

Logarithm Functions - Practice

- 1** Convert the given exponent to the equivalent in logarithm form

$$2^3 = 8$$

A $\log_8 3 = 2$

B $\log_8 2 = 3$

C $\log_2 8 = 3$

D $\log_3 2 = 8$

- 2** Convert the given logarithm to the equivalent in exponent form

$$\log_2 16 = 4$$

A $16^4 = 2$

B $4^{16} = 2$

C $2^4 = 16$

D $16^2 = 4$

- 3** Convert the given logarithm to the equivalent in base r

$$\log_z q$$

A $\frac{\log_r q}{\log_r z}$

B $\frac{\log_q r}{\log_z r}$

- 4** Convert the given logarithm fraction to its simplified form with a change of base

$$\frac{\log_y r}{\log_y z}$$

A $\log_r z$

B $\log_z r$

- 5** Convert the given logarithm fraction to its simplified form with a change of base

$$\frac{\log_2 11}{\log_2 8}$$

A $\log_8 10$

B $\log_{11} 8$

C $\log_8 11$

D $\log_8 13$

- 6** Convert the given logarithm to the equivalent in base 5

$$\log_2 6$$

A $\frac{\log_6 5}{\log_6 2}$

B $\frac{\log_5 6}{\log_5 2}$

C $\frac{\log_5 2}{\log_5 6}$

D $\frac{\log_2 6}{\log_2 5}$

- 7** Convert the given logarithm to its equivalent based on the product property

$$\log_r (y \cdot m)$$

A $\log_r y + \log_r m$

B $y \cdot \log_r m$

C $\log_m r + \log_r y$

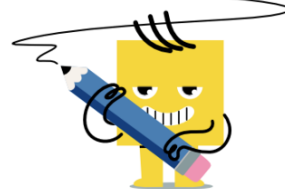
- 8** Convert the given logarithm to its equivalent based on the product property

$$\log_y w + \log_y p$$

A $\log_y (w \cdot p)$

B $\log_y \frac{w}{p}$

C $\log_p (y \cdot w)$



Logarithm Functions - Practice

- 9** Convert the given logarithm to its equivalent based on the quotient property

$$\log_z \frac{y}{x}$$

A $\log_z y - \log_z x$

B $\log_z x - \log_z y$

- 10** Convert the given logarithm to its equivalent based on the quotient property

$$\log_t n - \log_t x$$

A $\log_t \frac{x}{n}$

B $\log_x \frac{t}{n}$

C $\log_t \frac{n}{x}$

- 11** Convert the given logarithm to its equivalent based on the product property

$$\log_6 (10 \cdot 3)$$

A $\log_3 10 + \log_3 6$

B $\log_{10} 6 + \log_{10} 3$

C $\log_6 10 + \log_6 3$

- 12** Convert the given logarithm to its equivalent based on the product property

$$\log_4 7 + \log_4 3$$

A $\log_4 (7 \cdot 3)$

B $\log_3 (4 \cdot 7)$

C $\log_4 \frac{7}{3}$

- 13** Convert the given logarithm to its equivalent based on the quotient property

$$\log_3 \frac{10}{9}$$

A $\log_5 10 - \log_5 9$

B $\log_{10} 3 - \log_{10} 9$

C $\log_0 10 - \log_0 9$

D $\log_3 10 - \log_3 9$

- 14** Convert the given logarithm to its equivalent based on the quotient property

$$\log_5 9 - \log_5 2$$

A $\log_5 \frac{2}{9}$

B $\log_5 \frac{9}{2}$

C $\log_2 \frac{5}{9}$

- 15** Convert the given logarithm to its equivalent based on the product property

