1 Express as single logarithms:

a $\log 5 + \log 6$ **b** $\log 24 - \log 2$ **c** $2\log 8 - 4\log 2$

d $\frac{1}{2}\log 49$ **e** $3\log x - 2\log y$ **f** $\log x - \log y - \log z$

2 Express as single logarithms:

a $\log_2 6 + 2\log_2 3 - \log_2 4$ **b** $\log_3 40 - \log_3 15 + 2\log_3\left(\frac{3}{5}\right)$

c $\log_a 4 + 2\log_a 3 - 2\log_a 6$ **d** $2\ln 3 - \ln 18$

e $3\ln 2 - 2$ **f** $4\log_2 x + \frac{1}{3}\log_2 y - 5\log_2 z$

3 Find the value of each expression (each answer is an integer).

a $\log_6 2 + \log_6 18$ **b** $\log_2 24 - \log_2 3$ **c** $\log_8 2 + \log_8 32$

d $2\log_6 3 + \log_6 24$ **e** $\frac{1}{2}\log 36 - \log 15 + 2\log 5$