

27/01/2022

Fila A

$$\textcircled{1} \quad T(n) = 2T\left(\frac{n}{3}\right) + 5n$$

$$T(1) = 1$$

$$\frac{n}{3^i} = 1 \rightarrow 3^i = n$$

$$i = \log_3 n$$

$$T\left(\frac{n}{3}\right) = 2T\left(\frac{n}{9}\right) + 5 \cdot \frac{n}{3}$$

$$T\left(\frac{n}{9}\right) = 2T\left(\frac{n}{27}\right) + 5 \cdot \frac{n}{9}$$

$$T(n) = 2 \cdot \left(2 \cdot \left(2T\left(\frac{n}{27}\right) + \frac{5}{9}n \right) + \frac{5}{3}n \right) + 5n =$$

$$= \frac{4}{9} \cdot 5n + \frac{2}{3} \cdot 5n + 5n + 8T\left(\frac{n}{27}\right) \rightsquigarrow 5n \cdot \sum \left(\frac{2}{3}\right)^i$$

$$5n \cdot \underbrace{\frac{2}{3}}_{\frac{2}{3}-1}^{\log_3 n+1} = -15n \left(\frac{2}{3} \cdot \frac{2}{3}^{\log_3 n} - 1 \right)$$

$$= 15n - 10n \cdot \frac{1}{n} \cdot n^{\log_3 2} =$$

