

EXERCISES

Evaluate each expression .

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|--------------|-----------------|------------|---------------|-------------|
| 1. 2^3 | 2. 3^2 | 3. -2^3 | 4. $(-2)^3$ | 5. -2^4 |
| 6. $(-2)^4$ | 7. $(-5^n)^4$ | 8. 3^5 | 9. $(-5)^2$ | 10. -5^2 |
| 11. $(-3)^3$ | 12. $(-3)^4$ | 13. -3^4 | 14. 9 squared | 15. 92^0 |
| 16. 1^{15} | 17. $(-1)^{15}$ | 18. 8^0 | 19. 0^0 | 20. 9 cubed |

Simplify each expression. Leave the product in exponent form.

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|----------------------------|--|---------------------|------------------------|------------------------|
| 21. $2^3 \cdot 2^4$ | 22. $(2^3)^4$ | 23. $a^3 \cdot a^4$ | 24. $(a^3)^4$ | 25. $m^{10} \cdot m^5$ |
| 26. $(m^{10})^5$ | 27. $a^n \cdot a^2$ | 28. $(a^n)^2$ | 29. $10^3 \cdot 10^5$ | 30. $(10^3)^5$ |
| 31. $x^6 \cdot x^7$ | 32. $-(a^3)^2$ | 33. $(-a^3)^2$ | 34. $a^8 \cdot a^{-3}$ | 35. $a^{-8} \cdot a^3$ |
| 36. $3^{10} \cdot 3^{-10}$ | 37. $a^{10} \cdot a^{-10}$ if $a \neq 0$ | 38. $x^a \cdot x^b$ | 39. $a^x \cdot a^y$ | 40. $(a^x)^y$ |

Divide. Assume that no denominator equals 0.

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|-----------------------------|----------------------------------|------------------------------------|--------------------------------------|--------------------------------------|
| 41. $\frac{2^8}{2^3}$ | 42. $\frac{2^3}{2^8}$ | 43. $\frac{a^8}{a^3}$ | 44. $\frac{a^3}{a^8}$ | 45. $\frac{10^8}{10^3}$ |
| 46. $\frac{2^{20}}{2^{17}}$ | 47. $\frac{5^{15}}{5^{12}}$ | 48. $\frac{2^{17}}{2^{20}}$ | 49. $\frac{5^{12}}{5^{15}}$ | 50. $\frac{x^5}{x^9}$ |
| 51. $\frac{x^9}{x^5}$ | 52. $\frac{x^2}{x^8}$ | 53. $\frac{a^6}{a^6}$ | 54. $\frac{x^5}{x^5}$ | 55. $\frac{x^{12}}{x^n}$ |
| 56. $\frac{x^n}{x^{12}}$ | 57. $\left(\frac{a}{b}\right)^4$ | 58. $\frac{x^2 \cdot x^n}{x^{2n}}$ | 59. $\left(\frac{a^2}{b^3}\right)^4$ | 60. $\left(\frac{x^n}{y^n}\right)^5$ |

Simplify each expression.

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|--|--------------------------|--|
| 61. $3x + 4x$ | 62. $3x - 4x$ | 63. $3x \cdot 4x$ |
| 64. $(2x^2)(3x^5)$ | 65. $(3a)(6a^4)$ | 66. $(x^2y^3)(x^4y^5)$ |
| 67. $(3a^5b)(6a^3b^6)$ | 68. $(2x^2y^4)(-2y)$ | 69. $(-x^5y^5)(-2xy)$ |
| 70. $(pq)(2pq)(5p^2q^7)$ | 71. $(-xy)(-x^2y^3)(-y)$ | 72. $\left(\frac{3}{4}a^5\right)\left(\frac{8}{3}a^2\right)$ |
| 73. $(-4m^2n^3)(6n^6)$ | 74. $(-7m^6)(mp)$ | 75. $(2x^4)^3$ |
| 76. $(-\frac{1}{2}a^4)^5$ | 77. $(-2a^2)^4$ | 78. $3(5x^3)^3$ |
| 79. $-(3x^4y)^3$ | 80. $(p^2q^3)^4(pq)$ | 81. $(3xy^2)(2y^3)^4$ |
| 82. $(3a^4)^5(2a^2)^2$ | 83. $(2x^n)^4$ | 84. $(2a^n)^3(3a^n)^2$ |
| 85. $(\frac{2}{3}x^2)^2(\frac{3}{2}x^3)^4$ | | |

-----Continued-----

Simplify each expression. Assume that no denominator equals 0.

