estruturas de dados persistentes

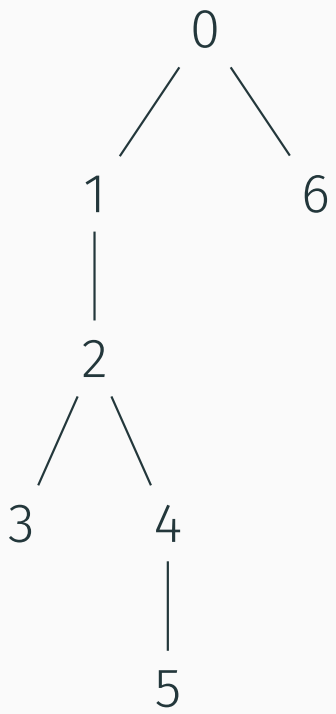
Yan Soares Couto

Orientadora: Cristina Gomes Fernandes

2019

Instituto de Matemática e Estatística

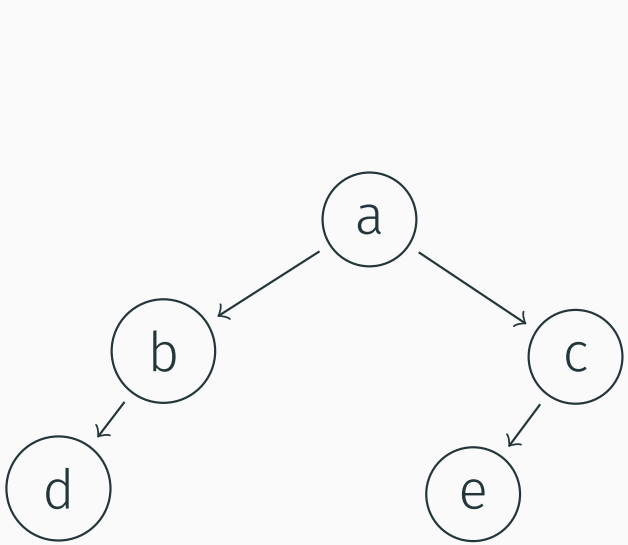
persistência

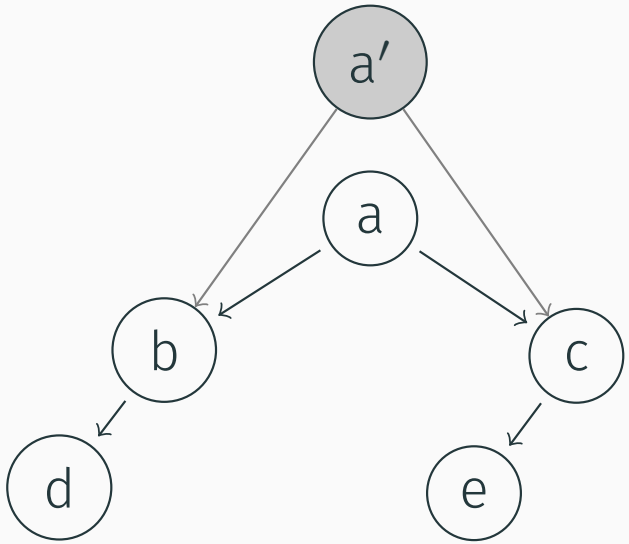


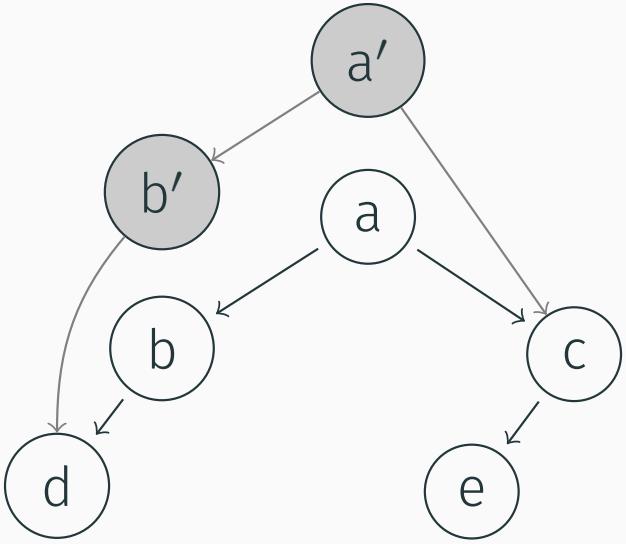
$p_0 = \text{Stack}()$
$p_1 = \text{Push}(p_0, 5)$
$p_2 = \text{Push}(p_1, 7)$
$p_3 = \text{Push}(p_2, 6)$
$p_4 = \text{Pop}(p_2)$
$\text{Top}(p_3)$
$p_5 = \text{Push}(p_4, 9)$
$\text{Top}(p_4)$
$p_6 = \text{Push}(p_0, 5)$

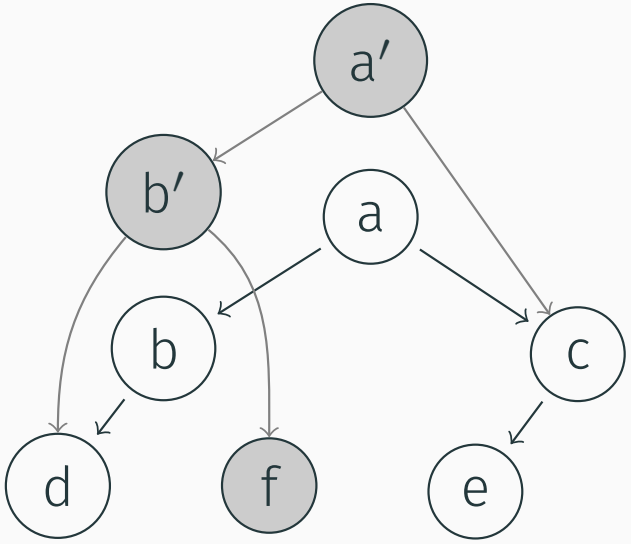
p_0 :
$p_1 : 5$
$p_2 : 5\ 7$
$p_3 : 5\ 7\ 6$
$p_4 : 5$
Devolve 6
$p_5 : 5\ 9$
Devolve 5
$p_6 : 5$

