Operations with Scientific Notation

Repair Operations and Find Missing Values

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

QUICK REVIEW

Check the operation before changing exponents. A sum does not add exponents: $2 \times 10^3 + 3 \times 10^3 = 5 \times 10^3$. In division, subtract the entire denominator exponent, so $10^4 \div 10^{-2} = 10^6$. To recover an unknown factor, divide the product by its known factor; to recover an addend, subtract on a common scale. Normalize only after computing the equivalent value.

Worked example

Correct $(4 \times 10^5) + (3 \times 10^4) = 7 \times 10^9$.

1. Align the powers: $4 \times 10^5 = 40 \times 10^4$; $3 \times 10^4 = 3 \times 10^4$.
2. Combine aligned coefficients: $(40 + 3) \times 10^4 = 43 \times 10^4$. Keep exponent 4.
3. Normalize: 4.3×10^5, with $1 \leq 4.3 < 10$. Expanded-value check: 430000.
Answer: 4.3×10^5

Practice Problems

Show your thinking.

1. A student writes $(3 \times 10^4) + (2 \times 10^3) = 5 \times 10^7$. Correct the sum.

2. Correct $(4 \times 10^{-2})(3 \times 10^{-5}) = 12 \times 10^{-10}$. Normalize the actual product.

3. A student gets 3×10^1 for $(6 \times 10^3) \div (2 \times 10^{-2})$. Correct the exponent subtraction.

4. Correct $(8 \times 10^5) - (5 \times 10^4) = 3 \times 10^1$. Show common-scale subtraction.

5. Find x if $(5 \times 10^2)x = 2.5 \times 10^7$. Give normalized scientific notation.

6. Find the positive factor x if $(2.4 \times 10^{-3})x = 7.2 \times 10^{-3}$.

7. Find the missing addend x if $x + 6.5 \times 10^6 = 9 \times 10^6$.

8. Find x if $x - 3 \times 10^{-3} = 1.2 \times 10^{-2}$. Give scientific notation.

9. Is 6×10^{12} a correct result for $(1.5 \times 10^4)(4 \times 10^3)$? Give the correct product.

10. Which is larger: $(2 \times 10^3)(3 \times 10^2)$ or $(9 \times 10^7) \div (3 \times 10^2)$? State both results.

Answer Key

1. 3.2×10^{4}
2. 1.2×10^{-6}
3. 3×10^{5}
4. 7.5×10^{5}
5. 5×10^{4}
6. 3×10^{0}
7. 2.5×10^{6}
8. 1.5×10^{-2}
9. 6×10^{7}
10. First: $6 \times 10^{5} > 3 \times 10^{5}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Align the powers: $3 \times 10^{4} = 30 \times 10^{3}$; $2 \times 10^{3} = 2 \times 10^{3}$.
2. Combine aligned coefficients: $(30 + 2) \times 10^{3} = 32 \times 10^{3}$. Keep exponent 3.
3. Normalize: 3.2×10^{4}, with $1 \leq 3.2 < 10$. Expanded-value check: 32000.

Problem 2

1. Coefficients: $4 \cdot 3 = 12$. Powers: $10^{-2} \cdot 10^{-5} = 10^{-2+(-5)} = 10^{-7}$.
2. Combine the coefficient and power: 12×10^{-7}. Next normalize the coefficient.
3. Normalize: 1.2×10^{-6}, with $1 \leq 1.2 < 10$. Expanded-value check: 0.0000012.

Problem 3

1. Coefficients: $6 \div 2 = 3$. Powers: $10^{3} \div 10^{-2} = 10^{3-(-2)} = 10^{5}$.
2. Combine the coefficient and power: 3×10^{5}. Next normalize the coefficient.
3. Normalize: 3×10^{5}, with $1 \leq 3 < 10$. Expanded-value check: 300000.

Problem 4

1. Align the powers: $8 \times 10^{5} = 80 \times 10^{4}$; $5 \times 10^{4} = 5 \times 10^{4}$.
2. Combine aligned coefficients: $(80 - 5) \times 10^{4} = 75 \times 10^{4}$. Keep exponent 4.
3. Normalize: 7.5×10^{5}, with $1 \leq 7.5 < 10$. Expanded-value check: 750000.

Problem 5

1. Isolate $x = \frac{2.5 \times 10^{7}}{5 \times 10^{2}}$. Coefficients: $2.5 \div 5 = 0.5$. Powers: $10^{7} \div 10^{2} = 10^{7-(2)} = 10^{5}$.
2. Combine the coefficient and power: 0.5×10^{5}. Next normalize the coefficient.
3. Normalize: 5×10^{4}, with $1 \leq 5 < 10$. Expanded-value check: 50000.0.

Problem 6

1. Isolate $x = \frac{7.2 \times 10^{-3}}{2.4 \times 10^{-3}}$. Coefficients: $7.2 \div 2.4 = 3$. Powers: $10^{-3} \div 10^{-3} = 10^{-3-(-3)} = 10^{0}$.
2. Combine the coefficient and power: 3×10^{0}. Next normalize the coefficient.
3. Normalize: 3×10^{0}, with $1 \leq 3 < 10$. Expanded-value check: 3.

Problem 7

1. Isolate $x = 9 \times 10^{6} - 6.5 \times 10^{6}$. Align the powers: $9 \times 10^{6} = 9 \times 10^{6}$; $6.5 \times 10^{6} = 6.5 \times 10^{6}$.
2. Combine aligned coefficients: $(9 - 6.5) \times 10^{6} = 2.5 \times 10^{6}$. Keep exponent 6.
3. Normalize: 2.5×10^{6}, with $1 \leq 2.5 < 10$. Expanded-value check: 2500000.0.

Problem 8

1. Isolate $x = 1.2 \times 10^{-2} + 3 \times 10^{-3}$. Align the powers: $1.2 \times 10^{-2} = 12.0 \times 10^{-3}$; $3 \times 10^{-3} = 3 \times 10^{-3}$.
2. Combine aligned coefficients: $(12.0 + 3) \times 10^{-3} = 15.0 \times 10^{-3}$. Keep exponent -3.
3. Normalize: 1.5×10^{-2}, with $1 \leq 1.5 < 10$. Expanded-value check: 0.0150.

Problem 9

1. Coefficients: $1.5 \cdot 4 = 6.0$. Powers: $10^{4} \cdot 10^{3} = 10^{4+(3)} = 10^{7}$.
2. Combine the coefficient and power: 6.0×10^{7}. Next normalize the coefficient.
3. Normalize: 6×10^{7}, with $1 \leq 6 < 10$. Expanded-value check: 60000000.0.

Problem 10

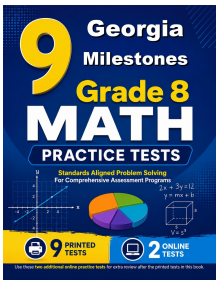
1. The first expression is $(2 \cdot 3) \times 10^{3+2} = 6 \times 10^{5}$. Its coefficient already satisfies the normalized range.
2. The second expression is $(9 \div 3) \times 10^{7-2} = 3 \times 10^{5}$. With matching positive scales, $6 > 3$, so the first result is larger.

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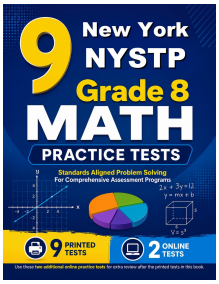
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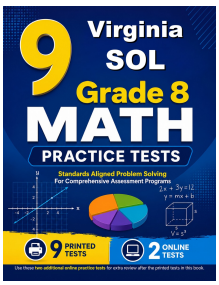
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