

To The Proper Number Of Significant Figures, What Is The Solution To Calculation Below?(165.43 G-78.15

To The Proper Number Of Significant Figures, What Is The Solution To Calculation Below?(165.43 G-78.15 is a common question encountered in scientific and mathematical contexts, especially when dealing with measurements and calculations. Understanding how to correctly determine the result with the appropriate number of significant figures is essential for maintaining precision and accuracy in scientific communication. In this article, we will explore the principles of significant figures, step through the specific calculation, and provide guidance on how to ensure your final answer adheres to the proper significant figure rules.

Understanding Significant Figures: The Foundation of Precision

What Are Significant Figures?

Significant figures (often abbreviated as "sig figs") are digits in a number that carry meaningful contributions to its precision. They include all non-zero digits, any zeros between significant digits, and trailing zeros in a decimal number.

Examples:

- 123.45 has 5 significant figures.
- 0.00456 has 3 significant figures.
- 7.8900 has 5 significant figures.

Rules for Determining Significant Figures

When performing calculations, the rules for significant figures guide how to round the result:

1. Addition and Subtraction:

The result should have the same number of decimal places as the measurement with the fewest decimal places.

2. Multiplication and Division:

The result should have the same number of significant figures as the measurement with the fewest significant figures.

Applying Significant Figures to the Calculation: 165.43

G - 78.15

Step 1: Identify the Numbers and Their Significant Figures

- 165.43 G has 5 significant figures.
- 78.15 has 4 significant figures.

Step 2: Determine the Type of Operation

Since this is a subtraction problem, we follow the rule for addition and subtraction:

The number of decimal places in the result should match the measurement with the fewest decimal places.

- 165.43 has 2 decimal places.
- 78.15 has 2 decimal places.

Both numbers have 2 decimal places, so the result should be rounded to 2 decimal places.

Step 3: Perform the Calculation

Subtract the numbers:

$$165.43 - 78.15 = 87.28$$

Step 4: Round the Result to the Proper Number of Significant Figures

Since both numbers have 2 decimal places, the answer should be rounded to 2 decimal places: 87.28 (already at 2 decimal places, so no change needed).

Final answer with proper significant figures: 87.28

Key Takeaways for Significant Figures in Calculations

- Always identify the number of significant figures in each measurement.
- Use the appropriate rule depending on whether you're adding/subtracting or multiplying/dividing.
- Round the final answer to match the measurement with the least precision.
- Remember that zeros can be tricky; understand whether they are significant or just placeholders.

Common Mistakes and How to Avoid Them

Mistake 1: Ignoring the Rules for Addition and Subtraction

Solution: Always check the decimal places in the operands. The rounding should be based on decimal places, not significant figures alone.

Mistake 2: Rounding Too Early

Solution: Perform the calculation with full precision, then round only at the end according to the rules.

Mistake 3: Confusing Significant Figures with Decimal Places

Solution: Practice differentiating between the two. Significant figures count all meaningful digits, while decimal places refer to digits after the decimal point.

Additional Tips for Mastering Significant Figures

- Always record measurements with as many significant figures as possible, then round appropriately.
- Use a calculator that preserves the full precision during calculations.
- When in doubt, review the rules or consult a scientific calculator or software that can handle significant figures automatically.

Conclusion: Ensuring Accuracy and Precision in Scientific Calculations

Properly handling significant figures is crucial for conveying the correct level of precision in scientific and mathematical work. For the calculation $165.43 \text{ g} - 78.15$, the correct result, considering significant figures, is 87.28. This answer maintains the appropriate precision based on the initial measurements, adhering to the rule that the result should be rounded to two decimal places, matching the measurement with the fewest decimal places.

By mastering these principles, you can confidently perform calculations that are not only mathematically correct but also scientifically precise, ensuring clarity and accuracy in your reports, experiments, and analyses. Remember, attention to detail in significant figures reflects a thorough understanding of measurement and precision—cornerstones of scientific integrity.

Frequently Asked Questions

What is the result of subtracting 78.15 from 165.43 when considering the proper number of significant figures?

The result is 87.28, rounded to 4 significant figures, because the number with the fewest decimal places (78.15 with 2 decimal places) limits the precision.

How do you determine the proper number of significant figures in the calculation $165.43\text{ G} - 78.15\text{ G}$?

You identify the number with the fewest decimal places—in this case, 78.15 has 2 decimal places—so the answer should be rounded to 2 decimal places.

What is the step-by-step process to solve $165.43\text{ G} - 78.15\text{ G}$ with the correct significant figures?

Subtract: $165.43 - 78.15 = 87.28$. Since 78.15 has 2 decimal places, round 87.28 to 2 decimal places, resulting in 87.28 G.

Why is it important to consider significant figures in this calculation?

To ensure the precision of the result reflects the least precise measurement used in the calculation, maintaining scientific accuracy.

What would be the answer if the calculation was $165.430\text{ G} - 78.150\text{ G}$ considering significant figures?

The result would be 87.280 G, rounded to 5 significant figures, matching the precision of the original measurements.

Can you provide the final answer to 165.43 G minus 78.15 G with proper significant figures?

Yes, the final answer is 87.28 G, rounded to 2 decimal places.

How many decimal places should the final answer have for the calculation $165.43\text{ G} - 78.15\text{ G}$?

It should have 2 decimal places because the measurement with the least decimal places (78.15) has 2 decimal places.

Is the calculation $165.43\text{ G} - 78.15\text{ G}$ exact or approximate, and why?

It is approximate because it involves measurements with limited precision, so the result is rounded to the appropriate significant figures.

What is the significance of the digits in the number 78.15 in the calculation?

The digits indicate the measurement's precision, specifically that it is precise to two decimal places, which limits the precision of the final result.

