

Example 5

Solve each equation.

45. $3^x = 243$

46. $12^x = 144$

47. $16^x = 4$

48. $27^x = 3$

49. $9^x = 27$

50. $32^x = 4$

51. $2^{x-1} = 128$

52. $4^{2x+1} = 1024$

53. $6^{x-4} = 1296$

54. $9^{2x+3} = 2187$

55. $4^{3x} = 512$

56. $128^{3x} = 8$

Example 6

57. CONSERVATION Water collected in a rain barrel can be used to water plants and reduce city water use. Water flowing from an open rain barrel has velocity $v = 8h^{\frac{1}{2}}$, where v is in feet per second and h is the height of the water in feet. Find the height of the water if it is flowing at 16 feet per second.

58. ELECTRICITY The radius r in millimeters of a platinum wire L centimeters long with resistance 0.1 ohm is $r = 0.059L^{\frac{1}{2}}$. How long is a wire with radius 0.236 millimeter?



Write each expression in radical form, or write each radical in exponential form.

59. $17^{\frac{1}{3}}$

60. $q^{\frac{1}{4}}$

61. $7b^{\frac{1}{3}}$

62. $m^{\frac{2}{3}}$

63. $\sqrt[3]{29}$

64. $\sqrt[5]{h}$

65. $2\sqrt[3]{a}$

66. $\sqrt[3]{xy^2}$

Simplify.

67. $\sqrt[3]{0.027}$

68. $\sqrt[4]{\frac{n^4}{16}}$

69. $a^{\frac{1}{3}} \cdot a^{\frac{2}{3}}$

70. $c^{\frac{1}{2}} \cdot c^{\frac{3}{2}}$

71. $(8^2)^{\frac{2}{3}}$

72. $(y^{\frac{3}{4}})^{\frac{1}{2}}$

73. $9^{-\frac{1}{2}}$

74. $16^{-\frac{3}{2}}$

75. $(3^2)^{-\frac{3}{2}}$

76. $(81^{\frac{1}{4}})^{-2}$

77. $k^{-\frac{1}{2}}$

78. $(d^{\frac{4}{3}})^0$

Solve each equation.

79. $2^{5x} = 8^{2x-4}$

80. $81^{2x-3} = 9^{x+3}$

81. $2^{4x} = 32^{x+1}$

82. $16^x = \frac{1}{2}$

83. $25^x = \frac{1}{125}$

84. $6^{8-x} = \frac{1}{216}$

85. **CCSS MODELING** The frequency f in hertz of the n th key on a piano is $f = 440\left(2^{\frac{1}{12}}\right)^{n-49}$.