86. $\frac{5 \times 10^3}{15 \times 10^2}$

87. $\frac{15 \times 10^2}{5 \times 10^3}$

88. $\frac{4 \times 10^8}{2 \times 10^6}$

89. $\left(\frac{3}{5}\right)^2$

90. $\left(\frac{3}{5}\right)^{-2}$

91. $\frac{4x}{2}$

92. $\frac{4x}{2x}$

93. $\frac{4x^2}{2x}$

94. $\frac{2x}{4x}$

95. $\frac{2x}{4x^2}$

96. $\frac{3a^4}{15a}$

97. $\frac{8m^3}{2m^2}$

98. $\frac{4xy^3}{8y}$

99. $\frac{-6a^2b^4}{15ab}$

100. $\frac{-p^5q^3}{-p^2q^6}$

101. $\frac{x^4y^4}{x^4y}$

102. $\frac{3a^7b^2}{21a^4b^5}$

103. $\frac{mn^4}{m^5n^2}$

104. $\frac{12k^2}{-k^7}$

105. $\frac{-12x^3y^3}{4xy}$

106. $\frac{(2a^2)^3}{2a}$

107. $\frac{(3x)^4}{9x^2}$

108. $\frac{2x^3}{(4x^2)^3}$

109. $\frac{4m}{(2m)^3}$

110. $\frac{5p}{15p}$

111. $\frac{-2m^5}{10m}$

112. $\frac{(-2a^2)^3}{(-2a)^2}$

113. $\frac{-(2x)^2}{(-2x^2)^2}$

114. $\frac{-24r^7}{-32r^9}$

115. $\frac{16x^5}{-2x^4}$

116. $\frac{2x^2y^4}{(-xy)^2}$

117. $\frac{(4ab)^2}{4ab^2}$

118. $\frac{(2x^2)^4}{(2x^4)^2}$

119. $\frac{(-a)^{12}}{(-a)^9}$

120. $\frac{(-m^2)^5}{(-m^4)^3}$

121. $\left(\frac{2}{3}\right)^4$

122. $\left(\frac{2}{3}\right)^{-4}$

123. $\left(\frac{2a^2}{b^3}\right)^2$

124. $\left(\frac{xy}{x^3y^2}\right)^3$

125. $\left(\frac{xy}{x^3y^2}\right)^{-3}$

126. $\left(\frac{3ab^2}{2a^2b}\right)^3$

127. $\frac{a^5 \cdot a^{-5}}{a^3}$

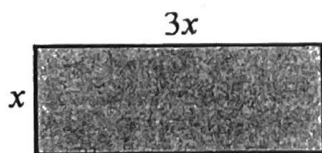
128. $\frac{a^5}{a^{-3}}$

129. $\frac{3x^{-4}}{6x^{-6}}$

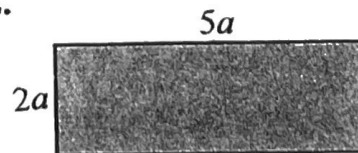
130. $\frac{x^5y^{-3}}{x^{-2}y^2}$

Find the area of each shaded region.

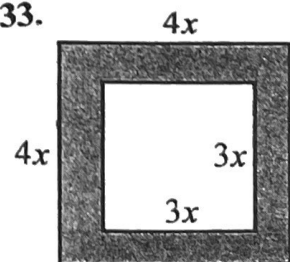
131.



132.

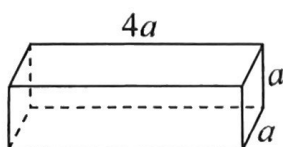


133.



Find the total surface area and volume of each solid.

134.



135.

