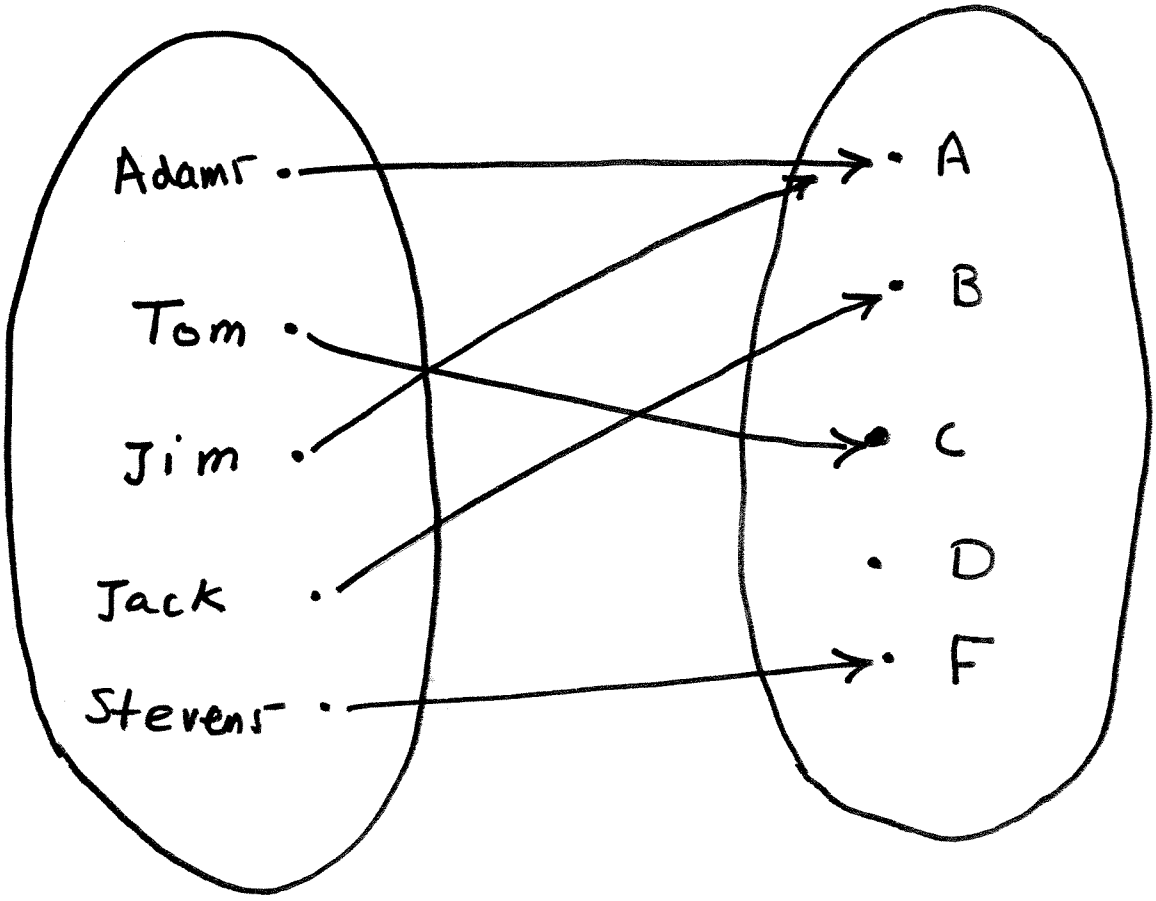
Functions

$A = \{ \text{Adams}, \text{Tom}, \text{Jim}, \text{Jack}, \text{Stevens} \}$

$B = \{ A, B, C, D, F \}$



A function f from A to B is an assignment of exactly one element of B to each element of A