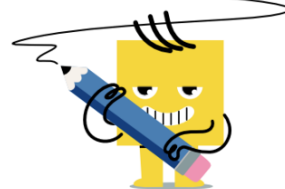
$$\log_8 50$$

A $\log_8 10 + \log_8 5$

B $\log_8 9 + \log_8 13$

C $\log_{10} 5 + \log_{10} 8$

D $\log_{10} 8 + \log_{10} 5$



Logarithm Functions - Practice

- 16** Convert the given logarithm to its equivalent based on the product property

$$\log_8 9 + \log_8 5$$

A $\log_9 45$

B $\log_{45} 8$

C $\log_8 45$

- 17** Convert the given logarithm to its equivalent based on the quotient property

$$\log_9 0.71$$

A $\log_9 5 - \log_9 7$

B $\log_6 5 - \log_6 7$

C $\log_8 5 - \log_8 7$

D $\log_9 7 - \log_9 5$

E $\log_5 9 - \log_5 7$

- 18** Convert the given logarithm to its equivalent based on the quotient property

$$\log_6 7 - \log_6 8$$

A $\log_6 -1.13$

B $\log_6 0.88$

C $\log_5 0.88$

D $\log_{0.88} 6$

E $\log_4 0.88$

- 19** Simplify and solve for t

$$3^{(2t)} = 81$$

A $t = 2$

B $t = 1$

- 20** Simplify and solve for x

$$3^{(x-8)} = 81$$

A $x = 12$

B $x = -4$

- 21** Simplify and solve for x

$$2^{(6x-9)} = 8$$

A $x = 4$

B $x = 2$

C $x = 1$

D $x = 3$

- 22** Simplify and solve for q

$$5^{(q-8)} = 25^q$$

A $q = -8$

B $q = -9$

- 23** Simplify and solve for t

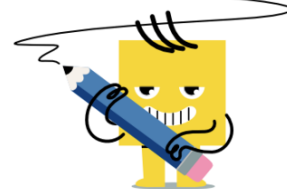
$$3^{(5t-2)} = 81^t$$

A $t = 2$

B $t = 1$

C $t = 4$

D $t = 3$

**Logarithm Functions - Practice****24** Simplify and solve for y

$$6^{\left(\frac{y+56}{y}\right)} = 216$$

A

$$y = 28$$

B

$$y = 27$$

25 Simplify and solve for n

$$4^{\left(\frac{2n+54}{4n}\right)} = 16$$

A

$$n = 10$$

B

$$n = 9$$

C

$$n = 11$$

D

$$n = 8$$

26 Convert the given logarithm to its equivalent based on the power property

$$\log_n m^w$$

A

$$n \log_w m$$

B

$$m \log_n w$$

C

$$w \log_n m$$

27 Convert the given logarithm to its equivalent based on the power property

$$t \log_q z$$

A

$$\log_q z^t$$

B

$$q \log_t z^t$$

C

$$\log_q t^z$$

28 Convert the given logarithm to its equivalent based on the power property

$$\log_6 5^3$$

A

$$3 \log_5 6$$

B

$$5 \log_6 3$$

C

$$6 \log_3 5$$

D

$$3 \log_6 5$$

29 Convert the given logarithm to its equivalent based on the power property

$$2 \log_8 3$$

A

$$\log_8 3^2$$

B

$$\log_8 2^3$$

C

$$\log_3 8^2$$

30 Convert the given logarithm to its equivalent based on the power property

$$\log_5 8$$

A

$$3 \log_5 2$$

B

$$5 \log_3 2$$

C

$$3 \log_2 5$$

D

$$2 \log_5 3$$

31 Convert the given logarithm to its equivalent based on the power property

$$2 \log_3 4$$

A

$$\log_3 17$$

B

$$\log_4 16$$

C

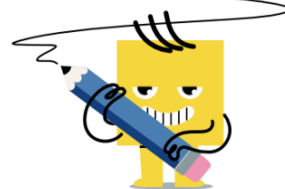
$$\log_3 18$$

D

$$\log_{16} 3$$

E

$$\log_3 16$$



Logarithm Functions - Practice

- 32** Use the product rule to simplify this to a quadratic of variable 'w'
 $\log_{10}(w+8) + \log_{10}(w+8) = \log_{10}(4)$

A $2w^2 + 18w + 59 = 0$

B $w^2 + 16w + 60 = 0$

C $2w^2 + 18w + 64 = 0$

- 33** Use the quotient rule to simplify this to a quadratic of variable 'm'
 $\log_3(m+8) - \log_3(m-1) = \log_3(1m)$