árvores -- implementação funcional









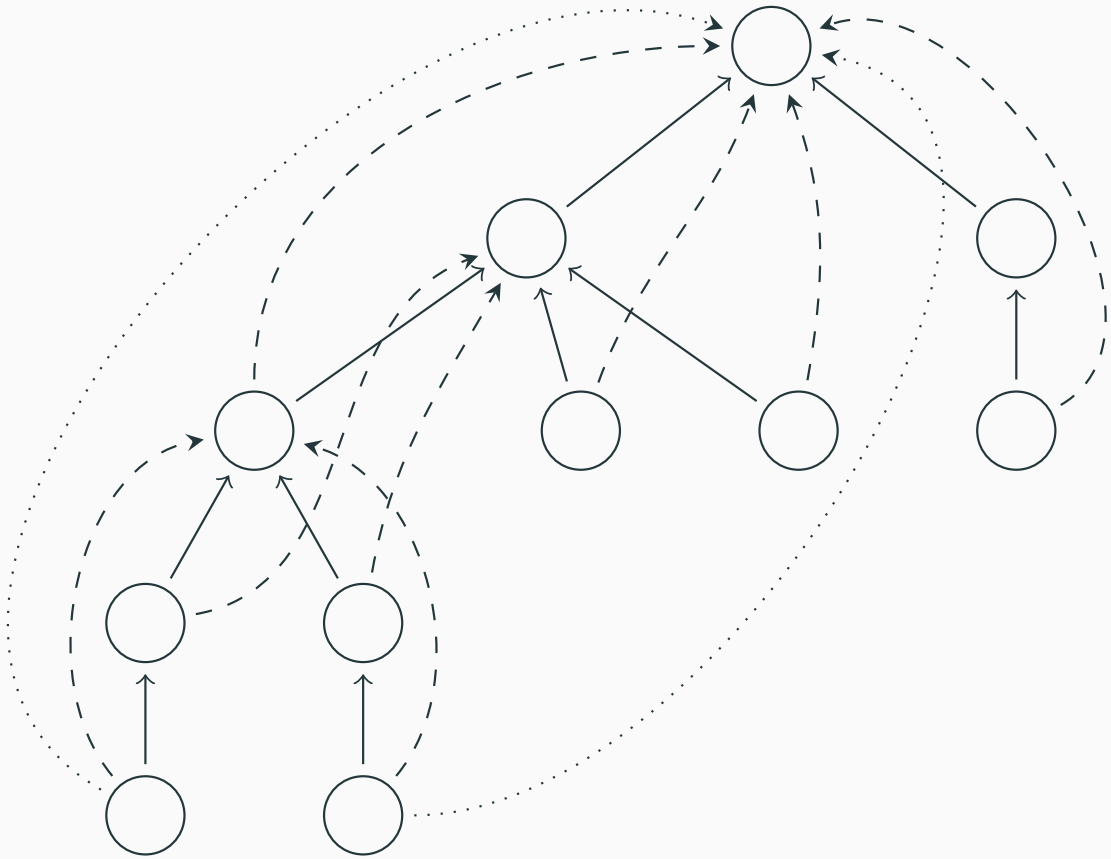
representações numéricas

$$
\begin{aligned}
59 &= 59 && \text{(decimal)} \\
&= 111011 && \text{(binária)} \\
&= 11120 && \text{(skew-binary)} \\
&= 102011 && \text{(binária redundante regular)}
\end{aligned}
$$

