Math 12 Unit 1 Logarithms Review Name: Key

Multiple Choice Section

1. (specs-01)
The population of ABC high school is currently 1 250 students and is decreasing at an annual rate of 3%. Which expression represents the population, P, of the school 5 years from now?

A. $P = 1\,250(1.03)^5$
B. $P = 1\,250(1.03)^{-5}$
C. $P = 1\,250(0.97)^5$
D. $P = 1\,250(0.97)^{-5}$

2. (specs-02)
Change $y = 5^x$ to logarithmic form.

A. $\log_5 x = y$
B. $\log_5 y = x$
C. $\log_y 5 = x$
D. $\log_x 5 = y$

$\log_5 y = x$

3. (specs-03)
The population of a particular country is 25 million. Assuming the population is growing continuously, the population P, in millions, t years from now can be determined by the formula $P = 25e^{0.022t}$. What will be the population, in millions, 20 years from now?

A. 29.90
B. 37.97
C. 38.63
D. 38.82

base "e"

$P = 25\,e^{(.022)(20)} = 38.82$

4. (specs-04)
Simplify: $\log_2 4^x$

A. x
B. $2x$
C. 2^x
D. x^2

$x \log_2 4 = x(2)$

5. (specs-05)
If $\log_4 x = a$, determine $\log_{16} x$ in terms of a.

A. $\frac{a}{4}$
B. $\frac{a}{2}$
C. $2a$
D. $4a$

$\log_{16} x = \frac{\log_4 x}{\log_4 16} = \frac{a}{2}$ ($x = 4^a$, $16 = 4^2$)

6. (specs-07)
Given $\log_a 2 = x$ and $(\log_a 8)(a^{\log_a x}) = 12$, solve for a.

A. 2
B. ± 2
C. $\sqrt{2}$
D. $\pm\sqrt{2}$

Note: $x > 0$, since you can't take log of a -ve

$(\log_a 2^3)(x) = 12$

$3(\log_a 2)(x) = 12$

$3(x)(x) = 12$

$x^2 = 4$

$x = 2$

$\log_a 2 = 2$

$a^2 = 2$

$a = \sqrt{2}$

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7. (specs-06)

The Richter scale is used for comparing the intensities of earthquakes. On the Richter scale, each increase of 1 unit in magnitude represents a 10-fold increase in intensity as measured on a seismometer. In 1976, an earthquake in Guatemala had a magnitude of 7.5 on the Richter scale and in 1960, an earthquake in Morocco had a magnitude of 5.8. How many times as intense was the 1976 Guatemalan earthquake compared to the 1960 Moroccan earthquake?

A. 1.29
B. 1.7
C. $10^{1.29}$
D. $10^{1.7}$

$10^{7.5-5.8}$: intensity

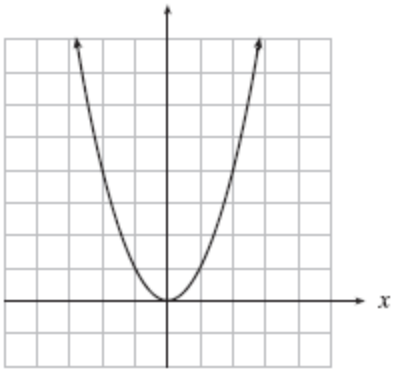
$10^{1.7}$: intensity

8. (specs-08)

Which of the following is a graph of $\log_x y = 2$?

$x > 0, x \neq 1$

A.



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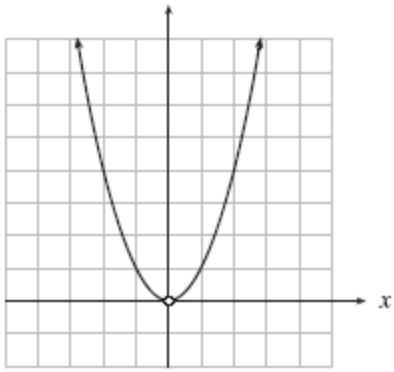

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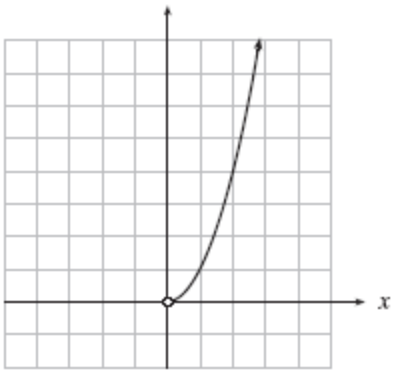

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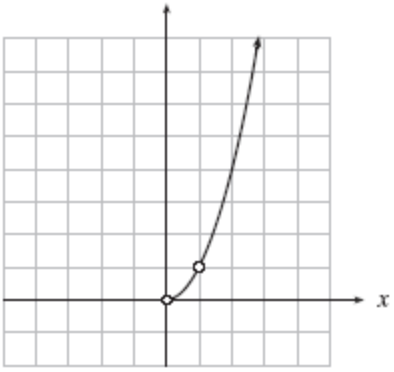

9. (sample02-16)

Change to exponential form: $\log_k \ell = m$

A. $\ell = m^k$
B. $\ell = k^m$
C. $k = m^\ell$
D. $k = \ell^m$

$k^m = \ell$

10. (sample02-17)

Determine the domain of the function $y = \log(2x+3)$.

A. $x > -\frac{3}{2}$

B. $x > -\frac{2}{3}$

C. $x > \frac{2}{3}$

D. $x > \frac{3}{2}$

$2x+3 > 0$

$2x > -3$

$x > -3/2$

11. (sample02-18)

A recent earthquake in Washington measured 6.3 on the Richter scale. In 1964, the Alaskan earthquake measured 8.5. How many times as intense was the 1964 Alaskan earthquake compared to the recent Washington earthquake?

