What is the relationship between the three numbers in each equation?

Work together as a table

a) $\log_3 9 = 2$ $3^2 = 9$

b) $\log_2 32 = 5$ $2^5 = 32$

c) $\log_2 16 = 4$ $2^4 = 16$

d) Define "inverse operation" and give a few examples

inverse operation is an operation that undoes what was done.

$x + 2 = 8$
$-2 \quad -2$ ← Inverse operation

$x = 6$

Housekeeping...

- Homework
- Classroom interaction
- Essentials that must be passed to pass this class...

5-1 Defining and Evaluating Logarithms

5-1a: I can evaluate a logarithmic expression

How could we solve each of the following equations algebraically for x?

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$3^x = 9$

$9 = 3^2$

$3^x = 3^2$

$x = 2$

What's the difference?

In this one we are looking for the base of an exponential equation

In this one we are looking for an unknown exponent.

Problems like $3^x = 9$

are why we have logarithms!

Solving using logarithms

To write a logarithm you must understand... base...

$$3^x = 9$$

base

Logarithms are written like this $\log_3 9 = x$ but is said log base 3 of 9 = x.

What happened to the exponent?

The exponent becomes the answer.

What does the following equation mean?

$$\log_3 9 = x$$

log base 3 of 9 equals x.

3 to some power equals 9.

What about this one?

$$5^x = 50$$

$\log_5 50 = x$

This one is harder to solve for. This is why we must use Logarithms

How would you go about solving these?

$$3^x = 90$$

$\log_3 90 = x$

$$y^x = z$$

$\log_y z = x$

What does a logarithm do? In what situations do we use a logarithm?

A logarithm solves for an unknown exponent.

We use logarithms to find an exponent that is not easy to find.

What does the following equation mean?

$$\log_4 16 = x$$

$4^x = 16$

$4^x = 4^2$

$x = 2$

$$\log_4 \frac{1}{16} = x$$

$4^x = \frac{1}{16}$

What type of exponent would cause 4^x to become $\frac{1}{16}$?

$4^2 = 16$ $\quad 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

$x = -2$

$\log_4 16 = -2$

$$\log_3 \sqrt{3} = x$$

What type of exponent causes 3 to become $\sqrt{3}$.

$$3^{1/2} = \sqrt{3}$$

$$\log_3 \sqrt{3} = \frac{1}{2}$$

$$\log_{\frac{1}{2}} 4 = x$$

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

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

$x = -2$

In your own words, what is a "logarithm"?

a way to solve for an unknown exponent

*Number line activity
(See me for this)

If $\log 100 = 2$ what is the

base of the logarithm?

Base is 10 since $10^2 = 100$

If you see log with no base it is just base 10.

If $\ln e^4 = 4$ what is the

base of the logarithm?

$x^4 = e^4$

$x = e$

ln read natural log. It is another way to write the $\log_e$ (log base e).

In your own words, what is a "logarithm"?

a way to solve for an unknown exponent

End of Day 1...

Scroll down for Day 2...

keep scrolling

Starter:

1.) Is it possible for a logarithm to equal a negative number? Explain to a neighbor and if possible write an example equation.

Yes $\log_2 \frac{1}{4} = -2$ $2^{-2} = \frac{1}{4}$

2.)Is it possible for a logarithm to equal zero? Explain to a neighbor and if possible write an example equation.

Yes $\log_2 1 = 0$

$2^0 = 1$

Does $\log_x 0$ have an answer?

Why or why not?

No it does not - because no number to a power can equal zero.

Does $\log_x x^5$ have an answer?

Why or why not?

Yes it does...

$x^y = x^5$

$y = 5$

End of Day 2.

Homework.