EXERCISES

Simplify each expression. Leave the product in exponent form.

1. $2^3 \cdot 2^4$
2. $(2^3)^4$
3. $a^3 \cdot a^4$
4. $(a^3)^4$
5. $m^{10} \cdot m^5$
6. $(m^{10})^5$
7. $a^n \cdot a^2$
8. $(a^n)^2$
9. $10^3 \cdot 10^5$
10. $(10^3)^5$
11. $x^6 \cdot x^7$
12. $-(a^3)^2$
13. $(-a^3)^2$
14. $a^8 \cdot a^{-3}$
15. $a^{-8} \cdot a^3$
16. $3^{10} \cdot 3^{-10}$
17. $x^a \cdot x^b$
18. $a^x \cdot a^y$
19. $(a^x)^y$
20. $a^{10} \cdot a^{-10}$ if $a \neq 0$
21. $(3a^2)^{-3}$
22. $a^{-3} \cdot a^{-3} \cdot a^{-6}$
23. $16^{\frac{1}{4}}$
24. $32^{\frac{2}{5}}$
25. $5^2 x^0$ if $x \neq 0$
26. $(2x^2)(3x^5)$
27. $(\frac{3}{4}a^5)(\frac{8}{3}a^2)$
28. $(-2a^2)^4$
29. $(3xy^2)(2y^3)^4$
30. $(\frac{2}{3}x^2)^2(\frac{3}{2}x^3)^4$

Simplify each expression. Assume that no denominator equals 0.

31. $\dfrac{2^8}{2^3}$
32. $\dfrac{2^3}{2^8}$
33. $\dfrac{a^8}{a^3}$
34. $\dfrac{a^3}{a^8}$
35. $\dfrac{10^8}{10^3}$
36. $\dfrac{2^{20}}{2^{17}}$
37. $\dfrac{5^{15}}{5^{12}}$
38. $\dfrac{2^{17}}{2^{20}}$
39. $\dfrac{5^{12}}{5^{15}}$
40. $\dfrac{x^5}{x^9}$
41. $\dfrac{x^9}{x^5}$
42. $\dfrac{x^2}{x^8}$
43. $\dfrac{a^6}{a^6}$
44. $\dfrac{x^5}{x^5}$
45. $\dfrac{x^{12}}{x^n}$
46. $\dfrac{x^n}{x^{12}}$
47. $\left(\dfrac{a}{b}\right)^4$
48. $\dfrac{x^2 \cdot x^n}{x^{2n}}$
49. $\left(\dfrac{a^2}{b^3}\right)^4$
50. $\left(\dfrac{x^n}{y^n}\right)^5$
51. $\dfrac{x^4y^4}{x^4y}$
52. $\dfrac{3a^7b^2}{21a^4b^5}$
53. $\dfrac{mn^4}{m^5n^2}$
54. $\dfrac{12k^2}{-k^7}$
55. $\dfrac{-12x^3y^3}{4xy}$
56. $\dfrac{(2a^2)^3}{2a}$
57. $\dfrac{(3x)^4}{9x^2}$
58. $\dfrac{2x^3}{(4x^2)^3}$
59. $\dfrac{4m}{(2m)^3}$
60. $\dfrac{5p}{15p}$
61. $\dfrac{-2m^5}{10m}$
62. $\dfrac{(-2a^2)^3}{(-2a)^2}$
63. $\dfrac{-(2x)^2}{(-2x^2)^2}$
64. $\dfrac{-24r^7}{-32r^9}$
65. $\dfrac{16x^5}{-2x^4}$
66. $\dfrac{2x^2y^4}{(-xy)^2}$
67. $\dfrac{(4ab)^2}{4ab^2}$
68. $\dfrac{(2x^2)^4}{(2x^4)^2}$
69. $\dfrac{(-a)^{12}}{(-a)^9}$
70. $\dfrac{(-m^2)^5}{(-m^4)^3}$
71. $\left(\dfrac{2}{3}\right)^4$
72. $\left(\dfrac{2}{3}\right)^{-4}$
73. $\left(\dfrac{2a^2}{b^3}\right)^2$
74. $\left(\dfrac{xy}{x^3y^2}\right)^3$
75. $\left(\dfrac{xy}{x^3y^2}\right)^{-3}$
76. $\left(\dfrac{3ab^2}{2a^2b}\right)^3$
77. $\dfrac{a^5 \cdot a^{-5}}{a^3}$
78. $\dfrac{a^5}{a^{-3}}$
79. $\dfrac{3x^{-4}}{6x^{-6}}$
80. $\dfrac{x^5y^{-3}}{x^{-2}y^2}$
81. $(-x)^{-10}$
82. $\dfrac{2^{-2}s^{-1}t}{s^3t^{-2}}$
83. $\left(-\dfrac{x^2}{y}\right)^{-3}$
84. $\dfrac{9^0a^{-3}x}{2^{-1}a^{-1}x^{-2}}$
85. $\dfrac{x^{-2}}{2y^{-3}}\left(\dfrac{-2}{x^2y^{-2}}\right)^{-3}$
86. $\sqrt{8} \cdot \sqrt[3]{8}$
87. $27^{-\frac{2}{3}} \cdot 9$
88. $9^{3\sqrt{2}} \div 3^{2\sqrt{2}}$
89. $9^{\pi+\sqrt{3}} \div 3^{\pi-\sqrt{3}}$
90. $10^{2+\pi} \div 5^{2+\pi}$