A. 1.35

B. 2.2

C. $10^{1.35}$

D. $10^{2.2}$

$10^{8.5-6.3} = \text{intensity} \rightarrow 10^{2.2}$

12. (sample02-19)

Solve for x: $\log_3(x-6)+\log_3 x = 3$

A. 4.5

B. 9

C. 16.5

D. −3, 9

$\log_3[(x-6)x] = 3 \rightarrow x^2-6x-27=0$

$(x-6)(x) = 3^3$

$(x-9)(x+3)=0$

$x = 9, -3$

13. (sample02-20)

Solve for x: $81^{x-1} = \left(\frac{1}{27}\right)^{x-4}$

A. −8

B. −3

C. $-\frac{3}{7}$

D. $\frac{16}{7}$

$(3^4)^{x-1} = (3^{-3})^{x-4}$

$4x-4 = -3x+12$

$7x-4 = 12$

$7x = 16$

$x = 16/7$

14. (jan02-16)

Change to logarithmic form: $p = q^r$

A. $\log_p q = r$

B. $\log_q p = r$

C. $\log_r p = q$

D. $\log_q r = p$

$\log_q p = r$

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15. (sample02-22)

Solve for x in terms of $\log a$, $\log b$, and $\log c$: $ab^x = c$

A. $x = \dfrac{\log c}{\log a + \log b}$

B. $x = \dfrac{\log c + \log a}{\log b}$

C. $x = \dfrac{\log c - \log a}{\log b}$

D. $x = \dfrac{\log c}{\log b} - \log a$

$\log[ab^x] = \log c$

$\log a + x\log b = \log c$

$x\log b = \log c - \log a$

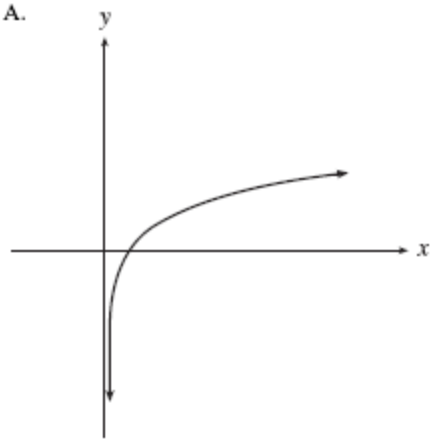
$x = \dfrac{\log c - \log a}{\log b}$

16. (sample02-21)

If $0 < a < 1$, which of the following is the best graph of $y = \log_a x$?

a is a fraction

A.



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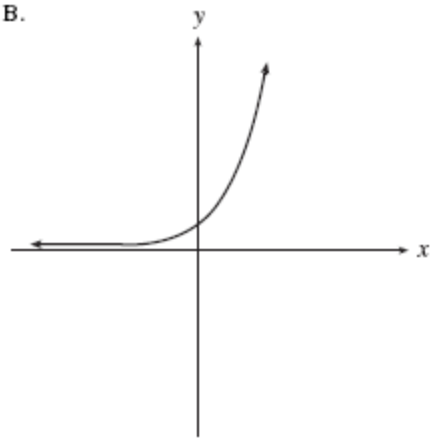
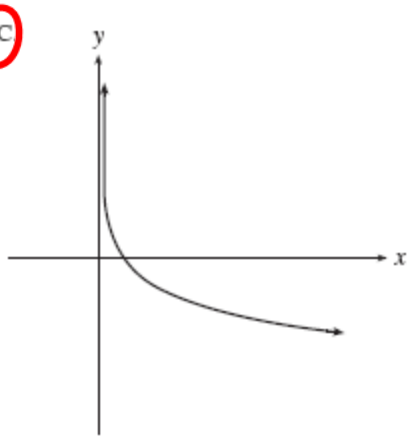
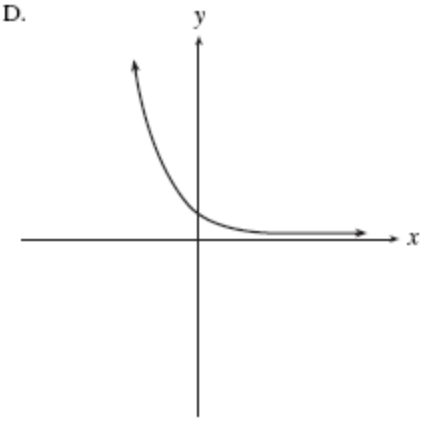


C



D.



17. (jan02-17)

Evaluate: $\log_2 7.5$

A. 0.44
B. 0.57
C. 2.26
D. 2.91

$\dfrac{\log 7.5}{\log 2} = 2.91$

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18. (jan02-18)

Determine the range of the function $y = 2^{x-3} + 4$.

A. $y > 4$
B. $y > -4$
C. $x > 3$
D. $x > -3$

19. (jan02-19)

Solve: $16^{x+1} = 8^{1-x}$

A. $-\frac{1}{3}$
B. $-\frac{1}{7}$
C. $\frac{2}{7}$
D. $\frac{2}{5}$

$(2^4)^{x+1} = (2^3)^{1-x}$

$4x + 4 = 3 - 3x$

$7x + 4 = 3$

$7x = -1 \quad x = -1/7$

20. (jan02-20)

Which expression is equivalent to $\log\left(\frac{100x^3}{y}\right)$?

A. $2 + \log(3x - y)$
B. $300 \log x - \log y$
C. $2 + 3\log x - \log y$
D. $\log(100 + x^3 - y)$

$= \log 100 + \log x^3 - \log y$

$= 2 + 3\log x - \log y$

21. (jan02-21)

Solve: $\log_3(x+4) + \log_3(6-x) = 2$

A. 3
B. 5
C. 3, −5
D. 5, −3

$\log_3[(x+4)(6-x)] = 2$

$(x+4)(6-x) = 3^2$

$-x^2 + 2x + 24 = 9$

$0 = x^2 - 2x - 15$

$0 = (x-5)(x+3) \rightarrow x = 5, -3$

22. (jan02-22)

Simplify: $a^{\log_a 8 + \log_a 2}$

A. 10
B. 16
C. a^{10}
D. a^{16}

$a^{\log_a 16} = 16$

23. (apr02-16)

Change $y = \log_7 x$ to exponential form.