$$= 15n - 10n^{\log_3 2} \rightarrow \Theta(n)$$

\textcircled{2} Primi due passi del quick sort \rightarrow crescente

(221) 16 89 56 144 27 33 91 132 37 49 53

Pivot = 53

49 16 89 56 144 27 33 91 132 37 221 53

49 16 37 56 144 27 33 91 132 89 221 53

49 16 37 33 144 27 56 91 132 89 221 53

49 16 37 33 27 144 56 91 132 89 221 53

49 16 37 33 27 53 56 91 132 89 221 144



Pivot = 27

49 16 37 33 27

16 49 37 33 27

16 27 37 33 49

16 27 37 33 49 53 56 91 132 89 144 221

Pivot = 144
NO SCAMBIO

56 91 132 89 221 144

56 91 132 89 144 221

③ Open addressing con linear probing

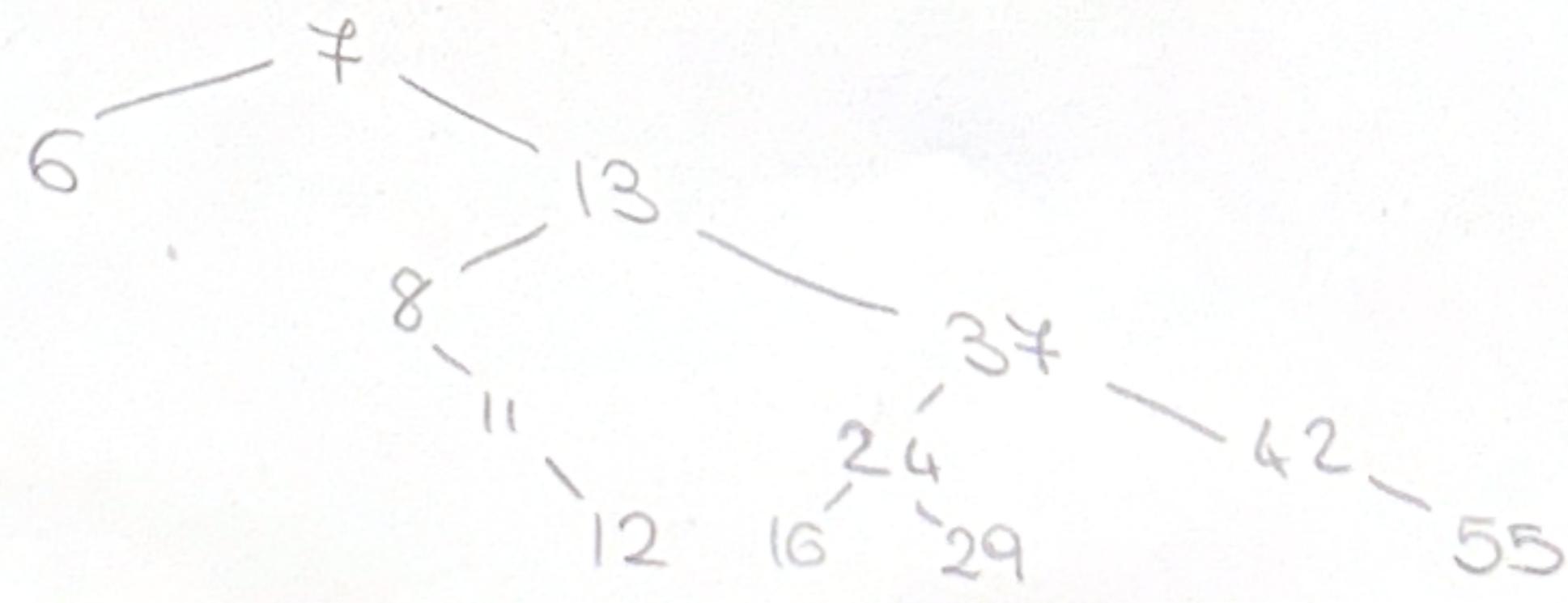
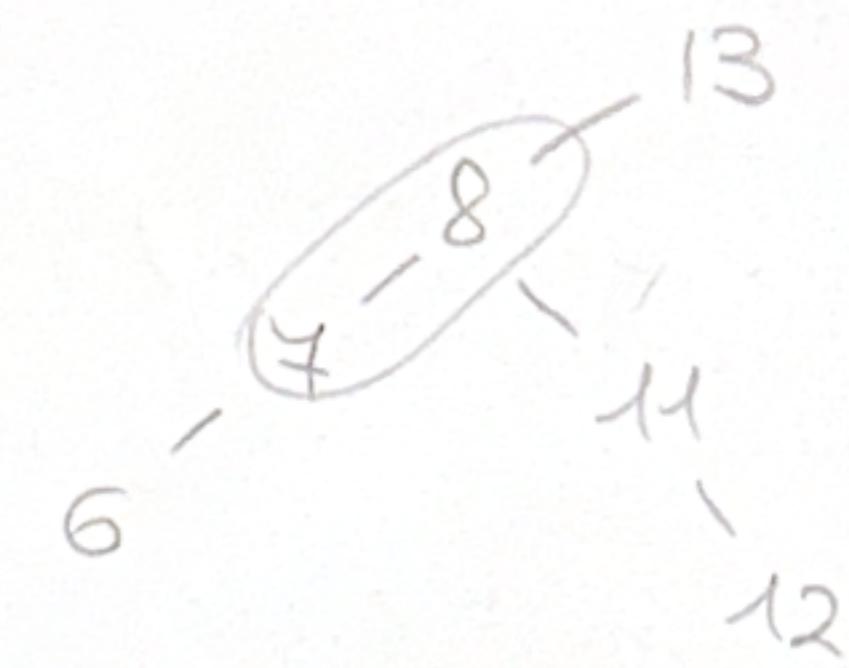
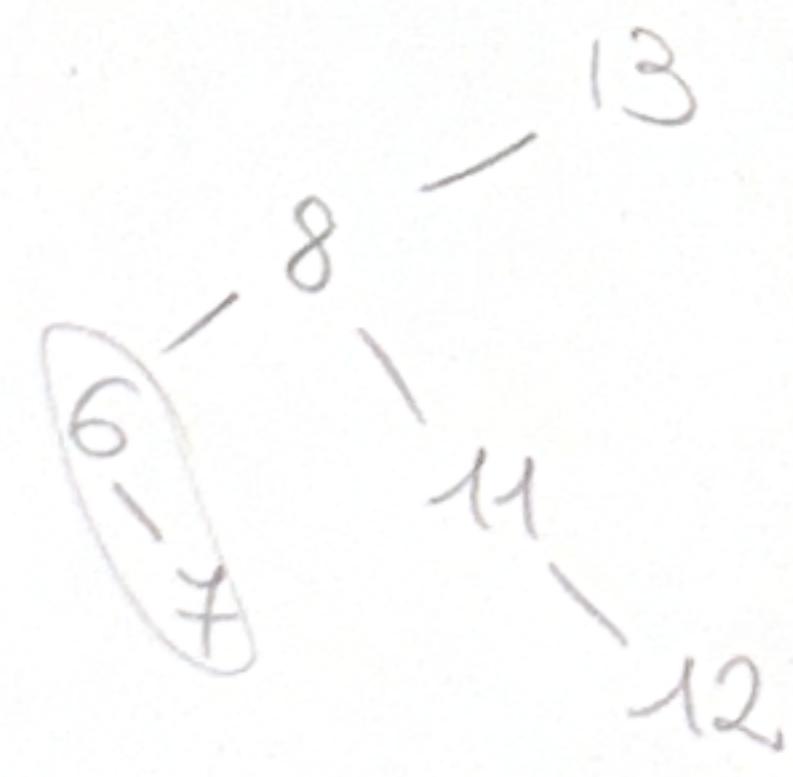
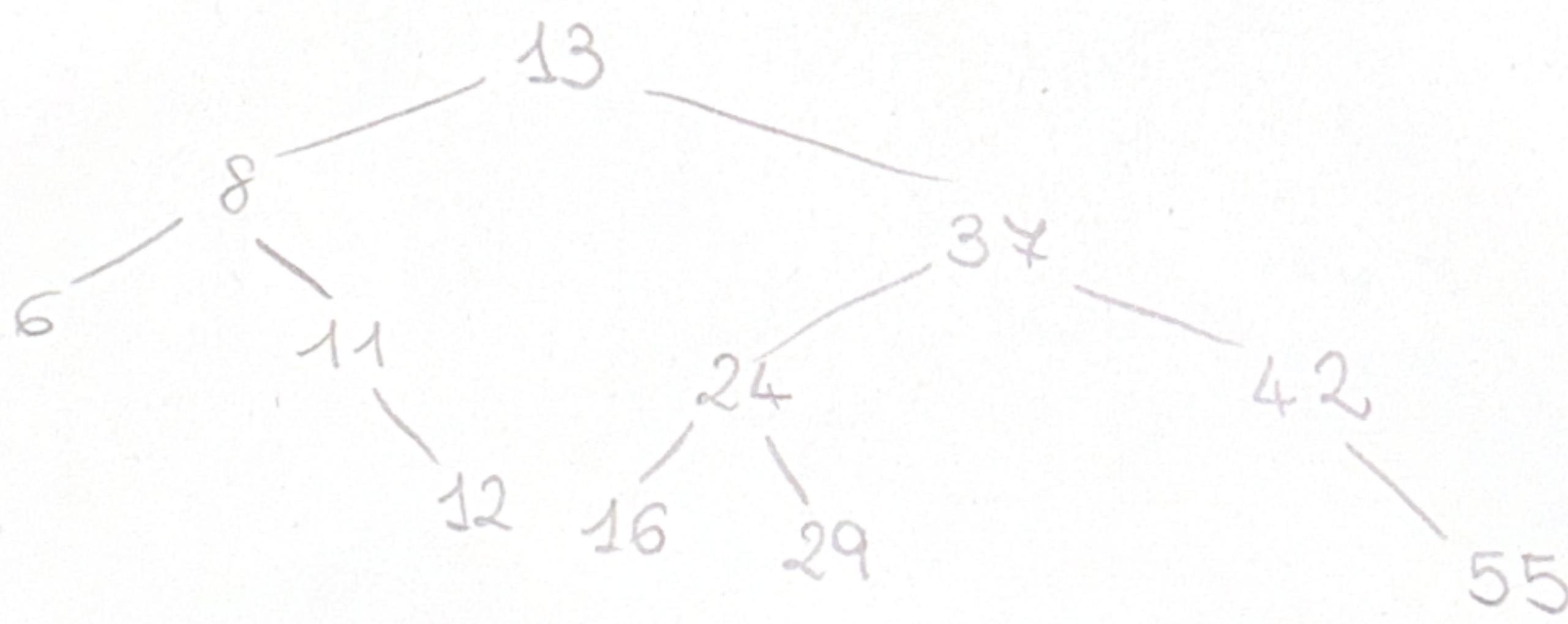
Tabella di hash dim 17

