- Sets
- Graphs

Set: - "collection of distinguishable objects"
- fully defined by the membership ($\in$) relation.

(Note: No order, no multiple copies).

e.g. $S = \{green, blue, red\}$
green $\in S$, orange $\notin S$, $5 \notin S$.

Special Sets: $\emptyset$: empty set
$\mathbb{Z}$: integers
$\mathbb{R}$: reals, $\mathbb{R}^+$: ~~nonnegative~~ positive reals
$\mathbb{N}$: natural numbers $\{0, 1, 2, \ldots\}$

Forming new sets:

$A \cup B = \{x : x \in A \text{ or } x \in B\}$
$A \cap B = \{x : x \in A \text{ and } x \in B\}$
$A - B = \{x : x \in A \text{ and } x \notin B\}$

Relations:

$A = B$: $x \in A$ iff $x \in B$

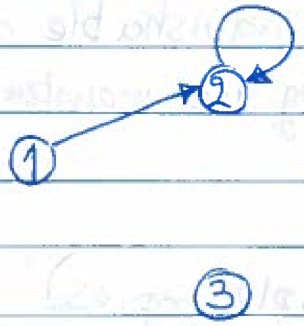
$A \subseteq B$: $x \in A$ implies $x \in B$

$A \subset B$: $A \subseteq B$ and $A \neq B$

Graphs

Directed Graph (aka ~~digraph~~) G, is a pair (V, E), where V is a finite set of vertices (aka node) and E is a set of ordered pairs of vertices (u, v)

e.g.



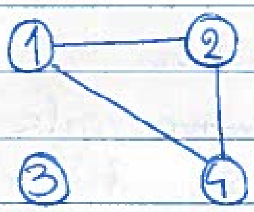
$V = \{1, 2, 3\}$

$E = \{(1,2), (2,2)\}$

tuples (order)

Undirected Graph G is a pair (V, E), where V is a finite set of vertices and E is a set of unordered pairs $\{u, v\}$, where $u \neq v$.

e.g.



$V = \{1, 2, 3, 4\}$

$E = \{\{1,2\}, \{1,4\}, \{2,4\}\}$

sets (no order)

Choosing what type of graph to use:

TRANSPORTATION: • direct flights (undirected graph)
• streets (directed graph)

SOCIAL NETWORKS: • friendship (undirected) • "has crush on" (directed)

$u \xrightarrow{e} v \qquad e = (u, v)$

e leaves from u to v
e incident from u to v
v is adjacent to u

out degree : number of edges starting from u
in degree : ———— " ———— ending in u

e.g.  = u has in degree 3
and out degree 1