A. $y = x^7$
B. $y = 7^x$
C. $x = y^7$
D. $x = 7^y$

$7^y = x$

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24. (apr02-17)

What is the domain of $y = \log_3(4x-1)+3$?

A. $x > 0$

B. $x > 1$

C. $x > \frac{1}{4}$

D. all real numbers

$4x-1 > 0$ → $x > 1/4$

$4x > 1$

25. (apr02-18)

Simplify the expression: $\log_a\left(\frac{1}{a^b}\right)$

A. $-b$

B. b

C. a^b

D. a^{-b}

$= \log_a 1 - \log_a a^b = 0 - b\log_a a = -b$

26. (apr02-19)

$A = A_0(\_)^{t/p}$

The intensity of light is reduced by 2% for each metre that a diver descends below the surface of the water. At what depth is the intensity of light only 10% of that at the surface?

A. 5 m

B. 18 m

C. 98 m

D. 114 m

$\frac{10}{10} = \frac{100}{100}(.98)^d$ → $0.1 = .98^d$

$\log(.1) = d\log.98$ → $d = \frac{\log.1}{\log.98}$

27. (apr02-20)

Solve for x: $5^{x-1} = 125^{3-x}$

A. 2

B. 5

C. $\frac{2}{5}$

D. $\frac{5}{2}$

$5^{x-1} = (5^3)^{3-x}$ → $x-1 = 9-3x$

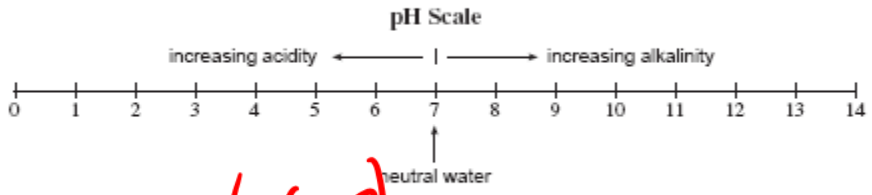
$5^{x-1} = 5^{9-3x}$

$4x-1 = 9$

$4x = 10$ → $x = 10/4 = 5/2$

28. (apr02-21)

In chemistry, the pH scale measures the acidity (0–7) or alkalinity (7–14) of a solution. It is a logarithmic scale in base 10. Thus, a pH of 9 is 10 times more alkaline than a pH of 8. If a solution has a pH of 7.6, how many times more alkaline is it than neutral water which has a pH of 7?



A. 0.6

B. 1.09

C. 3.98

D. 12.18

$10^{(7.6-7)} = 3.98$

29. (jun02-16)

Determine the logarithmic form of $a = b^c$.

A. $\log_a b = c$
B. $\log_a c = b$
C. $\log_c a = b$
D. $\log_b a = c$

30. (jan02-43)

The population of a city grows continuously according to the formula $P = P_0 e^{kt}$. Determine the value of the growth rate, k, if the population increases from 30 000 to 45 000 in 8 years.

A. 0.02
B. 0.05
C. 0.41
D. 1.05

$\frac{45000}{30000} = \frac{30000}{30000} e^{8k} \rightarrow 1.5 = e^{8k} \rightarrow \ln(1.5) = \ln(e^{8k})$

$\ln(1.5) = 8k \ln(e)^{=1}$

$k = \frac{\ln(1.5)}{8}$

31. (jun02-18)

Solve: $\left(\frac{1}{4}\right)^{1-2x} = 8^{x-3}$

A. -7
B. $\frac{11}{7}$
C. $\frac{7}{4}$
D. no solution

$(2^{-2})^{1-2x} = (2^3)^{x-3}$

$-2+4x = 3x-9$

$x = -7$

32. (jun02-19)

If the graph of $y = \log_a x$ goes through the point $(1\,024,\ 5)$, determine a.

A. 4
B. 4.31
C. 10
D. 204.8

$5 = \log_a 1024 \rightarrow a^5 = 1024 \quad a = \sqrt[5]{1024}$

(x y)

33. (jun02-21)

A sample of water contains 200 g of pollutants. Each time the sample is passed through a filter, 20% of its pollutants are removed. Determine an expression that gives the number of grams of pollutants still in the water after it passes through five filters.

A. $200(0.8)^4$
B. $200(1.2)^4$
C. $200(0.8)^5$
D. $200(1.2)^5$

$A = A_0 r^{t/p} \rightarrow A = 200(.8)^5$

34. (jun02-42)

Simplify: $e^{\ln a}$

A. a
B. e^a
C. $\ln a$
D. ae

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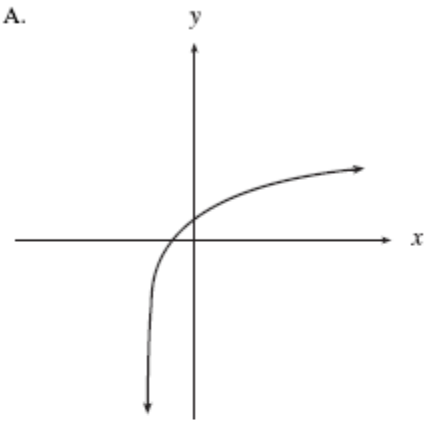
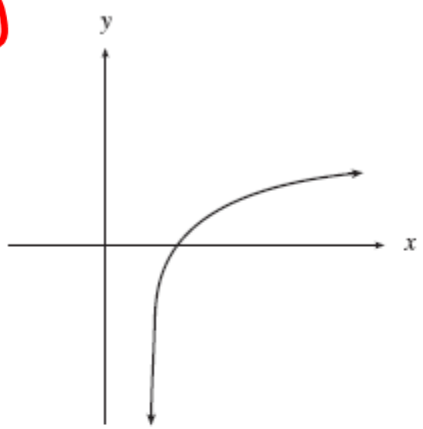
35. (jun02-20)

Which graph best represents the function $y = \log_2(x-2)$?