221 16 89 56 144 27 33 259

0	221
1	33
2	
3	
4	89
5	56
6	259
7	
8	144
9	

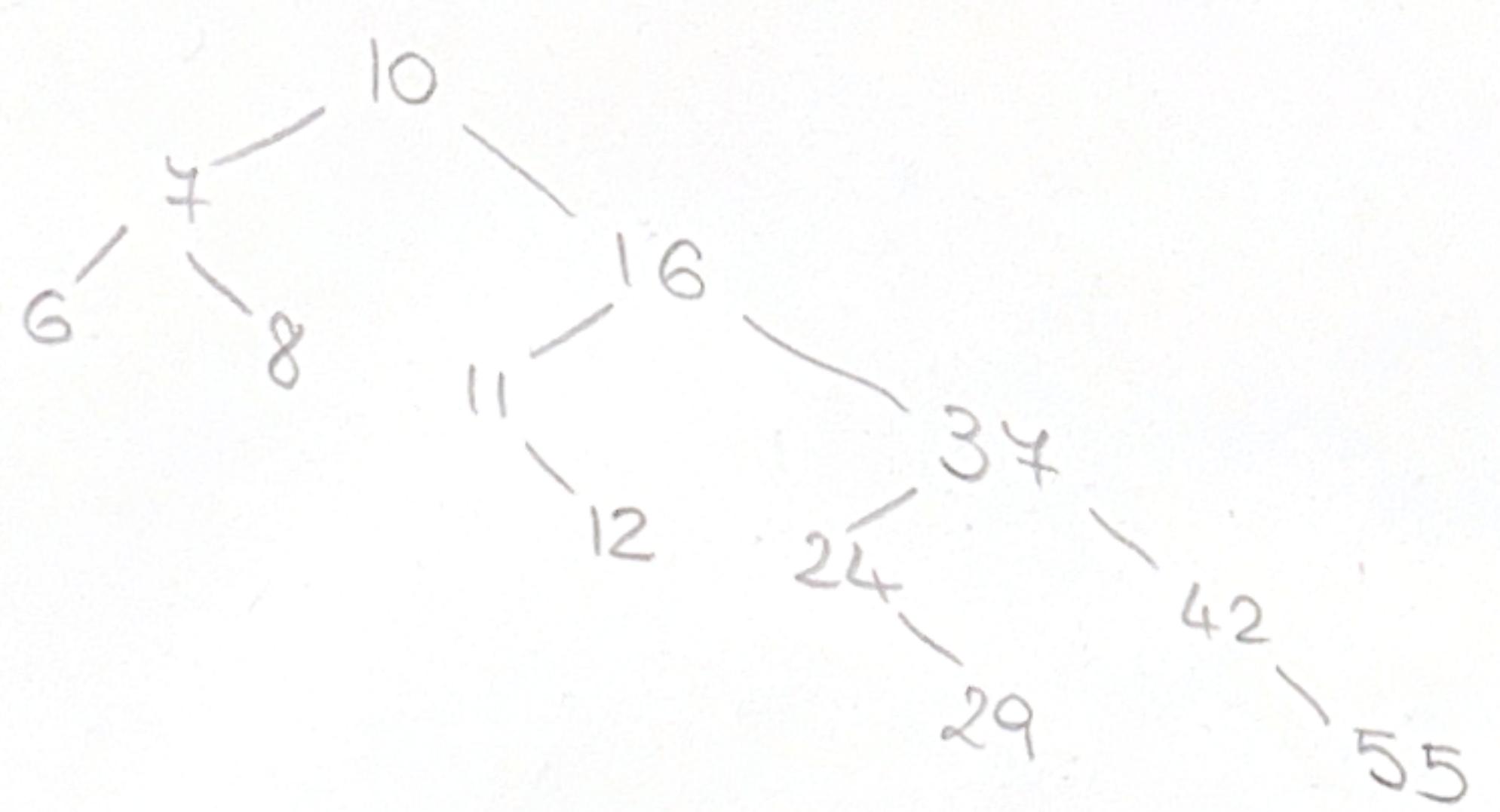
10	27
11	
12	
13	
14	
15	
16	16

④ Si inseriscono in radice le chiavi 4 e 10
Si cancelli la chiave 13



- 13

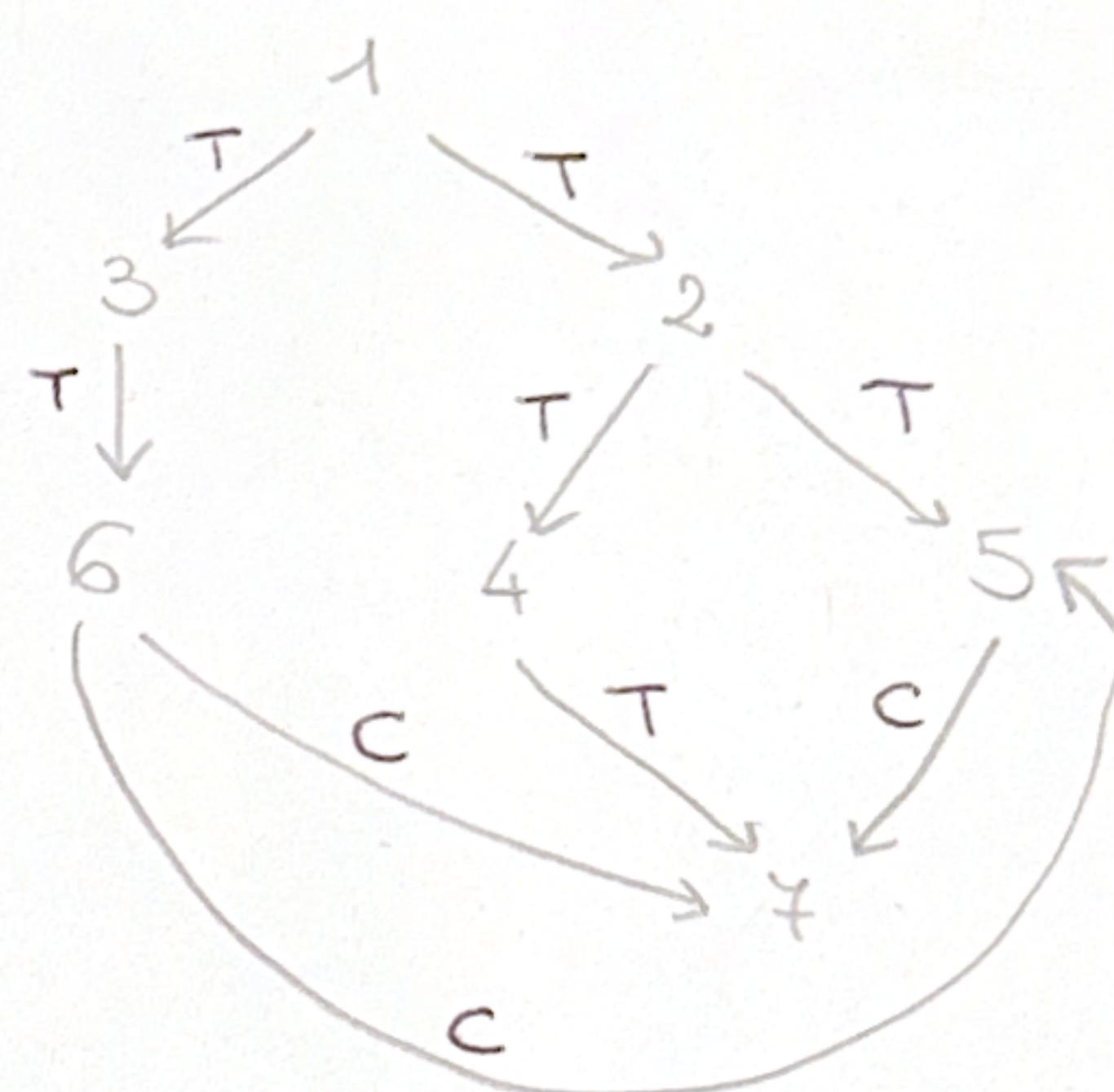
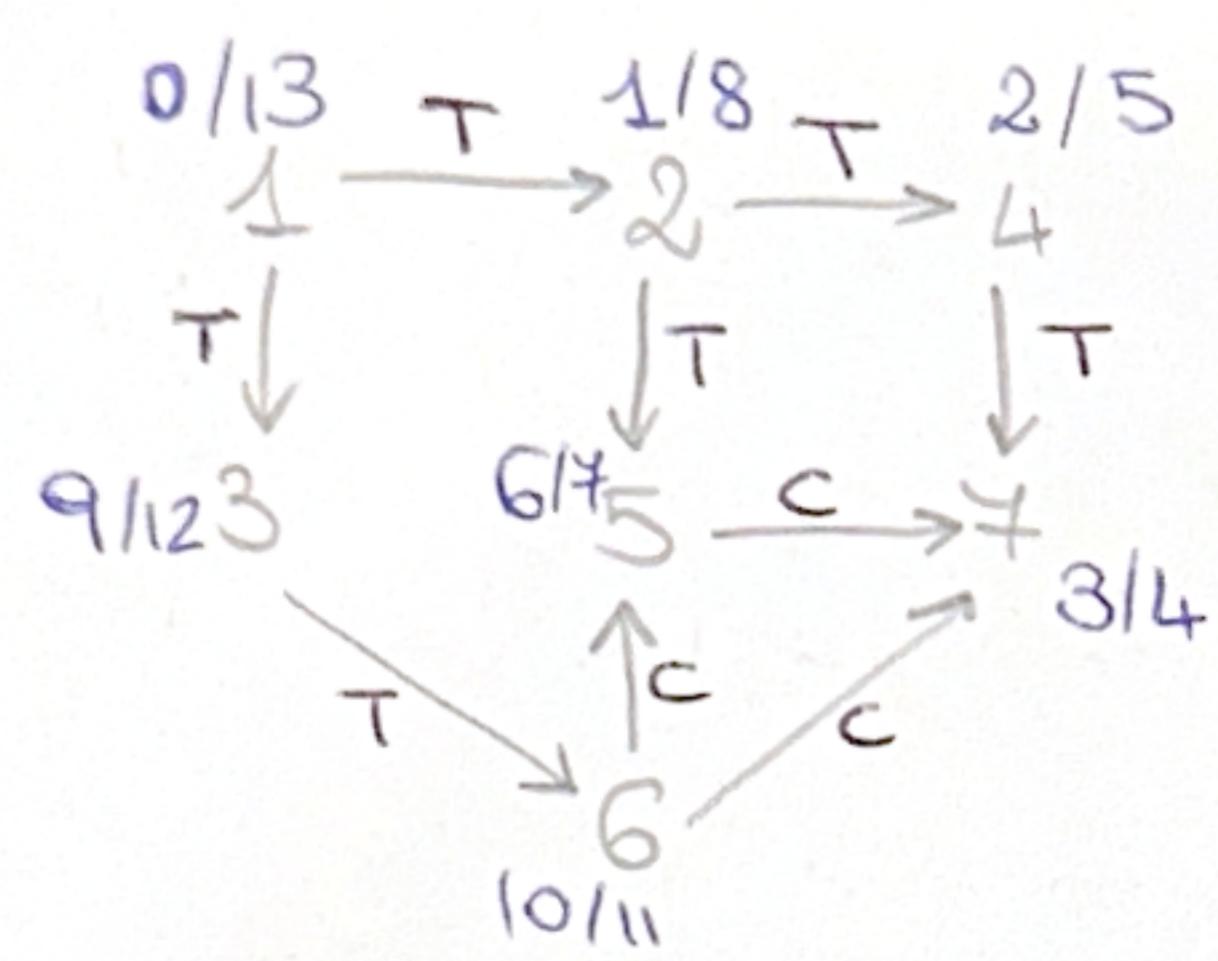
Ricombino



⑤ Visita in profondità

- Etichettare i vertici con t
- Etichettare gli archi (T,B,F,C)

