


Practice and Apply

Evaluate each expression.

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|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| 19. 3^0 | 20. 9^0 | 21. $(5a)^0$ | 22. $(2^5 \cdot 2^3)^0$ |
| 23. 6^{-1} | 24. 4^{-2} | 25. $\left(\frac{3}{5}\right)^4$ | 26. $\left(\frac{4}{5}\right)^2$ |
| 27. $\left(\frac{1}{4}\right)^{-1}$ | 28. $\left(\frac{2}{5}\right)^{-2}$ | 29. $\left(-\frac{1}{3}\right)^{-3}$ | 30. $\left(-\frac{2}{3}\right)^{-3}$ |
| 31. $49^{\frac{1}{2}}$ | 32. $27^{\frac{2}{3}}$ | 33. $64^{\frac{4}{3}}$ | 34. $25^{\frac{3}{2}}$ |
| 35. $36^{\frac{6}{4}}$ | 36. $8^{\frac{2}{6}}$ | 37. $-64^{\frac{2}{3}}$ | 38. $81^{-\frac{3}{4}}$ |

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for Exercises 39–70

Simplify each expression, assuming that no variable equals zero. Write your answer with positive exponents only.

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|--|--|--|---|
| 39. $y^5 y^2$ | 40. $-2z^3 z^5$ | 41. $-2y^3(5xy^4)$ | 42. $6x^5 \cdot 3x^5 \cdot x^0$ |
| 43. $\frac{m^0}{m^5}$ | 44. $\frac{bb^4}{b^4}$ | 45. $\frac{x^2 x^{-5}}{x^4}$ | 46. $\frac{s^5 t^2}{st^{-4}}$ |
| 47. $(2x^4 y)^3$ | 48. $(3st^{12})^3$ | 49. $(-5w^4 v^5)^2$ | 50. $(-3x^2 y^7)^3$ |
| 51. $\left(\frac{-2z^2}{x^5}\right)^7$ | 52. $\left(\frac{2b^4}{-a^2}\right)^3$ | 53. $\left(\frac{-2p^5 q^4}{q^3}\right)^3$ | 54. $\left(\frac{3m^2 n^3}{m^4}\right)^5$ |
| 55. $\left(\frac{3x^4}{y^{-2}}\right)^5$ | 56. $\left(\frac{-7y^{-2}}{-x^5}\right)^6$ | 57. $\left(\frac{5r^2 s^{-2}}{s^{-5}}\right)^{-1}$ | 58. $\left(\frac{x^{-2} y}{y^{-1}}\right)^{-3}$ |

Simplify each expression, assuming that no variable equals zero. Write your answer with positive exponents only.

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|--|---|---|
| 59. $\left(\frac{15xy^3}{3y^2}\right)^{-1}$ | 60. $\left[\frac{2x^{-3}}{(2x)^3}\right]^{-1}$ | 61. $\left(\frac{4a^3 b^{-3}}{a^{-1} b^2}\right)^{-2}$ |
| 62. $\left(\frac{15a^7 b^{-2}}{-3ab^{-3}}\right)^{-2}$ | 63. $(x^{-3} y^{-1})^{-1}(x^{-3} y^0)^2$ | 64. $(a^{-3} b^2)^4(-2a^3 b^7)^{-3}$ |
| 65. $\left[\frac{(a^3 b^2)^2}{a^5 b^2}\right]^{-1}$ | 66. $\left(\frac{s^{-3}}{4t}\right)^{-3}\left(\frac{5t}{s^7}\right)^{-2}$ | 67. $\left(\frac{3z}{x^4}\right)^2\left(\frac{3x^{-12} yz^{-3}}{2xy^7}\right)^{-3}$ |
| 68. $\left[\left(\frac{x^5 y^2}{x^{-3} y}\right)^{-2}\left(\frac{y^{-3}}{2x^5}\right)^3\right]^{-1}$ | 69. $\left[\frac{(a^{-5} b^2)^{-1}}{(-a^4 b^4 c^{-1})^2}\right]^{-3}$ | 70. $\left[\frac{(2s^3 t^2)^2}{(s^3 t^{-4})^{-1}}\right]^{12}$ |

Use a calculator to evaluate each expression to the nearest tenth.

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|---|---|
| 71. $12^{6.05} + 8.8^{3.24}$ | 72. $3.3^{2.7} - 5^{1.9} + 0.63^{0.95}$ |
| 73. $0.005^{21.53} + 9.05^{0.034}$ | 74. $71.33^{0.44} + 478.2^{0.4}$ |
| 75. $11.7^{0.6} + 29.3^{1.23} - 6^{-2.2}$ | 76. $89^{3.5} - 5.25^{9.25} + 324^{0.05}$ |

CHALLENGES

77. Show that if $y \neq 0$, then $y^{a-b} = \frac{1}{y^{b-a}}$.
78. Show that $\frac{x^{-1} - y^{-1}}{x - y} = -\frac{1}{xy}$.

CONNECTION

79. **GEOMETRY** The height, h , of a right circular cone can be calculated from the equation $h = \frac{3}{\pi} V r^{-2}$, where V is the volume of the cone and r is the radius of the circular base.

- a. Find the height to the nearest tenth of a right circular cone whose volume is 200 cubic centimeters and whose radius is 4 centimeters.

- b. Write the equation for the height of a right circular cone with positive exponents only.

