

## 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
$n$ -tuple	$(x_1, x_2, x_3)$ $(3, 4)$	The 3-tuple of $x_1$ , $x_2$ , and $x_3$ The 2-tuple or <b>ordered pair</b> of 3 and 4
sequence	$x_1, \dots, x_n$ $x_1, \dots, x_n$ where $n = 0$ $x_1, \dots, x_n$ where $n = 1$ $x_1, \dots, x_n$ where $n = 2$ $x_1, x_2$	A sequence $x_1$ to $x_n$ An empty sequence A sequence containing just $x_1$ A sequence containing just $x_1$ and $x_2$ in order A sequence containing just $x_1$ and $x_2$ in order
set		Unordered collection of objects. The set of ...
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. <b>Note:</b> we use the convention that 0 is a natural number.
roster method	$\{43, 7, 9\}$ $\{9, \mathbb{N}\}$	The set whose elements are 43, 7, and 9 The set whose elements are 9 and $\mathbb{N}$
set builder notation	$\{x \in \mathbb{Z} \mid x > 0\}$ $\{3x \mid x \in \mathbb{Z}\}$	The set of all $x$ from the integers such that $x$ is greater than 0 The set of all integer multiples of 3. <b>Note:</b> we use the convention that writing two numbers next to each other means multiplication.
function definition	$f(x) = x + 4$	Define $f$ of $x$ to be $x + 4$
function application	$f(7)$ $f(z)$ $f(g(z))$	$f$ of 7 <b>or</b> $f$ applied to 7 <b>or</b> the image of 7 under $f$ $f$ of $z$ <b>or</b> $f$ applied to $z$ <b>or</b> the image of $z$ under $f$ $f$ of $g$ of $z$ <b>or</b> $f$ 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
summation notation	$\sum_{i=1}^n i$ $\sum_{i=1}^n i^2 - 1$	The sum of the integers from 1 to $n$ , inclusive The sum of $i^2 - 1$ ( $i$ squared minus 1) for each $i$ from 1 to $n$ , inclusive
quotient, integer division	$n \text{ div } m$	The (integer) quotient upon dividing $n$ by $m$ ; informally: divide and then drop the fractional part
modulo, remainder	$n \text{ mod } m$	The remainder upon dividing $n$ by $m$

# 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

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

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

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

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.

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

$$\{0, 0\}$$

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

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

$$\emptyset$$

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

$$\mathbb{Z}^+ = \{x \in \mathbb{Z} \mid x > 0\}$$

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

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

# Data types

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