Algebra 2 7.6

Solve exponential equations and inequalities using common logs

base = 10

Evaluate logarithmic expressions by changing bases

$\log_{10} 100 = 2$

$\log 100 = 2$

base
exponent
logarithm
default
common log (default base)
Whiteboards

Use a calculator to evaluate each expression to the nearest ten-thousandth.

a. log 5 = 0.69897

$10^{?} = 5$ $\boxed{0.6990}$

b. log 0.3

$10^{?} = 0.3$ $\boxed{-0.5229}$

$8^{1.7740} =$

23. $8^x = 40$

$2^x = 16^{x-3}$

Can we get the bases the same?

$\log 8^x = \log 40$

$x(0.9031) = 1.6021$

$x = 1.7740$

$9^{7.7461} = 7^{8.7461}$

$2.46 \times 10^7 = 2.46 \times 10^7$

26. $9^{b-1} = 7^b$

$(b-1)(0.9542) = b(0.8451)$

$0.9542b - 0.9542 = 0.8451b$

$-0.9542b \qquad -0.9542b$

$-0.9542 = -0.1091b$

$b = 8.7461$

1. Write in exp form
2. log (base 10) each side to solve

Example 5 Change of Base Formula base 10

Express $\log_3 20$ in terms of common logarithms. Then round to the nearest ten-thousandth.

$\log_3 20 = x$

$3^{2.7269} = 20$

$\log_3 20 = x$

$\log 3^x = \log 20$

$x(0.4771) = 1.3010$

$x = 2.7269$

$17^{?}=400$

Guess and check...

2	289
2.1	383.66
2.2	509.32
3	4913

2.1147

$17^{x}=400$

$13^{?}=1093$

$7^{?}=40$

Express each logarithm in terms of common logarithms. Then approximate its value to the nearest ten-thousandth.

$$\frac{\log_{10} 18}{\log_{10} 7}$$

$$\log 7^x = \log 18$$

$$\frac{x(0.8451)}{0.8451} = \frac{(1.2553)}{0.8451}$$

33. $\log_7 18 = x$

1.4854

36. $\log_4 9$

$(x-1)\log 4^{3} = \log 9$

$\frac{\log 4}{\log 9}$

$= \frac{\log 9}{\log 4}$

Guided Practice

5. Express $\log_6 8$ in terms of common logarithms. Then round to the nearest ten-thousandth.

$x \log 6^x = \log 8$

$\frac{\log(8)}{\log(6)}$

1.1606

Can we get the bases to be the same?
Always do the same thing to both sides...

Example 4 Solve Exponential Inequalities Using Logarithms

Solve $3^{5y} < 7^{y-2}$. Round to the nearest ten-thousandth.

$10^1 = 10$

$5y(\log 3) < (y-2)(\log 7)$

$5y(0.4771) < 0.8451y - 1.6902$

$2.3855y < 0.8451y - 1.6902$

$-0.8451y \quad -0.8451y$

$1.5404y < -1.6902$

$y < -1.0975$