F.BF.B.5: Logarithmic Equations 2

1 If $\log_2 x = -3$, then x is equal to

1) 9 2) –6 3) $\frac{1}{8}$ 4) –8

2 What is the solution of the equation $2\log_4(5x) = 3$?

1) 6.4 2) 2.56 3) $\frac{9}{5}$ 4) $\frac{8}{5}$

3 If $\log_2 a = \log_3 a$, what is the value of a?

1) 1 2) 2 3) 3 4) 4

4 If $\log_8 x = \frac{2}{3}$, find the value of x.

5 Solve for x: $\log_8(x+1) = \frac{2}{3}$

6 Find x if $\log_9 x = \frac{3}{2}$.

7 Solve algebraically for x: $\log_{27}(2x-1) = \frac{4}{3}$

8 If $\log_x 9 = -2$, what is the value of x?

1) 81 2) $\frac{1}{81}$ 3) 3 4) $\frac{1}{3}$

9 Which expression could be used to determine the value of y in the equation $\log_x 8 = y$?

1) $\frac{\log 8}{x}$ 2) $\frac{\log 8}{\log x}$ 3) $\frac{8}{\log x}$ 4) $\frac{\log x}{\log 8}$

10 If $\log_x 5 = \frac{1}{2}$, find the value of x.

11 Solve algebraically for x: $\log_{5x-1} 4 = \frac{1}{3}$

12 If $\log_x \frac{1}{4} = -1$, find x.

13 If $\log_x \frac{1}{4} = -2$, find x.

14 If $\log_4 x = 2.5$ and $\log_y 125 = -\frac{3}{2}$, find the numerical value of $\frac{x}{y}$, in simplest form.

15 The temperature, T, of a given cup of hot chocolate after it has been cooling for t minutes can best be modeled by the function below, where T_0 is the temperature of the room and k is a constant.

$$\ln(T - T_0) = -kt + 4.718$$

A cup of hot chocolate is placed in a room that has a temperature of 68°. After 3 minutes, the temperature of the hot chocolate is 150°. Compute the value of k to the nearest thousandth. [Only an algebraic solution can receive full credit.] Using this value of k, find the temperature, T, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*. [Only an algebraic solution can receive full credit.]

F.BF.B.5: Logarithmic Equations 2
Answer Section

1 ANS: 3 REF: 088624siii

2 ANS: 4

$2\log_4(5x) = 3$

$\log_4(5x) = \frac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \frac{8}{5}$

REF: fall0921a2

3 ANS: 1

Let $\log_2 a = \log_3 a = x$. Then $2^x = a$ and $3^x = a$. Then $2^x = 3^x$, which is true only if $x = 0$. $2^0 = a$ or $1 = a$

$3^x = a$

$3^0 = a$

$1 = a$

REF: 080720b

4 ANS:
4

REF: 068404siii

5 ANS:

$\log_8(x+1) = \frac{2}{3}$

3. $x+1 = 8^{\frac{2}{3}}$

$x+1 = 4$

$x = 3$

REF: 060925b

6 ANS:
27

REF: 018407siii

7 ANS:

$2x - 1 = 27^{\frac{4}{3}}$

$2x - 1 = 81$

$2x = 82$

$x = 41$

REF: 061329a2

8 ANS: 4

$\log_x 9 = -2$

$x^{-2} = 9$

$x^2 = \frac{1}{9}$

$x = \frac{1}{3}$

REF: 010819b

9 ANS: 2

$\log_x 8 = y$

$x^y = 8$

$\log x^y = \log 8$

$y \log x = \log 8$

$y = \frac{\log 8}{\log x}$

REF: 081621a2

10 ANS:

25

REF: 068813siii

11 ANS:

$(5x - 1)^{\frac{1}{3}} = 4$

$5x - 1 = 64$

$5x = 65$

$x = 13$

REF: 061433a2

12 ANS:
4

REF: 089006siii

13 ANS:
2

REF: 019818siii

14 ANS:

800. $x = 4^{2.5} = 32$. $y^{-\frac{3}{2}} = 125$. $\frac{x}{y} = \frac{32}{\frac{1}{25}} = 800$

$y = 125^{-\frac{2}{3}} = \frac{1}{25}$

REF: 011237a2

15 ANS:

$\ln(T - T_0) = -kt + 4.718$. $\ln(T - 68) = -0.104(10) + 4.718$.

$\ln(150 - 68) = -k(3) + 4.718$ $\ln(T - 68) = 3.678$

$4.407 \approx -3k + 4.718$ $T - 68 \approx 39.6$

$k \approx 0.104$ $T \approx 108$

REF: 011139a2