

# Definitions

| Term                      | Notation  | Example(s) | We say in English ...   |
|---------------------------|---|------------|---|
| sequence                  | $x_1, \dots, x_n$   |            | A sequence $x_1$ to $x_n$   |
| summation                 | $\sum_{i=1}^n x_i$ or $\sum_{i=1}^n x_i$  |            | 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. <b>Note:</b> 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 <b>or</b> $f$ applied to 7 <b>or</b> the image of 7 under $f$<br>$f$ of $z$ <b>or</b> $f$ applied to $z$ <b>or</b> the image of $z$ under $f$<br>$f$ 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   |

# 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

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

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.

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

$$\{0, 0\}$$

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

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

$$\{\}$$

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

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

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

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