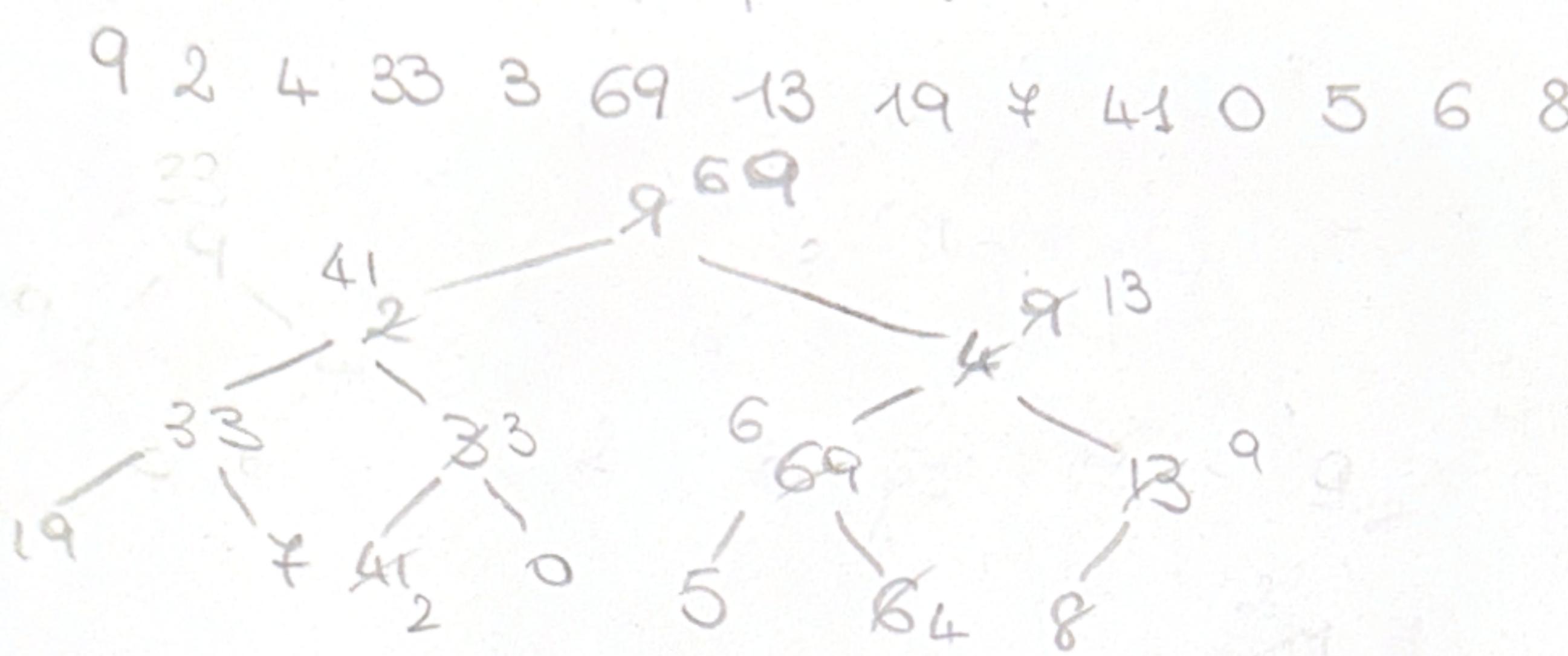
A partire dal vertice 1



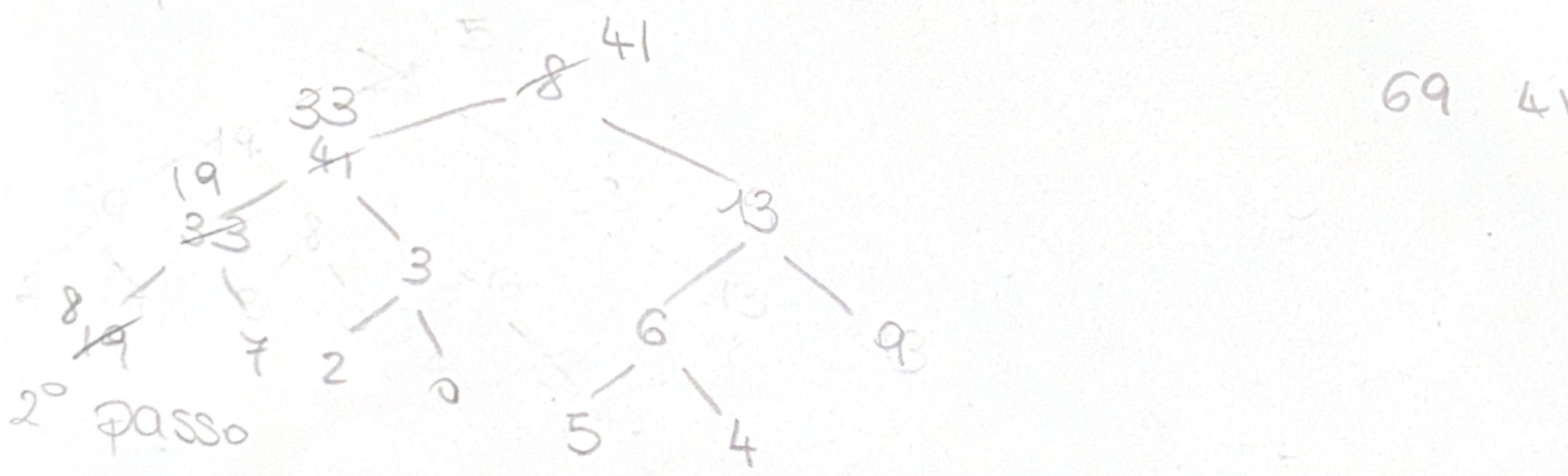
09/02/2022

① Heap di dati → nella radice val. max

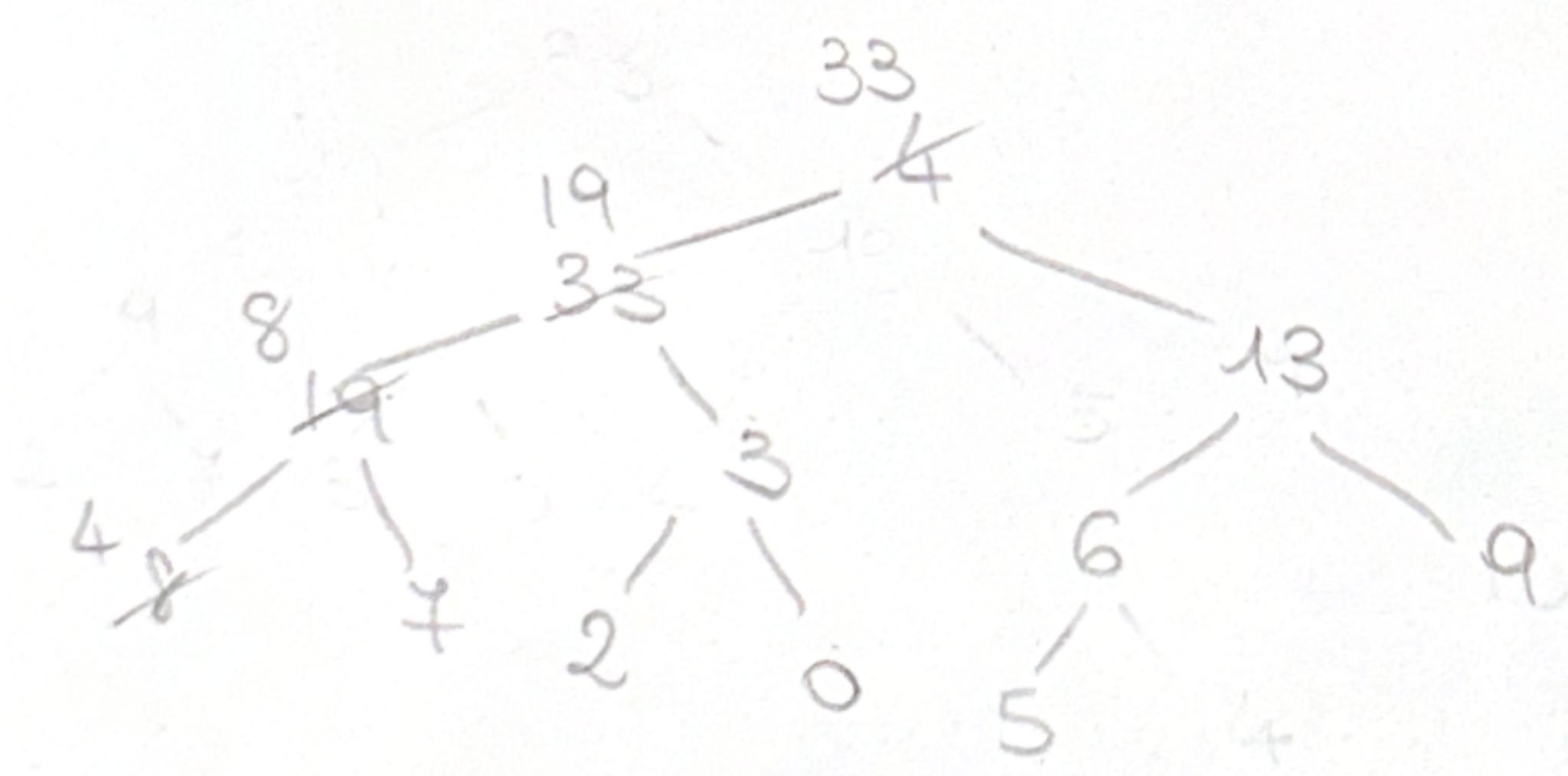
• Primi due passi di heap sort



1° passo:



