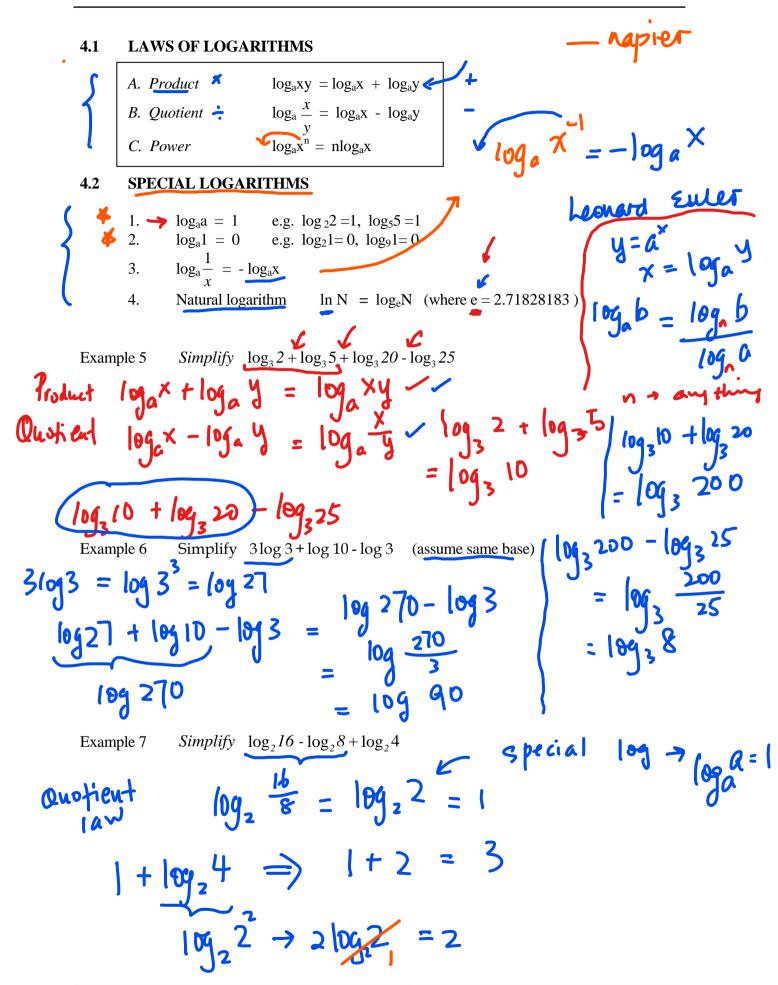
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CHAPTER 4

