helping understand its scale relative to 1.

How accurate is the approximation of the exponent as -2.122?

Using a calculator, log10(0.00756) ≈ -2.122, so the approximation is quite precise for most practical purposes.

Why do we need to find the exponent on 10 in this problem?

Finding the exponent helps understand the order of magnitude of the number 0.00756 and relates it to powers of 10 for scientific notation or logarithmic calculations.

Additional Resources

What Number Should Be The Exponent On The 10 So That The Two Numbers Are Equivalent? 75.6 - 10% = 0.00756

In the realm of mathematics, understanding the relationship between numbers—particularly when involving exponents and percentages—is essential for both students and professionals. The question, “What number should be the exponent on the 10 so that the two numbers are equivalent?” may seem straightforward at first glance, but it encapsulates a rich tapestry of concepts including exponential notation, percentage calculations, and scientific notation. This article aims to dissect this problem thoroughly, providing clarity on how exponents relate to the given numbers, and exploring the mathematical principles that underpin this relationship.

Understanding the Problem: Breaking Down the Question

The core of the problem involves two key elements: the number 75.6 decreased by 10%, and the number 0.00756. The question asks us to find the exponent on 10 that makes these two numbers equivalent. In mathematical terms, it’s about expressing one or both of these numbers as powers of 10 and then finding the exponent that links them.

Let’s clarify what each component signifies:

- 75.6 - 10%: This indicates a reduction of 75.6 by 10%. Calculating this involves understanding percentages and their impact on a base number.
- 0.00756: This is a small decimal number, often expressed in scientific notation for clarity.
- Exponent on 10: This refers to a power of 10, such as 10^x, where x is the exponent we need to determine.

Calculating the Reduced Number: 75.6 minus 10%

Before we find the exponent, we need to understand the value of the first number after the percentage reduction.

Step 1: Calculate 10% of 75.6

10% is equivalent to 0.10 in decimal form. So,

$$
10\% \text{ of } 75.6 = 75.6 \times 0.10 = 7.56
$$

Step 2: Subtract this value from 75.6

$$
75.6 - 7.56 = 68.04
$$

Thus, after reducing 75.6 by 10%, the resulting number is 68.04.

Comparing the Numbers: 68.04 and 0.00756

Now, the question becomes: What power of 10 makes 68.04 equivalent to 0.00756? Alternatively, does a common exponential form relate these two numbers? To answer this, we need to express both numbers in scientific notation.

Expressing Numbers in Scientific Notation

Scientific notation simplifies the comparison of very large or very small numbers by expressing them as a product of a coefficient between 1 and 10, and a power of 10.

Number 1: 68.04

$$
68.04 = 6.804 \times 10^1
$$

Number 2: 0.00756

To express 0.00756 in scientific notation:

- Count the number of decimal places moved to get a number between 1 and 10.

$$
0.00756 = 7.56 \times 10^{-3}
$$

Finding the Exponent: Connecting the Two Numbers

The core of the problem reduces to: What exponent on 10 makes 6.804×10^1 equal to 7.56×10^{-3}?

Mathematically, we are looking for x such that:

$$
6.804 \times 10^1 = 7.56 \times 10^{x}
$$

Dividing both sides by 7.56:

$$
\frac{6.804 \times 10^1}{7.56} = 10^{x}
$$

Calculating the left side:

$$
\frac{6.804}{7.56} \approx 0.899
$$

So,

$$
0.899 \times 10^1 = 10^{x}
$$

Express 0.899 in scientific notation:

$$
0.899 = 8.99 \times 10^{-1}
$$

\]

Therefore,

\[
8.99 \times 10^{-1} \times 10^1 = 8.99 \times 10^{0} = 10^{x}
\]

This simplifies to:

\[
8.99 \times 10^{0} = 10^{x}
\]

Taking the base-10 logarithm of both sides:

\[
\log_{10} (8.99) = x
\]

Calculating:

\[
x \approx \log_{10}(8.99) \approx 0.954
\]

Final Answer: The Exponent

Thus, the number on the right side that makes the two numbers equivalent is approximately:

\[
x \approx 0.954
\]

or rounded to three decimal places:

\[
x \approx 0.954
\]

Practical Implications and Broader Understanding

This calculation illustrates the importance of scientific notation in comparing magnitudes, especially when dealing with numbers of vastly different sizes. It’s common in scientific and engineering contexts to express numbers in this form, making it easier to understand and manipulate exponential relationships.

Why Does This Matter?

- Data Analysis: When analyzing data, especially in fields like physics or finance, understanding how to convert between different forms of numbers helps in modeling and interpretation.
- Scientific Communication: Clear communication of very large or small numbers using exponents avoids confusion and reduces errors.
- Mathematical Proficiency: Mastery of exponential notation and logarithms enhances problem-solving skills in various disciplines.

Summary

In summary, the question about finding the exponent on 10 that equates the two numbers—75.6 reduced by 10% and 0.00756—can be addressed through scientific notation and logarithmic calculations. After reducing 75.6 by 10%, we obtained 68.04, which in scientific notation is \(6.804 \times 10^1\). Comparing it to 0.00756, expressed as \(7.56 \times 10^{-3}\), led us to a solution involving logarithms, resulting in an exponent of approximately 0.954.

This exercise underscores the interconnectedness of percentages, scientific notation, and logarithms in solving real-world mathematical problems. Whether in academic settings or professional environments, these tools are invaluable for interpreting and manipulating numerical data effectively.

Final Thoughts

Understanding the relationship between different numerical representations is crucial for advancing in fields that depend on precise calculations and data interpretation. While the question initially appears simple, delving into the mathematical details reveals the depth of concepts involved. Mastery of exponentials, logarithms, and scientific notation not only enhances mathematical literacy but also empowers professionals and students to approach complex problems with confidence and clarity.

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