2° passo



② Parenthesizzazione ottima

$$(4 \times 6) (6 \times 2) (2 \times 8) (8 \times 3)$$

$$\Phi = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4, 6, 2, 8, 3 \end{bmatrix}$$

$$m(1,2) = \Phi_0 \Phi_1 \Phi_2 = 48 \quad \boxed{k=1}$$

$$m(2,3) = \Phi_1 \Phi_2 \Phi_3 = 96 \quad \boxed{k=2}$$

$$m(3,4) = \Phi_2 \Phi_3 \Phi_4 = 48 \quad \boxed{k=3}$$

$$m(1,3) = m(1,1) + m(2,3) + \Phi_0 \Phi_1 \Phi_3 = 288$$

$$m(1,3) = m(1,2) + m(3,3) + \Phi_0 \Phi_2 \Phi_3 = 192 \quad \boxed{k=2}$$

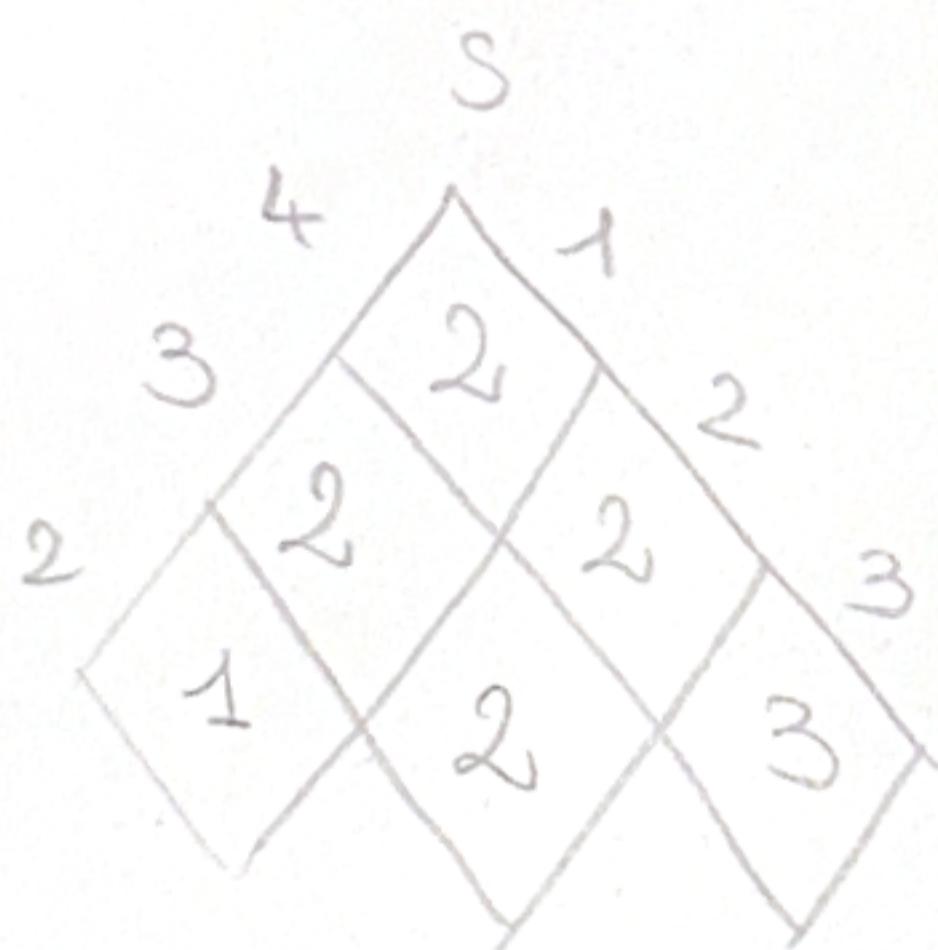
$$m(2,4) = m(2,2) + m(3,4) + \Phi_1 \Phi_2 \Phi_4 = 84 \quad \boxed{k=2}$$

