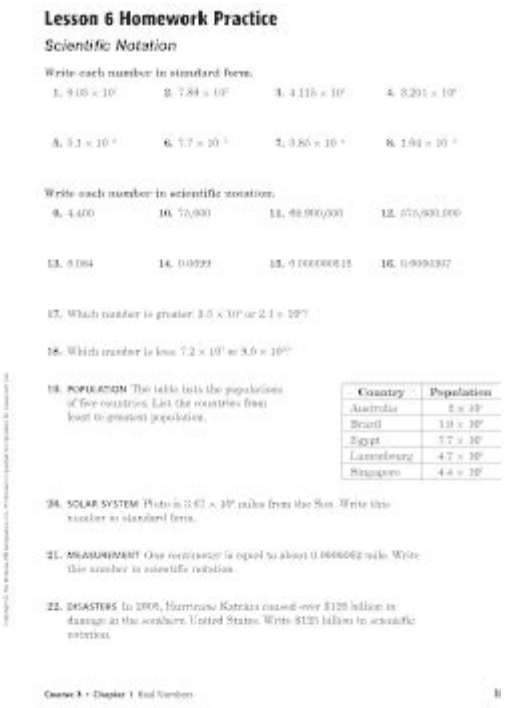
Lesson 6 Homework Practice Scientific Notation



Lesson 6 Homework Practice

Scientific Notation

Write each number in standard form.

1. 9.05×10^{1} 2. 7.84×10^{2} 3. 4.118×10^{3} 4. 8.201×10^{4}

5. 3.1×10^{-1} 6. 7.7×10^{-2} 7. 3.65×10^{-3} 8. 1.91×10^{-5}

Write each number in scientific notation.

9. 4,400 10. 57,000 11. 48,000,000 12. 670,000,000

13. 0.084 14. 0.0099 15. 0.00000015 16. 0.0001037

17. Which number is greater: 3.5×10^{5} or 2.1×10^{6}?

18. Which number is less: 7.2×10^{7} or 8.9×10^{6}?

19. **POPULATION** The table lists the populations of five countries. List the countries from least to greatest population.

Country	Population
Australia	2×10^{7}
Brazil	1.9×10^{8}
Egypt	7.7×10^{7}
Luxembourg	4.7×10^{5}
Singapore	4.4×10^{6}

20. **SOLAR SYSTEM** Pluto is 3.67×10^{9} miles from the Sun. Write this number in standard form.

21. **MEASUREMENT** One centimeter is equal to about 0.0000062 mile. Write this number in scientific notation.

22. **DISASTERS** In 2005, Hurricane Katrina caused over $125 billion in damage in the southern United States. Write $125 billion in scientific notation.

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Lesson 6 Homework Practice Scientific Notation is an essential component of understanding how to work with large and small numbers in a manageable format. Scientific notation simplifies calculations and helps to express values that would otherwise be cumbersome to write out in standard form. In this article, we will explore the concept of scientific notation, its importance, and provide comprehensive practice problems and solutions to help reinforce these concepts.

Understanding Scientific Notation

Scientific notation is a method of expressing numbers that are either very large or very small in a more convenient form. It uses powers of ten to represent these numbers, which allows for easier calculations and comparisons.

Structure of Scientific Notation

A number is expressed in scientific notation as follows:

$$ a \times 10^n $$

Where:
- a is a number greater than or equal to 1 and less than 10.
- n is an integer that indicates the power of ten.

For example, the number 3000 can be written in scientific notation as:

$$3.0 \times 10^3$$

Conversely, a small number like 0.0045 can be expressed as:

$$4.5 \times 10^{-3}$$

Why Use Scientific Notation?

Scientific notation is valuable for several reasons:

1. Simplicity: It simplifies the process of writing and reading large numbers. For instance, instead of writing 1,000,000, one can simply write 1.0×10^6.
2. Clarity: It reduces the risk of errors when dealing with very small or very large values, making it easier to see the scale of numbers.
3. Facilitates Calculations: Operations such as multiplication and division can be performed more easily with numbers in scientific notation.

Applications of Scientific Notation

Scientific notation is commonly used in various fields, including:

- Science: To express quantities like the speed of light (approximately 3.0×10^8 m/s) or the mass of electrons (about 9.11×10^{-31} kg).
- Engineering: To represent measurements and tolerances in a compact form.
- Finance: To handle large figures in economics, like national debts or GDP figures.

Converting Numbers to Scientific Notation

Converting a number to scientific notation involves a few simple steps:

1. Identify the significant figures: Determine the first non-zero digit in the number.
2. Place the decimal point: Move the decimal point to create a new number a between 1 and 10.
3. Count the moves: Count how many places the decimal point has moved to determine n:

- If you moved to the left, n is positive.
- If you moved to the right, n is negative.