Functions & Relations

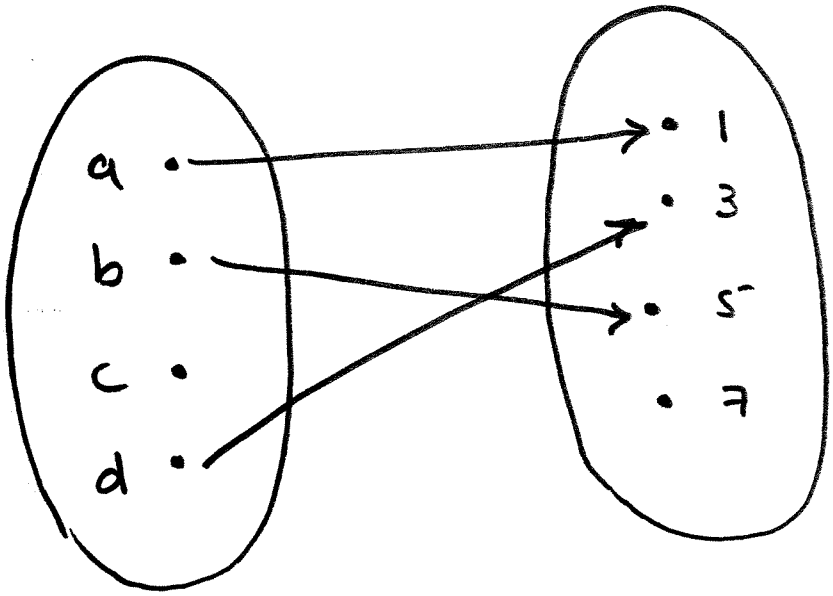
Functions are special case of relations

$$f : A \longrightarrow B$$

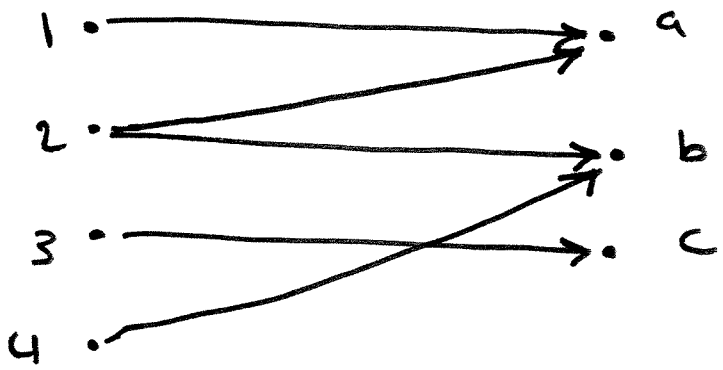
$$f \subseteq A \times B$$

every function is a relation

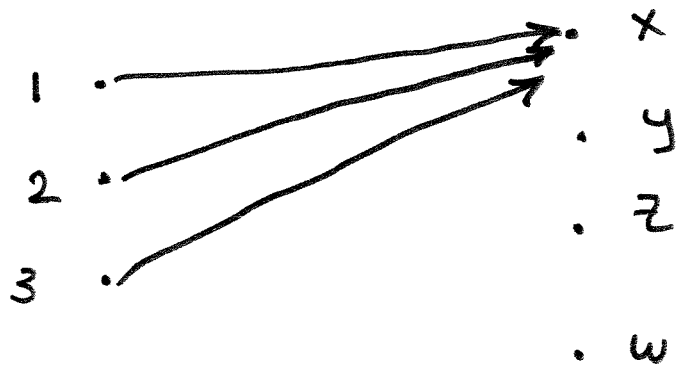
not every relation is a function



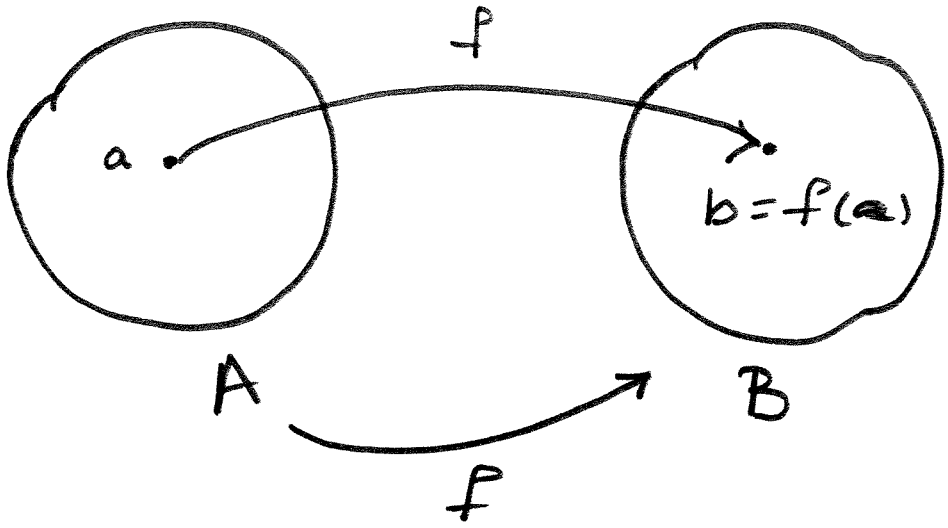
Not a function



Not a function