Ancestrais em árvores

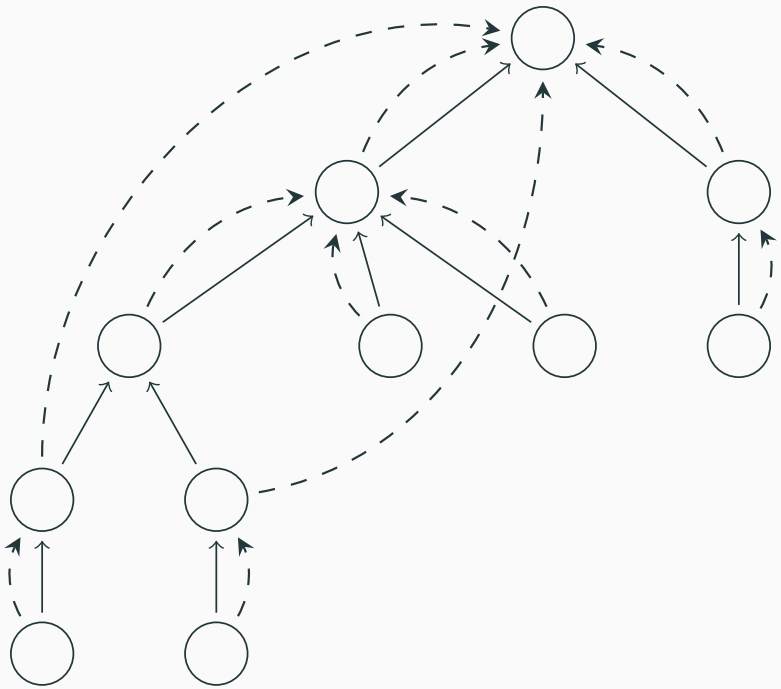
representação binária

$$43 = 101011 = 32 + 8 + 2 + 1$$



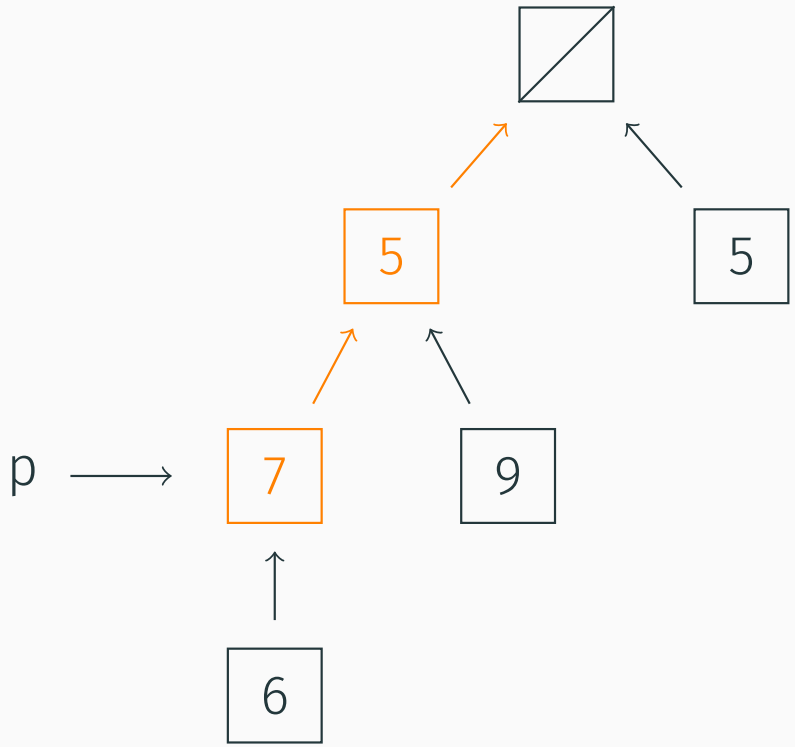
representação skew-binary

x	59	56	53	46	45	44	41	40
CSB	11120	11110	11100	11000	10200	10120	10110	10102
	x=J(x)	x=J(x)	x=J(x)	x=x−1	x=x−1	x=J(x)	x=x−1	

