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Reteaching 6-1

Scientific Notation

To write a number such as 67,000 in *scientific notation,* move the decimal point to form a number between 1 and 10. The number of places moved shows which power of 10 to use.

- Write 67,000 in scientific notation.

  6.7 is between 1 and 10. So, move the decimal point in 67,000 to the left 4 places and multiply by 10^4.

  $67{,}000 = 6.7 \times 10^4$

To write scientific notation in *standard form,* look at the exponent. The exponent shows the number of places and the direction to move the decimal point.

- Write 8.5×10^5 in standard form.

  The exponent is positive 5, so move the decimal point 5 places to the right.

  $8.5 \times 10^5 = 850{,}000$

Write each number in scientific notation.

1. 6,500 _____

2. 65,000 _____

3. 6,520 _____

4. 345 _____

5. 29,100 _____

6. 93,000,000 _____

7. 200 _____

8. 2,300 _____

9. 23,000 _____

Write each number in standard form.

10. 4×10^4 _____

11. 4×10^5 _____

12. 3.6×10^3 _____

13. 4.85×10^4 _____

14. 4.05×10^2 _____

15. 7.1×10^5 _____

16. 4×10^2 _____

17. 1.3×10^2 _____

18. 7×10^1 _____

19. 1.81×10^3 _____

20. Jupiter orbits at an average of 7.783×10^8 kilometers from the Sun. _____

Which number is greater?

21. 5×10^2 or 2×10^5 _____

22. 2.1×10^3 or 2.1×10^6 _____

23. 6×10^{10} or 3×10^9 _____

24. 3.6×10^1 or 3.6×10^3 _____

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Reteaching 6-2

Exponents and Multiplication

- To multiply numbers or variables with the same base, add the exponents.

Simplify $3^2 \cdot 3^4$	Simplify $n^3 \cdot n^4$	Simplify $(-4)^3 \cdot (-4)^5$
$3^2 \cdot 3^4 = 3^{(2+4)}$	$n^3 \cdot n^4 = n^{(3+4)}$	$(-4)^3 \cdot (-4)^5 = (-4)^{(3+5)}$
$= 3^6$	$= n^7$	$= (-4)^8$

- You can also simplify expressions with exponents.

$6x^2 \cdot -2x^5 = 6 \cdot -2 \cdot x^2 \cdot x^5$ ← Use the Commutative Property of Multiplication

$= -12x^{(2+5)}$ ← Add the exponents.

$= -12x^7$ ← Simplify.

Write each expression using a single exponent.

1. $5^3 \cdot 5^4$ _____

2. $a^2 \cdot a^5$ _____

3. $(-8)^4 \cdot (-8)^5$ _____

4. $n^6 \cdot n^2$ _____

5. $m^3 \cdot m^6$ _____

6. $(-7)^4 \cdot (-7)^2$ _____

7. $(-3)^2 \cdot (-3)^2$ _____

8. $2^5 \cdot 2^2$ _____

9. $c^5 \cdot c^3$ _____

Find each product. Write the answer in scientific notation.

10. $2x^3 \cdot x^2$ _____

11. $-4x^3 \cdot 2x^4$ _____

12. $3a^3 \cdot a$ _____

13. $-x^2 \cdot 2x^3$ _____

14. $-5m^2 \cdot -2m^4$ _____

15. $x^8 \cdot x^4$ _____

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Reteaching 6-3

Multiplying with Scientific Notation

- To multiply numbers in scientific notation.

Find the product $(5 \times 10^4)(7 \times 10^5)$. Write the result in scientific notation.

$(5 \times 10^4)(7 \times 10^5)$

$(5 \cdot 7)(10^4 \cdot 10^5)$	←	Use the Associative and Commutative properties.
$35 \times (10^4 \cdot 10^5)$	←	Multiply 5 and 7.
$35 \times 10^{4+5}$	←	Add the exponents for the powers of 10.
35×10^9		
$3.5 \times 10^1 \times 10^9$	←	Write 35 in scientific notation.
3.5×10^{10}	←	Add the exponents.

Find each product. Write the answer in scientific notation.

