Logarithms and inverse functions
Lesson 5
23.1,23.2

Find the inverse of a function

To find the inverse function, swap the x and y and solve for y.

I do:
Find the inverse function of

$$y = 2x + 3$$

Original Function	$y = 2x + 3$
Swap “x” and “y”	
Solve for y	

We Do:

Find the inverse function of

$$y = \frac{1}{3}x - 10$$

Original Function	$y = \frac{1}{3}x - 10$
Swap “x” and “y”	
Solve for y	

Find the inverse function of

$$y = \frac{x - 3}{2}$$

Original Function	
Swap “x” and “y”	
Solve for y	

You do:

Left Talk, Right Write
On your Whiteboards with your partner

1) Find the inverse function of

$$y = \frac{2x - 3}{4}$$

2) Find the inverse function of

$$y = 4(x + 1)$$

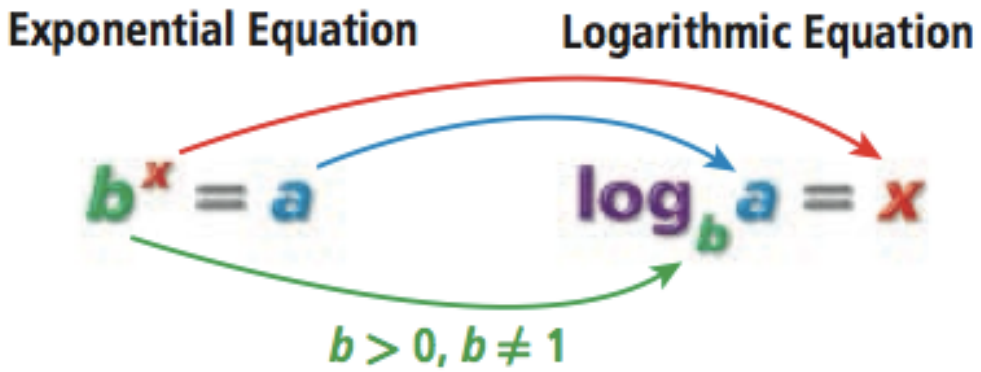
The inverse of exponential functions is the log form.

$$y = 3^x$$

the inverse is

$$y^{-1} = log_3 x$$

A ***Logarithm*** is the exponent to which a specified base is raised to obtain a given value.



Examples

$2^3 = 8$ $\log_2 8 = 3$

$5^4 = 625$ $\log_5 625 = 4$

Exponential Logarithmic

$$log_e x = lnx$$

We Try:

Write each exponential equation in logarithmic form.

1) $4^3 = 64$

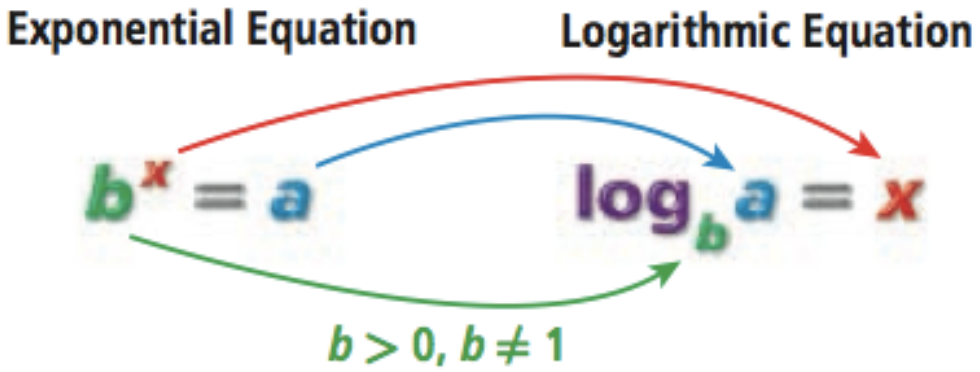
2) $3^4 = 81$

3) $e^x = y$

You Try with your partner on the whiteboards:

1) $5^2 = 25$

2) $3^3 = 27$



Write each logarithmic equation in exponential form

We Try:

1) $\log_7 343 = 3$

2) $\log_4 64 = 3$

$\log_4 4^3 = 3$

You Try with your partners on whiteboards:

1) $\log_4 16 = 2$
2) $log_2 1 = 0$

Special Properties of Logarithms

For any base b such that $b > 0$ and $b \neq 1$,

LOGARITHMIC FORM	EXPONENTIAL FORM	EXAMPLE
Logarithm of Base b		
$\log_b b = 1$	$b^1 = b$	$\log_{10} 10 = 1$ $10^1 = 10$
Logarithm of 1		
$\log_b 1 = 0$	$b^0 = 1$	$\log_{10} 1 = 0$ $10^0 = 1$

A logarithm with base 10 is called a ***Common Logarithm.*** If there is no base, you can assume it to be 10.

EXAMPLE: $log 5 = \log_{10} 5$

$$6^{log_6 x} = x$$
$$7^{log_7 x} = x$$

I Try:

Evaluate by using mental math.

$\log_2 1$

Setup by solving for x	$\log_2 1 = x$
Write in exponential form	$2^x = 1$
Solve for x	$2^0 = 1, x = 0$

We Try:

Evaluate by using mental math.

1) $\log_6 36$

Setup by solving for x	
Write in exponential form	

Solve for x	

You Try with your partner on a whiteboard.
Odd Talk, Even Write
Evaluate by using mental math.
1) $\log_3 81$

2) $\log_4 4$

Please take out a piece of paper. Please put your name on it.

Diagnostic Quiz Exit Slip.

1) Evaluate
   $\log_4 64 =$x

2) Find the inverse of
   $y = \frac{4x-2}{5}$

3) Express as a single logarithm.
   $\log_8 4 + \log_8 16$

4) Solve for x
   $8^x = 2^{x+6}$

5) $Solve\ for\ x$
   $\log_3(x-5) = 2$