

multiplying and dividing scientific notation worksheet with answer key

Multiplying and Dividing Scientific Notation Worksheet with Answer Key

Scientific notation is a method of expressing very large or very small numbers in a compact form. This notation is particularly useful in fields such as science, engineering, and mathematics, where numbers can vary widely in magnitude. Multiplying and dividing numbers in scientific notation can be straightforward if you follow specific rules. In this article, we will explore how to multiply and divide numbers in scientific notation, provide a worksheet with practice problems, and include an answer key for self-assessment.

Understanding Scientific Notation

Before diving into multiplication and division, let's clarify what scientific notation is. A number expressed in scientific notation has two main components:

1. A coefficient (a number between 1 and 10)
2. A power of ten (an exponent indicating how many places to move the decimal)

For example, the number 4,500 can be expressed in scientific notation as (4.5×10^3) . Similarly, the number 0.00456 can be expressed as (4.56×10^{-3}) .

Rules for Multiplying Scientific Notation

When multiplying numbers in scientific notation, follow these steps:

1. Multiply the coefficients: Take the numbers before the powers of ten and multiply them.
2. Add the exponents: Take the exponents from both numbers and add them together.
3. Adjust the result if necessary: If the coefficient is not between 1 and 10, adjust it accordingly.

Example: Multiply (3.0×10^4) and (2.0×10^3) .

- Step 1: Multiply the coefficients: $(3.0 \times 2.0 = 6.0)$
- Step 2: Add the exponents: $(4 + 3 = 7)$
- Result: (6.0×10^7) (this is acceptable as the coefficient is between 1 and 10).

Example of Multiplying with Adjustment

Example: Multiply (5.6×10^2) and (4.0×10^5) .

- Step 1: Multiply the coefficients: $(5.6 \times 4.0 = 22.4)$

- Step 2: Add the exponents: $(2 + 5 = 7)$
- Result: (22.4×10^7)

Since the coefficient 22.4 is not between 1 and 10, we must adjust:

- Adjust: $(22.4 = 2.24 \times 10^1)$
- Final result: $(2.24 \times 10^{7+1} = 2.24 \times 10^8)$

Rules for Dividing Scientific Notation

Dividing numbers in scientific notation follows similar steps as multiplying:

1. Divide the coefficients: Take the numbers before the powers of ten and divide them.
2. Subtract the exponents: Subtract the exponent of the denominator from the exponent of the numerator.
3. Adjust the result if necessary: If the coefficient is not between 1 and 10, adjust it.

Example: Divide (8.0×10^6) by (2.0×10^3) .

- Step 1: Divide the coefficients: $(8.0 \div 2.0 = 4.0)$
- Step 2: Subtract the exponents: $(6 - 3 = 3)$
- Result: (4.0×10^3) (acceptable as the coefficient is between 1 and 10).

Example of Dividing with Adjustment

Example: Divide (3.2×10^5) by (1.6×10^2) .

- Step 1: Divide the coefficients: $(3.2 \div 1.6 = 2.0)$
- Step 2: Subtract the exponents: $(5 - 2 = 3)$
- Result: (2.0×10^3) (this is acceptable as well).

Practice Worksheet

Now that we understand the rules, it's time for some practice. Below is a worksheet with problems that involve multiplying and dividing numbers in scientific notation.

Worksheet: Multiplying and Dividing Scientific Notation

Multiplying Problems:

1. $(2.5 \times 10^3) \times (3.0 \times 10^2)$
2. $(7.1 \times 10^5) \times (4.0 \times 10^3)$
3. $(1.2 \times 10^{-4}) \times (5.0 \times 10^2)$
4. $(6.3 \times 10^6) \times (2.0 \times 10^{-3})$
5. $(9.0 \times 10^1) \times (1.0 \times 10^4)$

Dividing Problems:

6. $(5.0 \times 10^9) \div (1.0 \times 10^3)$
7. $(7.5 \times 10^8) \div (2.5 \times 10^4)$
8. $(3.6 \times 10^{-2}) \div (1.2 \times 10^{-5})$
9. $(9.8 \times 10^7) \div (4.0 \times 10^1)$
10. $(1.5 \times 10^3) \div (3.0 \times 10^2)$

Answer Key

Here are the answers to the problems presented in the worksheet:

Multiplying Answers:

1. $(2.5 \times 10^3) \times (3.0 \times 10^2) = 7.5 \times 10^5$
2. $(7.1 \times 10^5) \times (4.0 \times 10^3) = 28.4 \times 10^8 = 2.84 \times 10^9$
3. $(1.2 \times 10^{-4}) \times (5.0 \times 10^2) = 6.0 \times 10^{-2}$
4. $(6.3 \times 10^6) \times (2.0 \times 10^{-3}) = 12.6 \times 10^3 = 1.26 \times 10^4$
5. $(9.0 \times 10^1) \times (1.0 \times 10^4) = 9.0 \times 10^5$

Dividing Answers:

6. $(5.0 \times 10^9) \div (1.0 \times 10^3) = 5.0 \times 10^6$
7. $(7.5 \times 10^8) \div (2.5 \times 10^4) = 3.0 \times 10^4$
8. $(3.6 \times 10^{-2}) \div (1.2 \times 10^{-5}) = 3.0 \times 10^3$
9. $(9.8 \times 10^7) \div (4.0 \times 10^1) = 2.45 \times 10^6$
10. $(1.5 \times 10^3) \div (3.0 \times 10^2) = 5.0 \times 10^0 = 5.0$

Conclusion

Multiplying and dividing numbers in scientific notation is a valuable skill that simplifies calculations involving very large or very small numbers. By following the outlined steps and practicing with the provided worksheet, you can enhance your understanding and proficiency in using scientific notation. Whether in academic pursuits or professional fields, mastering this concept is essential for effective communication and calculation of numerical data.

Frequently Asked Questions

What is scientific notation?

Scientific notation is a way of expressing numbers that are too large or too small to be conveniently written in decimal form, typically in the format of a number between 1 and 10 multiplied by a power of 10.

How do you multiply numbers in scientific notation?

To multiply numbers in scientific notation, you multiply the coefficients (the numbers in front) and add the exponents of the powers of ten.

What is the product of (3.0×10^4) and (2.0×10^3) ?

The product is 6.0×10^7 .

How do you divide numbers in scientific notation?

To divide numbers in scientific notation, you divide the coefficients and subtract the exponent of the denominator from the exponent of the numerator.

What is the quotient of (4.5×10^5) and (1.5×10^2) ?

The quotient is 3.0×10^3 .

When multiplying (5.0×10^{-2}) and (4.0×10^6) , what exponent do you get?

You get 2×10^4 after multiplying the coefficients (5.0×4.0) and adding the exponents ($-2 + 6$).

Can you explain how to convert a non-scientific notation number to scientific notation?

To convert a non-scientific notation number to scientific notation, move the decimal point to create a number between 1 and 10, and count the number of places you moved the decimal. This count becomes the exponent of 10.

What is the result of (6.0×10^8) divided by (3.0×10^4) ?

The result is 2.0×10^4 .

In a worksheet, how do you check your answers for multiplying and dividing scientific notation?

You can check your answers by re-calculating the coefficients and exponents, ensuring that you follow the rules of multiplication (multiply coefficients and add exponents) and division (divide coefficients and subtract exponents).

What common errors should you avoid when working with scientific notation?

Common errors include not properly adding or subtracting exponents, miscalculating coefficients, and failing to convert results back into proper scientific notation format when necessary.

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