



## Why

We want to associate elements of  $\mathbf{Z}$  with bitstrings for use on digital computers.<sup>1</sup>

## Definition

A *digital integer* is a bit-string. The set of *d-bit integers* is the set of length-*d* bit strings  $\{0, 1\}^d$ . For example, the set of 8-bit digital integers is the set  $\{0, 1\}^8$ .

## Correspondence with $\mathbf{Z}$

The bit string  $x \in \{0, 1\}^d$  corresponds to the integer  $\sum_{i=1}^d x_i 2^i$ .

## Notation

We denote the set of 8-bit (16-bit, 32-bit, 64-bit) integers by `int64` (`int8`, `int16`, `int32`).

It is easy to embed  $x$  in `int8` by considering  $x'$  in `int16` defined by

$$x' = (x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, 0, 0, 0, 0, 0, 0, 0, 0)$$

In other words, we associate an 8-bit integer with a 16-bit integer. Naturally, we associate the integers with bit strings.

## Signed integers

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<sup>1</sup>Future editions will discuss digital computers.

<sup>2</sup>Future editions will include an account of signed integers, or will place this in another sheet.