1. $(3 \times 10^4)(5 \times 10^3)$

_____

2. $(2 \times 10^3)(7 \times 10^6)$

_____

3. $(8 \times 10^2)(5 \times 10^2)$

_____

4. $(9 \times 10^4)(7 \times 10^4)$

_____

5. $(4 \times 10^2)(7 \times 10^5)$

_____

6. $(8 \times 10^3)(4 \times 10^5)$

_____

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Reteaching 6-4

Exponents and Division

To divide powers with the same base, subtract exponents.

$\frac{8^6}{8^4} = 8^{6-4}$ $\quad$ $\frac{a^5}{a^3} = a^{5-3}$

$= 8^2$ $\quad$ $= a^2$

$= 64$

- For any nonzero number a, $a^0 = 1$.

  $3^0 = 1$ $\quad$ $(-6)^0 = 1$ $\quad$ $4t^0 = 4(1) = 4$

- For any nonzero number a and any integer n, $a^{-n} = \frac{1}{a^n}$.

  $2^{-4} = \frac{1}{2^4}$ $\quad$ $3c^{-2} = \frac{3}{c^2}$ $\quad$ $\frac{5^3}{5^6} = 5^{3-6}$ $\quad$ $\frac{10z^3}{5z} = 2z^{3-1}$

  $= \frac{1}{16}$ $\quad$ $= 5^{-3}$ $\quad$ $= 2z^2$

  $= \frac{1}{5^3}$

  $= \frac{1}{125}$

Simplify each expression.

1. $\frac{6^5}{6^3} =$ _____ **2.** $(-4)^5 \div (-4)^3 =$ _____ **3.** $(-3)^{-2} =$ _____

4. $\frac{2^5}{2^7} =$ _____ **5.** $(-8)^0 =$ _____ **6.** $\frac{5^0}{5^2} =$ _____

7. $\frac{(-6)^4}{(-6)^6} =$ _____ **8.** $7^3 \div 7^5 =$ _____ **9.** $9^8 \div 9^{10} =$ _____

Simplify each expression. Write your answer using only positive exponents.

10. $w^8 \div w^3 =$ _____ **11.** $x^6 \div x^1 =$ _____ **12.** $\frac{d^7}{d^3} =$ _____

13. $\frac{w^2}{w^6} =$ _____ **14.** $4c^5 \div c^8 =$ _____ **15.** $\frac{8x^2}{4x^5} =$ _____

16. $8a^4 \div 2a^2 =$ _____ **17.** $6w^2 \div 2w^5 =$ _____ **18.** $\frac{6x^6}{3x^9} =$ _____

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Reteaching 6-5

Dividing with Scientific Notation

You can separate the coefficients and powers of ten to divide numbers in scientific notation.

$(8.4 \times 10^6) \div (2.5 \times 10^4) = \frac{8.4 \times 10^6}{2.5 \times 10^4}$ ← Write a fraction.

$= \frac{8.4}{2.5} \times \frac{10^6}{10^4}$ ← Separate the coefficients and the power of ten.

$\approx 3.4 \times \frac{10^6}{10^4}$ ← Divide the coefficients.

$\approx 3.4 \times 10^2$ ← Subtract the exponents.

You can divide numbers in standard form by numbers in scientific notation.

$(9.2 \times 10^4) \div 4.8 = \frac{9.2 \times 10^4}{4.8}$ ← Write a fraction.

$= \frac{9.2}{4.8} \times 10^4$ ← Write as a product of quotients and a power of ten.

$\approx 1.9 \times 10^4$ ← Divide.

You can divide numbers in scientific notation by numbers in standard form.

$6.8 \div (3.9 \times 10^2) = \frac{6.8}{3.9 \times 10^2}$ ← Write a fraction.

$\approx \frac{6.8}{3.9} \times \frac{1}{10^2}$ ← Write as a product of quotients and a power of ten.

$\approx 1.7 \times 10^{-2}$

Divide. Write each quotient in scientific notation. Round answers to the nearest tenth.

1. $\frac{6.4 \times 10^5}{1.8 \times 10^3}$

_____

2. $\frac{7.4 \times 10^4}{3.3}$

_____

3. $\frac{8}{2.6 \times 10^2}$

_____

4. $\frac{9.2 \times 10^4}{5.9 \times 10^2}$

_____

5. $\frac{6.5 \times 10^8}{8.9}$

_____

6. $\frac{12.2}{6.3 \times 10^4}$

_____

7. $\frac{5.4 \times 10^2}{0.5}$

_____

8. $\frac{3.4 \times 10^8}{1.2 \times 10^6}$

_____