Operations with Scientific Notation

Compute with Scientific Notation

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

For products, multiply coefficients and add powers: $(a \times 10^m)(b \times 10^n) = ab \times 10^{m+n}$. For quotients, divide coefficients and subtract exponents. Addition and subtraction require matching powers of ten first. After any operation, normalize the coefficient into $[1, 10)$: $24 \times 10^5 = 2.4 \times 10^6$. Preserve the computed value while adjusting coefficient and exponent in opposite directions.

Worked example

Calculate $(3.2 \times 10^4) \cdot (5 \times 10^{-2})$. Give normalized scientific notation.

1. Coefficients: $3.2 \cdot 5 = 16.0$. Powers: $10^4 \cdot 10^{-2} = 10^{4+(-2)} = 10^2$.

2. Combine the coefficient and power: 16.0×10^2. Next normalize the coefficient.

3. Normalize: 1.6×10^3, with $1 \leq 1.6 < 10$. Expanded-value check: 1600.0.

Answer: 1.6×10^3

Practice Problems

Show your thinking.

1. Calculate $(2.4 \times 10^5) \cdot (3 \times 10^2)$. Give normalized scientific notation.

2. Calculate $(6 \times 10^{-3}) \cdot (4 \times 10^{-2})$. Give normalized scientific notation.

3. Calculate $(8.4 \times 10^7) \div (2.1 \times 10^3)$. Give normalized scientific notation.

4. Calculate $(3.6 \times 10^{-4}) \div (9 \times 10^2)$. Give normalized scientific notation.

5. Calculate $(5.2 \times 10^6) + (1.7 \times 10^6)$. Give normalized scientific notation.

6. Calculate $(7.5 \times 10^{-3}) + (2 \times 10^{-4})$. Give normalized scientific notation.

7. Calculate $(9.1 \times 10^5) - (4.6 \times 10^5)$. Give normalized scientific notation.

8. Calculate $(6 \times 10^{-2}) - (8 \times 10^{-3})$. Give normalized scientific notation.

9. Calculate $(7 \times 10^4) \cdot (5 \times 10^3)$. Give normalized scientific notation.

10. Calculate $(1.8 \times 10^3) \div (6 \times 10^5)$. Give normalized scientific notation.

Answer Key

1. 7.2×10^{7}
2. 2.4×10^{-4}
3. 4×10^{4}
4. 4×10^{-7}
5. 6.9×10^{6}
6. 7.7×10^{-3}
7. 4.5×10^{5}
8. 5.2×10^{-2}
9. 3.5×10^{8}
10. 3×10^{-3}

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Coefficients: $2.4 \cdot 3 = 7.2$. Powers: $10^{5} \cdot 10^{2} = 10^{5+(2)} = 10^{7}$.
2. Combine the coefficient and power: 7.2×10^{7}. Next normalize the coefficient.
3. Normalize: 7.2×10^{7}, with $1 \leq 7.2 < 10$. Expanded-value check: 72000000.0.

Problem 2

1. Coefficients: $6 \cdot 4 = 24$. Powers: $10^{-3} \cdot 10^{-2} = 10^{-3+(-2)} = 10^{-5}$.
2. Combine the coefficient and power: 24×10^{-5}. Next normalize the coefficient.
3. Normalize: 2.4×10^{-4}, with $1 \leq 2.4 < 10$. Expanded-value check: 0.00024.

Problem 3

1. Coefficients: $8.4 \div 2.1 = 4$. Powers: $10^{7} \div 10^{3} = 10^{7-(3)} = 10^{4}$.
2. Combine the coefficient and power: 4×10^{4}. Next normalize the coefficient.
3. Normalize: 4×10^{4}, with $1 \leq 4 < 10$. Expanded-value check: 40000.

Problem 4

1. Coefficients: $3.6 \div 9 = 0.4$. Powers: $10^{-4} \div 10^{2} = 10^{-4-(2)} = 10^{-6}$.
2. Combine the coefficient and power: 0.4×10^{-6}. Next normalize the coefficient.
3. Normalize: 4×10^{-7}, with $1 \leq 4 < 10$. Expanded-value check: 0.0000004.

Problem 5

1. Align the powers: $5.2 \times 10^{6} = 5.2 \times 10^{6}$; $1.7 \times 10^{6} = 1.7 \times 10^{6}$.
2. Combine aligned coefficients: $(5.2 + 1.7) \times 10^{6} = 6.9 \times 10^{6}$. Keep exponent 6.
3. Normalize: 6.9×10^{6}, with $1 \leq 6.9 < 10$. Expanded-value check: 6900000.0.

Problem 6

1. Align the powers: $7.5 \times 10^{-3} = 75.0 \times 10^{-4}$; $2 \times 10^{-4} = 2 \times 10^{-4}$.
2. Combine aligned coefficients: $(75.0 + 2) \times 10^{-4} = 77.0 \times 10^{-4}$. Keep exponent -4.
3. Normalize: 7.7×10^{-3}, with $1 \leq 7.7 < 10$. Expanded-value check: 0.00770.

Problem 7

1. Align the powers: $9.1 \times 10^{5} = 9.1 \times 10^{5}$; $4.6 \times 10^{5} = 4.6 \times 10^{5}$.
2. Combine aligned coefficients: $(9.1 - 4.6) \times 10^{5} = 4.5 \times 10^{5}$. Keep exponent 5.
3. Normalize: 4.5×10^{5}, with $1 \leq 4.5 < 10$. Expanded-value check: 450000.0.

Problem 8

1. Align the powers: $6 \times 10^{-2} = 60 \times 10^{-3}$; $8 \times 10^{-3} = 8 \times 10^{-3}$.
2. Combine aligned coefficients: $(60 - 8) \times 10^{-3} = 52 \times 10^{-3}$. Keep exponent -3.
3. Normalize: 5.2×10^{-2}, with $1 \leq 5.2 < 10$. Expanded-value check: 0.052.

Problem 9

1. Coefficients: $7 \cdot 5 = 35$. Powers: $10^{4} \cdot 10^{3} = 10^{4+(3)} = 10^{7}$.
2. Combine the coefficient and power: 35×10^{7}. Next normalize the coefficient.
3. Normalize: 3.5×10^{8}, with $1 \leq 3.5 < 10$. Expanded-value check: 350000000.

Problem 10

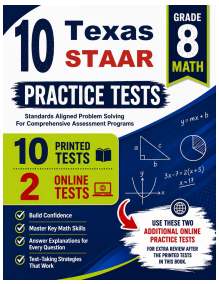
1. Coefficients: $1.8 \div 6 = 0.3$. Powers: $10^{3} \div 10^{5} = 10^{3-(5)} = 10^{-2}$.
2. Combine the coefficient and power: 0.3×10^{-2}. Next normalize the coefficient.
3. Normalize: 3×10^{-3}, with $1 \leq 3 < 10$. Expanded-value check: 0.003.

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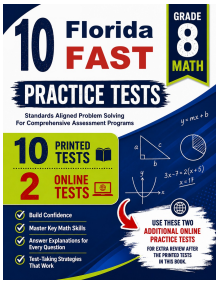
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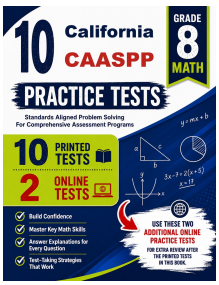
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