Warm up:

Write the following in exponential form:

$$x = \log_4 52 = x \qquad \log_m n = y$$

$$y = 107 = x \qquad m_{=n}^{y}$$

Write the following in logarithmic form:

$$3^{x} = 28$$
 $y^{5} = 50$ $c^{t} = m$

Just like exponents, logarithms have special properties for simplification. Work in partners/groups to find these properties...

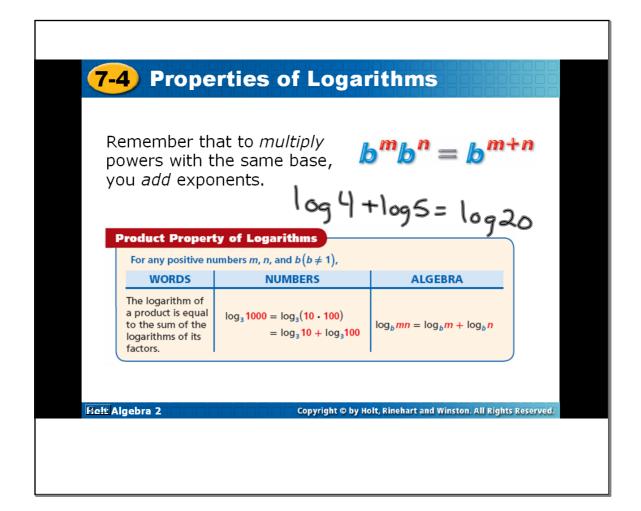


Objectives

Use properties to simplify logarithmic expressions.

Translate between logarithms in any base.

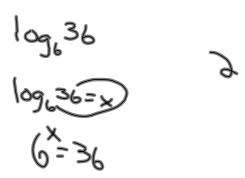
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Example 1: Adding Logarithms

Express $\log_{6}4 + \log_{6}9$ as a single logarithm. Simplify.



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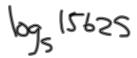
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7-4 Properties of Logarithms

Check It Out! Example 1a

Express as a single logarithm. Simplify, if possible.

$$\log_{5}625 + \log_{5}25$$



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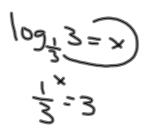


7-4 Properties of Logarithms

Check It Out! Example 1b

Express as a single logarithm. Simplify, if possible.

$$\log_{\frac{1}{3}}27 + \log_{\frac{1}{3}}\frac{1}{9}$$



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Properties of Logarithms

10940-10910=1094 For any positive numbers m, n, and $b(b \neq 1)$,

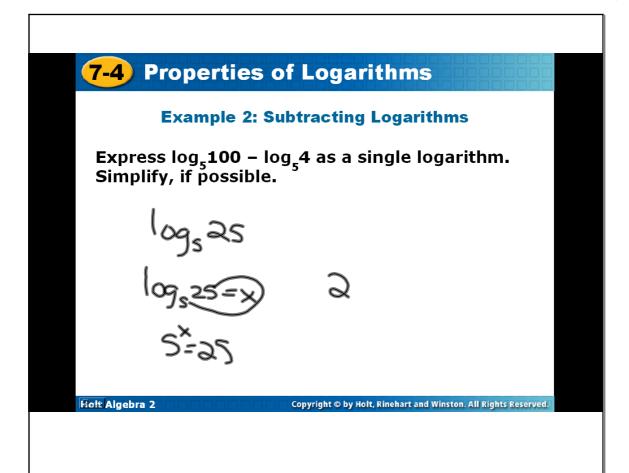
WORDS	NUMBERS	ALGEBRA
The logarithm of a quotient is the logarithm of the dividend minus the logarithm of the divisor.	$\log_5\left(\frac{16}{2}\right) = \log_5 16 - \log_5 2$	$\log_b \frac{m}{n} = \log_b m - \log_b n$

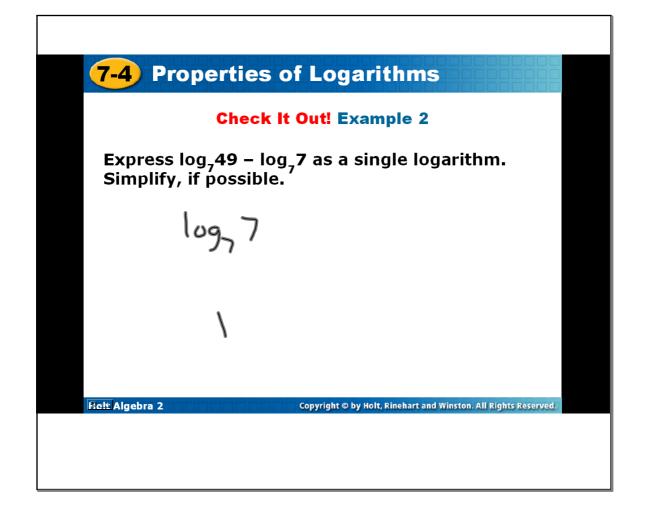
The property above can also be used in reverse.

