Modulo Operation (mod) Algorithm and Examples

In computing, the modulo (sometimes called modulus, or mod) operation finds the remainder of division of one number by another. Given two positive numbers, a (the dividend) and *n* (the divisor), a modulo *n* (abbreviated as a mod *n*) is the remainder of the Euclidean division of a by *n*. For instance, the expression "5 mod 2" would evaluate to 1 because 5 divided by 2 leaves a quotient of 2 and a remainder of 1, while "9 mod 3" would evaluate to 0 because the division of 9 by 3 has a quotient of 3 and leaves a remainder of 0; there is nothing to subtract from 9 after multiplying 3 times 3. Note that doing the division with a calculator won't show the result referred to here by this operation; the quotient will be expressed as a decimal fraction. Although typically performed with *a* and *n* both being integers, many computing systems allow other types of numeric operands. The range of numbers for an integer modulo of *n* is 0 to *n* - 1. (*n* mod 1 is always 0; *n* mod 0 is undefined, possibly resulting in a "Division by zero" error in computer programming languages) See modular arithmetic for an older and related convention applied in number theory. When either *a* or *n* is negative, the naive definition breaks down and programming languages differ in how these values are defined.

Example 1. $a \bmod n \equiv a - [n \times \mathrm{int}(\frac{a}{n})]$

$$\begin{aligned}
&[269.86] - [n \times \mathrm{int}(\tfrac{a}{n})] \\
&= 269 - [100 \times \mathrm{int}(\tfrac{269.86}{100})] \\
&= 269 - [100 \times \mathrm{int}(2.6986)] \\
&= 269 - [100 \times 2] \\
&= 69
\end{aligned}$$

Example 2. $M_t^b \equiv [100 \times 10^{(\log P_t) \bmod 1}] \bmod 100$

Step 1.

$$\begin{aligned}
&(\log P_t) \bmod 1 \\
&= \log(269.86) \bmod 1 \\
&= 2.4311 \bmod 1 \\
&= 2.4311 - [1 \times \mathrm{int}(\tfrac{2.4311}{1})] \\
&= 2.4311 - 2 \\
&= 0.4311
\end{aligned}$$

Step 2.

$$\begin{aligned}
&M_t^b = [100 \times 10^{0.4311}] \bmod 100 \\
&= [100 \times 2.6983] \bmod 100 \\
&= 269.83 - [100 \times \mathrm{int}(\tfrac{269.83}{100})] \\
&= 269.83 - 200 \\
&= 69
\end{aligned}$$