Name: _____   Date: _____

Notes: Solving Equations with Rational Exponents

Do Now: *ALGEBRAICALLY* solve each of the following equations.

1) $\sqrt{2x+3}^2 = 8^2$

$2x + 3 = 64$
$\quad -3 \quad -3$

$\dfrac{2x}{2} = \dfrac{61}{2}$

$\boxed{x = 30.5}$

Check
$\sqrt{2(30.5)+3} = 8$
$\sqrt{64} = 8$
$\checkmark \; 8 = 8$

2) $[(2x+3)^{1/2}]^2 = (8)^2$

$2x + 3 = 64$
$\quad -3 \quad -3$

$\dfrac{2x}{2} = \dfrac{61}{2}$

$\boxed{x = 30.5}$

Check:
$(2(30.5)+3)^{1/2} = 8$
$\checkmark \; 8 = 8$

3) $[(2x+3)^{1/3}]^3 = (8)^3$

$2x + 3 = 512$
$\quad -3 \quad -3$

$\dfrac{2x}{2} = \dfrac{509}{2}$

$\boxed{x = 254.5}$

Check
$(2(254.5)+3)^{1/3} = 8$
$\checkmark \; 8 = 8$

4) $[(2x+3)^{3/2}]^{2/3} = (8)^{2/3}$

$2x + 3 = 4$
$\quad -3 \quad -3$

$\dfrac{2x}{2} = \dfrac{1}{2}$

$\boxed{x = 0.5}$

Check:
$(2(0.5)+3)^{3/2} = 8$
$8 = 8 \checkmark$

What Should I Be Able to Do?

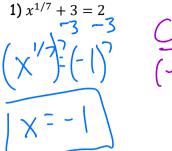**- I can solve equations with rational exponents.**

1) $3x^{5/4} - 1 = 95$
$\quad\quad +1 \quad +1$

$\dfrac{3x^{5/4}}{3} = \dfrac{96}{3}$

$(x^{5/4})^{4/5} = (32)^{4/5}$

$\boxed{x = 16}$

Check:
$3(16)^{5/4} - 1 = 95$
$\checkmark \; 95 = 95$

2) $-2(x+10)^{\frac{9}{5}} = 12$
$\quad\quad \dfrac{-2}{-2} \quad \dfrac{}{-2}$

$[(x+10)^{9/5}]^{5/9} = (-6)^{5/9}$

$x + 10 = (-6)^{5/9}$
$\quad -10 \quad\quad -10$

$\boxed{x = (-6)^{5/9} - 10}$

Check:
$-2[((-6)^{5/9} - 10) + 10]^{9/5} = 12$
$\checkmark \; 12 = 12$

Checkpoint:

Solve each of the following equations.

1) $x^{1/7} + 3 = 2$

$$\left(x^{1/7}\right)^7 = (-1)^7$$

$$-3 \quad -3$$

$$\boxed{x = -1}$$

Check:

$(-1)^{1/7} + 3 = 2$

$\checkmark \quad 2 = 2$

2) $\left[(x+2)^{3/2}\right]^{2/3} = (-64)^{2/3}$

$x + 2 = 16$

$-2 \quad -2$

~~$x = 14$~~

$\varnothing$

Check

$(14+2)^{3/2} \stackrel{?}{=} -64$

$64 \neq -64$

3) $\left(\frac{1}{5x+7}\right)^{-3/7} = 15$

$$\left[(5x+7)^{3/7}\right]^{7/3} = (15)^{7/3}$$

$$5x + 7 = 15^{7/3}$$

$$-7 \quad -7$$

$$\frac{5x}{5} = \frac{15^{7/3} - 7}{5}$$

$$\boxed{x = \frac{15^{7/3} - 7}{5}}$$

Check:

$$\left[\frac{1}{5\left(\frac{15^{7/3}-7}{5}\right)+7}\right]^{-3/7} = 15 \checkmark$$

4) $\frac{(x-1)^{\frac{5}{2}}}{3} = 7 \quad (3)$

$$\left[(x-1)^{5/2}\right]^{2/5} = (21)^{2/5}$$

$$x - 1 = (21)^{2/5}$$

$$+1 \quad +1$$

$$\boxed{x = (21)^{2/5} + 1}$$

Check:

$$\frac{\left((21^{2/5}+1)-1\right)^{5/2}}{3} = 7$$

$7 = 7 \checkmark$

5) Solve for a in the following equation:

$$(a+b)^{c/d} + f = g$$

$$-f \quad -f$$

$$\left[(a+b)^{c/d}\right]^{d/c} = (g-f)^{d/c}$$

$$a + b = (g-f)^{d/c}$$

$$-b \qquad\quad -b$$

$$\boxed{a = (g-f)^{d/c} - b}$$

Success Criteria

- I can solve equations with rational and negative exponents.

1) Solve each of the following equation.

$$\left[(x-5)^{3/5}\right]^{5/3} = (27)^{5/3}$$

$$x - 5 = 243$$
$$\underline{+5 \qquad + 5}$$
$$\boxed{x = 248}$$

Check:
$$(248-5)^{3/5} = 27$$
$$27 = 27 \checkmark$$

Explain what your first step accomplishes and how it helps solve the equation.

When I raise both sides of the equation to the $\frac{5}{3}$ power to get $x-5$ alone on the left side of the equation.

Solve each of the following equations.

2) $\frac{1}{4}(2x-2)^{5/2} = 60.75 (4)$

$$\left[(2x-2)^{5/2}\right]^{2/5} = (243)^{2/5}$$
$$2x - 2 = 9$$
$$\underline{+2 \quad +2}$$
$$\frac{2x}{2} = \frac{11}{2}$$
$$\boxed{x = 5.5}$$

Check:
$$\frac{1}{4}(2(5.5)-2)^{5/2} = 60.75$$
$$\checkmark 60.75 = 60.75$$

3) $-2(x+11)^{\frac{11}{7}} + 25 = -9$
$$\underline{-25 \quad -25}$$
$$\frac{-2(x+11)^{11/7}}{-2} = \frac{-34}{-2}$$
$$\left[(x+11)^{11/7}\right]^{7/11} = (17)^{7/11}$$
$$x + 11 = (17)^{7/11}$$
$$\underline{-11 \qquad -11}$$
$$\boxed{x = (17)^{7/11} - 11}$$

Check:
$$-2(17^{7/11} - 11 + 11)^{11/7} + 25 = -9$$
$$\checkmark -9 = -9$$