



Properties of Logarithms

Student Activity

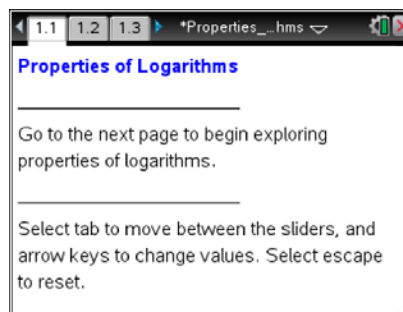


Name _____

Class _____

Open the TI-Nspire document *Properties_of_Logarithms.tns*.

This activity explores the product property, the quotient property, and the power property of logarithms.



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For this activity, the expression used is $\log_2(x)$. The investigations also work for any base > 0 and base $\neq 1$.

1. As you drag the sliders for m and n , note what happens as these values are substituted into the four expressions.
 - a. Which expressions, if any, appear to be equivalent independent of the values of m and n ?
 - b. Set $m = 8$ and $n = 4$. Substitute these values into the logarithmic expressions you found to be equivalent in part 1a, and simplify these expressions to show they are indeed equivalent.
 - c. Use the expressions you found in parts 1a and 1b to write a general logarithmic property for $\log_a mn$, where a is a real number, $a > 0$ and $a \neq 1$.
 - d. How do the operations in the logarithmic property in part 1c relate to the operations in the exponential property $a^m a^n = a^{m+n}$?



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2. As you drag the sliders for m and n , note what happens as these values are substituted into the four expressions.
 - a. Which expressions, if any, appear to be equivalent independent of the values of m and n ?
 - b. Set $m = 8$ and $n = 4$. Substitute these values into the logarithmic expressions you found to be equivalent in part 2a, and simplify these expressions to show they are indeed equivalent.
 - c. Use the expressions you found in parts 2a and 2b to write a general logarithmic property for $\log_a\left(\frac{m}{n}\right)$ where a is a real number, $a > 0$ and $a \neq 1$.
 - d. How do the operations in the logarithmic property in part 2c relate to the operations in the exponential property $\frac{a^m}{a^n} = a^{m-n}$?

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3. As you drag the sliders for m and n , note what happens as these values are substituted into the three expressions.
 - a. Which expressions, if any, appear to be equivalent independent of the values of m and n ?
 - b. Set $m = 4$ and $n = 3$. Substitute these values into the logarithmic expressions you found in part 3a, and simplify these expressions to show they are equivalent.



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- c. Use the expressions you found in parts 3a and 3b to write a general logarithmic property for $\log_a(m)^n$ where a is a real number, $a > 0$ and $a \neq 1$
- d. How do the operations in the logarithmic property in part 3c relate to the operations in the exponential property $(a^m)^n = a^{mn}$?
- e. Use the logarithmic property you proved in part 3c to show that $\log_a a = 1$ for all values of a where $a > 0$ and $a \neq 1$.
- f. Use the logarithmic property you proved in part 3c to show that $\log_a 1 = 0$ for all values of a where $a > 0$ and $a \neq 1$.