# Definitions

| Term | Notation Example(s) | We say in English ... |
|---|---|---|
| sequence | $x_1, \ldots, x_n$ | A sequence $x_1$ to $x_n$ |
| summation | $\sum_{i=1}^{n} x_i$ or $\displaystyle\sum_{i=1}^{n} x_i$ | The sum of the terms of the sequence $x_1$ to $x_n$ |
| all reals | $\mathbb{R}$ | The (set of all) real numbers (numbers on the number line) |
| 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. |
| 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 | $f(7)$<br>$f(z)$<br>$f(g(z))$ | $f$ of 7 **or** $f$ applied to 7 **or** the image of 7 under $f$<br>$f$ of $z$ **or** $f$ applied to $z$ **or** the image of $z$ under $f$<br>$f$ of $g$ of $z$ **or** $f$ applied to the result of $g$ applied to $z$ |
| absolute value | $\lvert -3 \rvert$ | The absolute value of $-3$ |
| square root | $\sqrt{9}$ | The non-negative square root of 9 |

# Defining sets

*To define 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 and give an example element.

$\{-1, 1\}$

$\{0, 0\}$

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

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

$\{\}$

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

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

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

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