

Lesson 4 Reteach

Scientific Notation

Numbers like 5,000,000 and 0.0005 are in **standard form** because they do not contain exponents. A number is expressed in **scientific notation** when it is written as a product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

By definition, a number in scientific notation is written as $a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

Example 1 Express the number 7.8×10^{-6} in standard form.

$$\begin{aligned} 7.8 \times 10^{-6} &= 7.8 \times 0.000001 & 10^{-6} &= 0.000001 \\ &= \underbrace{0.0000078} & & \text{Move the decimal point 6 places to the left.} \end{aligned}$$

Example 2 Express the number 62,000,000 in scientific notation.

$$\begin{aligned} 62,000,000 &= 6.2 \times 10,000,000 & \text{The decimal point moves 7 places.} \\ &= 6.2 \times 10^7 & \text{The exponent is positive.} \end{aligned}$$

To compare numbers in scientific notation, compare the exponents.

- If the exponents are positive, the number with the greatest exponent is the greatest.
- If the exponents are negative, the number with the least exponent is the least.
- If the exponents are the same, compare the factors.

Example 3 Compare each set of numbers using $<$, $>$ or $=$.

a. 2.097×10^5 ● 3.12×10^3 Compare the exponents: $5 > 3$.
So, $2.097 \times 10^5 > 3.12 \times 10^3$.

b. 8.706×10^{-5} ● 8.809×10^{-5} The exponents are the same, so compare the factors: $8.706 < 8.809$.
So, $8.706 \times 10^{-5} < 8.809 \times 10^{-5}$.

Exercises

Express each number in standard form.

- | | | |
|------------------------|--------------------------|--------------------------|
| 1. 4.12×10^6 | 2. 5.8×10^2 | 3. 9.01×10^{-3} |
| 4. 1.034×10^9 | 5. 3.48×10^{-4} | 6. 6.02×10^{-6} |

Express each number in scientific notation.

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|-------------------|---------------|----------------|
| 7. 12,000,000,000 | 8. 5000 | 9. 0.00475 |
| 10. 7,989,000,000 | 11. 0.0000403 | 12. 13,000,000 |

Order each set of numbers from least to greatest.

13. 6.9×10^3 , 7.6×10^{-6} , 7.1×10^3 , 6.8×10^4 14. 4.02×10^{-8} , 4.15×10^{-3} , 4.2×10^2 , 4.0×10^{-8}