

**LESSON 8.1****Key Skills**

**Simplify the product of monomials containing exponents.**

Simplify  $(4a^2b)(-3a^3b^2)$ .

Multiply the constants. Rearrange the terms to group the like variables together.

$$(4a^2b)(-3a^3b^2) = -12(a^2)(a^3)(b)(b^2)$$

Simplify by using the Product-of-Powers Property. Add the exponents of like variables.

$$-12(a^2)(a^3)(b)(b^2) = -12a^5b^3$$

**Exercises**

**Simplify each product.**

- $(5a^2)(4a^3)$
- $(3m^2)(-2m^2n)$
- $(7s^4t^3)(4t)$
- $(-p^2)(6pq^2)$
- $(4m^3)(3mn^2)$
- $(2a^2bc^2)(5b^2c)$
- $(-4xy)(-3x^2z)(2y^2z^2)$
- $(2x^4y^4)(-3x^m y)$

**LESSON 8.2****Key Skills**

**Use the properties of exponents to simplify an expression.**

Simplify  $(x^4)(x^3y^2)^2$ .

Use the Power-of-a-Power Property and the Power-of-a-Product Property to simplify  $(x^3y^2)^2$ .

$$(x^4)(x^3y^2)^2 = (x^4)(x^6y^4)$$

Use the Product-of-Powers Property to simplify  $(x^4)(x^6y^4)$ .

$$(x^4)(x^6y^4) = x^{10}y^4$$

**Exercises**

**Simplify each expression.**

- $(c^4)^2$
- $(s^3)^a$
- $(4x^2y)^3$
- $2(r^2)^5$
- $(-p^2)^3(p)$
- $(-xy^2)^6$
- $(-3mn^2)(2m^3)^3$
- $(5b^3c^2)^4(2d^4)$

**LESSON 8.3****Key Skills**

**Use the properties of exponents to simplify expressions containing fractions.**

Simplify. a.  $\frac{6x^2y^5}{2xy^2}$       b.  $\left(\frac{4c^5}{5d^6}\right)^2$

- a. Simplify by using the Quotient-of-Powers Property. First simplify any numerical coefficients. Then subtract the exponents in the denominator from the exponents in the numerator.

$$\frac{6x^2y^5}{2xy^2} = 3xy^3$$

- b. Simplify by using the Power-of-a-Fraction Property.

$$\left(\frac{4c^5}{5d^6}\right)^2 = \frac{(4c^5)^2}{(5d^6)^2} = \frac{16c^{10}}{25d^{12}}$$

**Exercises**

**Simplify each expression.**

- $\left(\frac{x}{y}\right)^4$
- $\left(\frac{2a^2}{b}\right)^3$
- $\left(\frac{4w^2}{6w^4}\right)^3$
- $\left(\frac{12fg^2}{6g}\right)^2$
- $\left(\frac{y^4}{5xy^2}\right)^3$
- $\left(\frac{7p^2q}{21q}\right)^2$
- $\left[\frac{-15(ab)^2}{5a^2b}\right]^5$
- $\left(\frac{st^2}{s^4}\right)^r$

**LESSON 8.4****Key Skills**

**Simplify expressions containing negative and zero exponents.**

Simplify  $\frac{-8a^3c^5}{2a^4b^3c^2}$  and write the expression with positive exponents only.

Use the properties of exponents and the definition of negative exponents.

$$\frac{-8a^3c^5}{2a^4b^3c^2} = -4(a^{3-4})(b^{-3})(c^{5-2}) = -4a^{-1}b^{-3}c^3 = \frac{-4c^3}{ab^3}$$

**Exercises**

**Simplify each expression. Write the expression with positive exponents only.**

- |                                        |                                              |
|----------------------------------------|----------------------------------------------|
| 25. $3^{-2}$                           | 26. $a^2b^{-3}$                              |
| 27. $a^0b^{-2}c^3$                     | 28. $5x^{-3}y^2$                             |
| 29. $\frac{12p^{-3}}{4p}$              | 30. $\left(\frac{4a^{-2}}{3b^{-3}}\right)^3$ |
| 31. $\frac{(15r^{-4})(r^5)}{-3r^{-2}}$ | 32. $(8b^2)(2b^{-8})(2b^6)$                  |

**LESSON 8.5****Key Skills**

**Perform computations involving scientific notation.**

Write the product  $(3 \times 10^3)(4 \times 10^5)$  in scientific notation.

Rearrange the factors:  $(3 \times 4)(10^3 \times 10^5)$

Multiply:  $12 \times 10^8$

Rewrite the first factor as a decimal between 1 and 10:  $1.2 \times 10^1$

Complete the simplification:  $12 \times 10^8 = (1.2 \times 10^1)(10^8) = 1.2 \times 10^9$

**Exercises**

**Write each number in scientific notation.**

33. 5,900,000      34. 0.0000075

**Perform each computation. Write the answer in scientific notation.**

35.  $(3 \times 10^2)(5 \times 10^5)$   
 36.  $(2.1 \times 10^5)(3 \times 10^{-3})$   
 37.  $(8 \times 10^2) + (2 \times 10^2)$   
 38.  $(9 \times 10^5) - (3 \times 10^5)$   
 39.  $\frac{9 \times 10^7}{3 \times 10^4}$   
 40.  $\frac{8 \times 10^4}{2 \times 10^{-2}}$

**LESSON 12.1****Key Skills**

**Simplify radical expressions, and estimate square roots.**

To express  $\sqrt{12} + 2\sqrt{3}$  in simplest radical form, first use the Multiplication Property of Square Roots.

$$\begin{aligned}\sqrt{12} + 5\sqrt{3} &= \sqrt{4 \cdot 3} + 5\sqrt{3} \\ &= \sqrt{4} \cdot \sqrt{3} + 5\sqrt{3} \\ &= 2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3} \\ &\approx 12.12\end{aligned}$$

**Exercises**

**Find the value of each square root. If the square root is irrational, find the value to the nearest hundredth.**

1.  $\sqrt{20}$       2.  $\sqrt{\frac{9}{16}}$

**Simplify each radical expression.**

3.  $\sqrt{a^2b^7}$       4.  $\sqrt{2} + 3\sqrt{7} - 3\sqrt{2}$   
 5.  $(2\sqrt{3})^2$       6.  $\sqrt{3}(2 - \sqrt{12})$   
 7.  $(\sqrt{5} - 6)(\sqrt{5} + 6)$       8.  $(\sqrt{17} - 8)(\sqrt{17} + 4)$