$$m(2,4) = m(2,3) + m(4,4) + \Phi_1 \Phi_3 \Phi_4 = 240$$

$$m(1,4) = m(1,1) + m(2,4) + \Phi_0 \Phi_1 \Phi_4 = 156$$

$$m(1,4) = m(1,2) + m(3,4) + \Phi_0 \Phi_2 \Phi_4 = 120$$

$$m(1,4) = m(1,3) + m(4,4) + \Phi_0 \Phi_3 \Phi_4 = 288 \quad \boxed{k=2}$$



$$A[1..4] = A[1..2] \cdot A[3..4]$$

$$A[1..2] = A_1 \cdot A_2$$

$$A[3..4] = A_3 \cdot A_4$$

Parenthesizzazione ottima: $(A_1 \cdot A_2) \cdot (A_3 \cdot A_4)$

③ Si trasformi da pre-order a in-order

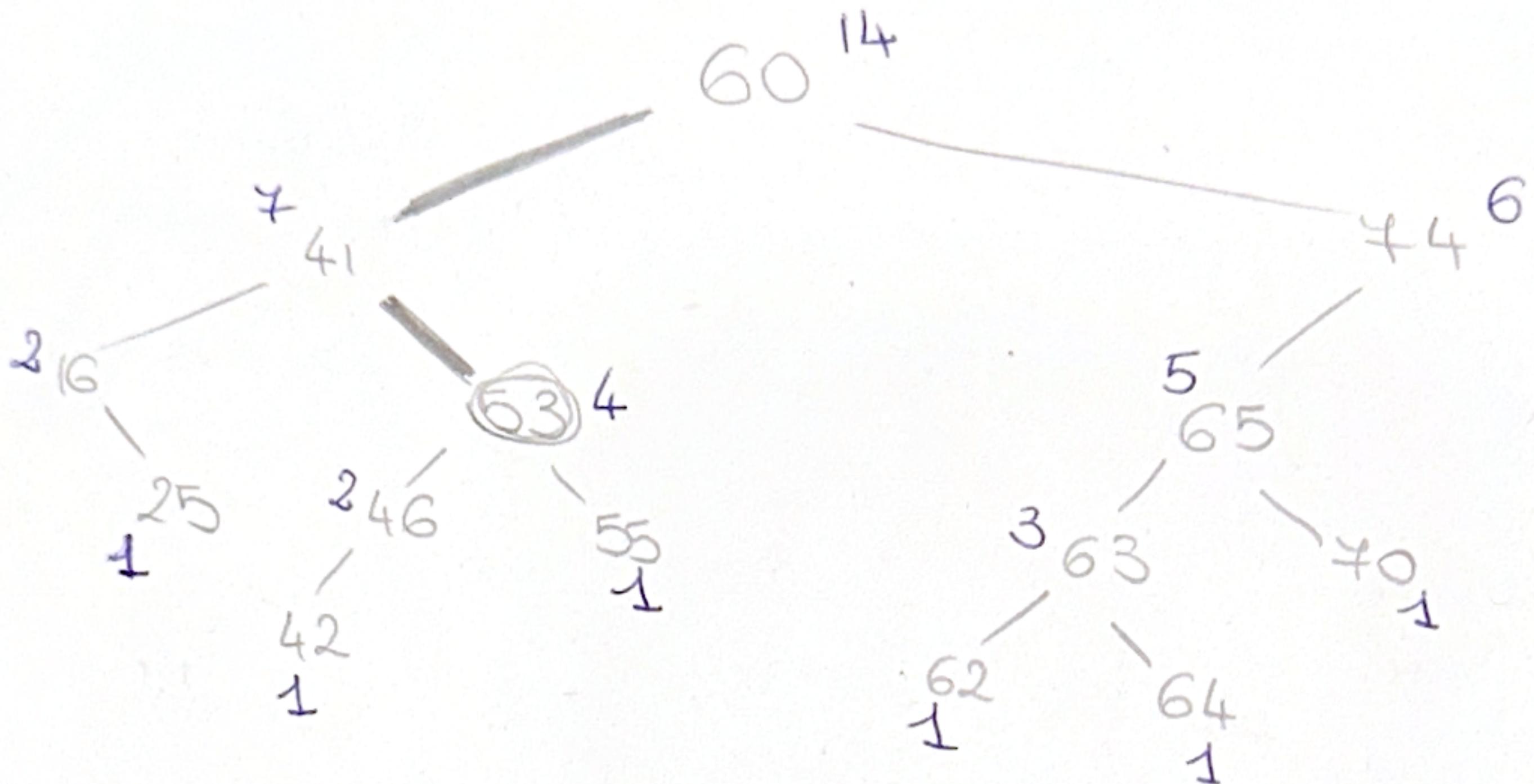
$\text{/*} - A B / C D / E * - F G + H \text{ / }$

IN $\Rightarrow BAC$
PRE $\Rightarrow ABC$
POST $\Rightarrow BCA$



IN-ORDER:

A - B * C / D / E / F - G * H + I



K=5

- ① $t = 4 > \pi$

② $t = 2 < \pi$

③ $t = 2 = \pi$

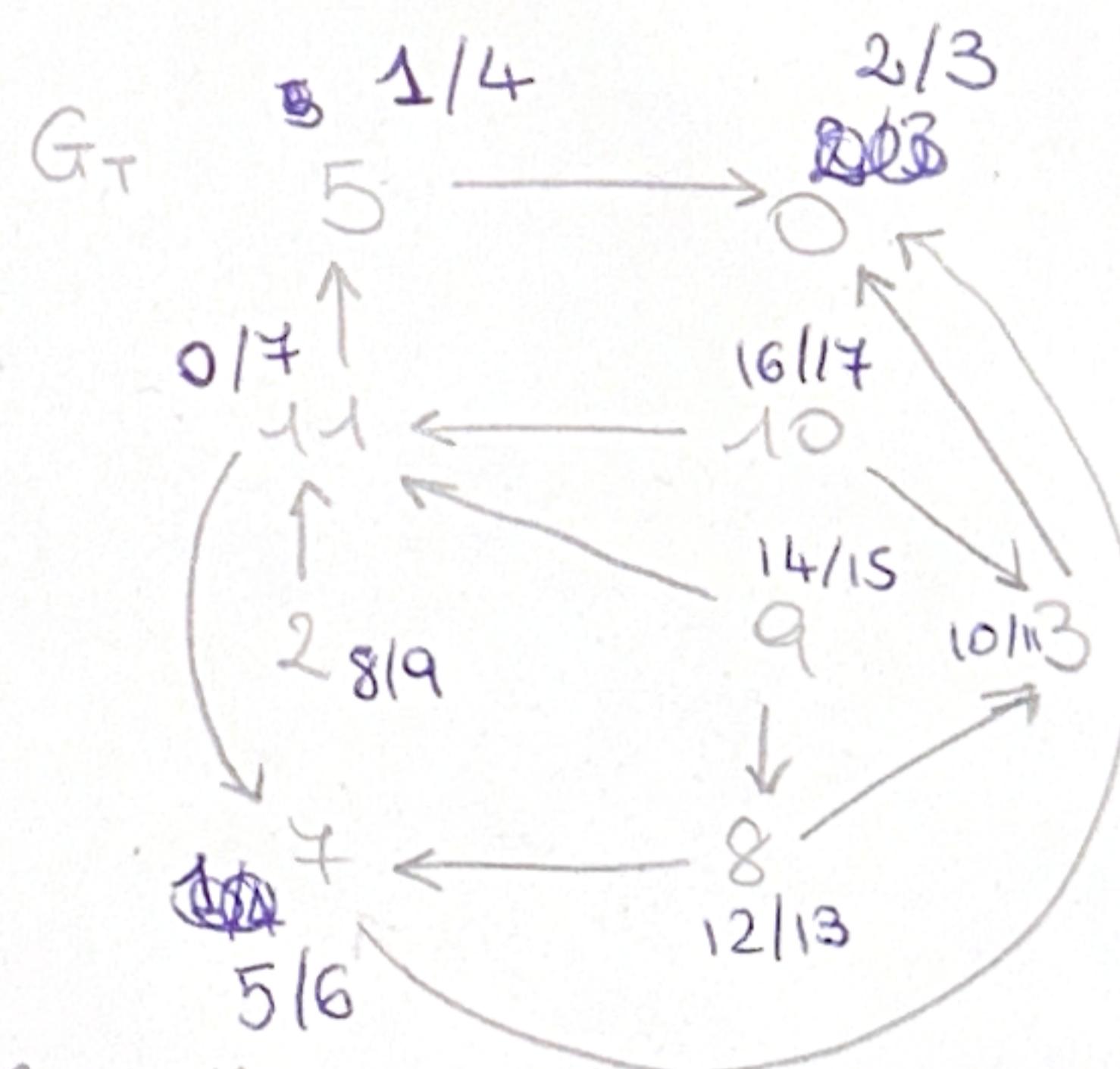
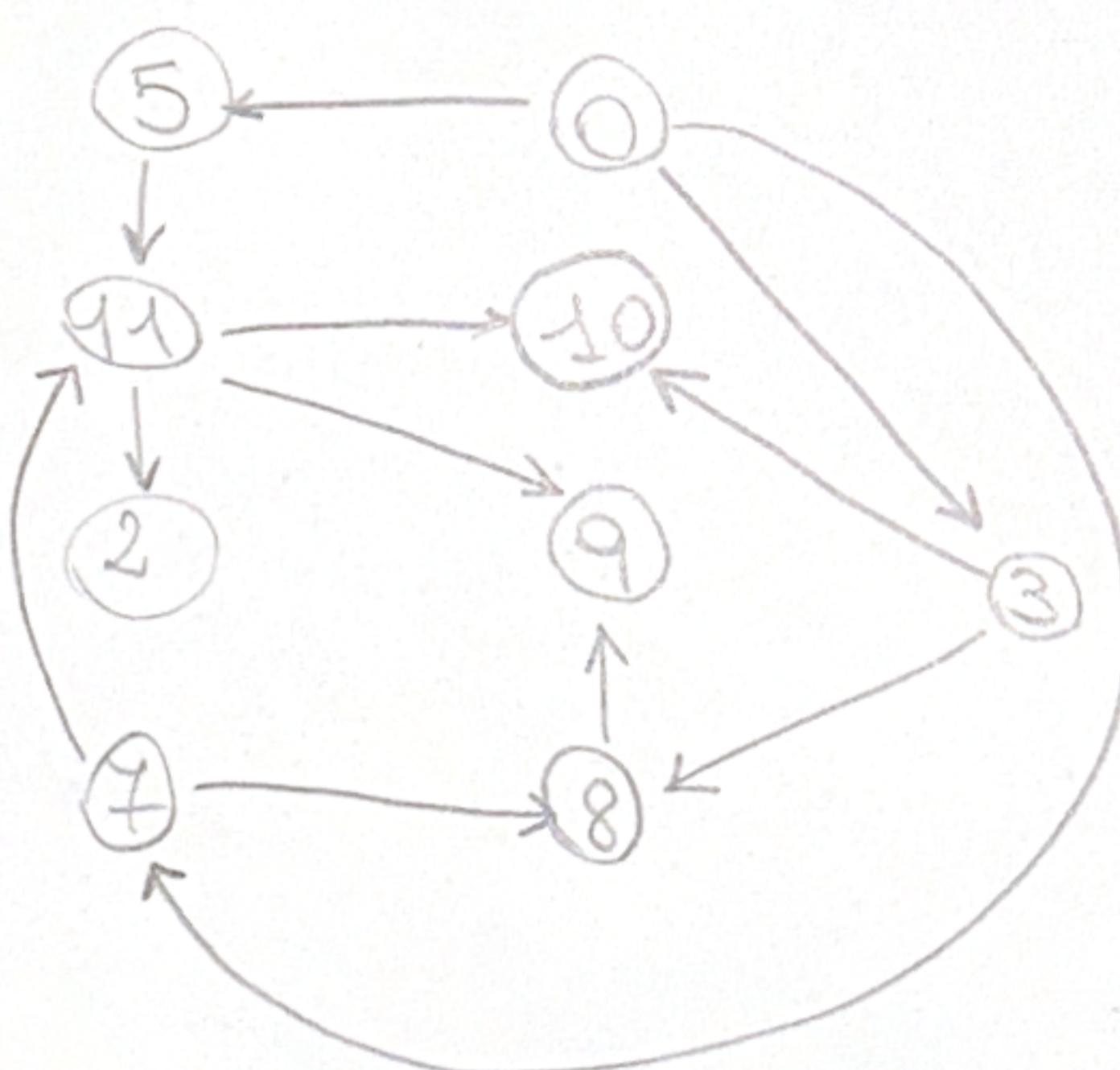
5