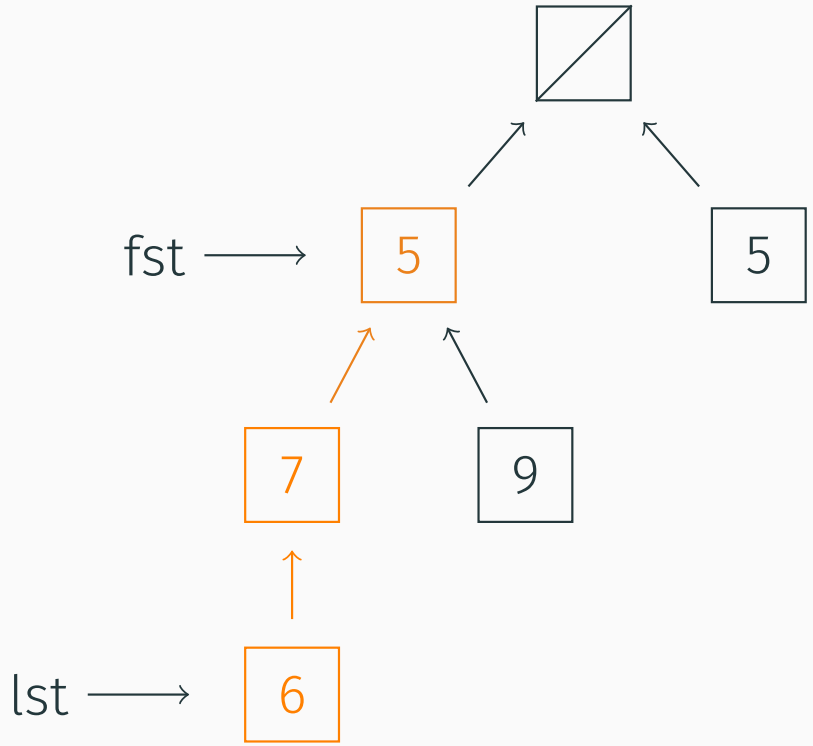


Estruturas

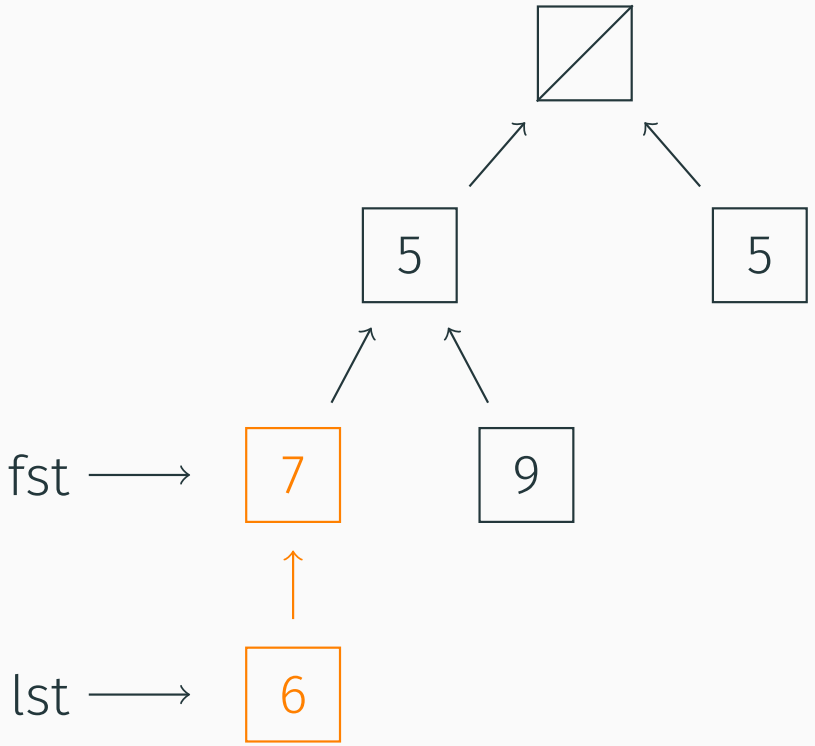
pilha



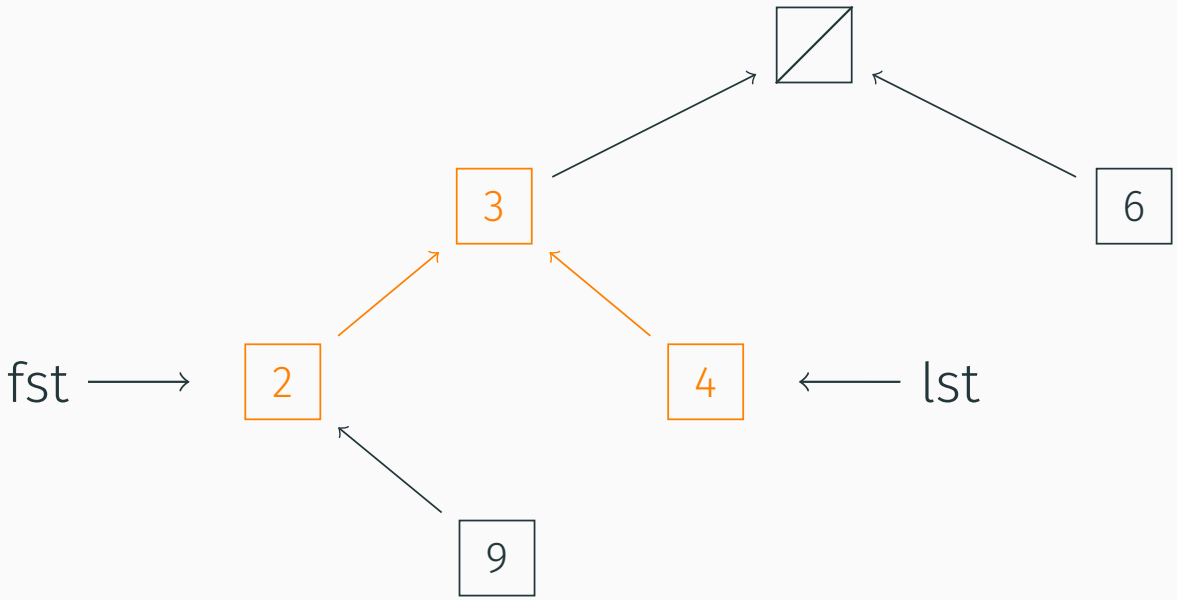
fila



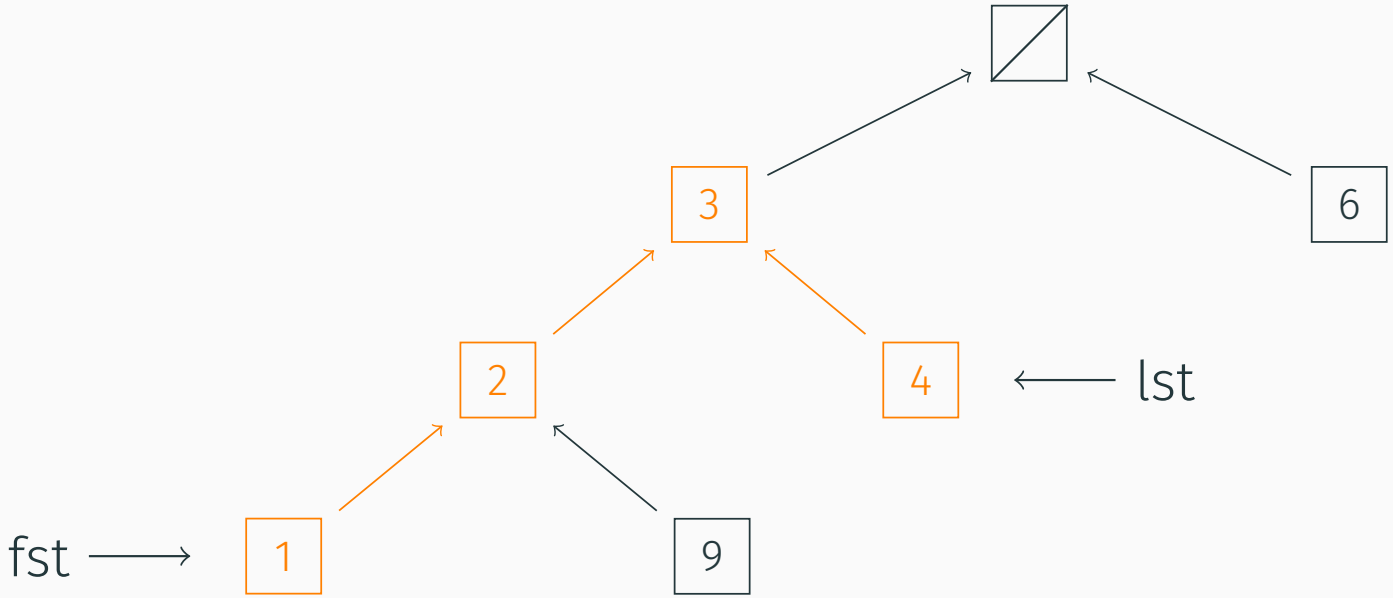
