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** $\log_3 5 - 2 \log_3 6 - \log_3 (3\frac{3}{4})$