condensing logarithms EXAMPLES

$\frac{4\log_6(x)}{2}$

$\frac{4}{2}\cdot\log_6 x$

$2\cdot\log_6 x$

$\log_6 x^2$

$\frac{4\log_6(x)}{\log_6 2}$ → $\frac{4\log_6(x)}{\frac{\log(2)}{\log(6)}}$

$\frac{4\log_6 x}{0.387}$ 0.387

$\frac{4}{0.387}\log_6 x$

$\log_6 x^{10.336}$

$\log_3(6)+\log_3 7+\log_3 y$

$\log(6\cdot 7\cdot y)$

$\log(42x)$

$3\log_7 w + \log_7 y - \log_7 x$

$\log_7 w^3 + \log_7 y - \log_7 x$

$\log\left(\frac{w^3\cdot y}{x}\right)$

$5\log 4 + \log x - 3\log y - \log a$

$\log 4^5 + \log x - \log y^3 - \log a$

$\log\left(\frac{4^5\cdot x}{y^3\cdot a}\right)$

because

$\frac{\frac{4^5\cdot x}{y^3}}{\frac{a}{1}} = \frac{4^5\cdot x}{y^3}\cdot\frac{1}{a}$

$\frac{4^5\cdot x}{y^3}\cdot\frac{1}{a}$

Multple Ways $\log_5 \frac{1}{625}$

Power Rule

$\log_5 \frac{1}{625} = x$

$\log_5 625^{-1}$

$-1\cdot\log_5 625$

Definition of log

$\log_5 \frac{1}{625} = x$

$\rightarrow 5^x = \frac{1}{625}$

Quotient Property

$\log_5 1 - \log_5 625$

$0 - \log_5 625$

Change of base Rule

$\frac{\log\left(\frac{1}{625}\right)}{\log(5)}$

Oooh weee!

Base b $\log_b b = 1$

$7 + 3\log_4 x - 2\log_4 y$

$7 + \log_5 x - 4\log_5 x$

$7 + \log_5 x - \log_5 x^4$

multiply by 1! $7 \cdot \log_5 5 + \log_5 x - \log_5 x^4$

$\log_{\text{common base}}(\text{common base})$ then bring up exponent

$\log_5 5^7 + \log_5 x - \log_5 x^4$

$\log_5 \left(\frac{5^7 \cdot x}{x^4}\right)$

$\log_5 \left(\frac{5^7}{x^3}\right)$

$7 \cdot \log_4 4 + \log_4 x^3 - \log_4 y^2$

$\log_4 \left(\frac{4^7 \cdot x^3}{y^2}\right)$

$\log_5 \sqrt{125x^2y^7}$

$\log_5 (125x^2y^7)^{1/2}$

$\frac{1}{2}(\log_5 (125 \cdot x^2 \cdot y^7))$

$\frac{1}{2}(\log_5 125 + \log_5 x^2 + \log_5 y^7)$

$\frac{1}{2}(\log_5 125 + 2\log_5 x + 7\log_5 y)$

$\frac{1}{2}\log_5 125 + \log_5 x + \frac{7}{2}\log_5 y$

$\frac{\log_5 125}{2} + \log_5 x + \frac{7\log_5 y}{2}$

Reduce $\log_5(5^3)$

$\frac{3}{2} + \log_5 x + \frac{7\log_5 y}{2}$

$\log_5 3 = 0.683$ $\log_5 6 = 1.113$

$\log_5(2)$

$\log_5\left(\frac{6}{3}\right)$

$\log_5 6 - \log_5 3$

$1.113 - 0.683$

0.43

$\log_5 18$

$\log_5(6 \cdot 3)$

$\log_5 6 + \log_5 3$

$1.113 + 0.683$

1.796

$\log_5 36$

$\log_5 6^2$

$2 \cdot \log_5 6$

$2 \cdot 1.113$

2.226

$\log_5 \frac{1}{3}$

Way 1	Way 2
$\log_5 3^{-1}$	$\log_5 1 - \log_5 3$
$-1 \log_5 3$	$0 - 0.683$
$-1 \cdot 0.683$	
-0.683	

Log Theory

$\log_b m = n \longrightarrow b^n = m$

b can be positive ($b > 0$) $b \neq 1$ (horizontal line), $b \neq 0$ (can't divide by 0)

m can be positive $m > 0$

n can be any Real number

$\log_{17} a = 1$ (base, exponent) — definition log, same — $17^1 = a$ — Same as Base Rule

$\log_{17} d = 0$ — Log = 0 Rule — $d = 1$ — $17^0 = 1$

$\log_{17} c < 0$ — when is log negative? — when is exponent negative — c is a Fraction less than 1 — $0 < c < 1$

$\frac{\log\left(\frac{5}{4}\right)}{\log(17)} =$ positive