fila



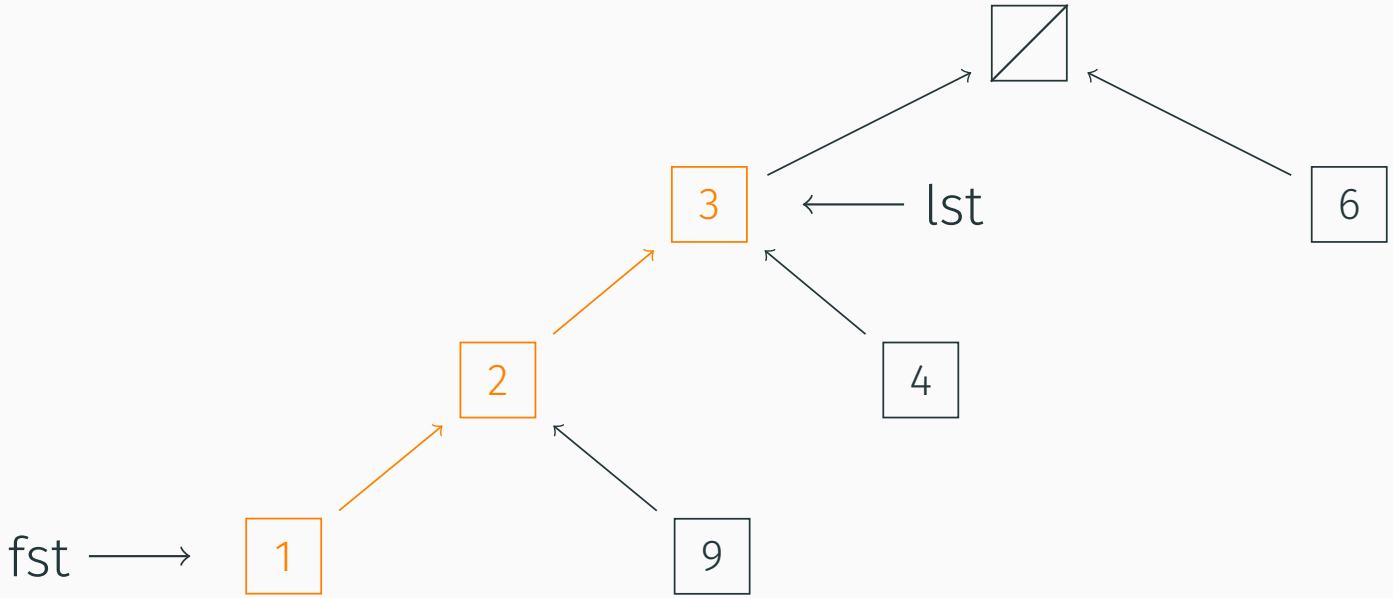
deque com la e lca



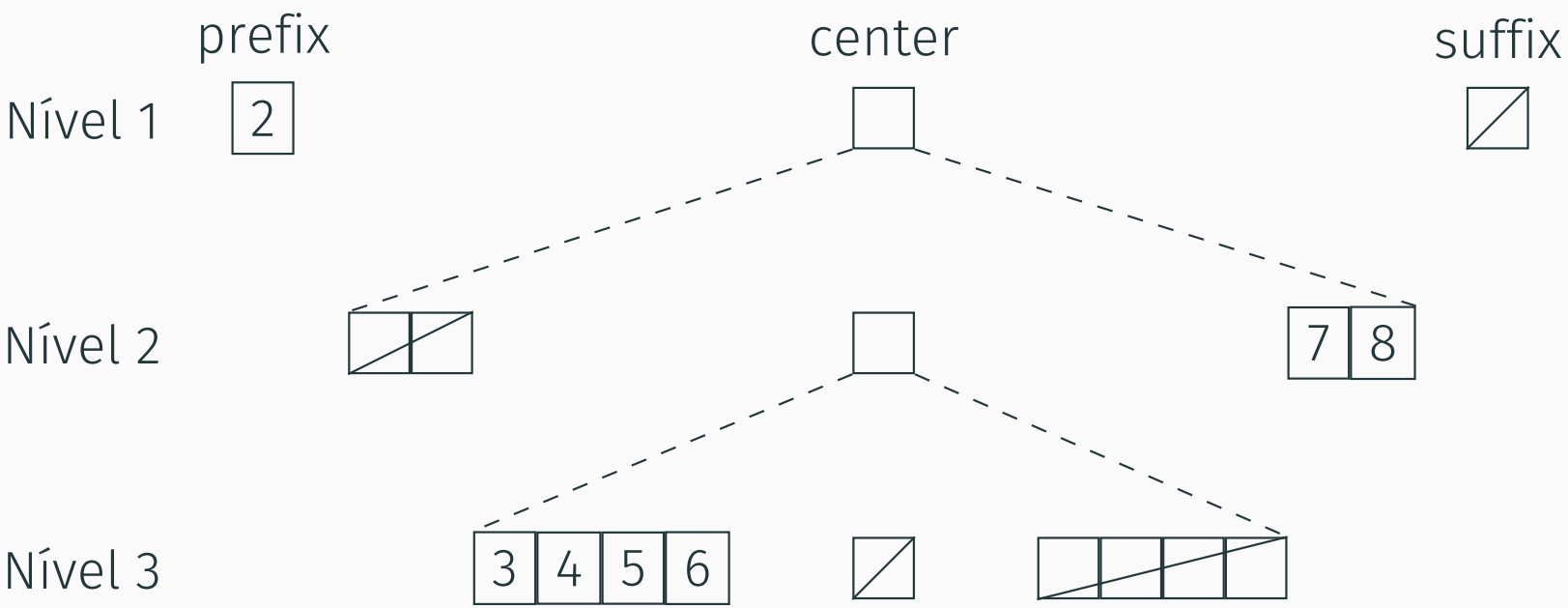
deque com la e lca



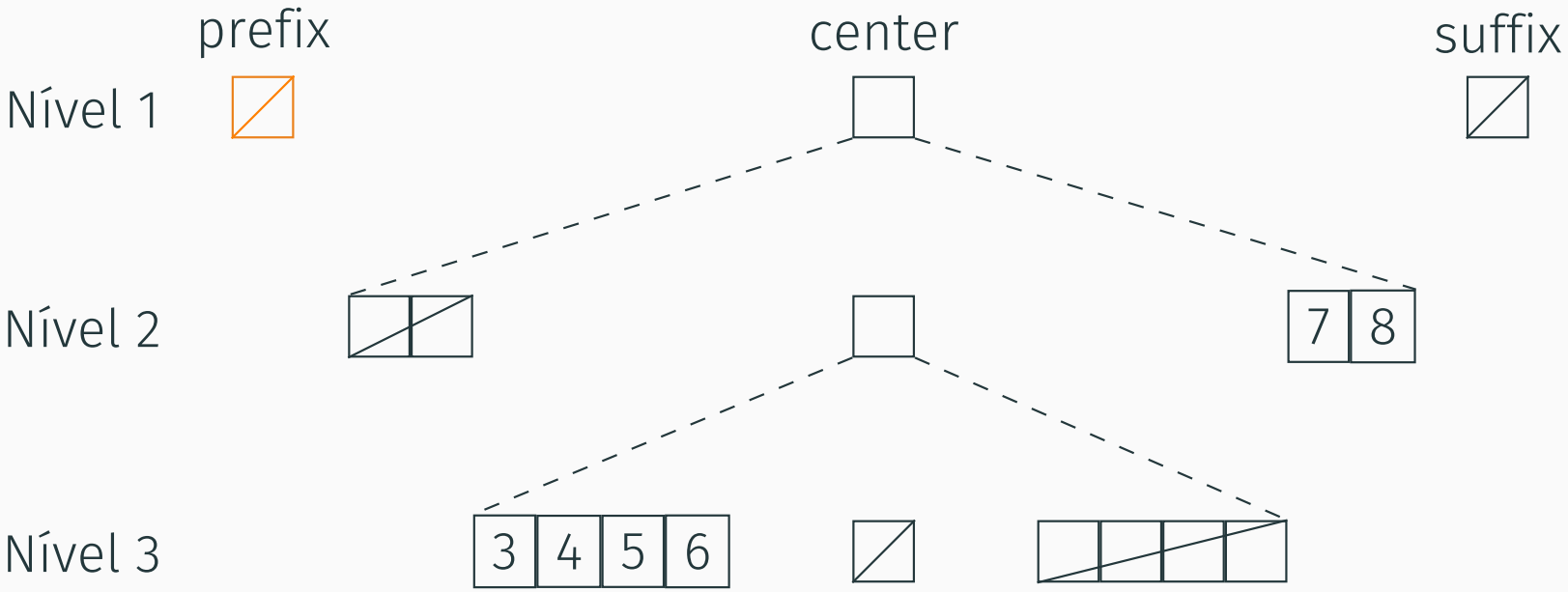
deque com la e lca



