Review Key Vocabulary

power, *p. 352*   exponent, *p. 352*
base, *p. 352*   scientific notation, *p. 378*

Review Examples and Exercises

9.1 Exponents *(pp. 350–355)*

Write $(-4) \cdot (-4) \cdot (-4) \cdot y \cdot y$ using exponents.

Because -4 is used as a factor 3 times, its exponent is 3. Because y is used as a factor 2 times, its exponent is 2.

So, $(-4) \cdot (-4) \cdot (-4) \cdot y \cdot y = (-4)^3 y^2$.

Exercises

Write the product using exponents.

1. $(-9) \cdot (-9) \cdot (-9) \cdot (-9) \cdot (-9)$ **2.** $2 \cdot 2 \cdot 2 \cdot n \cdot n$

Evaluate the expression.

3. 6^3 **4.** $-\left(\dfrac{1}{2}\right)^4$ **5.** $\left| \dfrac{1}{2}(16 - 6^3) \right|$

9.2 Product of Powers Property *(pp. 356–361)*

a. $\left(-\dfrac{1}{8}\right)^7 \cdot \left(-\dfrac{1}{8}\right)^4 = \left(-\dfrac{1}{8}\right)^{7+4}$ The base is $-\dfrac{1}{8}$. Add the exponents.

$= \left(-\dfrac{1}{8}\right)^{11}$ Simplify.

b. $(3m)^2 = 3m \cdot 3m$ Write as repeated multiplication.

$= (3 \cdot 3) \cdot (m \cdot m)$ Use properties of multiplication.

$= 3^{1+1} \cdot m^{1+1}$ The bases are 3 and m. Add the exponents.

$= 3^2 \cdot m^2 = 9m^2$ Simplify.

Exercises

Simplify the expression.

6. $p^5 \cdot p^2$ **7.** $\left(n^{11}\right)^2$ **8.** $(5y)^3$ **9.** $(-2k)^4$

9.3 Quotient of Powers Property (pp. 362–367)

a. $\dfrac{(-4)^9}{(-4)^6} = (-4)^{9-6}$ The base is -4. Subtract the exponents.

         $= (-4)^3$ Simplify.

b. $\dfrac{x^4}{x^3} = x^{4-3}$ The base is x. Subtract the exponents.

       $= x^1$

       $= x$ Simplify.

Exercises

Simplify the expression. Write your answer as a power.

10. $\dfrac{8^8}{8^3}$ **11.** $\dfrac{5^2 \cdot 5^9}{5}$ **12.** $\dfrac{w^8}{w^7} \cdot \dfrac{w^5}{w^2}$

Simplify the expression.

13. $\dfrac{2^2 \cdot 2^5}{2^3}$ **14.** $\dfrac{(6c)^3}{c}$ **15.** $\dfrac{m^8}{m^6} \cdot \dfrac{m^{10}}{m^9}$

9.4 Zero and Negative Exponents (pp. 370–375)

a. $10^{-3} = \dfrac{1}{10^3}$ Definition of negative exponent

         $= \dfrac{1}{1000}$ Evaluate power.

b. $(-0.5)^{-5} \cdot (-0.5)^5 = (-0.5)^{-5+5}$ Add the exponents.

                  $= (-0.5)^0$ Simplify.

                  $= 1$ Definition of zero exponent

Exercises

Evaluate the expression.

16. 2^{-4} **17.** 95^0 **18.** $\dfrac{8^2}{8^4}$

19. $(-12)^{-7} \cdot (-12)^7$ **20.** $\dfrac{1}{7^9} \cdot \dfrac{1}{7^{-6}}$ **21.** $\dfrac{9^4 \cdot 9^{-2}}{9^2}$

Reading Scientific Notation   *(pp. 376–381)*

  a. Write 5.9×10^4 in standard form.

$$5.9 \times 10^4 = 59{,}000$$ Move decimal point 4 places to the right.
                 4

  b. Write 7.31×10^{-6} in standard form.

$$7.31 \times 10^{-6} = 0.00000731$$ Move decimal point 6 places to the left.
                    6

Exercises

Tell whether the number is written in scientific notation. Explain.

22. 0.9×10^9 **23.** 3.04×10^{-11} **24.** 15×10^{26}

Write the number in standard form.

25. 2×10^7 **26.** 4.8×10^{-3} **27.** 6.25×10^5

Writing Scientific Notation   *(pp. 382–387)*

  a. In 2010, the population of the United States was about 309,000,000. Write this number in scientific notation.

The number is greater than 1. So, move the decimal point 8 places to the left.
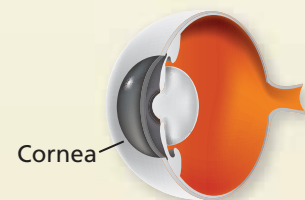
$$309{,}000{,}000 = 3.09 \times 10^8$$ The exponent is positive.
                8

  b. The cornea of an eye is 0.00056 meter thick. Write this number in scientific notation.

Cornea

The number is between 0 and 1. So, move the decimal point 4 places to the right.

$$0.00056 = 5.6 \times 10^{-4}$$ The exponent is negative.
         4

Exercises

Write the number in scientific notation.

28. 0.00036   **29.** 800,000   **30.** 79,200,000

Multiply. Write your answer in scientific notation.

31. $(4 \times 10^3) \times (2 \times 10^2)$ **32.** $(1.5 \times 10^{-9}) \times (8 \times 10^{-3})$