

C2

EXPONENTIALS AND LOGARITHMS

Worksheet A

- 1 Express each of the following in the form $\log_a b = c$.
- a $10^3 = 1000$ b $3^4 = 81$ c $256 = 2^8$ d $7^0 = 1$
 e $3^{-3} = \frac{1}{27}$ f $32^{-\frac{1}{5}} = \frac{1}{2}$ g $19^1 = 19$ h $216 = 36^{\frac{3}{2}}$
- 2 Express each of the following using index notation.
- a $\log_5 125 = 3$ b $\log_2 16 = 4$ c $5 = \log_{10} 100\,000$ d $\log_{23} 1 = 0$
 e $\frac{1}{2} = \log_9 3$ f $\lg 0.01 = -2$ g $\log_2 \frac{1}{8} = -3$ h $\log_6 6 = 1$
- 3 Without using a calculator, find the exact value of
- a $\log_7 49$ b $\log_4 64$ c $\log_2 128$ d $\log_3 27$
 e $\log_5 625$ f $\log_8 8$ g $\log_7 1$ h $\log_{15} \frac{1}{15}$
 i $\log_3 \frac{1}{9}$ j $\lg 0.001$ k $\log_{16} 2$ l $\log_4 8$
 m $\log_9 243$ n $\log_{100} 0.001$ o $\log_{25} 125$ p $\log_{27} \frac{1}{9}$
- 4 Without using a calculator, find the exact value of x in each case.
- a $\log_5 25 = x$ b $\log_2 x = 6$ c $\log_x 64 = 3$ d $\lg x = -3$
 e $\log_x 16 = \frac{2}{3}$ f $\log_5 1 = x$ g $\log_x 9 = 1$ h $\lg 10^{12} = x$
 i $2 \log_x 7 = 1$ j $\log_4 x = 1.5$ k $\log_x 0.1 = -\frac{1}{3}$ l $3 \log_8 x + 1 = 0$
- 5 Express in the form $\log_a n$
- a $\log_a 4 + \log_a 7$ b $\log_a 10 - \log_a 5$ c $2 \log_a 6$
 d $\log_a 9 - \log_a \frac{1}{3}$ e $\frac{1}{2} \log_a 25 + 2 \log_a 3$ f $\log_a 48 - 3 \log_a 2 - \frac{1}{2} \log_a 9$
- 6 Express in the form $p \log_q x$
- a $\log_q x^5$ b $\frac{1}{2} \log_q x^{15}$ c $\log_q \frac{1}{x}$ d $\log_q \sqrt[3]{x}$
 e $4 \log_q \frac{1}{\sqrt{x}}$ f $\log_q x^2 + \log_q x^5$ g $\log_q \frac{1}{x^2} + \log_q \frac{1}{x^3}$ h $3 \log_q x^2 - \frac{1}{2} \log_q x^4$
- 7 Express in the form $\lg n$
- a $\lg 5 + \lg 4$ b $\lg 12 - \lg 6$ c $3 \lg 2$ d $4 \lg 3 - \lg 9$
 e $\frac{1}{2} \lg 16 - \frac{1}{5} \lg 32$ f $1 + \lg 11$ g $\lg \frac{1}{50} + 2$ h $3 - \lg 40$
- 8 Without using a calculator, evaluate
- a $\log_3 54 - \log_3 2$ b $\log_5 20 + \log_5 1.25$ c $\log_2 16 + \log_3 27$
 d $\log_6 24 + \log_6 9$ e $\log_3 12 - \log_3 4$ f $\log_4 18 - \log_4 9$
 g $\log_9 4 + \log_9 0.25$ h $2 \lg 2 + \lg 25$ i $\frac{1}{3} \log_3 8 - \log_3 18$
 j $\frac{1}{3} \log_4 64 + 2 \log_5 25$ k $\frac{1}{2} \log_5 (1\frac{9}{16}) + 2 \log_5 10$ l $\log_3 5 - 2 \log_3 6 - \log_3 (3\frac{3}{4})$