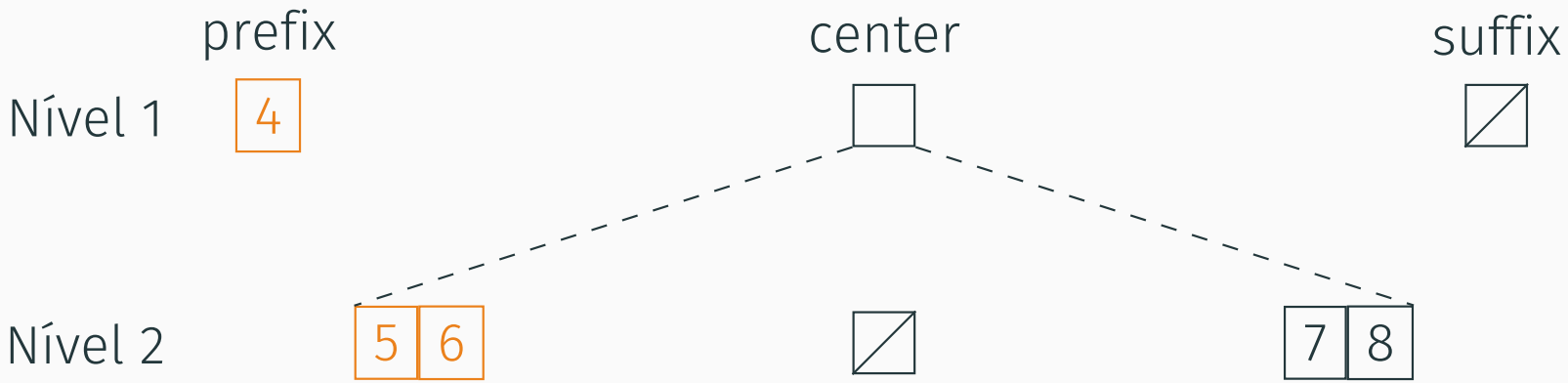
deque recursiva



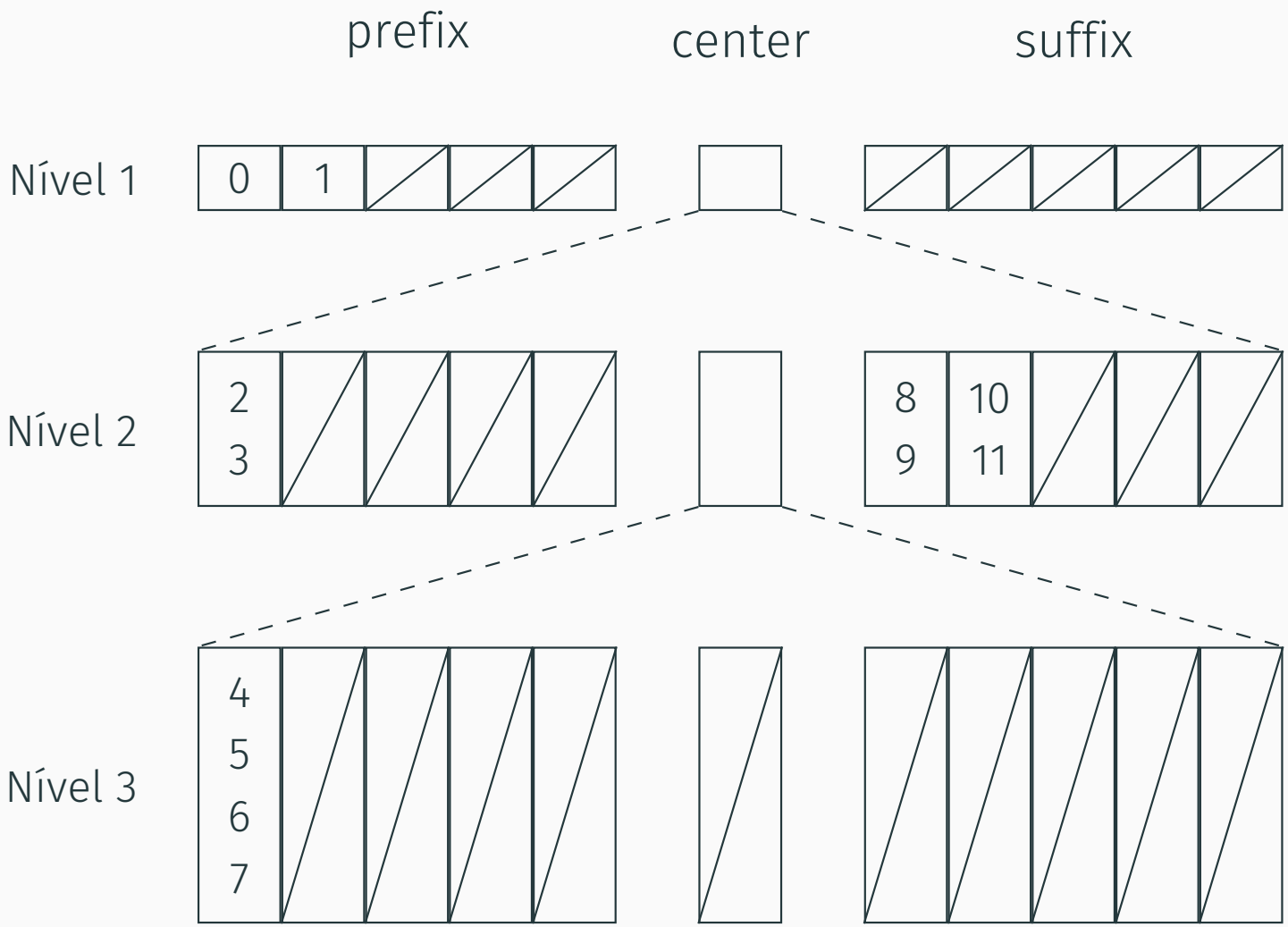
deque recursiva



deque recursiva



deque de kaplan e tarjan



