Question

Simplify or express a logarithmic expression in terms of an unknown value.

GIven that lg 2=p , and lg 3 = q , express the following in terms of p and q.

(a) lg 54;

(b) lg squareroot 120;

(c) lg 3 and ¾.

Solution

(a)

$$\lg 54 = \lg 2 \cdot 27 = \lg 2 + \lg 27 = p + \lg 3^3 = p + 3\lg 3 = p + 3q.$$

(b)

$$\lg \sqrt{120} = \lg 120^{1/2} = \frac{1}{2}\lg(5 \cdot 3 \cdot 8) = \frac{1}{2}(\lg 5 + \lg 3 + \lg 8) = \frac{1}{2}(\lg 5 + q + \lg 2^3) = \frac{1}{2}(\lg 5 + q + 3p).$$

(c)

$$\lg 3\frac{3}{4} = \lg\frac{12+3}{4} = \lg\frac{15}{4} = \lg 15 - \lg 4 = \lg(5 \cdot 3) - \lg 2^2 = \lg 5 + \lg 3 - 2\lg 2 = \lg 5 + q - 2p.$$

Answer: (a) $p + 3q$; **(b)** $\frac{1}{2}(\lg 5 + q + 3p)$; **(c)** $\lg 5 + q - 2p$.