A $m^2 + 3m + 9 = 0$

B $m^2 + 2m + 7 = 0$

C $-1m^2 + 2m + 8 = 0$

- 34** Use the product rule to simplify this to a quadratic and solve for 'x'
 $\log_{10}(x+3) + \log_{10}(x+5) = \log_{10}(3)$

A $x = -2$

B $x = -6$

C $x = 1$

- 35** Use the quotient rule to simplify this to a quadratic and solve for 'n'
 $\log_4(n+10) - \log_4(n-8) = \log_4(1n)$

A $n = 18$

B $n = 10$

- 36** Use the power rule to simplify this to an equation with variable 'n'
 $2\log_9(n+6) = \log_9(1)$

A $(n+6)^2 = 1$

B $2(n+6) = 1$

C $(n+12) = 1$

- 37** Use the power rule to simplify this and solve for 'y'
 $2\log_5(y+2) = \log_5(4)$

A $y = -4$

B $y = 0$

C $y = -8$

- 38** Use the product rule to simplify this to a quadratic of variable 't'
 $\log_4(-3t+1) + \log_4(3t+1) = \log_4(1)$

A $-9t^2 + 0t + 0 = 0$

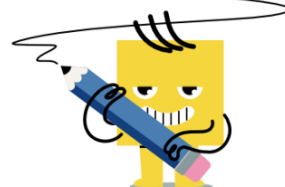
B $-8t^2 + 1t + 3 = 0$

C $-10t^2 - 2t + 3 = 0$

- 39** Use the quotient rule to simplify this to a quadratic of variable 'm'
 $\log_9(2m+6) - \log_9(-3m-1) = \log_9(-2m)$

A $-6m^2 + 0m + 6 = 0$

B $-5m^2 - 2m + 5 = 0$



Logarithm Functions - Practice

- 40** Use the product rule to simplify this to a quadratic and solve for 'y'
 $\log_7(3y - 8) + \log_7(3y - 7) = \log_7(2)$

A $y = 3$

B $y = -3$

C $y = 9$

- 41** Use the quotient rule to simplify this to a quadratic and solve for 'r'
 $\log_7(-3r - 6) - \log_7(r + 8) = \log_7(-1r)$

A $r = -11$

B $r = -6$

C $r = 3$

- 42** Use the power rule to simplify this to an equation with variable 'y'

$$2\log_5(3y + 3) = \log_5(9)$$

A $(3y + 6) = 81$

B $(3y + 3)^2 = 81$

C $2(3y + 3) = 81$

- 43** Use the power rule to simplify this and solve for 'm'