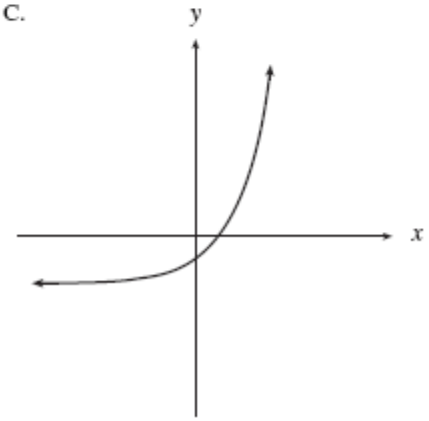
A.



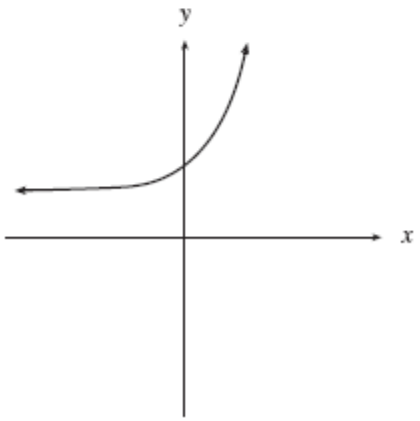
B.



C.



D.



36. (aug02-16)

Change $\log_4 c = x$ to exponential form.

A. $x^4 = c$
B. $4^x = c$
C. $4^c = x$
D. $c^x = 4$

37. (aug02-17)

Determine the domain of $y = 2\log_4(x-1)+5$.

A. $x > 1$
B. $x > 4$
C. $x > 5$
D. all real numbers

$x - 1 > 0$

$x > 1$

38. (jun02-22)

If $\log_a x = 3$ and $\log_a y = 4$, evaluate $\left(\log_a \frac{1}{xy}\right)^2$.

A. $\frac{1}{49}$

B. 1

C. 14

D. 49

$\left[\log_a 1 - \log_a x - \log_a y\right]^2 = \left[0 - 3 - 4\right]^2$

39. (aug02-18)

Solve: $25^{x+3} = 125^{2x-1}$

A. $-\frac{16}{3}$

B. 1

C. $\frac{11}{8}$

D. $\frac{9}{4}$

$(5^2)^{x+3} = (5^3)^{2x-1} \rightarrow 2x+6 = 6x-3$

$6 = 4x - 3$

$9 = 4x$

40. (aug02-19)

Solve: $\log_4(x^2+1) - \log_4 6 = \log_4 5$

A. $\sqrt{10}$

B. $\pm\sqrt{10}$

C. $\sqrt{29}$

D. $\pm\sqrt{29}$

$\log_4\left[\frac{x^2+1}{6}\right] = \log_4 5 \rightarrow \frac{x^2+1}{6} = 5 \rightarrow x^2+1 = 30$

$x^2 = 29$

$x = \pm\sqrt{29}$

41. (aug02-20)

Determine the x-intercept of $y = \log_2(x+4)+1$.

A. -3

B. -3.5

C. -3.9

D. -4

$0 = \log_2(x+4)+1 \rightarrow -1 = \log_2(x+4) \rightarrow 2^{-1} = x+4$

$x = 2^{-1} - 4 = \frac{1}{2} - 4$

42. (aug02-42)

Simplify: $\ln e^{x^5}$

A. 5

B. $5x$

C. x^5

D. $\frac{x}{5}$

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43. (aug02-21)

Max invests $5 000 at an interest rate of 6% per annum, compounded monthly. Which expression represents the amount of Max's investment after t years?

A. $5\,000(1.06)^{12t}$
B. $5\,000(1.005)^{12t}$
C. $5\,000(1.06)^{t}$
D. $5\,000(1.005)^{\frac{t}{12}}$

44. (aug02-22)

Which expression is equivalent to $\log(m^2n)^3$?

A. $6\log m + 3\log n$
B. $6\log m + \log n$
C. $(2\log m + \log n)^3$
D. $\log 3m^2 + \log 3n$

$= \log m^6 n^3 = \log m^6 + \log n^3$

45. (jan03-16)

Evaluate: $\log_{5.3} 210$

A. 0.31
B. 1.60
C. 2.31
D. 3.21

$\frac{\log 210}{\log 5.3}$

46. (jan03-17)

Solve: $27^{x+2} = \left(\frac{1}{3}\right)^{3-6x}$

A. $-\frac{1}{3}$
B. $\frac{1}{7}$
C. $\frac{5}{3}$
D. 3

$(3^3)^{x+2} = (3^{-1})^{3-6x}$

$3x+6 = -3+6x$

$9 = 3x$

$x = 3$

47. (jan03-18)

Determine an equation of the asymptote of $f(x) = 2^{x-1} + 3$.

A. $y = 2$
B. $y = -2$
C. $y = 3$
D. $y = -3$

moved 3 up, $y = \cancel{0}3$

48. (apr03-17)

Determine an equation of the asymptote of $y = 2\log_3(x+4) - 5$.

A. $x = -5$
B. $x = -4$
C. $y = -5$
D. $y = -4$

moved 4 left, so $x = \cancel{0} -4$

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49. (jan03-22)

A radioactive substance decays continuously according to the formula $N = Ce^{kt}$, where N is the final amount, C is the initial amount, k is a constant, and t is the time in years. If 50 grams of the substance decays to 20 grams in 10 years, determine the value of k.

A. −0.0916
B. −0.0398
C. 0.0610
D. 0.0916

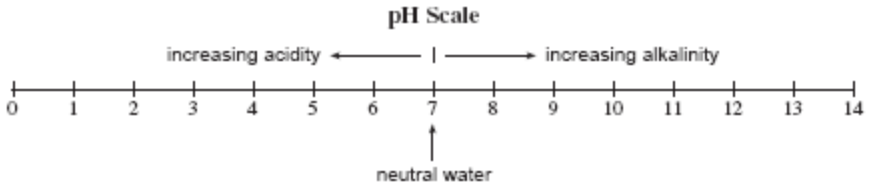
$\frac{20}{50} = \frac{50e^{10k}}{50} \rightarrow 0.4 = e^{10k}$

$\ln(0.4) = \ln e^{10k} \rightarrow \ln(0.4) = 10k$

$k = \frac{\ln(.4)}{10}$

50. (jan03-19)

The pH scale measures the acidity (0–7) or alkalinity (7–14) of a solution. It is a logarithmic scale in base 10. Thus, a pH of 12 is 10 times more alkaline than a pH of 11. If bleach has a pH of 13, how many times more alkaline is it than blood which has a pH of 8?