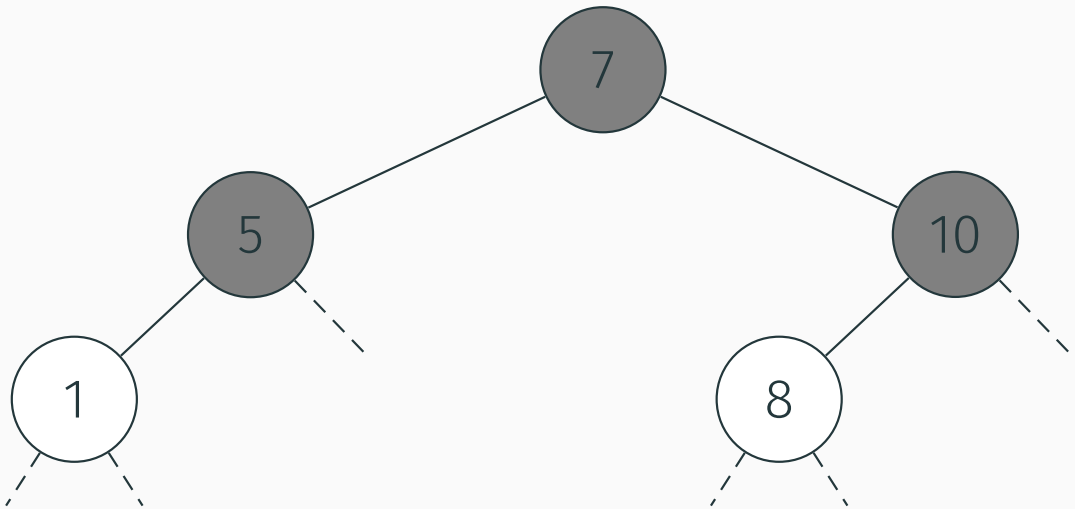
árvore rubro-negra

Implementação funcional: Totalmente persistente

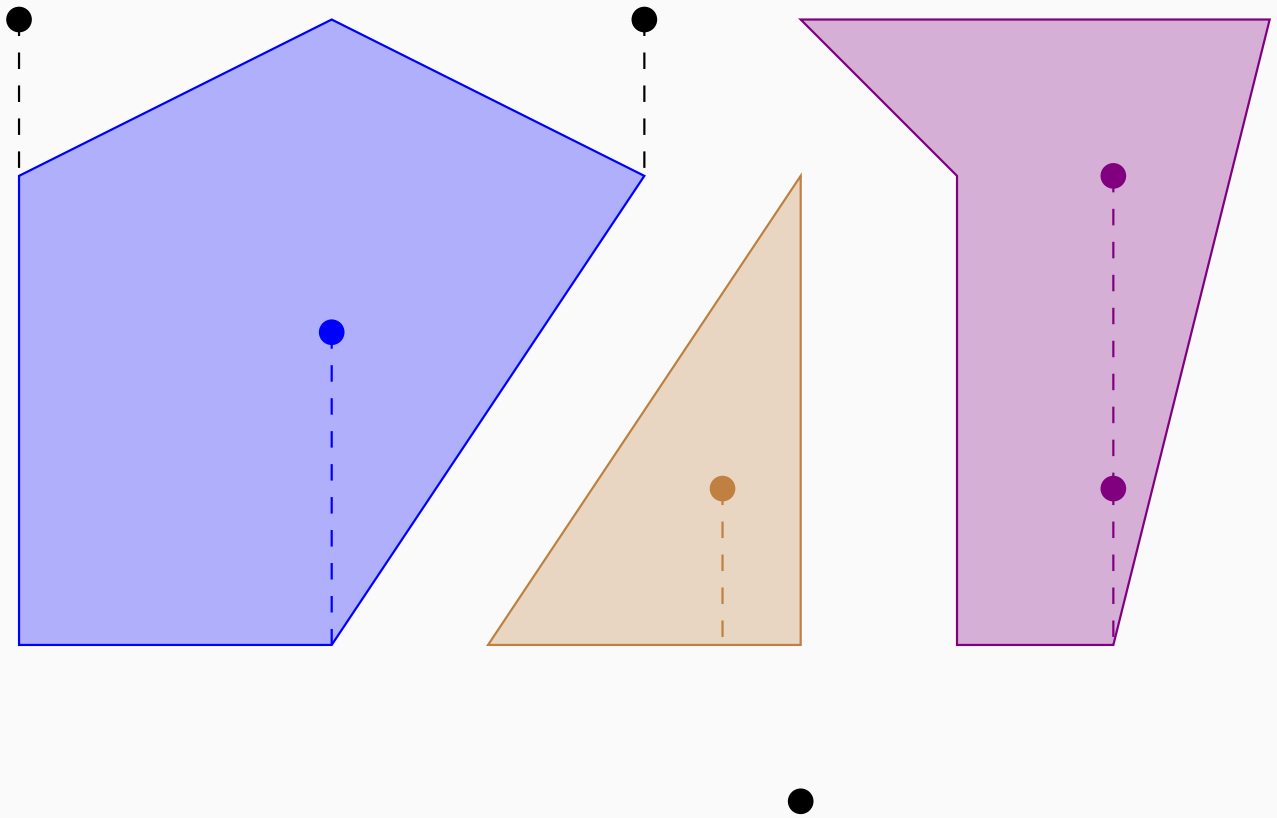
$\mathcal{O}(n \lg n)$ tempo e espaço

