

a well-defined collection, and every operation you can build from it

Set

A

a well-defined collection of distinct objects

→
also written

Roster form

$A = \{2, 4, 6, 8\}$

every element listed, comma-separated. Order and repeats don't matter

→
also written

Set-builder form

$A = \{x : x = 2n, n \in \mathbb{N}, n \leq 4\}$

a rule the elements must satisfy, instead of a list

test any candidate element against either form. Both must agree on what's in A and what's out

Five kinds of sets

Empty set

$\emptyset$: no elements at all, $n(A) = 0$

Finite set

counting the elements ends somewhere, $n(A)$ is a whole number

Infinite set

counting never ends. $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{R}$ are all infinite

Singleton set

exactly one element, $n(A) = 1$

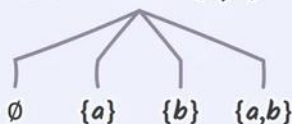
Equal sets

$A = B$ when every element of A is in B, and every element of B is in A

Subsets and the power set

- $A \subset B$ when every element of A is also in B
- every set is a subset of itself, and $\emptyset$ is a subset of every set, even of itself
- proper subset: $A \subset B$ but $A \neq B$, at least one element of B is left out
- power set $P(A)$ is the set of all subsets of A, $\emptyset$ and A included
- $n(A) = n \Rightarrow n(P(A)) = 2^n$

$P(A)$ for $A = \{a, b\}$



one branch per subset: 2 elements give 4 of them, $\emptyset$ and A included

Universal set and Venn diagrams *

- the universal set U holds every element under discussion. Every other set here sits inside it
- a Venn diagram draws U as a rectangle, each set as a circle inside it, elements as dots
- where two circles overlap is exactly $A \cap B$. Draw the picture before you compute

a set never repeats an element and never cares about order, so $\{1, 2\}$ and $\{2, 1, 1\}$ are the same set