A. 1.625
B. 5
C. 50
D. 100 000

$10^{(13-8)} = \_\_\_\_$

51. (jan03-20)

If $\log_3(m+n) = 2$, $(m+n) > 0$, express m in terms of n.

A. $m = 9 - n$
B. $m = 6 - n$
C. $m = \frac{9}{n}$
D. $m = \frac{6}{n}$

$3^2 = m + n$

$9 = m + n \rightarrow m = 9 - n$

52. (jan03-21)

If $B = \frac{A}{C^2}$, determine an expression for $\log B$.

A. $\log A - 2\log C$
B. $\log A - \log 2C$
C. $\frac{\log A}{2\log C}$
D. $\frac{\log A - \log C}{2}$

$\log B = \log\left[\frac{A}{C^2}\right]$

$= \log A - \log C^2$

$= \log A - 2\log C$

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53. (apr03-16)
Determine an equivalent expression for $\log P - \log Q$.

A. $\log(P-Q)$

B. $\log PQ$

C. $\log \frac{P}{Q}$

D. $\frac{\log P}{\log Q}$

54. (apr03-18)
Solve: $\log_5(x-3)=2$

A. 5
B. 13
C. 28
D. 35

$5^2 = x-3 \rightarrow x = 28$

55. (apr03-19)
Atmospheric pressure varies with altitude above the surface of the earth. For altitudes up to 10 km, the pressure, p, in kilopascals, is given by $p = 100e^{-0.139a}$, where a is the altitude in km. What would the pressure be at 5 km above the surface of the earth? (Answer to the nearest kilopascal.)

A. 22
B. 50
C. 93
D. 200

$p = 100\,e^{(-.139(5))} = 49.9$

56. (apr03-20)
Solve for x: $\left(\sqrt{a}\right)^{6x-2} = \left(a^2\right)^{2x+3}$

A. −7
B. −4
C. −5
D. 4

$\left(a^{\frac{1}{2}}\right)^{6x-2} = \left(a^2\right)^{2x+3} \rightarrow 3x-1 = 4x+6 \rightarrow -1 = x+6$

$-3x \quad -3x$

57. (apr03-21)
The half-life of Iodine-126 is 13 days. Calculate the length of time, in days, that it will take for 100 g of Iodine-126 to decay to 15 g.

A. 4.75
B. 9.00
C. 34.43
D. 35.58

$15 = 100\left(\frac{1}{2}\right)^{t/13} \rightarrow .15 = \left(\frac{1}{2}\right)^{t/13} \rightarrow \log .15 = \frac{t}{13}\log\left(\frac{1}{2}\right)$

$t = \frac{13\log .15}{\log \frac{1}{2}}$

58. (apr03-22)
If $\log c = 3$, evaluate $\log 10c^2$.

A. 6
B. 7
C. 8
D. 10

$\log 10 + \log c^2$

$= 1 + 2\log c = 1 + 2(3)$

59. (jun03-16)

Evaluate: $\log_2 700$

A. 1.42
B. 2.54
C. 3.37
D. 9.45

$\frac{\log 700}{\log 2}$

60. (jun03-17)

Change to exponential form: $\log_x 125 = \frac{3}{2}$

A. $125 = x^{\frac{3}{2}}$

B. $125 = \left(\frac{3}{2}\right)^x$

C. $x^{125} = \frac{3}{2}$

D. $125^{\frac{3}{2}} = x$

61. (jun03-18)

Determine the domain of the function $y = \log(3x - 5)$.

A. $x > -\frac{5}{3}$

B. $x > -\frac{3}{5}$

C. $x > \frac{3}{5}$

D. $x > \frac{5}{3}$

$3x - 5 > 0$

$3x > 5$

$x > 5/3$

62. (jun03-19)

Express as a single logarithm:

$$\log a - 2\log b - \log c$$

A. $\log \frac{ac}{2b}$

B. $\log \frac{ac}{b^2}$

C. $\log \frac{a}{2bc}$

D. $\log \frac{a}{b^2 c}$

$= \log a - \log b^2 - \log c$

$= \log\left(\frac{a}{b^2 c}\right)$

63. (jun03-21)

An earthquake off the coast of Alaska measured 6.4 on the Richter scale. Another earthquake near Japan was 50 times as intense. What was the Richter scale reading for the earthquake near Japan?

A. 7.1
B. 7.9
C. 8.1
D. 10.9

$10^{J-6.4} = 50$

$\log(10^{J-6.4}) = \log 50$ → $(J - 6.4)\log 10 = \log 50$

$J = \log 50 + 6.4$

Math 12 Unit 1 Logarithms Review Name:

64. (jun03-20)

Solve for x: $8^{x-1} = \left(\frac{1}{16}\right)^{5-x}$

A. $-\frac{19}{4}$

B. -3

C. $\frac{23}{7}$

D. 17

$(2^3)^{x-1} = (2^{-4})^{5-x}$ → $3x-3 = -20+4x$

$17 = x$

65. (jun03-22)

Which expression gives the amount that an investment of P dollars will grow to after 4 years if it is compounded semi-annually at a rate of 5% per annum?

A. $P(1.05)^4$

B. $P(1.025)^4$

C. $P(1.05)^8$

D. $P(1.025)^8$

66. (jun03-23)

Given that $y_1 = \log_a 0.4$ and $y_2 = \log_a 4$, where $0 < a < 1$, which of the following **must** be true?

A. $y_1 < y_2$

B. $y_1 > y_2$

C. $0.4 < y_1 < 4$

D. $0.4 < y_2 < 4$

67. (aug03-16)

Change $1000 = 7^x$ to logarithmic form.

