F.LE.A.4: Logarithmic Equations 1

1 If $\log_b x = y$, then x equals
  1) $y \cdot b$
  2) $\dfrac{y}{b}$
  3) y^b
  4) b^y

2 The equation $\log_a x = y$ where $x > 0$ and $a > 1$ is equivalent to
  1) $x^y = a$
  2) $y^a = x$
  3) $a^y = x$
  4) $a^x = y$

3 The function $y = 2^x$ is equivalent to
  1) $x = y \log 2$
  2) $x = \log_2 y$
  3) $y = x \log 2$
  4) $y = \log_2 x$

4 If $\log_4 x = 3$, then x is equal to
  1) 7
  2) 12
  3) 64
  4) 81

5 If $\log_5 x = 2$, what is the value of $\sqrt{x}$?
  1) $2^{\frac{2}{5}}$
  2) $\sqrt{5}$
  3) 5
  4) 25

6 What is the value of x in the equation $\log_5 x = 4$?
  1) 1.16
  2) 20
  3) 625
  4) 1,024

7 If $\log_2(x^2 - 1) = \log_2 8$, then the solution set for x is
  1) $\{3, -3\}$
  2) $\{-3\}$
  3) $\{3\}$
  4) $\{\ \}$

8 If $\log_4 x = 3$, find x.

9 If $\log_2 m = 5$, find the value of m.

10 If $\log_4 x = 2$, find x.

11 Find the value of x that satisfies the equation $\log_3 x = 4$.

19 Solve for x: $\log_x 125 = 3$

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

20 Solve algebraically for all values of x: $\log_{(x+4)}(17x-4) = 2$

13 Solve for x: $\frac{1}{2}\log(x+2) = 2$

21 If $\log_{(x+1)} 27 = 3$, find the value of x.

14 If $\log N = 3.8609$, find the value of N.

22 If $\log_{(x+1)} 64 = 3$, find the value of x.

15 The relationship between the relative size of an earthquake, S, and the measure of the earthquake on the Richter scale, R, is given by the equation $\log S = R$. If an earthquake measured 3.2 on the Richter scale, what was its relative size to the *nearest hundredth*?

23 Solve algebraically for x: $\log_{x+3} \frac{x^3 + x - 2}{x} = 2$

24 Solve for x to the *nearest tenth*: $\log_x 5 = 3$

16 Solve for the positive value of x: $\log_x 9 = 2$

25 The solution of $\log_x 8 = 2$ is
   1) $x < 2$
   2) $2 < x < 3$
   3) $3 < x < 4$
   4) $x > 4$

17 Solve for x: $\log_x 36 = 2$

18 If $\log_n 8 = 3$, find the value of n.

26 Solve algebraically for the *exact* value of x: $\log_8 16 = x + 1$

F.LE.A.4: Logarithmic Equations 1
Answer Section

1 ANS: 4   REF: 060409b
2 ANS: 3   REF: 011503a2
3 ANS: 2   REF: 080607b
4 ANS: 3   REF: 019920siii
5 ANS: 3

$$\log_5 x = 2$$
$$x = 5^2$$
$$x = 25$$
$$\sqrt{x} = 5$$

REF: 010519b
6 ANS: 3

$$x = 5^4 = 625$$

REF: 061106a2
7 ANS: 1   REF: 069919siii
8 ANS:
64

REF: 068017siii
9 ANS:
32

REF: 018508siii
10 ANS:
16

REF: 060206siii
11 ANS:
81

REF: 080307siii
12 ANS:

$$\log_2(x+1) = 3$$
7. $$x + 1 = 2^3$$
$$x = 7$$

REF: 060623b
13 ANS:
9998

REF: 019442siii

14 ANS:
7260

REF: 088715siii

15 ANS:

1,584.89. $\log_{10} S = 3.2$
$$S = 10^{3.2} \approx 1584.89$$

REF: 010324b

16 ANS:
3

REF: 018703siii

17 ANS:
6

REF: 068904siii

18 ANS:
2

REF: 089813siii

19 ANS:
5

REF: 069604siii

20 ANS:

$$(x+4)^2 = 17x - 4$$

$$x^2 + 8x + 16 = 17x - 4$$

$$x^2 - 9x + 20 = 0$$

$$(x-4)(x-5) = 0$$

$$x = 4, 5$$

REF: 011336a2

21 ANS:
2

REF: 069004siii

22 ANS:

$$(x+1)^3 = 64$$

$$x + 1 = 4$$

$$x = 3$$

REF: 061531a2

23 ANS:

$x = -\dfrac{1}{3}, -1$ $\log_{x+3} \dfrac{x^3 + x - 2}{x} = 2$

$$\dfrac{x^3 + x - 2}{x} = (x + 3)^2$$

$$\dfrac{x^3 + x - 2}{x} = x^2 + 6x + 9$$

$$x^3 + x - 2 = x^3 + 6x^2 + 9x$$

$$0 = 6x^2 + 8x + 2$$

$$0 = 3x^2 + 4x + 1$$

$$0 = (3x + 1)(x + 1)$$

$$x = -\dfrac{1}{3}, -1$$

REF: 081039a2

24 ANS:
1.7

REF: 018439siii

25 ANS: 2   REF: 080228siii

26 ANS:

$8^{x+1} = 16$

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

$3x + 3 = 4$

$3x = 1$

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

REF: 011630a2