Examples of Conversion

- Example 1: Convert 450000 to scientific notation.
- Significant figure: 4.5
- Decimal point moves: 5 places to the left
- Scientific notation: 4.5×10^5

- Example 2: Convert 0.00078 to scientific notation.
- Significant figure: 7.8
- Decimal point moves: 4 places to the right
- Scientific notation: 7.8×10^{-4}

Operations with Scientific Notation

When performing mathematical operations with numbers in scientific notation, certain rules apply.

Multiplication

To multiply numbers in scientific notation:

1. Multiply the coefficients (the values of a).
2. Add the exponents.

For example:

$$(2.0 \times 10^3) \times (3.0 \times 10^4) = (2.0 \times 3.0) \times 10^{3+4} = 6.0 \times 10^7$$

Division

To divide numbers in scientific notation:

1. Divide the coefficients.
2. Subtract the exponents.

For example:

$$\frac{6.0 \times 10^8}{2.0 \times 10^3} = \frac{6.0}{2.0} \times 10^{8-3} = 3.0 \times 10^5$$

Addition and Subtraction

For addition and subtraction, the numbers must have the same exponent:

1. Adjust the numbers to have the same exponent.
2. Add or subtract the coefficients.

For example:

$$ (4.0 \times 10^5) + (3.0 \times 10^6) $$

First, convert $ 3.0 \times 10^6 $ to $ 30.0 \times 10^5 $:

$$ 4.0 \times 10^5 + 30.0 \times 10^5 = (4.0 + 30.0) \times 10^5 = 34.0 \times 10^5 = 3.4 \times 10^6 $$

Homework Practice Problems

Now that we have covered the basics of scientific notation, here are some practice problems to help solidify your understanding.

Conversion Problems

1. Convert the following numbers to scientific notation:
- a) 0.00056
- b) 120000000
- c) 0.0000034

2. Convert these scientific notation numbers back to standard form:
- a) $ 5.2 \times 10^{-2} $
- b) $ 7.4 \times 10^{3} $
- c) $ 1.1 \times 10^{-5} $

Operations Problems

3. Perform the following operations:
- a) $ (4.5 \times 10^3) \times (2.0 \times 10^2) $
- b) $ \frac{9.0 \times 10^5}{3.0 \times 10^2} $
- c) $ (6.0 \times 10^4) + (3.0 \times 10^5) $

Solutions

Here are the solutions to the homework practice problems.

Conversion Solutions

1. Convert the following numbers to scientific notation:
- a) 0.00056 = 5.6×10^{-4}
- b) 120000000 = 1.2×10^8
- c) 0.0000034 = 3.4×10^{-6}

2. Convert these scientific notation numbers back to standard form:
- a) $5.2 \times 10^{-2} = 0.052$
- b) $7.4 \times 10^{3} = 7400$
- c) $1.1 \times 10^{-5} = 0.000011$

Operations Solutions

3. Perform the following operations:
- a) $(4.5 \times 10^3) \times (2.0 \times 10^2) = 9.0 \times 10^5$
- b) $\frac{9.0 \times 10^5}{3.0 \times 10^2} = 3.0 \times 10^3$
- c) $(6.0 \times 10^4) + (3.0 \times 10^5) = 3.6 \times 10^5$

Conclusion

Understanding scientific notation is crucial for working with a wide range of numerical values in various fields. Through this comprehensive guide, the foundational aspects of scientific notation, including conversion, operations, and practice problems, have been discussed in detail. Mastering these concepts will enhance your mathematical skills and prepare you for more advanced topics in both mathematics and science.

Frequently Asked Questions

What is scientific notation and why is it used in mathematics?

Scientific notation is a way of expressing numbers as a product of a coefficient and a power of 10. It is used to simplify the representation of very large or very small numbers, making calculations and comparisons easier.

How do you convert a large number into scientific notation?

To convert a large number into scientific notation, you move the decimal point to the left until only one non-zero digit remains to its left. The number of places you moved the decimal becomes the exponent of 10, which is positive.

What is the process for converting a small decimal into scientific notation?

To convert a small decimal into scientific notation, you move the decimal point to the right until you have one non-zero digit to its left. The number of places you moved the decimal becomes the exponent of 10, which is negative.

Can you provide an example of adding two numbers in scientific notation?

Sure! For example, to add 2.5 x 10^3 and 3.5 x 10^2, first convert them to the same exponent: 2.5 x 10^3 is already in the correct form, and 3.5 x 10^2 becomes 0.35 x 10^3. Then, add the coefficients: 2.5 + 0.35 = 2.85. The result is 2.85 x 10^3.

What are some common mistakes to avoid when working with scientific notation?

Common mistakes include misplacing the decimal when converting, incorrectly adding or subtracting exponents, and failing to express the final answer in proper scientific notation (i.e., having more than one non-zero digit to the left of the decimal).

How can scientific notation be applied in real-world scenarios?

Scientific notation is widely used in fields like science and engineering to express quantities such as distances in space, the size of atoms, or the speed of light, where numbers can be extremely large or small. It allows for clearer communication and easier calculations.

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