

## Osnovne operacije na množicah

$A \times B \rightsquigarrow (A, B)$  zapisi

$B^A \rightsquigarrow A \rightarrow B$

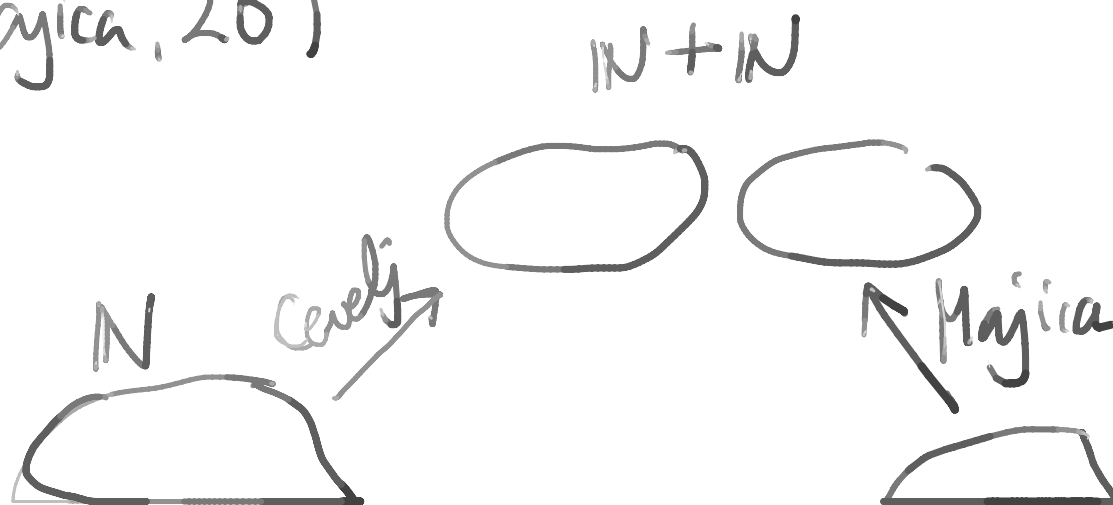
$A + B = \{(0, a) \mid a \in A\} \cup \{(1, b) \mid b \in B\}$

$\mathbb{N} + \mathbb{N}$

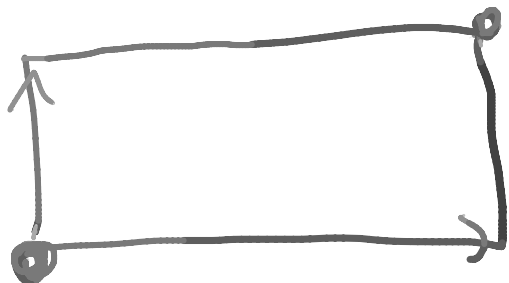
$\downarrow$   
(Cevelj, 15)

(Majica, 20)

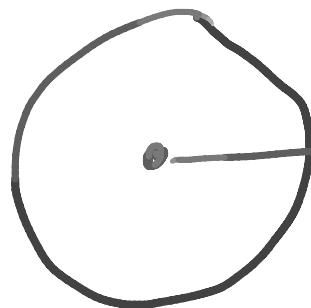
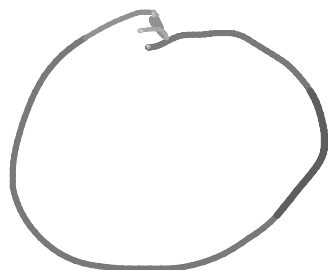
Cevelj 15



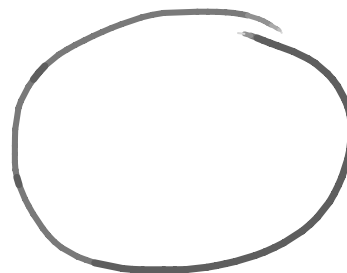
Vsote

 $\{*\} + \{*\}$  $\{\{False, True\}\}$ False ~~///~~ True ~~///~~ $\mathbb{R} \times \mathbb{R} \times \mathbb{R} \times \mathbb{R}$ 

+

 $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$  $\mathbb{R} \times \mathbb{R}$ 

→  
Point



## Zapisi (Record)

$$\text{String} \times \text{String} \times \mathbb{Z} \times \mathbb{R} \times \text{String}$$

$$\begin{array}{ccc} \mathbb{R} & \times & \mathbb{R} \times \mathbb{R} \\ x & & y \quad z \end{array}$$

$$(7, 5, 8)$$

$$x=7, y=5, z=8$$

$$\text{Shape} :: \text{Type}$$

$$\text{List} :: \text{Type} \rightarrow \text{Type}$$

data

Maybe

NULL, undef, None, nan, undefined, ...  
null

A + { ~~Null~~ }

~~Some~~

~~None~~

Just

Nothing

class Room {

boolean zasedena;

false

Person gost;

g

...

class Room

class EmptyRoom

class Occupied Room  
gost

data Room = Empty | Occupied Person

data Room = Room { empty : Bool  
, guest : Person  
}

## Induktivne in koinduktivne definicije

 $\mathbb{Z}$  $\mathbb{S}$ 

$$\mathbb{N} = \Phi(\mathbb{N}) \quad ?!$$

$$\Phi : \underline{\text{Set}} \rightarrow \underline{\text{Set}}$$

$$\text{Type} \rightarrow \text{Type}$$

funktor

$$\text{fib} : \mathbb{N} \rightarrow \mathbb{N}$$

$$\text{fib} = \Phi(\text{fib})$$

$$\Phi : (\mathbb{N} \rightarrow \mathbb{N}) \rightarrow (\mathbb{N} \rightarrow \mathbb{N})$$

$$\Phi(A) = A + \{*\}$$

$$\Phi(\Phi(\Phi(\Phi(\Phi(\dots$$

N

$$\phi(A) = \{(0,0)\} \cup \{(1,a) \mid a \in A\}$$

$$S = \phi(S) ?$$

$$\Phi(\{3\}) = \{(0,0)\}$$

$$\Phi(\Phi(\{3\})) = \{(0,0), (1, (0,0))\}$$

$$\bigcup_n \Phi^n(\{3\})$$

$$\Phi(\mathbb{R}) = \{(0,0)\} \cup \{(1,x) \mid x \in \mathbb{R}\}$$

## Drevo