How would the answer change if the numbers were 165.430 G and 78.150 G?

The result would be 87.280 G, maintaining 5 significant figures to match the precision of the measurements.

Additional Resources

To The Proper Number Of Significant Figures, What Is The Solution To Calculation Below? (165.43 G - 78.15)

In the realm of scientific calculations, precision and accuracy are paramount. When performing arithmetic operations such as subtraction, adhering to the rules governing significant figures ensures that the results are both meaningful and reliable. The question posed—what is the correct answer to the calculation $165.43\text{ G} - 78.15\text{ G}$, considering the proper number of significant figures—is a fundamental yet often misunderstood aspect of scientific work. This article delves into the principles underlying significant figures, explores the specific calculation step-by-step, and emphasizes the importance of proper rounding and reporting in scientific data.

Understanding Significant Figures: The Foundation of Precision

What Are Significant Figures?

Significant figures (or significant digits) are the digits in a number that carry meaningful contributions to its precision. They include all non-zero digits, zeros between significant digits, and trailing zeros in decimal numbers. Conversely, leading zeros—those before the first non-zero digit—are not counted as significant because they merely indicate the position of the decimal point.

For example:

- 165.43 has five significant figures.
- 78.15 has four significant figures.
- 0.0056 has two significant figures (5 and 6).
- 100.0 has four significant figures (the zeros after the decimal are significant).

The importance of significant figures:

- They communicate the precision of a measurement.
- They prevent overstatement of the certainty of a result.
- They ensure consistency and comparability across different measurements and calculations.

Rules for Significant Figures in Calculations

Different operations require different rules for handling significant figures:

- Addition and Subtraction: The result should be rounded to the least precise decimal place of any number in the operation.
- Multiplication and Division: The result should be rounded to the number of significant figures equal to that in the least precise measurement.

Understanding these rules ensures that the final answer accurately reflects the precision of the original data.

Step-by-Step Calculation of 165.43 G - 78.15 G

1. Write Down the Numbers Clearly

- First number: 165.43 G
- Second number: 78.15 G

2. Identify the Decimal Places

- 165.43 G has five decimal places (digits to the hundredths place).
- 78.15 G has two decimal places (digits to the hundredths place).

3. Perform the Subtraction

- Subtract: 165.43 G - 78.15 G

Let's perform the calculation:

$$\begin{array}{r} 165.43 \\ - 78.15 \\ \hline = 87.28 \end{array}$$

4. Determine the Appropriate Rounding

- Since we're performing subtraction, the result must be rounded to the least precise decimal place among the original numbers.
- 165.43 G has five decimal places.
- 78.15 G has two decimal places.

Therefore, the result should be rounded to two decimal places.

5. Final Answer with Proper Significant Figures

- Rounded to two decimal places: 87.28 G

Result: 87.28 G

Significant Figures in the Final Answer

The critical aspect here is understanding why 87.28 G is the correct answer in terms of significant figures and decimal places.

Key points:

- **Decimal Places:** Since the original numbers had different decimal precisions, the rule for addition/subtraction dictates that the final answer should be rounded to match the least precise decimal place, which is two decimal places.
- **Significant Figures:** The number 87.28 has five significant figures, matching the original data's precision where appropriate, but primarily, the focus in addition/subtraction is on decimal places rather than total significant figures.

This approach ensures that the reported result does not imply unwarranted precision beyond the original measurements.

Implications of Proper Significant Figures Handling

Why Does Proper Rounding Matter?

Incorrectly handling significant figures can lead to:

- Overestimation of precision, which might give a false sense of accuracy.
- Misinterpretation of data, especially in scientific, engineering, and technical contexts.
- Reduced credibility of reported results.

For example, reporting the result as 87.283 G would imply a higher precision than the original data supports, potentially misleading subsequent calculations or interpretations.

Impact on Scientific Communication

Accurate use of significant figures maintains integrity in scientific communication. It ensures that colleagues, reviewers, or readers understand the certainty level of measurements and calculations.

This precision is essential when combining data from various sources or when performing complex analyses where the cumulative effect of rounding errors can be significant.

Advanced Considerations and Common Pitfalls

Handling Multiple Operations

When calculations involve multiple steps, it is advisable to:

- Carry extra digits through intermediate steps.
- Round only after completing the entire calculation to minimize rounding errors.

Significant Figures in Measurements vs. Calculated Data

It is important to distinguish between the significant figures in the original measurements and those in derived data. The rules for the latter depend on the operation performed.

Common Mistakes to Avoid

- Rounding prematurely during intermediate steps.
- Ignoring decimal places when performing addition/subtraction.
- Using the wrong number of significant figures for the operation.

Conclusion: The Proper Solution and Its Significance

In the calculation of $165.43\text{ G} - 78.15\text{ G}$, the proper application of significant figures and decimal place considerations leads us to the final answer:

87.28 G

This result respects the rules governing subtraction, where the precision is limited by the measurement with the least decimal places—in this case, two decimal places. Such meticulous attention to detail underscores the importance of precision in scientific endeavors, ensuring that reported data accurately reflect the certainty of the measurements.

Ultimately, mastering significant figures is more than a technical requirement; it is a cornerstone of scientific integrity. By adhering to these principles, scientists and technicians uphold the standards of clarity, accuracy, and trustworthiness essential for advancing knowledge and technological development.

In summary:

- The calculation is straightforward: 165.43 G minus 78.15 G equals 87.28 G.
- The result is rounded to two decimal places, aligning with the least precise measurement.
- Proper handling of significant figures prevents overstatement of accuracy and maintains scientific rigor.
- This practice is essential across scientific disciplines, ensuring data integrity and meaningful communication.

Through understanding and applying these principles, practitioners can confidently report results that are both precise and honest, upholding the fundamental values of scientific inquiry.

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