

Rekurzija & sestopanje

Funkcijski predpisi v Pythonu

$$x \mapsto x^2 + 3$$

"X se slika v $x^2 + 3$ "

$$f: (x, y) \mapsto x + 2y^2$$

$$(x \mapsto x^2 + 3)(7) = 7^2 + 3$$

$$g: \underline{x} \mapsto (y \mapsto x + 2y^2)$$

$$f(2, u+1) = 2 + 2(u+1)^2$$

$$g(2, u+1) = \text{NAPAKA}$$

$$g(2) = (y \mapsto 2 + 2y^2)$$

$$g(2)(u+1) = 2 + 2(u+1)^2$$

λ -abstrakcija:

$$x \mapsto x^2 + 2$$

$$\lambda x. x^2 + 2$$

Python:

lambda x: x**2 + 2

Funkcije višjega reda:

$$f: \mathbb{R} \rightarrow \mathbb{R}$$

\mathbb{R} red 0
 $\mathbb{R} \rightarrow \mathbb{R}$ red 1
 red 2?

$$F: (\mathbb{R} \rightarrow \mathbb{R}) \rightarrow \mathbb{R} \quad \text{red 2}$$

$\underbrace{\hspace{10em}}$
 funkcije iz $\mathbb{R} \rightarrow \mathbb{R}$

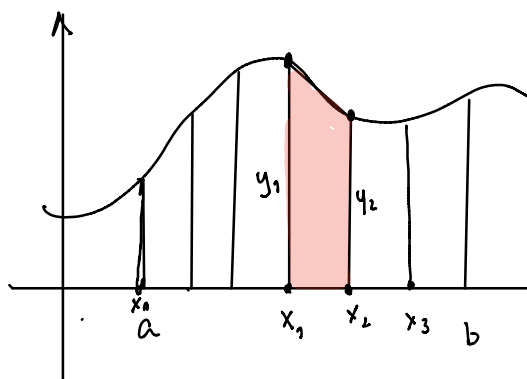
F slika funkcije u šerila

$$I: (\mathbb{R} \rightarrow \mathbb{R}) \rightarrow \mathbb{R}$$

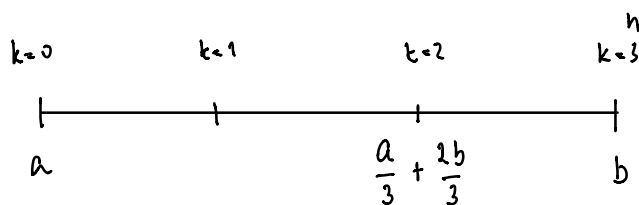
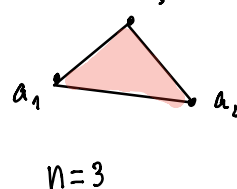
$$I(f) := \int_0^1 f(x) dx$$

$$\int_0^1 f$$

$$\text{map}(f, [a_0, a_1, \dots, a_n]) := [f(a_0), f(a_1), \dots, f(a_n)]$$



λ_i koeficijenti
 $\lambda_1 a_1 + \lambda_2 a_2 + \dots + \lambda_n a_n$
 $0 \leq \lambda_i \leq 1 \quad \sum_i \lambda_i = 1$
 konveksna



Rekurzivne funkcije

Funkcije, ki smejo klicati same sebe.

Primer:

$$x_0 = 2$$

$$x_{n+1} = \frac{1}{2}x_n + 3 \quad \forall n \geq 0$$

$x: \mathbb{N} \rightarrow \mathbb{R}$ Pišemo x_n namesto $x(n)$

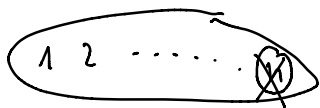
Primer: Binomski koeficient $\binom{n}{k}$

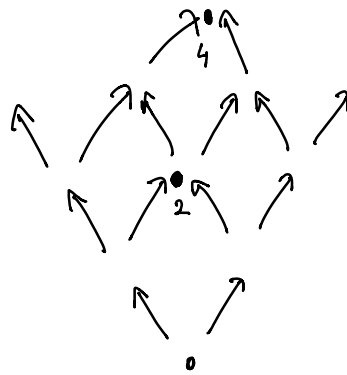
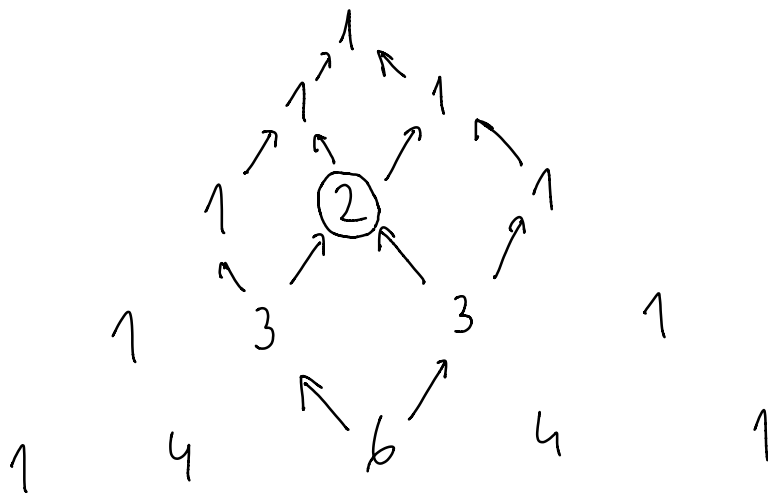
$\binom{n}{k}$: število podmnožic velikosti k množice $\{1, 2, \dots, n\}$