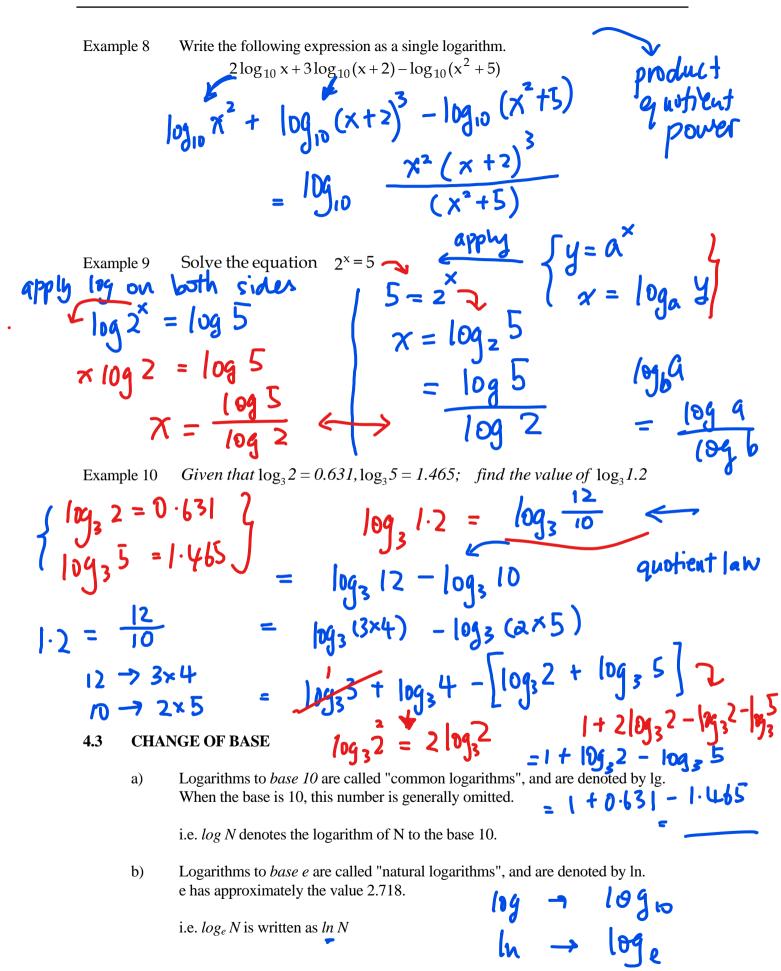
INTRODUCTION

The logarithm of *Y* to the base *a* is the exponent to which a must be raised to yield *Y*. That is,

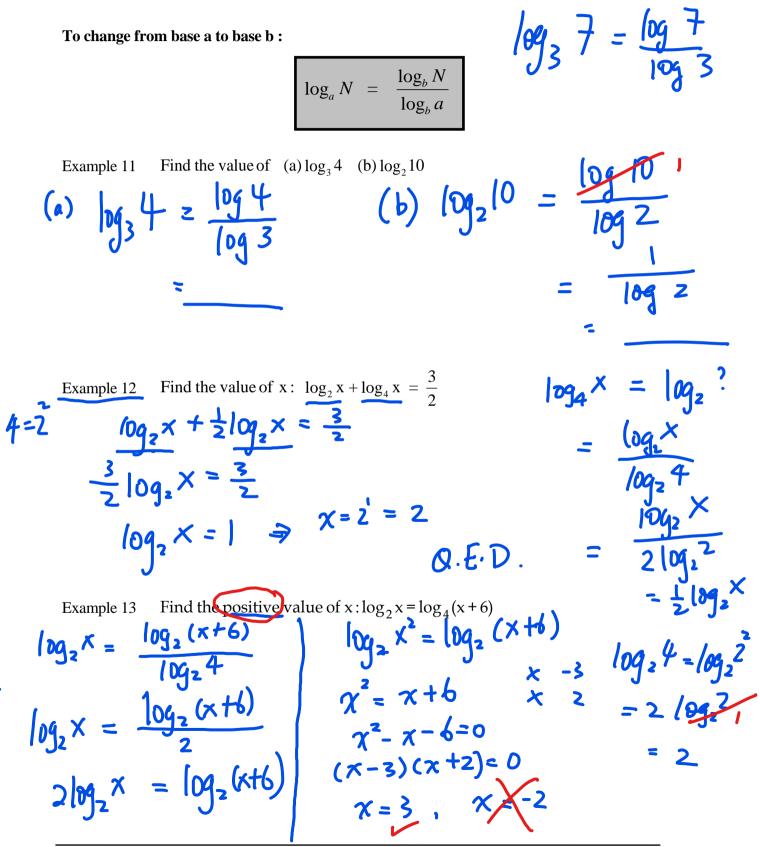
Thus
$$\log_2 4 = 2$$
 since $2^2 = 4$ and $\log_2 8 = 3$ since $2^3 = 8$
Example 1
a) $3^2 = 9$; then $2 = \log_3 9$
 2 is the logarithm of 9 to base 3.
b) $10^2 = 100$; so $2 = \log_3 0$
 2 is the logarithm of 100 to base 10.
Example 2
If $\log_1 N = 3$ jind the value of N.
 $N = |0^3 = |000$
Example 3
Given that $\log_3 81 = 4$, find the value of x.
 $8| = x^4$
 $x' = 3^4$
 $y = \sqrt{3}^2 = \sqrt{3}^2 = 3^4$
 $x' = 3^4$
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Preparatory Course for Direct Entry to Higher Nitec

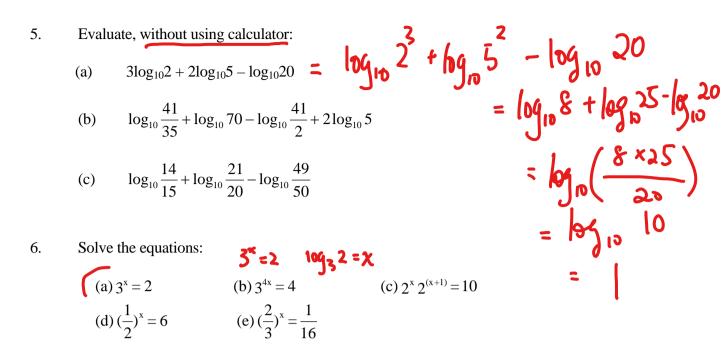


- c) Logarithms can be to any base; however common logarithms are exclusively used for calculations at this stage.
- d) Where logarithms to other bases are encountered, they have to be changed to base 10 for a numerical answer.



