Not so Discrete Math

Christian Rudder

August 2024

0.1 Introduction to Sets

In discrete math we work with some group of 'things,' a thing or something we fancily call an **object**. A group or categorization of objects is called a set.

Theorem 0.1: a Set

Is a collection of objects.

For Example:

- S = The set of all students in a classroom.
- A = The set of all vowels in the English alphabet.
- $\mathbb{Z}$ = The set of all integers.

Objects in a **set** are called **elements**.

Theorem 0.2: an Element

An object that is a member of a given set.

To expand on the previous example:

- $S = \{s_1, s_2, s_3\}$, where s_1, s_2, s_3 are students, elements of the set.
- $A = \{a, e, i, o, u\}$, where a, e, i, o, u are elements.
- $\mathbb{Z} = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$, elements of integer set.

Curly braces denote a set, commas to separate elements, The '...' or 'ellipse' indicate that the set continues indefinitely in that direction. When the set's pattern is clear to the reader, we use the dotted notation.

Symbols used to denote members of a set:

- '$\in$' = in the set.
- '$\notin$' = not in the set.

Theorem 0.3: Membership

If x is an element of set A, $x \in A$. If x is not an element of set A, $x \notin A$.

For Example: Given $A = \{a, e, i, o, u\}$,
$a \in A$, "a is an element of A," and $b \notin A$, "b is not an element of A."

Order nor repetition matter:

- $A = \{1, 2, 3\} = \{3, 2, 1\} = \{1, 2, 3, 3, 3, 3, 3\}$.
- $B = \{a, b, c\} = \{a, b, c, a, b, c\}$.

Theorem 0.4: Properties of a Set

- The order of elements does not matter.
- Duplicate elements are not counted.