$$2\log_3(m + 5) = \log_3(1)$$

A $m = -4$

B $m = -9$

- 44** Simplify and solve for x
 $\log_4(8x) = 3$

A $x = 8$

B $x = 7$

- 45** Simplify and solve for t
 $\log_7(t - 6) = 2$

A $t = 55$

B $t = 44$

- 46** Simplify and solve for m
 $\log_9(2m + 7) = 2$

A $m = 37$

B $m = 38$

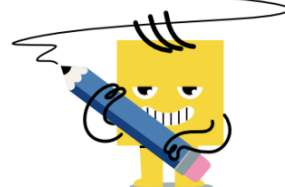
C $m = 36$

D $m = 39$

- 47** Simplify and solve for q
 $\log_4\left(\frac{q + 30}{q}\right) = 2$

A $q = 2$

B $q = 1$

**Logarithm Functions - Practice****48** Use the power rule to simplify this equation

$$3^{(t+9)} = 6^{(t)}$$

A $(t + 9) \ln 3 = (t) \ln 6$

B $(9t + 1) \ln 3 = (2t + 1) \ln 6$

C $(t - 9) \ln 3 = (t - 2) \ln 6$

49 Use the power rule to simplify this and solve for 'p'

$$2^{(p+3)} = 7^{(p)}$$

A $p = \frac{-3 \ln 2}{\ln 2 - \ln 7}$

B $p = \frac{-3 \ln 7}{\ln 7 - \ln 2}$

C $p = \frac{\ln 7 - \ln 2}{3 \ln 2 - 2 \ln 7}$

50 Simplify and solve for r

$$\log_3\left(\frac{9r + 36}{3r}\right) = 2$$

A $r = 4$

B $r = 2$

C $r = 1$

D $r = 3$

51 Use the power rule to simplify this equation

$$8^{(z-4)} = 7^{(-4z)}$$

A $(z + 4) \ln 8 = (-4z - 2) \ln 7$

B $(-4z + 1) \ln 8 = (2z - 4) \ln 7$

C $(z - 4) \ln 8 = (-4z) \ln 7$

52 Use the power rule to simplify this and solve for 'm'

$$3^{(-8m+9)} = 2^{(8m)}$$

A $m = \frac{-9 \ln 3}{-8 \ln 3 - 8 \ln 2}$

B $m = \frac{-9 \ln 2}{-8 \ln 2 - 8 \ln 3}$

C $m = \frac{8 \ln 2 + 8 \ln 3}{9 \ln 3 - 2 \ln 2}$

53 Use the power rule to simplify this equation

$$3^{(n+4)} = 10^{(n+8)}$$

A $(4n + 1) \ln 3 = (8n + 1) \ln 10$

B $(n - 4) \ln 3 = (n - 8) \ln 10$

C $(n + 4) \ln 3 = (n + 8) \ln 10$

54 Use the power rule to simplify this and solve for 'q'

$$4^{(q+7)} = 5^{(q+6)}$$

A $q = \frac{6 \ln 5 - 7 \ln 4}{\ln 4 - 1 \ln 5}$

B $q = \frac{6 \ln 4 - 7 \ln 5}{\ln 5 - \ln 4}$

C $q = \frac{\ln 5 - \ln 4}{7 \ln 4 - 6 \ln 5}$

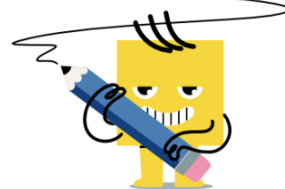
55 Use the power rule to simplify this equation

$$9^{(8y-3)} = 8^{(-9y-7)}$$

A $(8y - 3) \ln 9 = (-9y - 7) \ln 8$

B $(8y + 3) \ln 9 = (-9y + 7) \ln 8$

C $(-3y + 8) \ln 9 = (-7y - 9) \ln 8$



Logarithm Functions - Practice

56 Use the power rule to simplify this and solve for 'm'

$$4^{(3m-4)} = 3^{(6m+9)}$$

A $m = \frac{6 \ln 3 - 3 \ln 4}{-4 \ln 4 - 9 \ln 3}$

B $m = \frac{9 \ln 4 + 4 \ln 3}{3 \ln 3 - 6 \ln 4}$

C $m = \frac{9 \ln 3 + 4 \ln 4}{3 \ln 4 - 6 \ln 3}$

57 What is the magnitude on the Richter scale when the wave height is 10^6 micrometers?

$$M = \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 1 \mu\text{m}$$

$$I = 10^6 \mu\text{m}$$

A

$$M = 5$$

B

$$M = 6$$

58 What is the dB magnitude on the decibel scale when the sound energy is 10^1 W/m^2 ?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$I = 10^1 \text{ W/m}^2$$

A $\beta = 13 \text{ dB}$

B $\beta = 7 \text{ dB}$

59 What is the wave height of an earthquake with a magnitude of 5 on the Richter scale?

$$M = \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 1 \mu\text{m}$$

$$M = 5$$

A

$$I = 10^4 \mu\text{m}$$

B

$$I = 10^5 \mu\text{m}$$

60 What is the hydrogen ion concentration of a solution with a pH of 5 on the pH scale?

$$\text{pH} = -\log[\text{H}^+]$$

$$\text{pH} = 5$$

A $[\text{H}^+] = 10^{-10,000,000} \text{ mL/mol}$

B $[\text{H}^+] = 10^{-100,000} \text{ mL/mol}$

61 If a sound has 1×10^{10} times the sound energy as one with a dB magnitude of 20 on the decibel scale, what is its dB magnitude?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$\frac{I_2}{I_1} = 1 \times 10^{10}$$

$$\beta_1 = 20 \text{ dB}$$

A

$$\beta_2 = 120 \text{ dB}$$

B

$$\beta_2 = 127 \text{ dB}$$

62 If 2 sounds have dB magnitudes of 80 and 130 on the decibel scale what is the ratio of their sound energy measurements?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$\beta_2 = 130 \text{ dB}$$