A. $\log_7 x = 1000$

B. $\log_x 7 = 1000$

C. $\log_x 1000 = 7$

D. $\log_7 1000 = x$

68. (aug03-17)

Give the domain of $y = \log_3(x+7) - 5$.

A. $x > -7$

B. $x > -5$

C. $x > 0$

D. $x > 7$

$x+7 > 0 \rightarrow x > -7$

69. (aug03-22)

Determine the magnitude of an earthquake that is 200 times as intense as an earthquake of magnitude 3.7 on the Richter scale.

A. 5.4

B. 6.0

C. 6.5

D. 7.5

$10^{x-3.7} = 200$

$\log 10^{x-3.7} = \log 200$

$(x-3.7)\log 10 = \log 200$

$x = \log 200 + 3.7$

Math 12 Unit 1 Logarithms Review Name:

70. (aug03-18)

Which expression is equivalent to $\log\left(\frac{x}{100y}\right)$?

A. $\log x - 2 - \log y$
B. $\log x - 2 + \log y$
C. $\log x - 4 + 2\log y$
D. $\log x - 4 - 2\log y$

$\log x - \log 100 - \log y$

71. (aug03-19)

Solve: $\left(\frac{1}{6}\right)^{3x-2} = 36^{x+4}$

A. -2
B. $-\frac{6}{5}$
C. $-\frac{2}{5}$
D. 10

$(6^{-1})^{3x-2} = (6^2)^{x+4}$

$-3x+2 = 2x+8$

$-6 = 5x$

$x = -6/5$

72. (aug03-20)

Solve: $\log(3x-1) + \log 4 = \log(4x+5)$

A. -2
B. $-\frac{21}{13}$
C. $\frac{3}{4}$
D. $\frac{9}{8}$

$\log[4(3x-1)] = \log(4x+5)$

$4(3x-1) = 4x+5$

$12x - 4 = 4x + 5$

$8x = 9$

$x = 9/8$

73. (aug03-21)

If \$5000 is invested at 7.2% per annum compounded monthly, which equation can be used to determine the number of years, t, for the investment to increase to \$8000?

A. $8000 = 5000(1.072)^t$
B. $8000 = 5000(1.006)^t$
C. $8000 = 5000(1.072)^{12t}$
D. $8000 = 5000(1.006)^{12t}$

74. (jan04-15)

Evaluate: $\log_3 59.2$

A. 0.27
B. 1.30
C. 3.71
D. 19.73

$\frac{\log 59.2}{\log 3} =$

Math 12 Unit 1 Logarithms Review Name:

75. (aug03-23)
Solve for x: $a^{x-2} = b^x$

A. $\frac{-2\log a}{\log a - \log b}$

B. $\frac{2\log a}{\log a - \log b}$

C. $\frac{-2\log a}{\log a + \log b}$

D. $\frac{2\log a}{\log a + \log b}$

$\log a^{x-2} = \log b^x$

$(x-2)\log a = x\log b$

$x\log a - 2\log a = x\log b$

$x\log a - x\log b = 2\log a$

$x(\log a - \log b) = 2\log a$

$x = \frac{2\log a}{\log a - \log b}$

76. (jan04-16)
Determine the domain of $y = \log_a(-x)$.

A. $x < 0$
B. $x > 0$
C. $x \le 0$
D. $x \ge 0$

$-x > 0$

$x < 0$

77. (jan04-17)
Express as a single logarithm:

$$\log A - 3\log B + \log C$$

A. $\log \frac{AC}{3B}$

B. $\log \frac{AC}{B^3}$

C. $\log \frac{A}{B^3 C}$

D. $\log(A - 3B + C)$

$\log A - \log B^3 + \log C$

78. (jan04-18)
If the point $(2, 9)$ is on the graph of $y = a^x$, what point must be on the graph of $y = \log_a x$?

A. $\left(2, \frac{1}{9}\right)$

B. $(2, 9)$

C. $(9, -2)$

D. $(9, 2)$

this is the inverse of that

79. (jan04-19)
Solve: $\log_2(3-2x) - \log_2(2-x) = \log_2 3$

A. -2

B. $\frac{1}{2}$

C. 3

D. no solution

$\log_a\left[\frac{3-2x}{2-x}\right] = \log_2 3$

$\frac{3-2x}{2-x} = 3$

$3 - 2x = 6 - 3x$

$3 + x = 6$

$x = 3$ reject

80. (jan04-20) this one is tricky!

The number of insects in a colony can triple in 7 weeks. After 50 weeks, how many times greater will the number of insects be than after 20 weeks?

A. 81
B. 110.87
C. 243
D. 2.06×10^{14}

20 weeks: $A = A_0(3)^{20/7}$ | 50 weeks: $A = A_0(3)^{50/7}$ | $\frac{A_0(3)^{50/7}}{A_0(3)^{20/7}} = 3^{30/7}$

81. (jan04-21)

A radioactive substance decays from 600 g to 105 g in twelve days. Determine the half-life for this substance.

A. 4.77 d
B. 5.27 d
C. 7.43 d
D. 30.17 d

$105 = 600(.5)^{12/p}$ → $\log .175 = \frac{12 \log .5}{p}$

$.175 = .5^{12/p}$ → $p = \frac{12 \log .5}{\log .175}$

82. (apr04-15)

Change $a = \log_3 b$ to exponential form.

A. $a = b^3$
B. $a = 3^b$
C. $b = a^3$
D. $b = 3^a$

$3^a = b$

83. (apr04-16)

Solve for x: $32^{x-1} = 8^{3x-1}$

$(2^5)^{x-1} = (2^3)^{3x-1}$ → $2^{5x-5} = 2^{9x-3}$

A. -2
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 2

$5x - 5 = 9x - 3$

$-5 = 4x - 3$

$-2 = 4x$ $\quad x = -2/4 = -1/2$

84. (apr04-17)

An earthquake in Vancouver measured 3.2 on the Richter scale and an earthquake in San Francisco measured 5.1. How many times as intense was the earthquake in San Francisco compared to the earthquake in Vancouver?

