

- 1 Express in the form $p \log_{10} a + q \log_{10} b$
- a $\log_{10} ab$ b $\log_{10} ab^7$ c $\log_{10} \frac{a^3}{b}$ d $\log_{10} a\sqrt{b}$
 e $\log_{10} (ab)^2$ f $\log_{10} \frac{1}{ab}$ g $\log_{10} \sqrt{a^3b^5}$ h $3 \log_{10} \frac{a^2}{\sqrt[3]{b}}$
- 2 Given that $y = \log_q 8$, express each of the following in terms of y .
- a $\log_q 64$ b $\log_q 2$ c $\log_q \frac{16}{q}$ d $\log_q 4q^3$
- 3 Given that $a = \lg 2$ and $b = \lg 3$, express each of the following in terms of a and b .
- a $\lg 18$ b $\lg 96$ c $\lg \frac{9}{16}$ d $\lg 6 - \lg 8$
 e $\lg \sqrt{6}$ f $\frac{3}{2} \lg 16 + \frac{1}{2} \lg 81$ g $4 \lg 3 - 3 \lg 6$ h $\lg 60 + \lg 20 - 2$
- 4 Without using a calculator, evaluate
- a $\frac{1}{3} \log_5 1000 - \frac{1}{2} \log_5 4$ b $2 \log_{12} 4 + \frac{1}{2} \log_{12} 81$ c $\log_4 12 + \log_4 \frac{2}{3}$
 d $\frac{\log_7 81}{\log_7 3}$ e $3 \log_{27} 12 - 2 \log_{27} 72$ f $\frac{\log_{11} 25}{\log_{11} \frac{1}{5}}$
- 5 Solve each equation, giving your answers correct to 3 significant figures.
- a $\log_3 x = 1.8$ b $\log_5 x = -0.3$ c $\log_8 (x - 3) = 2.1$
 d $\log_4 (\frac{1}{2}x + 1) = 3.2$ e $15 - \log_2 3y = 9.7$ f $\log_6 (1 - 5t) + 4.2 = 3.6$
- 6 Express in the form $\log_2 [f(x)]$
- a $5 \log_2 x$ b $\log_2 x + \log_2 (x + 4)$ c $2 \log_2 x + \frac{1}{5} \log_2 x^5$
 d $3 \log_2 (x - 2) - 4 \log_2 x$ e $\log_2 (x^2 - 1) - \log_2 (x + 1)$ f $\log_2 x - \frac{1}{2} \log_2 x^4 + \frac{1}{3} \log_2 x^2$
- 7 Solve each of the following equations.
- a $\log_3 x + \log_3 5 = \log_3 (2x + 3)$ b $\log_9 x + \log_9 10 = \frac{3}{2}$
 c $\log_4 x - \log_4 (x - 1) = \log_4 3 + \frac{1}{2}$ d $\log_5 5x - \log_5 (x + 2) = \log_5 (x + 6) - \log_5 x$
 e $2 \log_6 x = \log_6 (2x - 5) + \log_6 5$ f $\log_7 4x = \log_7 \frac{1}{x-6} + 1$
- 8 Solve each pair of simultaneous equations.
- a $\log_x y = 2$ b $\log_5 x - 2 \log_5 y = \log_5 2$
 $xy = 27$ $x + y^2 = 12$
 c $\log_2 x = 3 - 2 \log_2 y$ d $\log_y x = \frac{3}{2}$
 $\log_y 32 = -\frac{5}{2}$ $x^{\frac{1}{3}} + 3y^{\frac{1}{3}} = 20$
 e $\log_a x + \log_a 3 = \frac{1}{2} \log_a y$ f $\log_{10} y + 2 \log_{10} x = 3$
 $3x + y = 20$ $\log_2 y - \log_2 x = 3$