



## Why

We generalize the notion of real matrices, to matrices with elements in any set.

## Definition

Let  $S$  be a set. A *matrix in  $S$*  (or *of elements in  $S$* ) is a two-dimensional array in  $S$ . We call the matrix's values the *entries* of the matrix.

As with real matrices, we think of the objects in the codo set as arrayed in a grid or arrayed in a table. We call  $n$  and  $m$  the *dimensions* of the matrix. We call  $n$  the *height* and  $m$  the *width*. If the height of the matrix is the same as the width of the matrix then we call the matrix *square*. If the height is larger than the width, we call the matrix *tall*. If the width is larger than the height, we call the matrix *wide*.

## Notation

Let  $S$  be nonempty set. We denote the set of  $n \times m$   $S$ -valued matrices by  $S^{n \times m}$ . Let  $a \in S^{n \times m}$ . This means the same as  $a : \{1, 2, \dots, n\} \times \{1, 2, \dots, m\} \rightarrow S$ . We denote  $a(i, j)$  by  $a_{ij}$ .