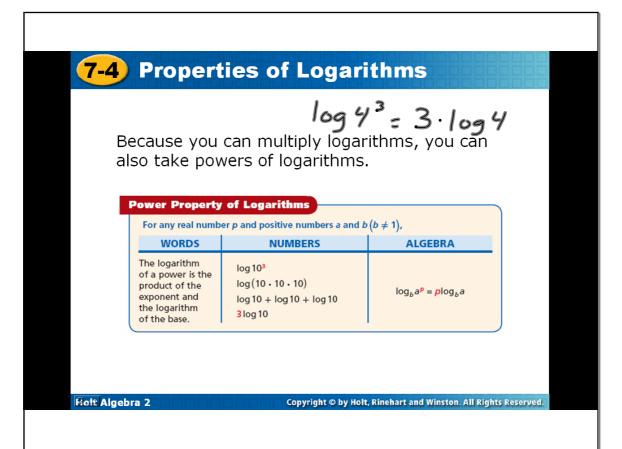
Caution

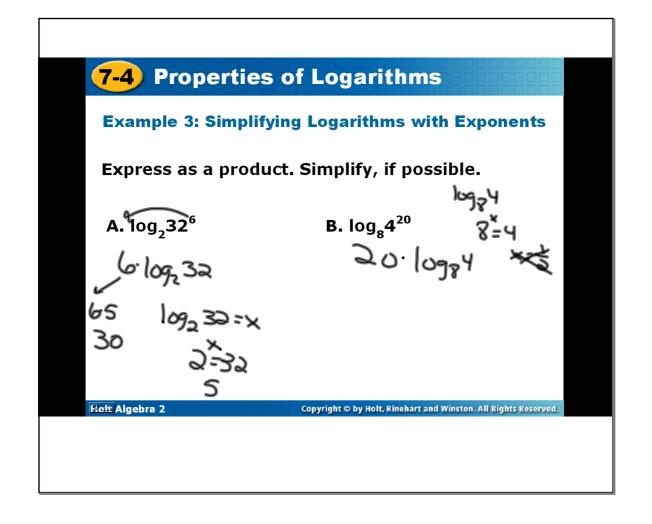
Just as a^5b^3 cannot be simplified, logarithms must have the same base to be simplified.

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Check It Out! Example 3

Express as a product. Simplify, if possibly.

b.
$$\log_5 25^2$$

$$2 \cdot \log_5 25 = \chi$$

$$2 \cdot \lambda$$

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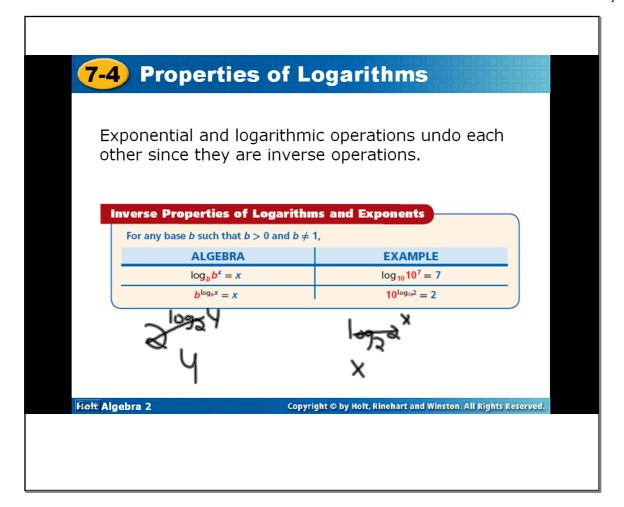
7-4 Properties of Logarithms

