## 7-4 Properties of Logarithms

## Objective:

Use properties to simplify logarithmic expressions.

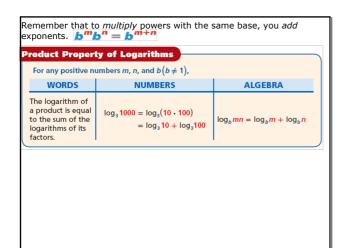
Translate between logarithms in any base.

The logarithmic function for pH that you saw in the previous lessons, pH =  $-\log[H^+]$ , can also be expressed in exponential form, as  $10^{-pH} = [H^+]$ .

Because logarithms are exponents, you can derive the properties of logarithms from the properties of exponents

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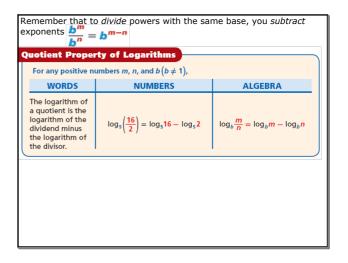


Express log<sub>6</sub>4 + log<sub>6</sub>9 as a single logarithm. Simplify.

To add the logarithms, multiply the numbers.

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Express as a single logarithm: log₅25 + log₅5



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Express log₅100 – log₅4 as a single logarithm. Simplify, if	
possible.	To subtract the logarithms, divide the numbers

Express log,343 – log,7 as a single logarithm. Simplify, if possible

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Because you can multiply logarithms, you can also take powers of logarithms.

Power Property of Logarithms

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

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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  $10 + \log 10$  alog  $10 \cdot \log_b a^p = p \log_b a$ 

Express as a product. Simplify, if possible.

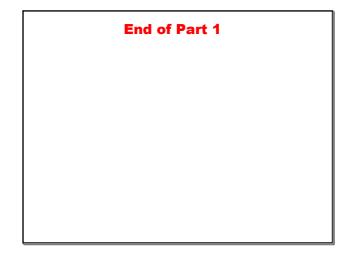
A. log<sub>2</sub>32<sup>6</sup>
B. log<sub>8</sub>4<sup>20</sup>

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Express as a product. Simplify, if possibly.

a. log10<sup>4</sup>

b. log<sub>5</sub>25<sup>3</sup>



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