a Functio



$f: A \to B$ f maps A to B

$f(a) = b$

A: Domain of f

B: Codomain of f

if $f(a) = b$

b is the <u>image</u> of a under f

a is the <u>pre image</u> of b

range of f: set of all images of A

One-to-one
Injective
} functions

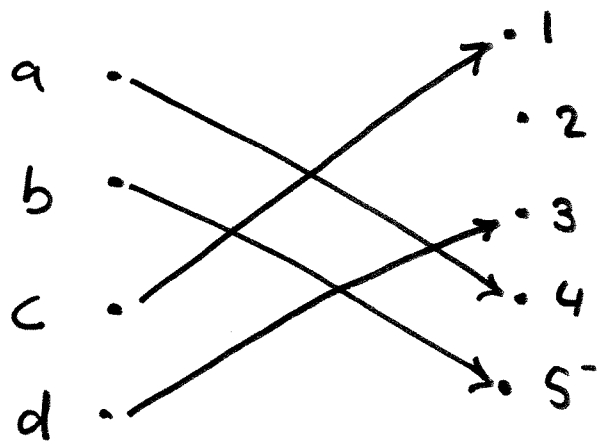
pre image is unique

if $a \neq b$ then $f(a) \neq f(b)$

or

$f(a) = f(b) \longrightarrow a = b$

Ex:



