Logarithm Answers

1) (a) $2^3 = 2\times2\times2 = 8$ and so $\log_2(8) = 3$

(b) $3^4 = 3\times3\times3\times3 = 81$ and so $\log_3(81) = 4$

(c) $4^2 = 4\times4 = 16$ and so $\log_4(16) = 2$

(d) $\log(1000)$ means $\log_{10}(1000)$, $10^3 = 10\times10\times10 = 1000$,

$\log(1000) = 3$

(e) $\ln(e)$ means $\log_e(e)$, and from the additional truths we know $\log_m m = 1$ and so $\ln(e) = 1$.

(f) $5^3 = 5\times5\times5 = 125$ and so $\log_5(125) = 3$

2) (a) $\log_5 5 + \log_5 4 = \log_5(5\times4) = \log_5 20$

(b) $\log 3 + \log 7 = \log(3\times7) = \log 21$

(c) This doesn't simplify because they have different bases and so the answer is $\log_6 7 + \log_5 7$

(d) $\ln 7 + \ln 2 = \ln(7\times2) = \ln 14$

(e) $\log_7 21 - \log_7 3 = \log_7\left(\frac{21}{3}\right) = \log_7 7 = 1$

(f) $\log 50 - \log 4 = \log\left(\frac{50}{4}\right) = \log 12.5$

(g) $\log 2^4 - \log 8 = 4\log 2 - \log 2^3 = 4\log 2 - 3\log 2$

$= \log 2$

(h) $\log_6(36) - \underbrace{\log_5(1)}_{\log_m(1)=0} = 2 - 0 = 2$

(i) $\log_{\pi}(\pi) = 1$ because any number to the power of 1 is that number.

(j) $(\log_2(4))^2 = (2)^2 = 4$

(k) $\log_6(4) + \log_6(9) = \log_6(4 \times 9) = \log_6 36 = 2$

(l) We know $\sqrt{9} = 3$, we also know a square root can be written by a power of a half.

i.e. $9^{1/2} = \sqrt{9} = 3 \Rightarrow \log_9(3) = \frac{1}{2}$

(m) We know that a number to the power of -1 is one over that number. i.e. $2^{-1} = \frac{1}{2}$ and so

$$\log_2\left(\frac{1}{2}\right) = -1$$

(n) Using the previous examples we can find this one.

$$3^2 = 9 \Rightarrow 3^{-2} = \frac{1}{9} \Rightarrow \log_3\left(\frac{1}{9}\right) = -2$$