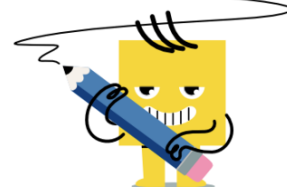
$$\beta_1 = 80 \text{ dB}$$

A

$$\frac{I_2}{I_1} = 100,000$$

B

$$\frac{I_2}{I_1} = 316,228$$



Logarithm Functions - Practice

- 63** If 2 earthquakes have magnitudes of 2.2 and 7.9 on the Richter scale what is the ratio of their wave size measurements?

$$M = \log\left(\frac{I}{I_0}\right)$$

$$M_2 = 7.9$$

$$M_1 = 2.2$$

A

$$\frac{I_2}{I_1} = 501,187$$

B

$$\frac{I_2}{I_1} = 5,012$$

- 64** If a solution has 19,953 times the Hydrogen ion concentration as one with a pH of 7.2 on the pH scale, what is its pH?

$$\text{pH} = -\log[\text{H}^+]$$

$$\frac{[\text{H}^+]_2}{[\text{H}^+]_1} = 19,953$$

$$\text{pH}_1 = 7.2$$

A

$$\text{pH}_2 = 3.4$$

B

$$\text{pH}_2 = 2.9$$

- 65** What is the dB magnitude on the decibel scale when the sound energy is 1 W/m^2 ?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$I = 1 \text{ W/m}^2$$

A

$$\beta = 120 \text{ dB}$$

B

$$\beta = 125 \text{ dB}$$

- 66** What is the dB magnitude on the decibel scale when the sound energy is $6.31 \times 10^{-11} \text{ W/m}^2$?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$I = 6.31 \times 10^{-11} \text{ W/m}^2$$

A

$$\beta = 18 \text{ dB}$$

B

$$\beta = 20 \text{ dB}$$

- 67** What is the sound intensity of a sound with a sound intensity of 30 dB on the decibel scale?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$\beta = 30 \text{ dB}$$

A

$$I = 1 \times 10^{-9} \text{ W/m}^2$$

B

$$I = 3.16 \times 10^{-8} \text{ W/m}^2$$

- 68** What is the sound intensity of a sound with a sound intensity of 29 dB on the decibel scale?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$\beta = 29 \text{ dB}$$

A

$$I = 2.51 \times 10^{-11} \text{ W/m}^2$$

B

$$I = 7.94 \times 10^{-10} \text{ W/m}^2$$

- 69** If a solution has 100 times the Hydrogen ion concentration as another what is their difference on the pH scale?

$$\text{pH} = -\log[\text{H}^+]$$

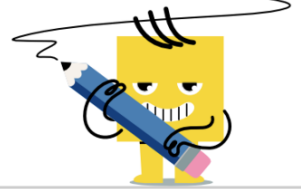
$$\frac{[\text{H}^+]_2}{[\text{H}^+]_1} = 100$$

A

$$\text{pH}_2 - \text{pH}_1 = -0.5$$

B

$$\text{pH}_2 - \text{pH}_1 = -2$$



Logarithm Functions - Practice

- 70** If a sound has 631 times the sound energy as another what is their difference on the decibel scale?

$$\text{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

$$\frac{I_2}{I_1} = 631$$

A

$$\beta_2 - \beta_1 = 29$$

B

$$\beta_2 - \beta_1 = 28$$

- 71** If an earthquake has a magnitude 4 higher on the Richter scale what is the ratio of their wave size measurements?

$$M = \log\left(\frac{I}{I_0}\right)$$

$$M_2 - M_1 = 4$$

A

$$\frac{I_2}{I_1} = 1,000$$

B

$$\frac{I_2}{I_1} = 10,000$$

- 72** If an earthquake has a magnitude 3.2 higher on the Richter scale what is the ratio of their wave size measurements?

$$M = \log\left(\frac{I}{I_0}\right)$$

$$M_2 - M_1 = 3.2$$

A

$$\frac{I_2}{I_1} = 1,585$$

B

$$\frac{I_2}{I_1} = 15.8$$