Lesson 7 Skills Practice Compute With Scientific Notation

NAME _____ DATE _____ PERIOD _____

Lesson 5 Homework Practice

Compute with Scientific Notation

Evaluate each expression. Express the result in scientific notation.

1. $(50{,}000)(4.2 \times 10^3)$ **2.1×10^8**
2. $(9.5 \times 10^5)(1.26 \times 10^{-2})$ **1.1718×10^4**
3. $(2.9 \times 10^5)(1.5 \times 10^{-4})$ **4.35×10^{-2}**
4. $(6.7 \times 10^{-3})(40{,}000)$ **2.68×10^2**
5. $(5.5 \times 10^3)(7 \times 10^3)$ **3.85×10^7**
6. $(4.3 \times 10^9)(2.1 \times 10^{-2})$ **9.03×10^7**
7. $\frac{7.6 \times 10^5}{3.8}$ **2×10^5**
8. $\frac{2.38 \times 10^{-3}}{1.7 \times 10^{-7}}$ **1.4×10^{-7}**
9. $\frac{1.44 \times 10^5}{6000}$ **2.4**
10. $\frac{8.01 \times 10^{11}}{9 \times 10^{-5}}$ **6.7×10^{15}**
11. $\frac{8.05 \times 10^7}{2.3 \times 10^2}$ **3.5×10^5**
12. $\frac{4.8 \times 10^{-1}}{5 \times 10^7}$ **9.6×10^{-9}**
13. $(1.6 \times 10^5) + (2.29 \times 10^5)$ **2.45×10^5**
14. $(9.38 \times 10^7) + (5 \times 10^5)$ **5.0938×10^7**
15. $(3.5 \times 10^7) - (1.7 \times 10^6)$ **3.33×10^7**
16. $(8.88 \times 10^{-1}) - (1.45 \times 10^{-2})$ **8.735×10^{-1}**
17. $(63{,}000) + (3.1 \times 10^3)$ **6.61×10^4**
18. $(7.14 \times 10^5) + (12{,}000)$ **8.34×10^5**
19. $(6.35 \times 10^6) - (7.9 \times 10^6)$ **-1.55×10^6**
20. $(4 \times 10^7) - (2 \times 10^7)$ **3.98×10^7**
21. $(8100) + (3.0 \times 10^3)$ **1.11×10^4**
22. $(1.06 \times 10^5) + (1.3 \times 10^5)$ **2.36×10^5**
23. $(5.4 \times 10^5) - (147{,}000)$ **5.253×10^5**
24. $(8.19 \times 10^5) - (7.15 \times 10^5)$ **7.475×10^5**

25. The distance from Earth to the Sun is 9.3×10^7 miles, and the distance from Earth to Mars is 4.6×10^7 miles. How many more miles is it from Earth to the Sun than Earth to Mars? **4.7×10^7 miles**

26. The area of the United States (including water) is approximately 3.8×10^6 sq. miles. The area of Alaska (including water) is approximately 6.6×10^5 sq. miles. About how many times the number of square miles of Alaska is the United States? **5.76×10^1 times**

Math Accelerated • **Chapter 6** Powers and Roots

Lesson 7 Skills Practice Compute with Scientific Notation is an essential part of mastering the fundamental concepts of mathematics and science. In this lesson, students learn how to effectively work with numbers expressed in scientific notation, a crucial skill that simplifies the handling of very large or very small numbers. This article delves into the significance of scientific notation, offers a comprehensive overview of the skills necessary for computation, and provides practice problems to enhance understanding.

Understanding Scientific Notation

Scientific notation is a way of expressing numbers that are too large or too small to be conveniently written in decimal form. It is particularly useful in fields such as physics, chemistry, and engineering, where extreme values are common. The format of scientific notation involves two main components:

- A coefficient, which is a number greater than or equal to 1 and less than 10.
- A power of ten, which indicates how many places the decimal point has moved. This is represented as 10 raised to an exponent.

For example, the number 4,500 can be expressed in scientific notation as 4.5×10^3. Conversely, a small number like 0.00056 can be written as 5.6×10^{-4}. Mastering this notation allows for easier calculations and a clearer representation of data.

Why is Scientific Notation Important?

Scientific notation is important for several reasons:

1. **Clarity:** It provides a clear and concise way to express large and small numbers, making them easier to read and understand.
2. **Simplification:** It simplifies calculations, particularly multiplication and division, by allowing for easier manipulation of exponents.
3. **Accuracy:** It helps maintain precision in calculations involving measurements, particularly in scientific experiments.
4. **Standardization:** It is a standardized method of expressing numbers that scientists and mathematicians use globally.

