

1. Express the following logarithmic equations as exponential equations.

(a) $\log_3 \left(\frac{1}{9} \right) = -2$

(b) $\log_2 \left(\frac{1}{4} \right) = -2$

(c) $\log_6 36 = 2$

(d) $\log_4 4 = 1$

(e) $\log_2 8 = 3$

(f) $\log_4 256 = 4$

(g) $\log_7 343 = 3$

(h) $\log_{11} \left(\frac{1}{11} \right) = -1$

2. Express the following exponential equations as logarithmic equations.

(a) $3^{-2} = \frac{1}{9}$

(b) $4^{-2} = \frac{1}{16}$

(c) $2^{-3} = \frac{1}{8}$

(d) $11^1 = 11$

(e) $11^2 = 121$

(f) $2^4 = 16$

(g) $10^{-2} = 0.01$

(h) $12^2 = 144$

3. Evaluate the following base 2 logarithms.

(a) $\log_2 8$

(b) $\log_2 32$

(c) $\log_2 16$

(d) $\log_2 128$

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

(f) $\log_2 1$

(g) $\log_2 \left(\frac{1}{16} \right)$

(h) $\log_2 \left(\frac{1}{4} \right)$

(i) $\log_2 \left(\frac{1}{8} \right)$

(j) $\log_2(\sqrt{2})$

(k) $\log_2(4\sqrt{2})$

(l) $\log_2 \left(\frac{1}{\sqrt[3]{2}} \right)$

(m) $\log_2(8\sqrt{2})$

4. Evaluate the following expressions.

(a) $\log_6 \left(\frac{1}{6} \right)$

(b) $\log_5 5$

(c) $\log_3 81$

(d) $\log_7 \left(\frac{1}{7} \right)$

(e) $\log_3 \left(\frac{1}{9} \right)$

(f) $\log_5 125$

(g) $\log_{16} 2$

(h) $\log_7 7$

(i) $\log_3 1$

(j) $\log_{49} 7$

(k) $\log_3 \left(\frac{1}{81} \right)$

(l) $\log_4 8$

(m) $\log_3 \left(\frac{1}{27} \right)$

(n) $\log_6 6$

(o) $\log_{10} \sqrt{10}$

(p) $\log_6 6^5$

$(q) \log_{36} 6$

$(r) \log_2 32$

$(s) \log_5 5^{20}$

$(t) 2^{\log_2 5}$

$(u) \log_2 \left(\frac{1}{4} \right)$

$(v) 3^{\log_3 7}$

$(w) 7^{\log_7 31}$

$(x) \log_2 \left(\frac{1}{32} \right)$

$(y) \log_4 \left(\frac{1}{2} \right)$

$(z) \log_{10} 1$

Answers

1. (a) $3^{-2} = \frac{1}{9}$ (b) $2^{-2} = \frac{1}{4}$ (c) $6^2 = 36$ (d) $4^1 = 4$
(e) $2^3 = 8$ (f) $4^4 = 256$ (g) $7^3 = 343$ (h) $11^{-1} = \frac{1}{11}$
2. (a) $\log_3 \left(\frac{1}{9} \right) = -2$ (b) $\log_4 \left(\frac{1}{16} \right) = -2$ (c) $\log_2 \left(\frac{1}{8} \right) = -3$ (d) $\log_{11} 11 = 1$
(e) $\log_{11} 121 = 2$ (f) $\log_2 16 = 4$ (g) $\log_{10} 0.01 = -2$ (h) $\log_{12} 144 = 2$
3. (a) 3 (b) 5 (c) 4 (d) 7 (e) -1
(f) 0 (g) -4 (h) -2 (i) -3 (j) 1/2
(k) 5/2 (l) -1/3 (m) 7/2
4. (a) -1 (b) 1 (c) 4 (d) -1 (e) -2
(f) 3 (g) 1/4 (h) 1 (i) 0 (j) 1/2
(k) -4 (l) 3/2 (m) -3 (n) 1 (o) 1/2
(p) 5 (q) 1/2 (r) 5 (s) 20 (t) 5
(u) -2 (v) 7 (w) 31 (x) -5 (y) -1/2
(z) 0