Scientific Notation

This skill will test your ability to convert numbers from decimal notation to scientific notation, and from scientific notation to decimal notation. It will also test your ability to multiply or divide numbers that have exponents, and your understanding of the associative and commutative properties of multiplication.

One idea that underlies this skill is that in some cases involving multiplication or division of certain "very large or very small" numbers, it may be convenient to first rewrite the numbers in scientific notation or another form that is closely related to scientific notation.

EXAMPLE A

$(8.5\times10^{6})\times(3\times10^{-5}) =$

A. 2.55 B. 25.5 C. 255 D. –25.5

SOLUTION

$(8.5\times10^{6})\times(3\times10^{-5})$

This computation involves just one operation: multiplication. For this reason we can use the associative and commutative properties of multiplication to regroup the factors.

$= (8.5\times 3)\times(10^{6}\times10^{-5})$

Multiply.

$(8.5)(3) = 25.5$

$(10^{6}\times10^{-5}) = 10^{6+(-5)} = 10^{1}$

$= 25.5\times10$

$= 255$

The correct choice is C.

EXAMPLE B

$.000066 \div 11{,}000{,}000 =$

$\frac{66}{11}$

A. -6×10^{-12} B. 6×10^{-12} C. 6 D. 6×10^{12}

SOLUTION

$.000066 \div 11{,}000{,}000$

If we observe that it is easy to divide 66 by 11, we can simplify this by writing both numbers in forms that are similar to scientific notation and are related to the numbers 11 and 66.

$.000066 = 66\times10^{-6}$

$11{,}000{,}000 = 11\times 10^{6}$

$=\left(66\times10^{-6}\right)\div\left(11\times10^{6}\right)$

$$= \frac{66}{11}\times\frac{10^{-6}}{10^{6}}$$

$$= \frac{b^{n}}{b^{m}} = b^{n-m}$$

10 b

$= 6 \times 10^{-6-6}$

$= 6 \times 10^{-12}$ The correct choice is B.

Exercises

1. $.00064 \div 1{,}600{,}000 =$

A. 4.00×10^{11} B. 4.00×10^{10} C. 4.00×10^{-10} D. 4.00×10^{2}

2. $(2.1\ 10) \times {}^{4} \times (3.0\ 10) \times {}^{-6} =$

A. .063 B. −.063 C. 630 D. −6300

3. $2{,}100{,}000{,}000 \div .00007 =$

A. 3.00×10^{23} B. 3.00×10^{-23} C. 3.00×10^{-13} D. 3.00×10^{13}

4. $(3.8\ 10) \times {}^{-8} \times (2.0\ 10) \times {}^{12} =$

A. 5.8×10^{-96} B. 7.6×10^{4} C. 5.8×10^{-4} D. 7.6×10^{-20}

5. $.00045 \div .00009 =$

A. 5.00×10^{-8} B. 4.15×10^{-8} C. 5 D. 4.15×10^{8}

6. $(7.5\ 10) \times {}^{5} \div (3.0\ 10) \times {}^{8} =$

A. 2500 B. -.0025 C. .0025 D. −.025

7. $(4.0\ 10) \times {}^{-8} \times (8.1\ 10) \times {}^{9} =$

A. 32.4 B. .324 C. −.324 D. 324

8. $.0012 \div 6{,}000{,}000 =$

A. 2.00×10^{-10} B. 2.00×10^{3} C. 2.00×10^{-9} D. 2.00×10^{9}

Answers

1. C 2. A 3. D 4. B 5. C 6. C 7. D 8. A