7-1 Exercises

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GUIDED PRACTICE

SEE EXAMPLE 1 p. 447

1. **Medicine** A typical virus is about 10^{-7} m in size. Simplify this expression.

SEE EXAMPLE 2 p. 447

Simplify.

2. 6^{-2} 3. 3^{0} 4. -5^{-2} 5. 3^{-3} 6. 1^{-8}
7. -8^{-3} 8. 10^{-2} 9. $(4.2)^{0}$ 10. $(-3)^{-3}$ 11. 4^{-2}

SEE EXAMPLE 3 p. 447

Evaluate each expression for the given value(s) of the variable(s).

12. b^{-2} for $b = -3$
13. $(2t)^{-4}$ for $t = 2$
14. $(m - 4)^{-5}$ for $m = 6$
15. $2x^{0}y^{-3}$ for $x = 7$ and $y = -4$

SEE EXAMPLE 4 p. 448

Simplify.

16. $4m^{0}$ 17. $3k^{-4}$ 18. $\frac{7}{r^{-7}}$ 19. $\frac{x^{10}}{d^{-3}}$
20. $2x^{0}y^{-4}$ 21. $\frac{f^{-4}}{g^{-6}}$ 22. $\frac{c^{4}}{d^{-3}}$ 23. $p^{7}q^{-1}$

PRACTICE AND PROBLEM SOLVING

Independent Practice

For Exercises	See Example
24	1
25–36	2
37–42	3
43–57	4

Extra Practice

Skills Practice p. S16
Application Practice p. S34

24. **Biology** One of the smallest bats is the northern blossom bat, which is found from Southeast Asia to Australia. This bat weighs about 2^{-1} ounce. Simplify this expression.

Simplify.

25. 8^{0} 26. 5^{-4} 27. 3^{-4} 28. -9^{-2}
29. -6^{-2} 30. 7^{-2} 31. $\left(\frac{2}{5}\right)^{0}$ 32. 13^{-2}
33. $(-3)^{-1}$ 34. $(-4)^{2}$ 35. $\left(\frac{1}{2}\right)^{-2}$ 36. -7^{-1}

Evaluate each expression for the given value(s) of the variable(s).

37. x^{-4} for $x = 4$
38. $\left(\frac{2}{3}v\right)^{-3}$ for $v = 9$
39. $(10 - d)^{0}$ for $d = 11$
40. $10m^{-1}n^{-5}$ for $m = 10$ and $n = -2$
41. $(3ab)^{-2}$ for $a = \frac{1}{2}$ and $b = 8$
42. $4w^{v}x^{v}$ for $w = 3$, $v = 0$, and $x = -5$

Simplify.

43. k^{-4} 44. $2z^{-8}$ 45. $\frac{1}{2b^{-3}}$ 46. $c^{-2}d$ 47. $-5x^{-3}$
48. $4x^{-6}y^{-2}$ 49. $\frac{2f^{0}}{7g^{-10}}$ 50. $\frac{r^{-5}}{s^{-1}}$ 51. $\frac{s^{5}}{t^{-12}}$ 52. $\frac{3w^{-5}}{x^{-6}}$
53. $b^{0}c^{0}$ 54. $\frac{2}{3}m^{-1}n^{5}$ 55. $\frac{q^{-2}r^{0}}{s^{0}}$ 56. $\frac{a^{-7}b^{2}}{c^{3}d^{-4}}$ 57. $\frac{h^{3}k^{-1}}{6m^{2}}$

Evaluate each expression for $x = 3$, $y = -1$, and $z = 2$.

58. z^{-5} **59.** $(x + y)^{-4}$ **60.** $(yz)^0$ **61.** $(xyz)^{-1}$

62. $(xy - 3)^{-2}$ **63.** x^{-y} **64.** $(yz)^{-x}$ **65.** xy^{-4}

66. ERROR ANALYSIS Look at the two equations below. Which is incorrect? Explain the error.

A $5x^{-3} = \frac{1}{5x^3}$ B $5x^{-3} = \frac{5}{x^3}$

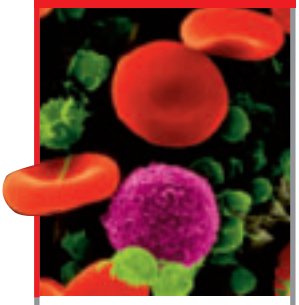
Simplify.

67. a^3b^{-2} **68.** $c^{-4}d^3$ **69.** $v^0w^2y^{-1}$ **70.** $(a^2b^{-7})^0$ **71.** $-5y^{-6}$

72. $\frac{2a^{-5}}{b^{-6}}$ **73.** $\frac{2a^3}{b^{-1}}$ **74.** $\frac{m^2}{n^{-3}}$ **75.** $\frac{x^{-8}}{3y^{12}}$ **76.** $-\frac{20p^{-1}}{5q^{-3}}$

LINK

Biology



When bleeding occurs, platelets (which appear green in the image above) help to form a clot to reduce blood loss. Calcium and vitamin K are also necessary for clot formation.

77. Biology Human blood contains red blood cells, white blood cells, and platelets. The table shows the sizes of these components. Simplify each expression.

Blood Components	
Part	**Size (m)**
Red blood cell	$125{,}000^{-1}$
White blood cell	$3(500)^{-2}$
Platelet	$3(1000)^{-2}$

Tell whether each statement is sometimes, always, or never true.

78. If n is a positive integer, then $x^{-n} = \frac{1}{x^n}$.

79. If x is positive, then x^{-n} is negative.

80. If n is zero, then x^{-n} is 1.

81. If n is a negative integer, then $x^{-n} = 1$.

82. If x is zero, then x^{-n} is 1.

83. If n is an integer, then $x^{-n} > 1$.

84. Critical Thinking Find the value of $2^3 \cdot 2^{-3}$. Then find the value of $3^2 \cdot 3^{-2}$. Make a conjecture about the value of $a^n \cdot a^{-n}$.

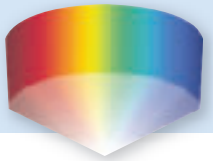
85. Write About It Explain in your own words why 2^{-3} is the same as $\frac{1}{2^3}$.

Find the missing value.

86. $\frac{1}{4} = 2^{\square}$ **87.** $9^{-2} = \frac{1}{\square}$ **88.** $\frac{1}{64} = \square^{-2}$ **89.** $\frac{\square}{3} = \cdot\, 3^{-1}$

90. $7^{-2} = \frac{1}{\square}$ **91.** $10^{\square} = \frac{1}{1000}$ **92.** $3 \cdot 4^{-2} = \frac{3}{\square}$ **93.** $2 \cdot \frac{1}{5} = 2 \cdot 5^{\square}$

MULTI-STEP TEST PREP



94. This problem will prepare you for the Multi-Step Test Prep on page 474.

a. The product of the frequency f and the wavelength w of light in air is a constant v. Write an equation for this relationship.

b. Solve this equation for wavelength. Then write this equation as an equation with f raised to a negative exponent.

c. The units for frequency are hertz (Hz). One hertz is one cycle per second, which is often written as $\frac{1}{s}$. Rewrite this expression using a negative exponent.