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6	Example 14 Find the value of $x: \log_3 x - 4\log_x 3 + 3 = 0$ Common bary 3 $\log_3 x - \log_3 x + 3 = 0$ $4 \log_x 3 - \log_x 3 + 3 = 0$ $= \frac{\log_3 8!}{\log_3 x} = \frac{4}{\log_3 x}$	
het p=	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
beth TUT	ORIAL 4 $(p+4)(p-1) = 0$ $p=-4$, $109_3 = -4$ $X = 3^{-4} = \frac{1}{8^{-1}}$	
1.	Write each of the following in logarithmic form. For example, $3^4 = 81$ can be written as $\log_3 81 = 4$.	
	(a) $2^4 = 16$ (b) $125 = 5^3$ (c) $64 = 16^{\frac{3}{2}}$ (d) $81 = (\frac{1}{3})^{\frac{4}{3}}$	
2.	Write each of the following in exponential form. For example, $\log_5 125 = 3$ can be written as $5^3 = 125$.	
•	(a) $\log_2 32 = 5$ (b) $2 = \log_5 25$ (c) $7 = \log_2 128$ (d) $-2 = \log_3(1/9)$	
	(e) $\log_e 1 = 0$ (f) $2 = \log_a X$ (g) $\ln 20.09 = 3$	
3.	Determine the value of each of the following logarithms.	
	(a) $\log_2 64$ (b) $\log_{10} 10^7$ (c) $\log_{27} 3$ (d) $\log_5 125$ (e) $\log_{10} 10^{-6}$ 6 7 $\frac{1}{3}$ 3 -6	
4.	Write each of the following as a single logarithm.	
	(a) $3\log_a 2 + 2\log_a 3 - 2\log_a 6$ (b) $3\log_2 5 - 2\log_2 7$	
7	(c) $\frac{1}{2}\log_5 64 + \frac{1}{3}\log_5 27 - \log_5(x^2 + 4) = 109c$ (24)	
	(d) $3\log_2(x+2) + \log_2 8x - 2\log_2(x+8)$	
7	7(e) $2\log_5 x - 3\log_5(2x+1) + \log_5(x-4) = \log_5 x^2 - \log_5 (2x+1)^3 + \log_5 (x-4)$	
2hgs×	$x = \log_5 x^2$ $x^2 (x-4)$	
3	$l_{95}(2x+1) = l_{95}(2x+1)^{5} = l_{95}\frac{1}{(2x+1)^{3}}$ QED	
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7. Given that
$$\log_2 3 = 1.585$$
, and $\log_2 5 = 2.322$, calculate the values of $\log_2 60$ and $\log_2 0.3$.

8. If
$$\log_7 2 = 0.356$$
 and $\log_7 3 = 0.565$, find the value of $\log_7 \frac{8}{9} + 2\log_7 \frac{9}{2}$

- 9. Solve each of the following equations.
 - (a) $\log_2 x + \log_2(x+2) = 3$ (b) $\log_3 x \log_3(2x+3) = -2$
- 10. Find the values of x in
 - (a) $\log_2 x + \log_x 2 = 2$ (b) $\log_3 x 2\log_x 3 = 1$

Challenging Questions

- 1 If $u = \log_4 x$, find in term of u
 - (a) X
 - (b) $\log_4 2x$
 - (c) $\log_x 64$
- 2 (a) If $\log_8 x = p$, express $\log_2 x$ in terms of p. Given that $\log_q(xy) = 3$ and $\log_q(x^2y^3) = 4$. Calculate the values of $\log_q x$ and $\log_q y$
- 3 (a) Calculate the value of $\log_3 8$. Giving your answer correct to 3 significant figures.
 - (b) Evaluate x if $\log_2(1+x) + \log_2(5-x) \log_2(x-2) = 3$