Algebra 2, Module 8 Lesson 8 Test Feedback

1. What is the value of x in the equation $\log_{\frac{1}{2}} 8 = x$?

(A) 64

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{2}} 8 = x$$
$$\left(\frac{1}{2}\right)^x = 8$$
$$\left(2^{-1}\right)^x = 2^3$$
$$\therefore -1x = 3$$
$$x = -3$$

(B) $2\sqrt{2}$

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{2}} 8 = x$$
$$\left(\frac{1}{2}\right)^x = 8$$
$$\left(2^{-1}\right)^x = 2^3$$
$$\therefore -1x = 3$$
$$x = -3$$

(C) 16

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{2}} 8 = x$$
$$\left(\frac{1}{2}\right)^x = 8$$
$$\left(2^{-1}\right)^x = 2^3$$
$$\therefore -1x = 3$$
$$x = -3$$

(D) -3

Correct!. Your solution should have been similar to:

$$\log_{\frac{1}{2}} 8 = x$$
$$\left(\frac{1}{2}\right)^x = 8$$
$$\left(2^{-1}\right)^x = 2^3$$
$$\therefore -1x = 3$$
$$x = -3$$

2. What is the value of x in the equation $\log_{\frac{1}{3}} x = -4$?

(A) 81

Correct. Your solution should have been similar to:

$$\log_{\frac{1}{3}} x = -4$$
$$\left(\tfrac{1}{3}\right)^{-4} = x$$
$$3^4 = x$$
$$x = 81$$

(B) . $\sqrt[3]{-4}$

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{3}} x = -4$$
$$\left(\tfrac{1}{3}\right)^{-4} = x$$
$$3^4 = x$$
$$x = 81$$

(C) $\frac{-4}{3}$

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{3}} x = -4$$
$$\left(\tfrac{1}{3}\right)^{-4} = x$$
$$3^4 = x$$
$$x = 81$$

(D) -12

Incorrect. If you change from log form to exponential form, you get the following:

$$\log_{\frac{1}{3}} x = -4$$
$$\left(\tfrac{1}{3}\right)^{-4} = x$$
$$3^4 = x$$
$$x = 81$$

3. Solve the equation $\log_4 x + \log_4 2x = 8$

(A) $128\sqrt{2}$

Correct. Very good. Your solution should have been similar to:

$$\log_4 x + \log_4 2x = 8$$
Domain: $x > 0$
$$\log_4\left(2x^2\right) = 8$$
$$4^8 = 2x^2$$
$$\left(2^2\right)^8 = 2x^2$$
$$2^{16} = 2x^2$$
$$2^{15} = x^2$$
$$x = \pm\sqrt{2^{15}}$$
$$x = \pm\sqrt{2^{14}\cdot 2}$$
$$x = \pm 2^7\sqrt{2}$$
$$x = \pm 128\sqrt{2}$$

Since the domain is $x > 0$, only $x = 128\sqrt{2}$ is a solution.

(B) $21{,}845\frac{1}{3}$

Incorrect. You should simplify the left side of the equation using your log rules, and the rewrite the equation in exponential form. The solution is:

$$\log_4 x + \log_4 2x = 8$$
Domain: $x > 0$
$$\log_4\left(2x^2\right) = 8$$
$$4^8 = 2x^2$$
$$\left(2^2\right)^8 = 2x^2$$
$$2^{16} = 2x^2$$
$$2^{15} = x^2$$
$$x = \pm\sqrt{2^{15}}$$
$$x = \pm\sqrt{2^{14}\cdot 2}$$
$$x = \pm 2^7\sqrt{2}$$
$$x = \pm 128\sqrt{2}$$

Since the domain is $x > 0$, only $x = 128\sqrt{2}$ is a solution.

(C) $\sqrt[8]{\frac{1}{2}}$

Incorrect. You should simplify the left side of the equation using your log rules, and the rewrite the equation in exponential form. The solution is:

$$\log_4 x + \log_4 2x = 8$$

Domain: $x > 0$

$$\log_4\left(2x^2\right) = 8$$

$$4^8 = 2x^2$$

$$\left(2^2\right)^8 = 2x^2$$

$$2^{16} = 2x^2$$

$$2^{15} = x^2$$

$$x = \pm\sqrt{2^{15}}$$

$$x = \pm\sqrt{2^{14} \cdot 2}$$

$$x = \pm 2^7\sqrt{2}$$

$$x = \pm 128\sqrt{2}$$

Since the domain is $x > 0$, only $x = 128\sqrt{2}$ is a solution.

(D) $32\sqrt{2}$

Incorrect. You should simplify the left side of the equation using your log rules, and the rewrite the equation in exponential form. The solution is:

$$\log_4 x + \log_4 2x = 8$$
Domain: $x > 0$
$$\log_4\left(2x^2\right) = 8$$
$$4^8 = 2x^2$$
$$\left(2^2\right)^8 = 2x^2$$
$$2^{16} = 2x^2$$
$$2^{15} = x^2$$
$$x = \pm\sqrt{2^{15}}$$
$$x = \pm\sqrt{2^{14}\cdot 2}$$
$$x = \pm 2^7\sqrt{2}$$
$$x = \pm 128\sqrt{2}$$

Since the domain is $x > 0$, only $x = 128\sqrt{2}$ is a solution.