A. 1.59
B. 1.90
C. 38.90
D. 79.43

$10^{5.1-3.2} = 10^{1.9} = 79.4$

85. (apr04-19)

If $\log_5 x = 25$, determine the value of $\log_5\left(\frac{x}{25}\right)$.

A. 0
B. 1
C. 20
D. 23

$= \log_5 x - \log_5 25$

$= 25 - 2 = 23$

86. (apr04-18)

If a radioactive substance decays from 100 g to 30 g in 12 years, which equation below could be used to determine the half-life, N years, of the substance?

A. $100 = 30\left(\frac{1}{2}\right)^{\frac{N}{12}}$

B. $100 = 30\left(\frac{1}{2}\right)^{\frac{12}{N}}$

C. $30 = 100\left(\frac{1}{2}\right)^{\frac{N}{12}}$

D. $30 = 100\left(\frac{1}{2}\right)^{\frac{12}{N}}$

$A = A_0(c)^{t/p}$ $A=30$ $A_0 = 100$ $t=12$ $p=N$

87. (apr04-20)

Solve for x: $\log(3-x)+\log(3+x)=\log 5$

A. $x=-2$

B. $x=2$

C. $x=\pm 2$

D. no solution

$\log[(3-x)(3+x)] = \log 5$

$(3-x)(3+x) = 5$

$9-x^2=5$

$4=x^2$

$x=\pm 2$ (both solutions work!)

88. (apr04-21)

Determine the domain of the function $y=\log_x(8-x)$.

A. $x<8$

B. $x<8,\ x\neq 1$

C. $0<x<8$

D. $0<x<8,\ x\neq 1$

$8-x>0$ also $x\neq 1$, $x>0$ from base

$8>x$

89. (jun04-15)

Give the domain of $f(x)=\log_7(x+6)+12$.

A. $x>6$

B. $x>-6$

C. $x>12$

D. $x>-12$

$x+6>0$

$x>-6$

90. (jun04-16)

Express $\log_5 30$ using logarithms in base 4.

A. $\log_4 30-\log_4 5$

B. $\frac{\log_4 5}{\log_4 30}$

C. $\frac{\log_4 30}{\log_4 5}$

D. $\frac{\log_{30} 4}{\log_5 4}$

$\log_5 30 = \frac{\log_4 30}{\log_4 5}$

Math 12 Unit 1 Logarithms Review Name:

91. (jun04-17)

Solve: $\left(\frac{1}{9}\right)^x = 27^{2-x}$

$(3^{-2})^x = (3^3)^{2-x}$

A. -6

B. $\frac{6}{5}$

C. 2

D. 6

$-2x = 6-3x$

$x = 6$

92. (jun04-18)

Which expression is equivalent to $\log\frac{x}{2y^3}$?

$= \log x - \log 2 - \log y^3$

A. $\log x - \log 2 + 3\log y$

B. $\log x - 3\log 2 + 3\log y$

C. $\log x - \log 2 - 3\log y$

D. $\log x - 3\log 2 - 3\log y$

93. (jun04-19)

Solve: $\log_2 x + \log_2(x-1) = 3$

$\log_2[x(x-1)] = 3$

A. 2.37

B. 3

C. 3.37

D. 3.5

$x(x-1) = 2^3$

$x^2 - x = 8$

$x^2 - x - 8 = 0$

Use quadratic formula

$x = -2.37, 3.37$

↑reject

94. (jun04-20)

The formula $A = P(1.09)^t$ is an example of exponential growth with base 1.09.

Determine an equivalent continuous growth formula using base e, $A = Pe^{kt}$.

A. $A = Pe^{0.086t}$

B. $A = Pe^{1.086t}$

C. $A = Pe^{0.86t}$

D. $A = Pe^{1.86t}$

$1.09 = e^k$

$\ln 1.09 = k \ln e$ $\quad k = \ln 1.09 = 0.0862$

95. (jun04-21)

Determine an exponential function in the form $y = 3^{x-h} + k$ with y-intercept 5 and asymptote $y = -4$.

A. $y = 3^{x-4} + 5$

B. $y = 3^{x-2} - 4$

C. $y = 3^{x-5} - 4$

D. $y = 3^{x+2} - 4$

$5 = 3^{0-h} - 4$ $\quad 0 - h = 2$

$9 = 3^{0-h}$ $\quad -h = 2$ $\quad h = -2$

96. (aug04-15)

Determine an equation of the asymptote of $y = 4\log_2(x+3) + 4$.

A. $x = -3$

B. $x = 3$

C. $y = -4$

D. $y = 4$

$x = -3$

97. (aug04-12)

If $600 is invested at 7% compounded quarterly, which expression will give the value of the investment in 9 years?

A. $600(1+0.07)^9$

B. $600\left(\frac{1+0.07}{4}\right)^{36}$

C. $600\left(1+\frac{0.07}{4}\right)^9$

D. $600\left(1+\frac{0.07}{4}\right)^{36}$

98. (aug04-16)

Evaluate: $5\log_4 3$

A. 1.95
B. 2.39
C. 3.96
D. 6.31

99. (aug04-17)

Express as a single logarithm:

$$\log a - \log b - 5\log c$$

A. $\log\frac{ac^5}{b}$

B. $\log\frac{5ac}{b}$

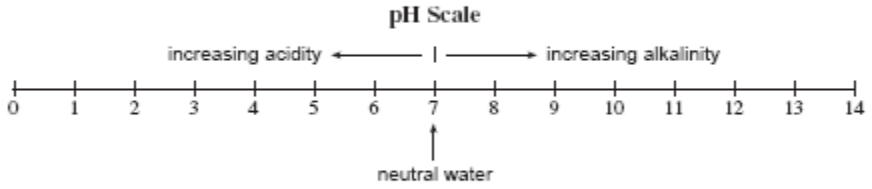
C. $\log\frac{a}{5bc}$

D. $\log\frac{a}{bc^5}$

$\log\left[\frac{a}{bc^5}\right]$

100. (aug04-18)

In chemistry, the pH scale measures the acidity (0–7) or alkalinity (7–14) of a solution. It is a logarithmic scale in base 10. Thus a pH of 9 is 10 times more alkaline than a pH of 8. An unknown solution is 40 times more alkaline than neutral water which has a pH of 7. Determine the pH of the unknown solution.



