What's Going On?

Checking In

Minds on A Change of Base

Action! Solving Exponential Expressions

Consolidation Spreading Rumours

Learning Goal - I will be able to solve exponential expressions.

Minds on

A Change of Base

Rewrite each power with the indicated base

a. 9^2 as a power of 3

$= (3^2)^2$

$= 3^4$

b. 4^3 as a power of 2

$= (2^2)^3$

$= 2^6$

c. 8^3 as a power of 2

$= (2^3)^3$

$= 2^9$

d. 27^5 as a power of 3

$= (3^3)^5$

$= 3^{15}$

Minds on

A Change of Base

$9^{\frac{1}{2}} = \sqrt{9} = 3$ $\sqrt[7]{9}$

Rewrite each power with the indicated base

e. 3^4 as a power of 9

$= (9^{\frac{1}{2}})^4 = 9^2$

f. 3^7 as a power of 9

$= (9^{\frac{1}{2}})^7 = 9^{\frac{7}{2}}$

g. 2^4 as a power of 4

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

$= 4^2$

h. 2^9 as a power of 8

$= (8^{\frac{1}{3}})^9$

$= 8^3$

Action!

Solving Exponential Equations

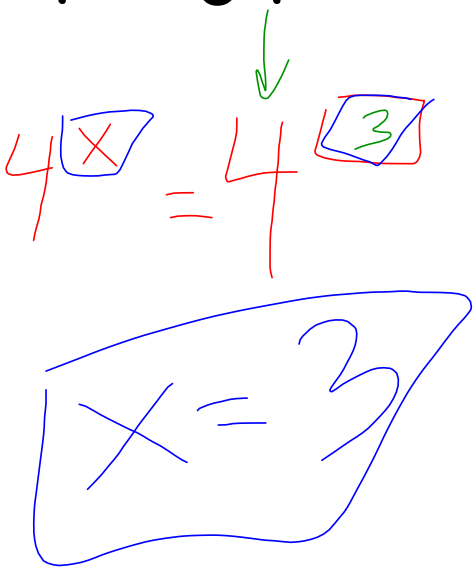
Solve each exponential equation by writing powers with a common base. Then check your solution by substituting into the left and right sides of the equation and evaluating.

a. $4^{x} = 64$

b. $3^{x+5} = 27^{x-1}$

c. $4^{2n-3} = 8^{n+1}$

a. $4^x = 64$



b. $3^{x+5} = 27^{x-1}$

$3^{x+5} = (3^3)^{x-1}$

$3^{x+5} = 3^{3(x-1)}$

$x+5 = 3(x-1)$

$x+5 = 3x-3$

$-3x \quad -3x$

$-2x+5 = -3$

$-5 \quad -5$

$-2x = -8$

$\frac{-2x}{-2} = \frac{-8}{-2}$

$x = 4$

Check

Sub $x=4$ into both sides of the original equation.

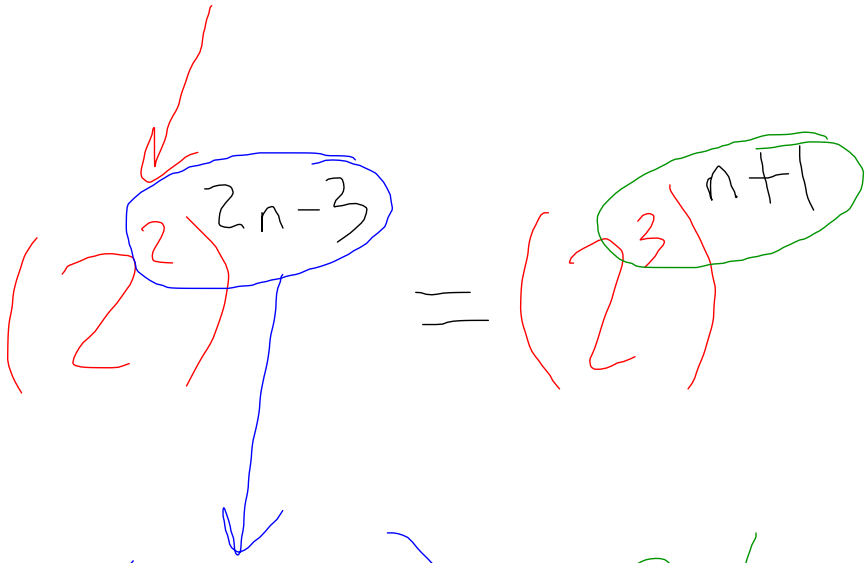
$$3^{x+5} = 27^{x-1}$$

$$3^{(4)+5} = 27^{(4)-1}$$

$$3^{9} = 27^{3} \rightarrow (3^3)^3$$

$$19683 \stackrel{\checkmark}{=} 19683$$

c. $4^{2n-3} = 8^{n+1}$



$2(2n-3) = 3(n+1)$

$4n - 6 = 3n + 3$

$-3n \quad -3n$

$n - 6 = 3$

$+6 \quad +6$

$n = 9$

c. $4^{2n-3} = 8^{n+1}$

Check $n = 9$

$4^{2(9)-3} = 8^{(9)+1}$

$4^{18-3} = 8^{10}$

$4^{15} = 8^{10}$

Consolidation

Spreading Rumours

Someone starts a rumour that the buses are cancelled in Muskoka. If every student that hears the rumour texts 3 friends within 1 minute, the number of students who have heard the rumour t minutes after it started is given by the equation $S = 3^t$.

Six minutes after the start of the rumour, the TLDSB begins contacting students to ensure them the buses are good to go! If every student texts 9 friends within 1 minute, the number of students who have heard the correction t minutes after it started is given by the equation $S = 9^{t-6}$.

After how many minutes do the same number of students hear the rumour AND the correction?

$3^t = 9^{t-6}$

$$3^t = 9^{t-6}$$

1. Find common base! base of 3!

$$3^t = (3^2)^{t-6}$$

2. Set the exponents equal and solve!

$$t = 2t - 12$$

$$-2t \quad -2t$$

$$-t = -12$$

$$\frac{-t}{-1} = \frac{-12}{-1}$$

$$t = 12$$

3. Check by subbing into original equation.