Name:_____ Date:_____

M12P HW Section 7.4 Basic Logarithm Rules :

$\log_a b = \dfrac{\log b}{\log a}$ $\log a^m = m \log a$ $\log(a \times b) = \log a + \log b$ $\log(a \div b) = \log a - \log b$

1. Rewrite each of the following in logarithm form:

$a)\ 5^x = y$	$b)\ 2a^x = c$	$c)\ 2(b)^x = y$
d) $d^x a^x = e$	e) $2^x a^{x+1} = f$	f) $2a^{x+1} + 3 = w$

2. Rewrite each of the following in exponential form:

$a)\ \log_3 27 = 3$	$b)\ \log_{13} 13 = x$	$\log_{\frac{1}{3}} \dfrac{1}{9} = x$
d) $\log_4 \left(\dfrac{1}{64}\right) = x$	e) $\log_a b = c$	f) $\log_a b = \dfrac{1}{2}$

3. Use the logarithm rules to evaluate each of the following without a calculator:

$a) \log_5 125$	$b) \log_2 128$	$c) \log_3 2183$
$d) \log_{16} 64$	$e) \log_7 \sqrt{343}$	$f) \log_{128} 1024$

g) $\log 10,000$	h) $\log_{\sqrt{123}} 1$	i) $\log_a a^b$
$j)\log_8\left(\frac{1}{4}\right)$	$k)-\log_{2.5}\left(\frac{125}{8}\right)$	L) $\log_{a^3}\left(\sqrt{a^5}\right)$
m) $\left(\log_{0.125} 64^{\frac{2}{3}}\right)^{-2}$	n) $\log_{\sqrt[5]{a^3\times a^2}}\left(\sqrt{a^5\times a^3}\right)$	o) $\log_{\sqrt[3]{a^{-7}\times a^{-2}}}\left(\frac{1}{\sqrt[3]{a^5}\sqrt{a}}\right)$

4. Simplify each of the following logarithms without using a calculator:

a) $\log_6 24+\log_6 9$	b) $\log_5 100-\log_5 4$	c) $\log_4 8+\log_4 64$
d) $\log_3 324-\log_3 4$	e) $\log_3\sqrt{45}-\log_3\sqrt{5}$	f) $\log_8 24+2\log_8 2-\log_8 3$
g) $\log_3 12-\log_3 4-1log10$	h) $\log_3\sqrt{27\times 4}-0.5\log_3 4+\log_9 81$	i) $\log_4 a^3+\log_4\left(a^4\right)-3\log_4 a$

j) $\log_4 a^3 + \log_4\left(a^4\right) - 3\log_4 a$	K) $\log\sqrt{a} - \log a^3 + \log\sqrt[3]{a}$	L) $\log_{x+1}\left(x^3 + 3x^2 + 3x + 1\right)$

5. Rewrite the following expressions in terms of $\log a$, $\log b$, and $\log c$:

a) $\log\left(a^3 b\right)$	b) $\log\dfrac{a^2 b^3}{c^4}$	c) $\log\dfrac{\sqrt{a}\sqrt[3]{b}}{\sqrt{c^2}}$
d) $\log\left(ab\sqrt{c}\right)$	e) $\log\left(\dfrac{a}{bc}\right)$	f) $\log\left(\dfrac{\sqrt{a}}{\sqrt[3]{b}\times c}\right)^2$
g) $\log\dfrac{\sqrt[4]{a}}{\sqrt[4]{bc}}$	h) $\log\sqrt[4]{\dfrac{b^4}{a^2 c}}$	i) $\log\sqrt{\dfrac{a\sqrt{b}}{c}}$

6. Given each of the expressions below, indicate if they are TRUE or FALSE:

a) $\log\left(\dfrac{a}{b^5}\right) = \log a - 5\log b$	b) $\log\left(b-a\right) = \log b - \log a$
c) $\log\left(a\right)^b = b\times\log a$	d) $\left(\log b\right)^a = a\times\log b$

e) $\log\left(\frac{a}{b}\right)=\frac{\log a}{\log b}$	f) $\log\left(\frac{a}{b}\right)=\log a-\log b$
g) $\log(a\times b)=\log a+\log b$	h) $\log(a+b)=\log a\times\log b$
i) $\log\sqrt{\frac{ab}{c}}=\frac{1}{2}\times\log\left(\frac{ab}{c}\right)$	j) $\sqrt{\log\left(\frac{ab}{c}\right)}=\frac{1}{2}\times\log\left(\frac{ab}{c}\right)$

7. Given that $\log 2=a$, $\log 3=b$, and $\log 7=c$, express the following in terms of "a", "b", and "c"

a) $\log 6$	b) $\log 14$	c) $\log\frac{140}{3}$
d) $\log 630$	e) $\log 24.5$	f) $\log\frac{8000}{27}$
g) $\log\frac{196}{300}$	h) $\log\frac{2430}{343}$	i) $\log\sqrt{\left(\frac{8\times 27}{343}\right)}$

8. Simplify and Write the following as a single logarithmic expression:

a) $3\log a + 5\log b$	b) $2\log_2 a - 4\log_2 b$
c) $4\log_2 a + 6\log_4 b$	d) $\log_4 a^4 - \log_8 b^3$
e) $\log_3 a + \log_3 \sqrt{b} - \log_9 c^3$	f) $\frac{1}{2}\log_3 144 - \log_3 4$
g) $2\log_4 a^3 + \frac{2}{3}\log_{16}\left(ab^2\right) - \frac{1}{3}\log_2 \sqrt{bc}$	h) $\frac{2}{3}\log_2 \sqrt{ab} - \frac{1}{2}\log_8 \sqrt[3]{abc} + \log_8 \sqrt{bc}$

9. Which is larger? 2^{24} *or* 3^{16}? [Try to prove this by using logs]

10. Arrange the following numbers from least to greatest:

$\log_2 8, \quad \log_6 16, \quad \log_{10} 21, \quad \log_{14} 45, \quad \log_{18} 100$

11. Suppose a bank pays 6% interest per year, compounded quarterly, meaning that it pays 1.5% interest every three months. How much money must be deposited so that at the end of the five years, there is exactly $1,000 in the account? Give your answer rounded to the nearest cent.

12. A train travels 2cm in the first second and increases its speed by 25% until it reaches a speed of 80km/hr. During which second of the trip will it reach a speed of 80km/hr?

13. Sharon starts a savings account with a deposit of $200. The bank pays 3.5% interest per year, compounded annually. If she leaves the money in the bank and makes no other deposits what amount will be in the account after ten years? Assume that the interest rate remains constant throughout the period.

14. The value of a car depreciates by 10% per year. How much would a $65000 car cost after 12years?

15. Given $\log_9 20 = a$ and $\log_3 n = 4a$. Find the value of "n"