A. 7.4
B. 8.4
C. 8.6
D. 11

$10^{x-7} = 40$

$\log 10^{x-7} = \log 40$

$(x-7)\log 10 = \log 40$

$x - 7 = \log 40$

$x = 7 + \log 40 = 8.6$

Math 12 Unit 1 Logarithms Review Name:

101. (aug04-19)

The population of rabbits is increasing by 70% every 6 months. Presently there are 200 rabbits. Determine an expression for the number of months it will take for the population to reach 800.

A. $6\log_{1.7} 4$

B. $\frac{1}{6}\log_{1.7} 4$

C. $4\log_{1.7} 6$

D. $\frac{1}{4}\log_{1.7} 6$

$800 = 200(1.7)^{t/6}$ → $\log 4 = \frac{t \log 1.7}{6}$

$4 = (1.7)^{t/6}$

$t = \frac{6\log 4}{\log 1.7} = 6 \log_{1.7} 4$

102. (aug04-20)

If $f(x) = 10^{x-3} + 4$, find $f^{-1}(x)$, the inverse of $f(x)$.

A. $f^{-1}(x) = \log(x-3) + 4$

B. $f^{-1}(x) = \log(x-4) + 3$

C. $f^{-1}(x) = 10^{3-x} + 4$

D. $f^{-1}(x) = \frac{1}{10^{x-3}+4}$

$x = 10^{y-3} + 4$

$x - 4 = 10^{y-3}$

$\log(x-4) = \log 10^{y-3}$ → $\log(x-4) = (y-3)\log 10$

$\log(x-4) + 3 = y$

103. (aug04-21)

Determine the value of $\log_n ab^2$ if $\log_n a = 5$ and $\log_n b = 3$.

A. 11

B. 14

C. 16

D. 45

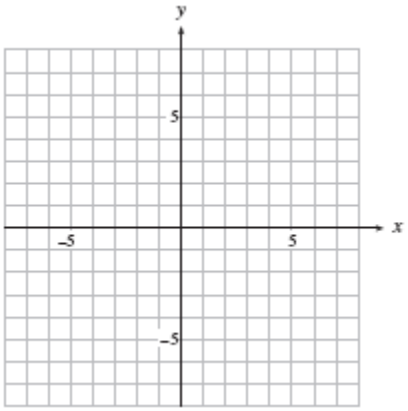
$= \log_n a + \log_n b^2 = 5 + 2(3)$

Math 12 Unit 1 Logarithms Review Name:

Written Section

1. (specs-09)

Graph $\log_5(y+2) = x+1$ on the grid below. State any asymptotes and give exact values for the x- and y-intercepts.



2. (specs-10)

The half-life of plutonium-239 is about 25 000 years. How many years does it take until only 36% of the plutonium still remains?

3. (specs-11)

It is estimated that 20% of a certain radioactive substance decays in 30 hours. What is the half-life of the substance?

4. (specs-12)

The population of Canada is 30 million people and is growing at an annual rate of 1.4%.
The population of Germany is 80 million people and is decreasing at an annual rate of 1.7%.
In how many years will the population of Canada be equal to the population of Germany?
(Use logarithms to solve the resulting equation and answer accurate to two decimal places.)

5. (sample02-05)

If 3150 mg of a radioactive substance decays to 450 mg in 73 weeks, determine the half-life of the substance to the nearest week. (Solve algebraically using logarithms.) **(5 marks)**

6. (jan02-03)

Strontium-90 is a radioactive substance with a half-life of 28 days. How many days will it take for a 200 gram sample of strontium-90 to be reduced to 8 grams? (Solve algebraically using logarithms.) **(5 marks)**

7. (apr02-02)

Solve algebraically. **(5 marks)**

$$\log_2(2-2x) + \log_2(1-x) = 5$$

8. (apr02-03)

A biologist determines that a particular type of bacteria grows continuously according to the formula $P = P_0e^{kt}$. Determine the value of the continuous growth rate if the population of the bacteria increases from 500 to 1500 in 8 days. **(5 marks)**

9. (jun02-01)

Solve algebraically: $\log_2 x + \log_2(x-7) = 3$ **(5 marks)**

10. (aug02-04)

A radioactive substance is produced from nuclear fallout. If 250 g of this substance decays to 150 g in 30 years, what is the half-life of this substance? (Solve algebraically using logarithms.) (Answer accurate to at least 2 decimal places.) **(5 marks)**

11. (jan03-03)

Solve algebraically: $2\log(3-x) = \log 4 + \log(6-x)$ **(5 marks)**

12. (apr03-03)

Solve algebraically: $\log_2 x = 3 - \log_2(x+2)$ **(5 marks)**

13. (jun03-03)

If 200 g of a substance decays to 17 g in 28 days, determine the half-life of this substance. (Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.) **(5 marks)**

14. (aug03-03)

Malcolm bought a new car for $24 000. Every year it will depreciate in value by 8%. How long will it take for the car to be worth $16 000? **(5 marks)**

(Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.)

15. (jan04-02)

Solve algebraically using logarithms: $2^x = 5^{x+1}$
(Answer accurate to at least 2 decimal places.) **(5 marks)**

16. (apr04-01)

Solve algebraically: $2\log_4 x - \log_4(x+3) = 1$ **(5 marks)**

17. (jun04-03)

The population of a nest of ants can multiply threefold (triple) in 8 weeks. If the population is now 12 000, how many weeks will it take for the population to reach 300 000 ants?

(Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.) **(5 marks)**

18. (aug04-03)

Solve algebraically: $\log(3-x) + \log(4-3x) - \log x = \log 7$ **(5 marks)**