Representing Positive and Negative Integers

There are many ways signed integers are represented. The three main notations are:

1. Sign-and-magnitude notation
2. Complement notation
3. Biased number notation

Let’s see why these multiple systems are useful.

Sign-and-Magnitude

Sign-and-magnitude notation is the familiar system you learned in grade school. Negative numbers are represented by placing an explicit minus sign (−) in front.

−1, −2, −8, −73

You can place an explicit plus sign (+) in front of positive numbers, but most often no sign is written.

+1, +2, +8, +73 more commonly 1, 2, 8, 73

In a computing machine, the sign must be explicit. Rather than use + and −, it is customary to use a 0 for + and a 1 for −.

Sign-and-Magnitude

Although sign-and-magnitude is the working system for everyday arithmetic, it is cumbersome for computing.

To compute \( a - b \) when \( a < b \), what is common is to compute \( b - a \) instead and negate the result.

For instance, to compute 39 − 55, compute 55 − 39 = 16 and conclude 39 − 55 = −16.

Sign-and-magnitude notation has little use in computing.

Complement Notation

Complement notation is the representation used for computation on machines.

Many decimal adding machines used nine’s and ten’s complements to perform subtraction.