$$\binom{n}{0} = 1$$

$$\binom{n}{n} = 1$$

$$\binom{n}{k} = \begin{cases} 1 & k=0 \text{ ali } n=k \\ 0 & k < 0 \text{ ali } k > n \\ \binom{n-1}{k} + \binom{n-1}{k-1} & 0 < k < n \end{cases}$$





$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

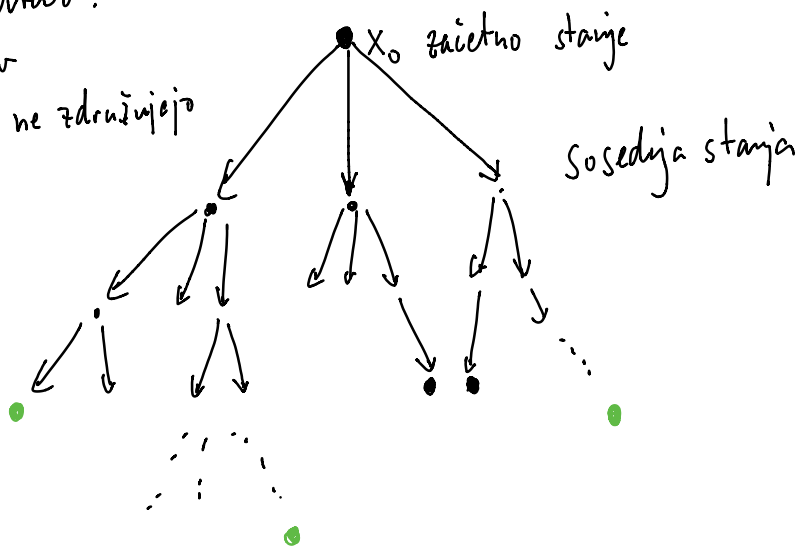
$$\binom{100}{99} = \frac{100!}{99! \cdot 1!}$$

Sestopanje

(Angl. backtracking)

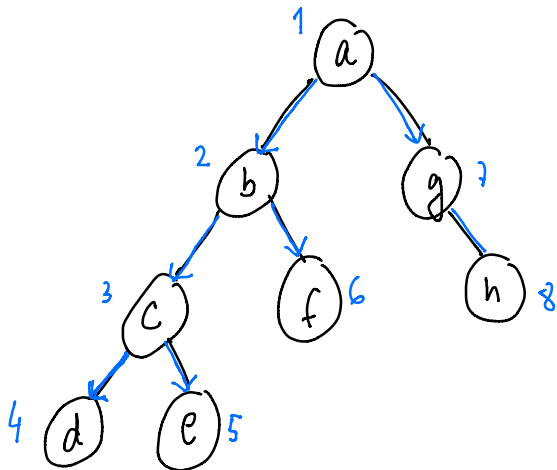
Preiskovalno drevo:

- ni ciklov
- stanja se ne združujejo

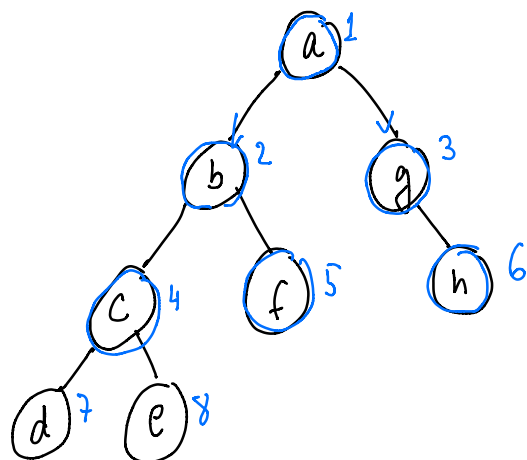


To drevo preiščemo:

- 1) V globino (depth-first search, DFS) ali sestopanje



2. V širino (breadth first search - BFS)



~~XXXXXX~~
vrsta čakajočih

Naloga: Dana je množica števil $S = \{a_1, \dots, a_m\}$ in $n \in \mathbb{N}$.

Poišči $T \subseteq S$, da bo $\sum_{k \in T} k = n$.

Primer:

$$S = \{1, 2, 3, 4, 5\} \quad n = 12$$

$$\text{Rešitev: } T = \{3, 4, 5\}$$

$$T = \{1, 2, 4, 5\}$$

⋮

