

Equation (2.3) on page 38 defines the ISBN by a weighted sum where digit d_i is multiplied by $11 - i$. It is more elegant to multiply d_i by i and write the ISBN in the form

$$\text{ISBN} = 11 - \left(\sum_{i=1}^9 i d_i \right) \text{ mod } 11. \quad (2.3a)$$

To see why equations (2.3) and (2.3a) are arithmetically identical, we look at a representative digit such as d_2 . In Equation (2.3) this digit is multiplied by 9 and those familiar with modulo computations know that $9d_2 \text{ mod } 11 = 2d_2 \text{ mod } 11$. Those who demand a proof can obtain it by first denoting $T = 9d_2 \text{ mod } 11$ and then observing that

$$\begin{aligned} 9d_2 \text{ mod } 11 &= T, \\ (9d_2 + 2d_2) \text{ mod } 11 &= T + (2d_2 \text{ mod } 11), \\ 11d_2 \text{ mod } 11 &= T + (2d_2 \text{ mod } 11), \\ 0 &= T + (2d_2 \text{ mod } 11), \\ T &= 2d_2 \text{ mod } 11, \\ 9d_2 \text{ mod } 11 &= 2d_2 \text{ mod } 11. \end{aligned}$$