Functions

Methods: Logic, Part 3b

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Topics covered

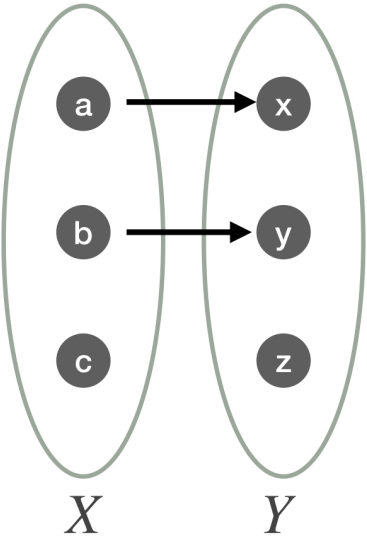
- functions
- properties of functions
  - injective
  - surjective
  - bijective

Functions

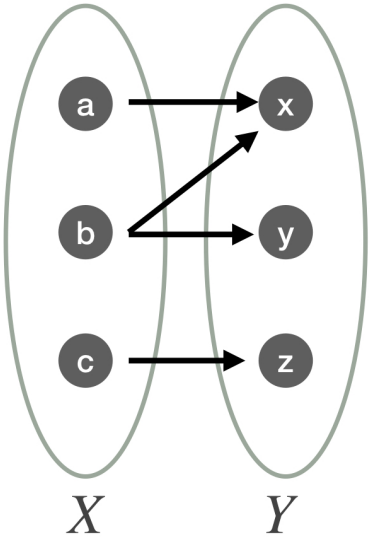
Definition

A function $f : X \to Y$ is a relation $f \subseteq X \times Y$ such that for every $x \in X$ there is a unique $y \in Y$ with $\langle x, y \rangle \in f$. We write $f(x)$ for the unique $y \in Y$ with $\langle x, y \rangle \in f$.

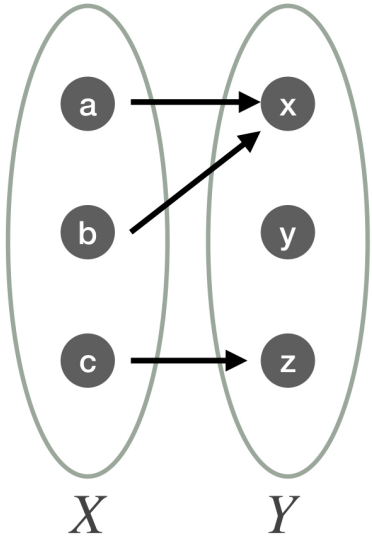
~~function~~ –



~~function~~ –



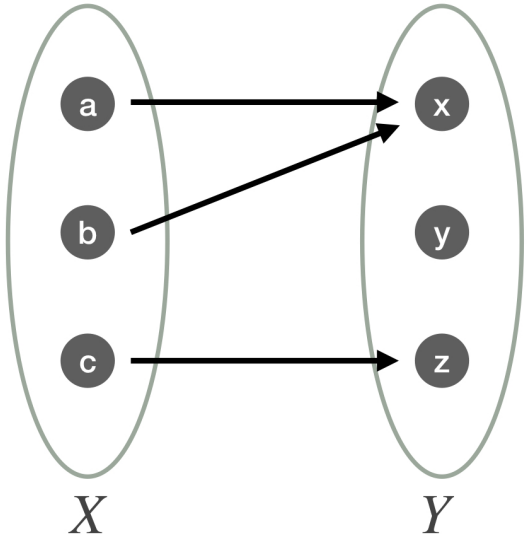
function ✔



Injection, surjection, bijection

A function $f : X \to Y$ is

- *injective* iff $f(x_1) = f(x_2)$ implies $x_1 = x_2$ [every x has its own unique y]
- *surjective* iff for each $y \in Y$ there is an $x \in X$ with $f(x) = y$ [every y is covered by some *unique* x]
- *bijective* iff f is injective and a surjective

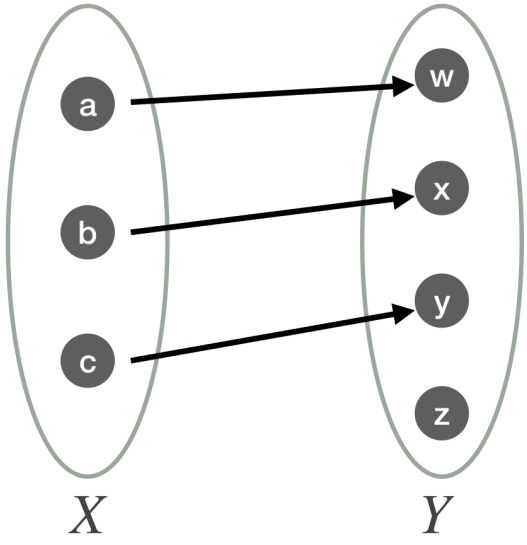


function ✔

~~injection~~ –

~~surjection~~ –

~~bijection~~ –

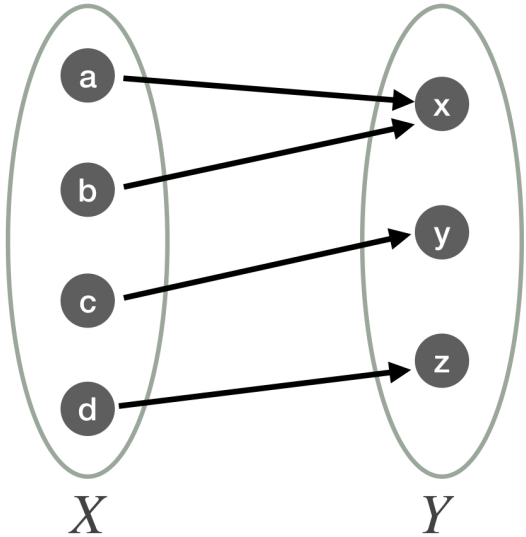


function ✔

injection ✔

~~**surjection**~~ –

~~**bijection**~~ –

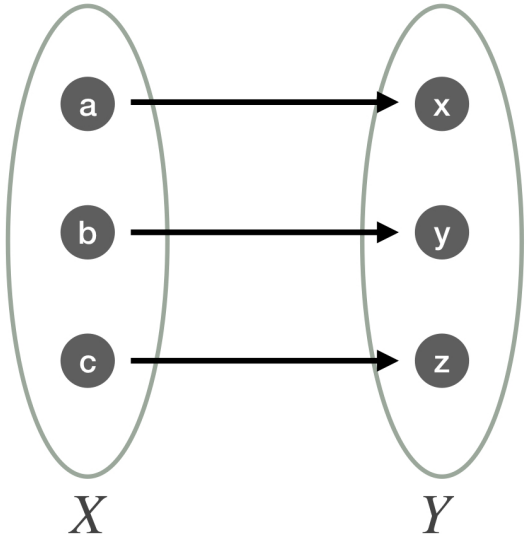


function ✔

~~**injection**~~ –

surjection ✔

~~**bijection**~~ –



function ✔

injection ✔

surjection ✔

bijection ✔