

ACOL 215

(01 Sept. 2025)

Digital logic and System Design

Representation

Basic set theory

A set is a collection of
distinct objects.

Subset
Supersets

Union

Intersection

Set difference

Power set of a set

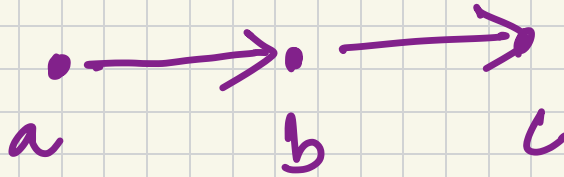
$\{1, 2, 3, 4, 5\}$

32 \approx 2^5 elements

Ordered pairs

$\{ \underline{(a,b)}, (b,c) \}$

directed
graph



Binary relation

$$R = \{(a, b)\}$$

$$n = n$$

$$m = n$$

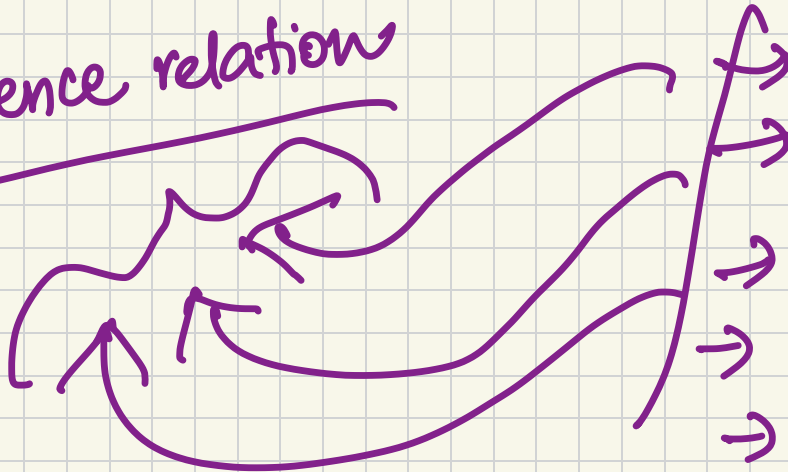
$$m = n$$

$$n = m$$

$$n = p \text{ then } m = p$$

$$\underline{\underline{a R b}}$$

equivalence relation



reflexive

symmetric

transitive

antisymmetric

irreflexive

Partially ordered set

\leq

$$a \leq a$$

$$a \leq b$$

$$b \leq a$$

then $a = b$

$$a \leq b$$

$$b \leq c$$

then

$$a \leq c$$

reflexive
transitive
antisymmetric

Let S be a partially ordered set
and $P \subseteq S$, then an
element $s \in S$ is an upper bound
of P iff $\forall p \in P, p \leq s$.

lower bound ||
~~greatest~~ lower bound || least upper bound
} bound

Lattice A partially ordered set in which every pair of elements has a unique greatest lower bound and a unique least upper bound is called a lattice.

$\{a, b, c\}$

$\phi, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}$

$\{a, b, c\}$

