Do Now:

Convert the following expressions between exponential & logarithmic form.

1) $7^2 = 49$ → $\log_7 49 = 2$

2) $3 = \log_x 64$ → $x^3 = 64$

$\log_x 64 = 3$

3) $-2 = \log_3 1/9$ → $3^{-2} = \frac{1}{9}$

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Working with Logarithms

CASE 1 $\log_x 343 = 3$

$x^3 = 343$

$(x^3)^{\frac{1}{3}} = (343)^{\frac{1}{3}}$

$x^{\frac{3}{3}} = \sqrt[3]{343}$

$x^1 = 7$

$x = 7$

$\sqrt[3]{7 \cdot 7 \cdot 7}$

$\sqrt[n]{x}$

variable in base

* Raise Both sides of equation to reciprocal power

CASE 2 $\log_2 16 = x$

$2^x = 16$

$2^x = 2^4$

$x = 4$

variable is power

* find common base set exponents equal.

CASE 3 $\log_7 k = 2$

$7^2 = k$

$49 = k$

$7 = 44$

variable is answer

evaluate!

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Solve for the unknown.

1. $\log_6 216 = s$
2. $\log_k 1/1296 = -4$

$k^{-4} = \frac{1}{1296}$

$(k^{-4})^{-\frac{1}{4}} = \left(\frac{1}{1296}\right)^{-\frac{1}{4}}$

$k = \sqrt[4]{1296} = 6$

3. $\log_{81} h = \frac{1}{4}$
4. $\log_{10} e = -3$
5. $\log_{(1/2)} 8 = r$
6. $\log_d 8 = \frac{3}{2}$
7. $\log_{(1/4)} 64 = a$
8. $\log_{27} x = \frac{2}{3}$

$27^{\frac{2}{3}} = x$

$\sqrt[3]{27^2} = x$

$3^2 = x$

$9 = x$

9. $\log_{(1/2)} \left[\frac{1}{16}\right] = h$

$\left(\frac{1}{2}\right)^h = \frac{1}{16}$

$\left(\frac{1}{2}\right)^h = \left(\frac{1}{2}\right)^4$

$h = 4$

$\left(\frac{1}{2}\right)^h = \frac{1}{16}$

$\left(\frac{1}{2}\right)^h = \frac{1}{2^4}$

$2^{-h} = 2^{-4}$

$-h = -4$

$h = 4$

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(1) (2)
$3 + 5 = 8$
8

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Evaluate each expression:

$\log_4 64$

$\log_4 16$

$\log_5 125$

$\log_{343} 7$

$\log_6 216$

$\log_3 \frac{1}{243}$

$\log_2 4$

$\log_2 16$

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Properties of Logs

Convert to logarithmic form:

$b^x = A$ $\quad \log_b A = x$

$b^y = B$ $\quad \log_b B = y$

Product Rule

Take the log:

$b^x b^y = AB$

$b^{x+y} = AB$

$\log_b AB = x + y$

$\log_b AB = \log_b A + \log_b B$ ✶✶

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Quotient Rule

$\log_b \frac{A}{B} = \log_b A - \log_b B$

Power Rule

$\log_b a^c = c \cdot \log_b a$

EX: $\log_2 4^3 = 3 \cdot \log_2 4$

ex: 2 $\log_{10} x^{2y} = 2y \cdot \log_{10} x$

ex: 3 $\log_2 xy = \log_2 x + \log_2 y$

ex 4 $\log_2 \frac{x}{y} = \log_2 x - \log_2 y$ ✓

example 5 $\log_2 (AB)^2 = 2(\log_2 AB)$ → $2(\log_2 A + \log_2 B)$ → $2\log_2 A + 2\log_2 B$

$(\log_2 A + \log_2 B)^2$ ↗

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pg 494 (25-35) odd

(25) Solve for x

$\log_2 x = 4$

$2^4 = x$

(27) $\log_3 x = -2$

(29) $\log_{81} x = \frac{1}{3}$

(31) $\log_6 x = -2$

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