7.4 Logarithmic Properties

Power Property of Logarithms

For any real number p and positive numbers a and b $(b \neq 1)$,

WORDS	NUMBERS	ALGEBRA
The logarithm of a power is the product of the exponent and the logarithm of the base.	$\log 10^3$ $\log(10 \cdot 10 \cdot 10)$ $\log 10 + \log 10 + \log 10$ $3 \log 10$	$\log_b a^p = p \log_b a$

I do:

1) $\log_5 6 + \log_5 7 = \log_5(6 \cdot 7) = \log_5 42$
2) $\log_4(30) = \log_4(3 \cdot 10) = \log_4 3 + \log_4 10$

We do

1) $\log_4 3 + \log_4 7 =$
2) $\log_5(56) =$

You do on your whiteboards with your partners
Odd Talk, Even Write

1) $log\, 3 + log\, 7 =$
2) $\log_3(20) =$

Quotient Property of Logarithms

For any positive numbers m, n, and b $(b \neq 1)$,

WORDS	NUMBERS	ALGEBRA
The logarithm of a quotient is the logarithm of the dividend minus the logarithm of the divisor.	$\log_5\left(\frac{16}{2}\right) = \log_5 16 - \log_5 2$	$\log_b \frac{m}{n} = \log_b m - \log_b n$

I do:

1) $\log_5 8 - \log_5 2 = \log_5\left(\frac{8}{2}\right) = \log_5 4$

2) $\log_4\left(\frac{10}{3}\right) = \log_4 10 - \log_4 3$

We do

1) $\log_4 3 - \log_4 7 =$

2) $log\left(\frac{9}{4}\right) =$

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1) $log\, 3 - log\, 7 =$

2) $\log_3\left(\frac{10}{7}\right) =$

Inverse Properties of Logarithms and Exponents

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

ALGEBRA	EXAMPLE
$\log_b b^x = x$	$\log_{10} 10^7 = 7$
$b^{\log_b x} = x$	$10^{\log_{10} 2} = 2$

$$I\ do:$$

$$\log_8 8^2 = 2$$

$$\log_5 5^{x-3} = x - 3$$

We do:

$$\log_2 2^x =$$

$$\log_4 4^{2-x} =$$