Lesson 54 Objective- SWBAT solve exponential equations.

Kickoff- Solve and check each of the following

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

$x+2 = \pm 8$

$x+2=8 \quad x+2=-8$

$x=6 \quad x=-10$

Check

$(6+2)^{\frac{2}{3}} = 4$ ✓ $\quad (-10+2)^{\frac{2}{3}} = 4$ ✓

2) $\sqrt{2-2y} = (y+3)^2$

$2-2y = y^2+6y+9$

$+2y \quad +2y$

$0 = y^2+8y+7$

$0 = (y+7)(y+1)$

$y=-7 \quad y=-1$

$\sqrt{2-2y} = y+3$

$\sqrt{2-2(-7)} = -7+3$

$\sqrt{16} = -4$

$\sqrt{16} = \pm 4$

$\pm 4 = 4$ ✓

~~$-4 = -4$~~

5) $x = 1$

6) $49 = x$

7) $r = 49$

8) $r = 12$

9) $k = 20$

$k = -\frac{110}{7}$

10) $x = \pm 64$

11) SKIP

12) $n = 27$

$n = 43$

13) $-507 = 5 - 2x^{\frac{4}{3}}$

$-5 \quad -5$

$-512 = -2x^{\frac{4}{3}}$

$\frac{-512}{-2} = \frac{-2x^{\frac{4}{3}}}{-2}$

$256 = x^{\frac{4}{3}}$

$\pm 64 = x$

Check

$-507 = 5 - 2(64)^{\frac{4}{3}}$

$-507 = -507$ ✓

$-16 - (35-n)^{\frac{4}{3}} = -22$

$+16 \quad +16$

$\frac{(35-n)^{\frac{4}{3}}}{-1} = \frac{16}{-1}$

$(35-n)^{\frac{4}{3}} = 16^{\frac{3}{4}}$

$35-n = \pm 8$

Exponential Equations

Try This:

1) Solve for x: $2^4 = 2^x$

$x = 4$

2) Solve for x: $3^x = 3^3$

$x = 3$

Solving Exponential Equations (Same Base)

- Set exponents =
- Solve
- Check!!!

Example: $3^{x^2-3} = 3^{2x}$

$x^2-3 = 2x$

$-2x \quad -2x$

$x^2-2x-3=0$

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

$x=3 \quad x=-1$

$3^{3^2-3} = 3^{2(3)}$ $\quad 3^{(-1)^2-3} = 3^{2(-1)}$

$3^6 = 3^6$ ✓ $\quad 3^{-2} = 3^{-2}$ ✓

$5^{x+8} = 5^{-x-2}$

$x+8 = -x-2$

$+x \quad +x$

$2x+8 = -2$

$-8 \quad -8$

$\frac{2x}{2} = \frac{-10}{2}$

$x = -5$

$5^{-5+8} = 5^{(-5)-2}$

$5^3 = 5^{-7}$

Solving Exponential Equations (Different Bases)

* get bases to be the same!

Examples:

$9^{x+1} = 27^x$

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

$-2x+2 = -3x$

$+2x \quad +2x$

$2 = x$

Check

$9^{2+1} = 27^2$

$729 = 729$ ✓

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

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

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

$-2x = 3-3x$

$+3x \quad +3x$

$x = 3$

$\left(\frac{1}{4}\right)^3 = 8^{1-3}$ ✓

$2^{x-1} = 8^2$

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

$2^{x-1} = 2^6$

$x-1 = 6$

$x = 7$