Skills Required for Computing with Scientific Notation

To effectively compute with scientific notation, students need to develop specific skills. These skills are essential for performing operations such as addition, subtraction, multiplication, and division.

1. Addition and Subtraction

When adding or subtracting numbers in scientific notation, the exponents must be the same. If they are not, you must adjust one of the numbers so that the exponents match. Here’s a step-by-step guide:

- Convert to the Same Exponent: If the numbers have different exponents, convert one number to match the exponent of the other.
- Perform the Operation: Once the exponents are the same, add or subtract the coefficients.
- Re-apply the Exponent: The final answer should be expressed in scientific notation.

2. Multiplication

Multiplication in scientific notation is straightforward. The steps are as follows:

- Multiply the Coefficients: Multiply the numbers in front (the coefficients).
- Add the Exponents: Add the exponents of the powers of ten.
- Express in Scientific Notation: Ensure the result is in proper scientific notation.

For example:
- $(3 \times 10^2) \times (2 \times 10^3) = (3 \times 2) \times 10^{(2+3)} = 6 \times 10^5$.

3. Division

Dividing numbers in scientific notation involves similar steps:

- Divide the Coefficients: Divide the first coefficient by the second.
- Subtract the Exponents: Subtract the exponent of the divisor from the exponent of the dividend.
- Express in Scientific Notation: Ensure the final result adheres to the scientific notation format.

For example:
- $(8 \times 10^5) \div (4 \times 10^2) = (8 \div 4) \times 10^{(5-2)} = 2 \times 10^3$.

Practice Problems

To solidify understanding, practicing problems is essential. Below are some problems that cover addition, subtraction, multiplication, and division in scientific notation.

1. Addition Problems

Compute the following:

1. $(3.2 \times 10^4) + (1.8 \times 10^4)$
2. $(5.6 \times 10^{-3}) + (2.4 \times 10^{-2})$

2. Subtraction Problems

Compute the following:

1. $(7.5 \times 10^6) - (2.5 \times 10^6)$
2. $(3.0 \times 10^{-1}) - (1.2 \times 10^{-2})$

3. Multiplication Problems

Compute the following:

1. $(4.0 \times 10^2) \times (3.0 \times 10^3)$
2. $(5.5 \times 10^{-4}) \times (2.0 \times 10^{-2})$

4. Division Problems

Compute the following:

1. $(6.0 \times 10^5) \div (2.0 \times 10^2)$
2. $(9.0 \times 10^{-3}) \div (3.0 \times 10^{-1})$

Conclusion

Lesson 7 Skills Practice Compute with Scientific Notation is a valuable exercise in understanding mathematical concepts that have practical applications in numerous fields. By mastering the skills involved in adding, subtracting, multiplying, and dividing numbers in scientific notation, students can simplify complex calculations and enhance their mathematical proficiency. Regular practice with the provided problems will further reinforce these skills, preparing students for advanced studies in mathematics and science. Embracing scientific notation not only makes computations easier but also lays a strong foundation for future learning and applications in various scientific disciplines.

Frequently Asked Questions

What is scientific notation and why is it useful in computations?

Scientific notation is a method of expressing very large or very small numbers in the form of 'a × 10^n', where 'a' is a number between 1 and 10, and 'n' is an integer. It is useful because it simplifies calculations and makes it easier to read and compare large numbers.

How do you multiply numbers in scientific notation?

To multiply numbers in scientific notation, you multiply the coefficients (the 'a' values) and add the exponents of the 10s. For example, $(3 \times 10^4) \times (2 \times 10^3) = (3 \times 2) \times 10^{(4+3)} = 6 \times 10^7$.

What are the steps to 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. For example, $(6 \times 10^8) \div (2 \times 10^4) = (6 \div 2) \times 10^{(8-4)} = 3 \times 10^4$.

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

To add numbers in scientific notation, the exponents must be the same. For example, to add $(2 \times 10^3) + (3 \times 10^3)$, you simply add the coefficients: $(2 + 3) \times 10^3 = 5 \times 10^3$. If the exponents are different, adjust one to match the other before adding.

What is a common mistake when working with scientific notation?

A common mistake is not aligning the exponents when adding or subtracting. It's crucial to ensure that the powers of 10 are the same before performing these operations; otherwise, the result will be incorrect.

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