one to one

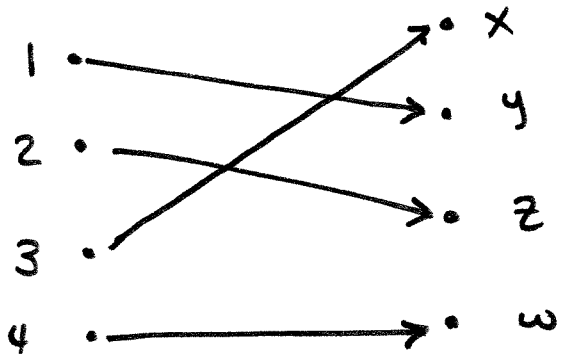
what about $f(x) = x^2$

$f(1) = f(-1) = 1$ but $1 \neq -1$

not one to one

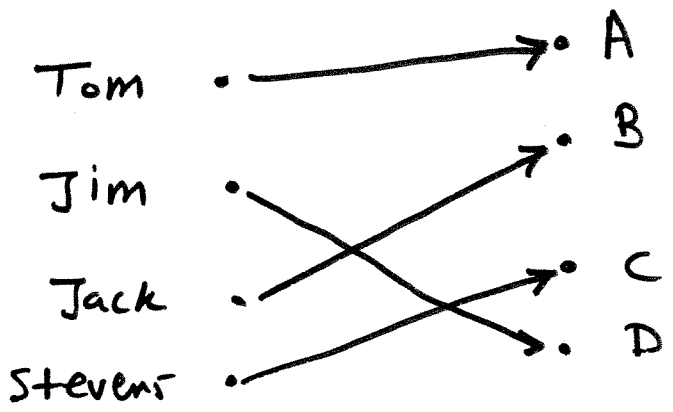
Onto
Surjective } functions

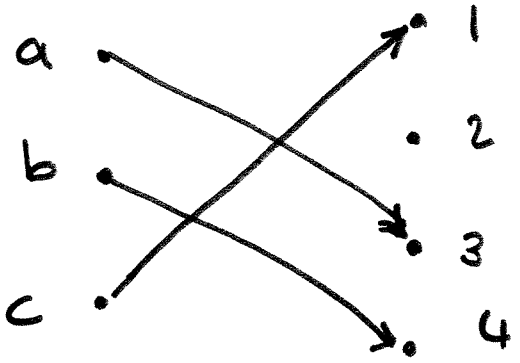
if every y in B has a preimage



ONTO

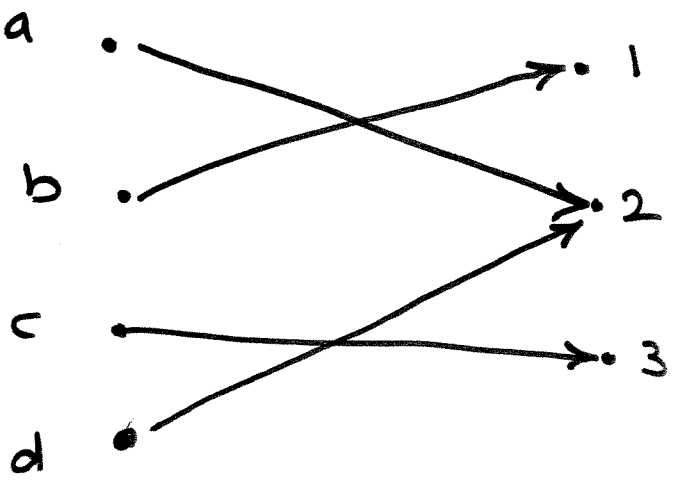
f is called one-to-one Correspondence or bijection if it is both one-to-one & onto





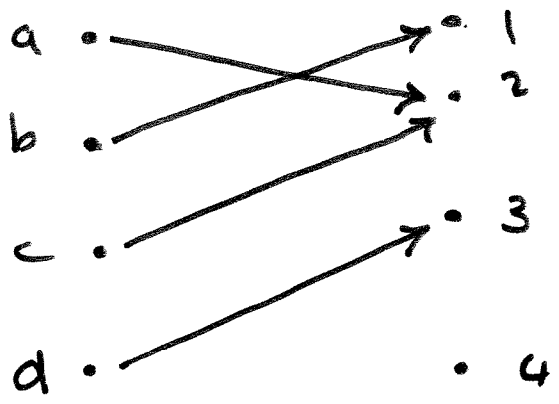
one to one

not onto



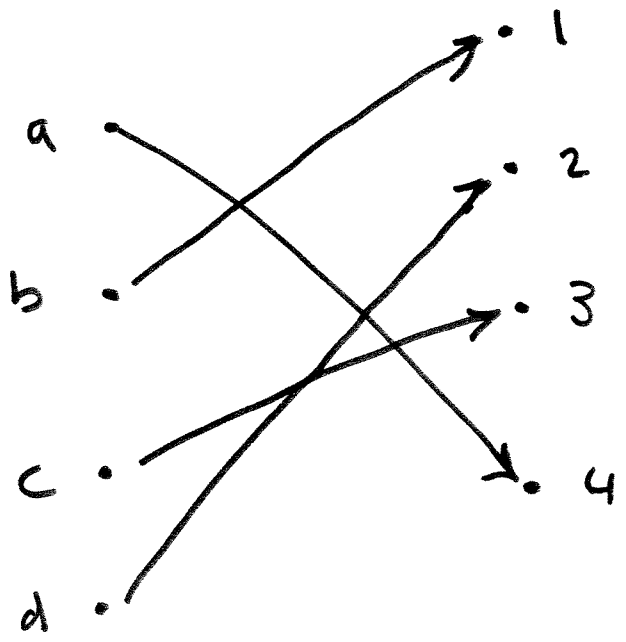
not one to one

onto



not onto

not one to one



onto

one to one

one-to-one Correspondence

bijection

$\lfloor 1/2 \rfloor = 0$

$\lceil 1/2 \rceil = 1$

$\lfloor -1/2 \rfloor = -1$

$\lceil -1/2 \rceil = 0$

$\lfloor 3.1 \rfloor = 3$

$\lceil 3.1 \rceil = 4$

$\lfloor -3.1 \rfloor = -4$

$\lceil -3.1 \rceil = -3$

$\lfloor 7 \rfloor = 7$

$\lceil 7 \rceil = 7$