Implementação node copying: Parcialmente persistente

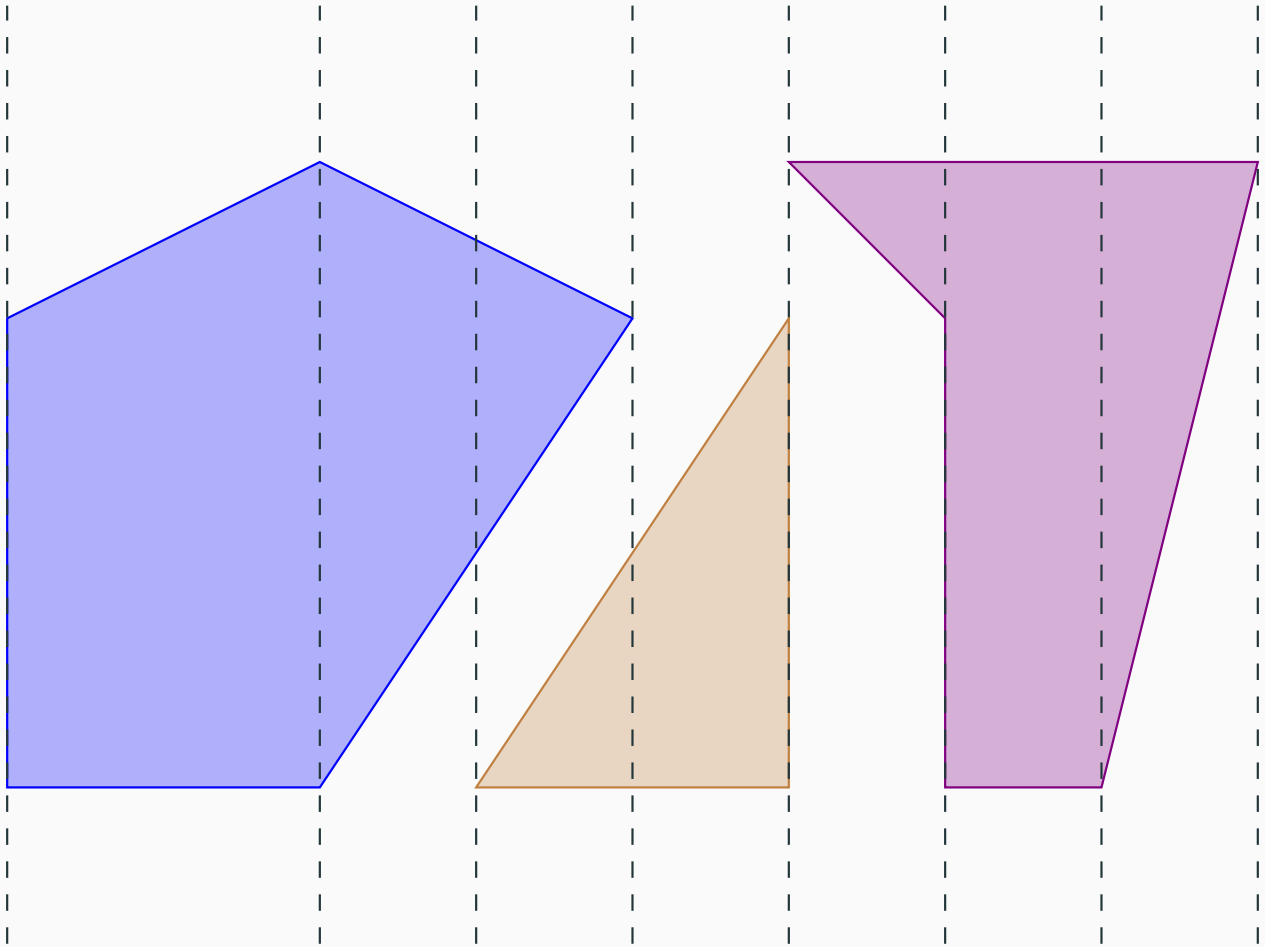
$\mathcal{O}(n \lg n)$ tempo e $\mathcal{O}(n)$ espaço



localização de ponto



localização de ponto



Obrigado!