Name:_____

PRACTICE for LOG and INDEX EQUATIONS.

Time allowed: 30 minutes

1. Write as the log of a single number:

a) log 3 + 2 log 4

$= \log 3 + \log 4^2$

$= \log 3 + \log 16 = \log 48$

b) log 15 – log 5

$= \log\left(\frac{15}{5}\right) = \log 3$

c) *log (x) + log (y) + log (z)*

$= \log(x \times y \times z)$ or $\log(xyz)$

d) *log x – log y – log z*

$= \log\left(\frac{x}{yz}\right)$

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2. Solve for *x* :

a) $\log_x 64 = 3$

$x^3 = 64$

$x = 4$

b) $2^x = 128$

$x = 7$

c) $x = \log_3 (1)$

$3^x = 1$

$x = 0$

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3. Solve for *x*, giving answers to 4 s.f.

a) $3^x = 30$

$\log 3^x = \log 30$

$x\log 3 = \log 30$

$x = \frac{\log 30}{\log 3}$

$= 3.095$

b) $x = \log_4 9$

$4^x = 9$

$\log 4^x = \log 9$

$x\log 4 = \log 9$

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

$= 1.585$

c) $2^{x+3} = 25$

$\log 2^{(x+3)} = \log 25$

$(x + 3)\log 2 = \log 25$

$x + 3 = \frac{\log 25}{\log 2}$

$x + 3 = 4.644$

$x = 1.644$

d) $5^{4x} = 30$

$\log 5^{4x} = \log 30$

$4x\log 5 = \log 30$

$4x = \frac{\log 30}{\log 5} = 2.11328$

$x = \frac{2.113}{4} = 0.5283$

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4. Solve for *x*, giving answers to 4 s.f.

a) $4^{3x} \times 3^{x+2} = 55$

$\log(4^{3x} \times 3^{x+2}) = \log 55$

$\log 4^{3x} + \log 3^{x+2} = \log 55$

$3x\log 4 + (x+2)\log 2 = \log 55$

$1.806x + 0.301x + 0.602 = 1.74$

$2.107x = 1.138$

$x = \frac{1.138}{2.107} = 0.540$

b) $\log(x) + \log(x - 4) = \log 5$

$\log x(x - 4) = \log 5$

$x(x - 4) = 5$

$x^2 - 4x = 5$

$x^2 - 4x - 5 = 0$

$(x - 5)(x + 1) = 0$

$x = 5$ or -1 but we can't have $\log(-1)$

only valid answer is $x = 5$

c) $2\log x - \log(12 - x) = \log 2$

$\log x^2 - \log(12 - x) = \log 2$

$\log \frac{x^2}{12 - x} = \log 2$

$\frac{x^2}{12 - x} = 2$

So $x^2 = 2(12 - x) = 24 - 2x$

$x^2 + 2x - 24 = 0$

$(x - 4)(x + 6) = 0$

$x = 4$ or -6 but log -6 not valid so

only valid answer is $x = 4$