4. What is the domain of the equation $\log_8(x) - \log_8(14-2x) = \log_8(3x-12)$?

(A) $x > 7$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_8(x) - \log_8(14-2x) = \log_8(3x-12)$$

$x > 0$	$14 - 2x > 0$	$3x - 12 > 0$
	$14 > 2x$	$3x > 12$
	$7 > x$	$x > 4$
	$x < 7$	

So x must be less than 7 but greater than 4.

(B) . $0 < x < 7$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_8(x) - \log_8(14-2x) = \log_8(3x-12)$$

$x > 0$	$14 - 2x > 0$	$3x - 12 > 0$
	$14 > 2x$	$3x > 12$
	$7 > x$	$x > 4$
	$x < 7$	

So x must be less than 7 but greater than 4.

(C) $4 < x < 7$

Correct. You correctly limited the domain.

$$\log_8(x) - \log_8(14-2x) = \log_8(3x-12)$$

$$x > 0 \qquad 14-2x > 0 \qquad 3x-12 > 0$$

$$14 > 2x \qquad 3x > 12$$

$$7 > x \qquad x > 4$$

$$x < 7$$

So x must be less than 7 but greater than 4.

(D) $x < 4$ or $x > 7$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_8(x) - \log_8(14-2x) = \log_8(3x-12)$$

$$x > 0 \qquad 14-2x > 0 \qquad 3x-12 > 0$$

$$14 > 2x \qquad 3x > 12$$

$$7 > x \qquad x > 4$$

$$x < 7$$

So x must be less than 7 but greater than 4.

5. What is the solution (rounded to 3 decimal places) to the equation:

$$\log_3(2-x) - \log_3(x+3) = \log_3(x)?$$

(A) $x = -4.449$ or $x = 0.449$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

Domain: $2-x>0$ $\quad x+3>0$ $\quad x>0$

$2>x$ $\quad x>-3$

$x<2$

$\therefore$ The domain is 0<x<2.

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

$$\log_3\left[\frac{2-x}{x+3}\right]=\log_3(x)$$

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

$$2-x=x(x+3)$$

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

$$x^2+4x-2=0$$

$$x=\frac{-4\pm\sqrt{4^2-4(1)(-2)}}{2(1)}$$

$x=0.449$ or $x=-4.449$

But since the domain is 0<x<2, the only solution is $x=0.449$.

So x must be less than 7 but greater than 4.

(B) . $x=1.646$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

Domain: $2-x>0$ $\quad x+3>0$ $\quad x>0$

$2>x$ $\quad x>-3$

$x<2$

$\therefore$ The domain is 0<x<2.

$\log_3(2-x)-\log_3(x+3)=\log_3(x)$

$\log_3\left[\dfrac{2-x}{x+3}\right]=\log_3(x)$

$\therefore \dfrac{2-x}{x+3}=x$

$2-x=x(x+3)$

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

$x^2+4x-2=0$

$x=\dfrac{-4\pm\sqrt{4^2-4(1)(-2)}}{2(1)}$

$x=0.449$ or $x=-4.449$

But since the domain is 0<x<2, the only solution is $x=0.449$.

So x must be less than 7 but greater than 4.

(C) $x=1.646$ or $x=-3.646$

Incorrect. Your thought process to determine the domain should be similar to:

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

Domain: $2-x>0$ $\quad x+3>0$ $\quad x>0$

$2>x$ $\quad x>-3$

$x<2$

∴ The domain is 0<x<2.

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

$$\log_3\left[\frac{2-x}{x+3}\right]=\log_3(x)$$

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

$$2-x=x(x+3)$$

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

$$x^2+4x-2=0$$

$$x=\frac{-4\pm\sqrt{4^2-4(1)(-2)}}{2(1)}$$

$x=0.449$ or $x=-4.449$

But since the domain is 0<x<2, the only solution is $x=0.449$.

(D) $x=0.449$

Correct. You correctly eliminated the extraneous solutions. Your solutions should have been similar to:

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

Domain: $2-x>0$ $\quad x+3>0$ $\quad x>0$

$2>x$ $\quad x>-3$

$x<2$

∴ The domain is 0<x<2.

$$\log_3(2-x)-\log_3(x+3)=\log_3(x)$$

$$\log_3\left[\frac{2-x}{x+3}\right]=\log_3(x)$$

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

$$2-x=x(x+3)$$

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

$$x^2+4x-2=0$$

$$x=\frac{-4\pm\sqrt{4^2-4(1)(-2)}}{2(1)}$$

$x=0.449$ or $x=-4.449$

But since the domain is 0<x<2, the only solution is $x=0.449$.