Lecture 5: Relations

Def

A **relation** between set A and set B is a subset (or equal) of $A \times B$

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

$$A \times B = \{(1,a), (1,b), (1,c), (2,a), (2,b), (2,c), (3,a), (3,b), (3,c)\}$$

example of relations between A and B

$X_1 = \{(1,a), (2,b), (3,c)\}$ ($X_1 \subseteq A \times B$ so relation from A to B)

$(2,a) \in X_2$

$X_2 = \{(2,a)\}$ ($X_2 \subseteq A \times B$ so a relation)

2 X_2 a

$X_3 = \{\}$? $X_3 \subseteq A \times B$?

Notations coming up

- Relations
- properties of relations
- Functions (a special kind of relation)
- properties
  - * injection
  - * surjection
  - * bijection

An X_i is a relation of $A \times B$ if $X_i \in \mathcal{P}(A \times B)$

!!! (equivalent)

$X_i \subseteq A \times B$

ANY SUBSET OF $A \times B$ IS A RELATION FROM A to B

⚠ A relation from A to A (same set in both cases) is called an endo relation

"endo" = itself

Notations: If X_1 is a relation then it is equivalent to write:

$(1,2) \in X_1$ $\quad$ $1 \; X_1 \; a$

↑ the relation can be used as an operator