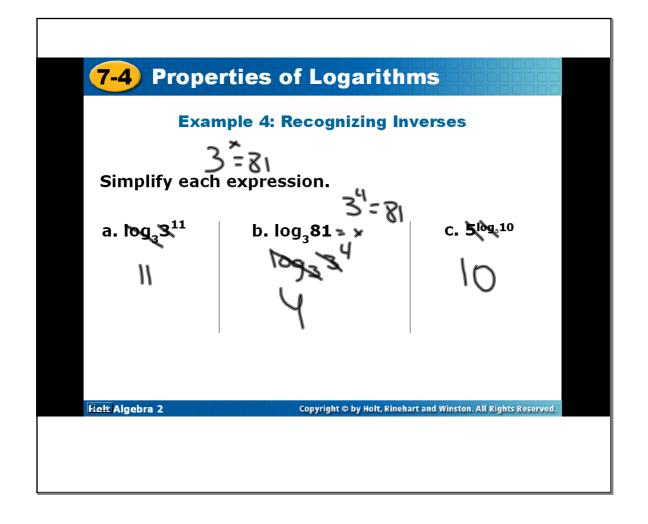
Check It Out! Example 3

Express as a product. Simplify, if possibly.

c.
$$\log_2(\frac{1}{2})^5$$

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Most calculators calculate logarithms only in base 10 or base e (see Lesson 7-6). You can change a logarithm in one base to a logarithm in another base with the following formula.

Change of Base Formula

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

ALGEBRA	EXAMPLE	
$\log_b x = \frac{\log_a x}{\log_a b}$	$\log_4 8 = \frac{\log_2 8}{\log_2 4}$	

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7-4 Properties of Logarithms

Example 5: Changing the Base of a Logarithm

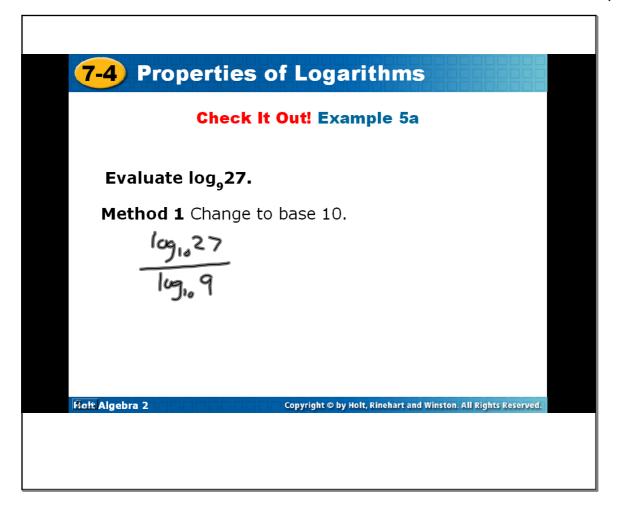
Evaluate log₃₂8.

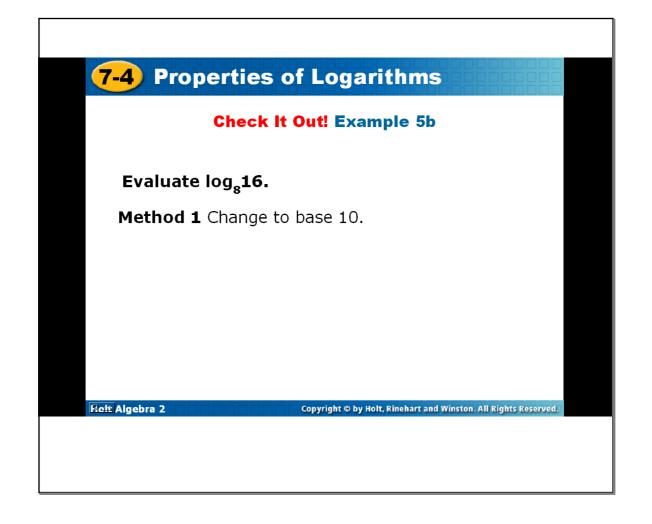
Method 1 Change to base 10



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Lesson 7-4 December 06, 2012





Write out your own simplification problems. Challenge your partners to solve them.

Find my mistake...

$$\log 3 + \log 7 = \log 10$$
 $\log_8 54 - \log_4 9 = \log 6$
 $2 (\log 4 + \log 6) = \log 96$
 $\log 15 - \log 3 + \log 4 = \log 1.25$

Homework p. 516 #20-34, 51-53, 60, 62, 65

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