

# Logarithms

## Learning Objectives

Students should be able to

Know simple properties and graphs of the logarithmic  
Know and use the laws of logarithms (including change of base of logarithms)



Nos	Questions	Reference
5	Solve $2\lg y - \lg(5y + 60) = 1$ .	Q2/0606/13/O/N/13
	$\lg y^2 - \lg(5y + 60) = 1$ $\frac{y^2}{(5y+60)} = 10 \rightarrow y^2 - 50y - 600 = 0$ $(y + 10)(y - 60) = 0 \rightarrow y = -10 \text{ (NA) or } y = 60$	
6	(i) Given that $\log_4 x = \frac{1}{2}$ , find the value of $x$ . (ii) Solve $2\log_4 y - \log_4(5y - 12) = \frac{1}{2}$ .	Q4/0606/11/M/J/13 Q4/0606/13/M/J/13
	(i) $\log_4 x = \frac{1}{2} \rightarrow x = 4^{\frac{1}{2}} \rightarrow x = 2$ (ii) $\log_4 y^2 - \log_4(5y - 12) = \frac{1}{2}$ $\frac{y^2}{5y-12} = 2 \rightarrow y^2 - 10y + 24 = 0 \rightarrow (y - 4)(y - 6) = 0 \rightarrow y = 4 \text{ or } y = 6$	
7	(a) Find the value of $x$ for which $2\lg x - \lg(5x + 60) = 1$ . (b) Solve $\log_5 y = 4\log_y 5$ .	Q8/0606/11/M/J/12 Q8/0606/13/M/J/12
	(a) $\lg x^2 - \lg(5x + 60) = 1 \rightarrow \frac{x^2}{5x+60} = 10 \rightarrow x^2 - 50x - 600 = 0$ $x^2 - 50x - 600 = 0 \rightarrow (x - 60)(x + 10) = 0 \rightarrow x = 60 \text{ or } x = -10 \text{ (NA)}$ (b) $\log_5 y = 4\log_y 5 \rightarrow \log_5 y = \frac{4\log_5 5}{\log_5 y} \rightarrow (\log_5 y) = 2 \text{ or } -2 \rightarrow y = 25 \text{ or } \frac{1}{25}$	
8	Given that $p = \log_q 32$ , express, in terms of $p$ , (i) $\log_q 4$ , (ii) $\log_q 16q$ .	Q3/0606/11/O/N/12
	(i) $p = \log_q 32 \rightarrow p = 5\log_q 2 \rightarrow \log_q 2 = \frac{p}{5} \rightarrow \log_q 4 = 2\log_q 2 = \frac{2p}{5}$ (ii) $\log_q 16q = \log_q 16 + \log_q q \rightarrow 4\log_q 2 + 1 = \frac{4p}{5} + 1$	

Nos	Questions	Reference
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19 (a) Solve  $\log_7(17y + 15) = 2 + \log_7(2y - 3)$ .

(b) Evaluate  $\log_p 8 \times \log_{16} p$ .

Q7/0606/01/O/N/05

(a)  $\log_7(17y + 15) = 2 + \log_7(2y - 3) \rightarrow \frac{17y+15}{2y-3} = 49 \rightarrow 17y + 15 = 98y - 147 \rightarrow 162 = 81y \rightarrow y = 2$

(b)  $\log_p 8 \times \log_{16} p = \frac{\log_8 8}{\log_8 p} \times \frac{\log_8 p}{\log_8 16} = \frac{1}{\log_8 16} = \frac{3}{4}$

20 Solve  $\log_4 2 + \log_9(2x + 5) = \log_8 64$

Q9(i)/0606/1/M/J/03

$\frac{\log_2 2}{\log_2 4} + \log_9(2x + 5) = \frac{\log_8 64}{\log_8 8} \rightarrow \frac{1}{2} + \log_9(2x + 5) = 2 \rightarrow \log_9(2x + 5) = \frac{3}{2} \rightarrow 2x + 5 = 27 \rightarrow x = 11$

21 Solve the equation  $\log_5(8y - 6) - \log_5(y - 5) = \log_4 16$ .

Q8(ii)/0606/01/O/N/02

$\log_5(8y - 6) - \log_5(y - 5) = \log_4 16 \rightarrow \log_5 \frac{8y-6}{y-5} = 2$

$\frac{8y-6}{y-5} = 25 \rightarrow 8y - 6 = 25y - 125 \rightarrow 17y = 119 \rightarrow y = 7$