

Ratings encoding

In the table below, each row represents a user's ratings of movies: ✓ (check) indicates the person liked the movie, ✗ (x) that they didn't, and • (dot) that they didn't rate it one way or another (neutral rating or didn't watch).

Person	Fyre	Frozen II	Picard	Ratings written as a 3-tuple
P_1	✗	•	✓	
P_2	✓	✓	✗	
P_3	✓	✓	✓	
P_4	•	✗	✓	

Definitions

Term	Notation	Example(s)	We say in English ...
sequence		x_1, \dots, x_n	A sequence x_1 to x_n
		x_1, \dots, x_n where $n = 0$	An empty sequence
		x_1, \dots, x_n where $n = 1$	A sequence containing just x_1
		x_1, \dots, x_n where $n = 2$	A sequence containing just x_1 and x_2 in order
		x_1, x_2	A sequence containing just x_1 and x_2 in order
all integers	\mathbb{Z}		The (set of all) integers (whole numbers including negatives, zero, and positives)
all positive integers	\mathbb{Z}^+		The (set of all) strictly positive integers
all natural numbers	\mathbb{N}		The (set of all) natural numbers. Note: we use the convention that 0 is a natural number.
function rule definition	$f(x) = x + 4$		Define f of x to be $x + 4$
piecewise rule definition	$f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$		Define f of x to be x when x is nonnegative and to be $-x$ when x is negative
function application		$f(7)$	f of 7 or f applied to 7 or the image of 7 under f
		$f(z)$	f of z or f applied to z or the image of z under f
		$f(g(z))$	f of g of z or f applied to the result of g applied to z
absolute value	$ -3 $		The absolute value of -3
square root	$\sqrt{9}$		The non-negative square root of 9

Data types

Term	Examples: (add additional examples from class)
set unordered collection of elements <i>repetition doesn't matter</i> <i>Equal sets agree on membership of all elements</i>	$7 \in \{43, 7, 9\}$ $2 \notin \{43, 7, 9\}$
n-tuple ordered sequence of elements with n “slots” ($n > 0$) <i>repetition matters, fixed length</i> <i>Equal n-tuples have corresponding components equal</i>	
string ordered finite sequence of elements each from specified set <i>repetition matters, arbitrary finite length</i> <i>Equal strings have same length and corresponding characters equal</i>	

Special cases:

When $n = 2$, the 2-tuple is called an **ordered pair**.

A string of length 0 is called the **empty string** and is denoted λ .

A set with no elements is called the **empty set** and is denoted $\{\}$ or \emptyset .

Defining sets

To define a set using **roster method**, explicitly list its elements. That is, start with $\{$ then list elements of the set separated by commas and close with $\}$.

To define a set using **set builder definition**, either form “The set of all x from the universe U such that x is ...” by writing

$$\{x \in U \mid \dots x \dots\}$$

or form “the collection of all outputs of some operation when the input ranges over the universe U ” by writing

$$\{\dots x \dots \mid x \in U\}$$

We use the symbol \in as “is an element of” to indicate membership in a set.

Example sets: For each of the following, identify whether it’s defined using the roster method or set builder notation and give an example element.

$$\{-1, 1\}$$

$$\{0, 0\}$$

$$\{-1, 0, 1\}$$

$$\{(x, x, x) \mid x \in \{-1, 0, 1\}\}$$

$$\{\}$$

$$\{x \in \mathbb{Z} \mid x \geq 0\}$$

$$\{x \in \mathbb{Z} \mid x > 0\}$$

$$\{\mathbf{A}, \mathbf{C}, \mathbf{U}, \mathbf{G}\}$$

$$\{\mathbf{AUG}, \mathbf{UAG}, \mathbf{UGA}, \mathbf{UAA}\}$$