$$K=5-2-1=2$$

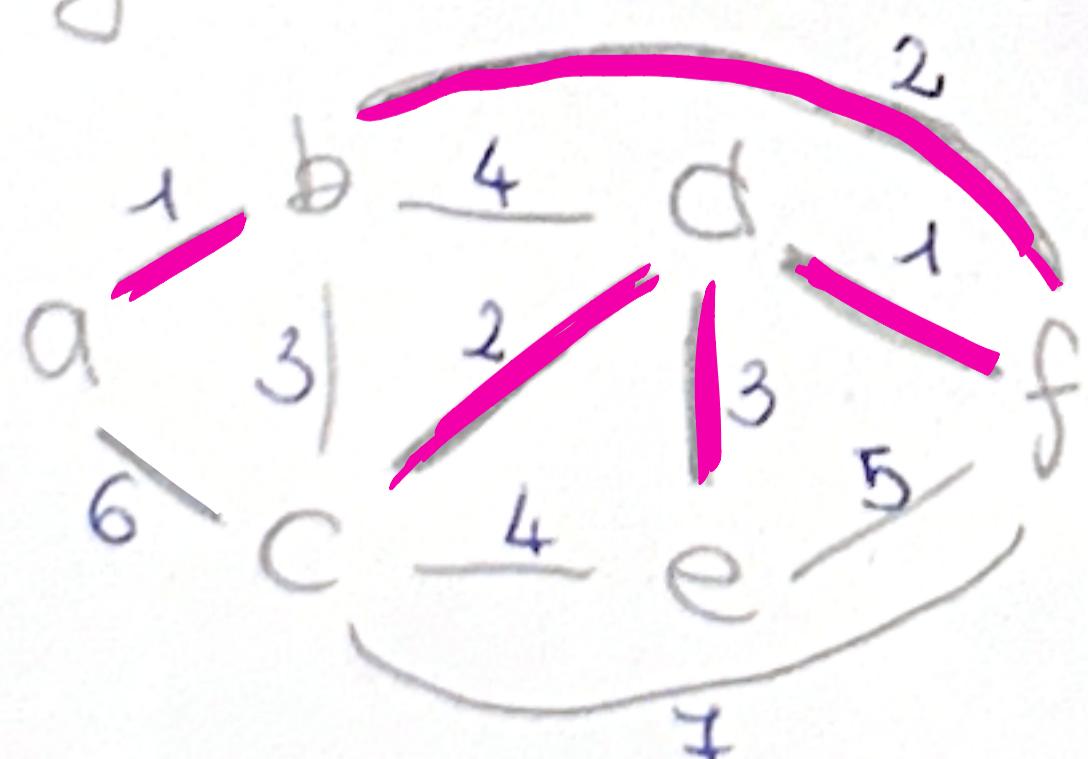
trovata.

⑤ Algoritmo di Kosaraju x componenti fortemente connesse

11 vertice di partenza



⑥ Algoritmo di Prim a partire da "a" e peso



$$\text{Peso: } 1+2+1+2+3=9$$

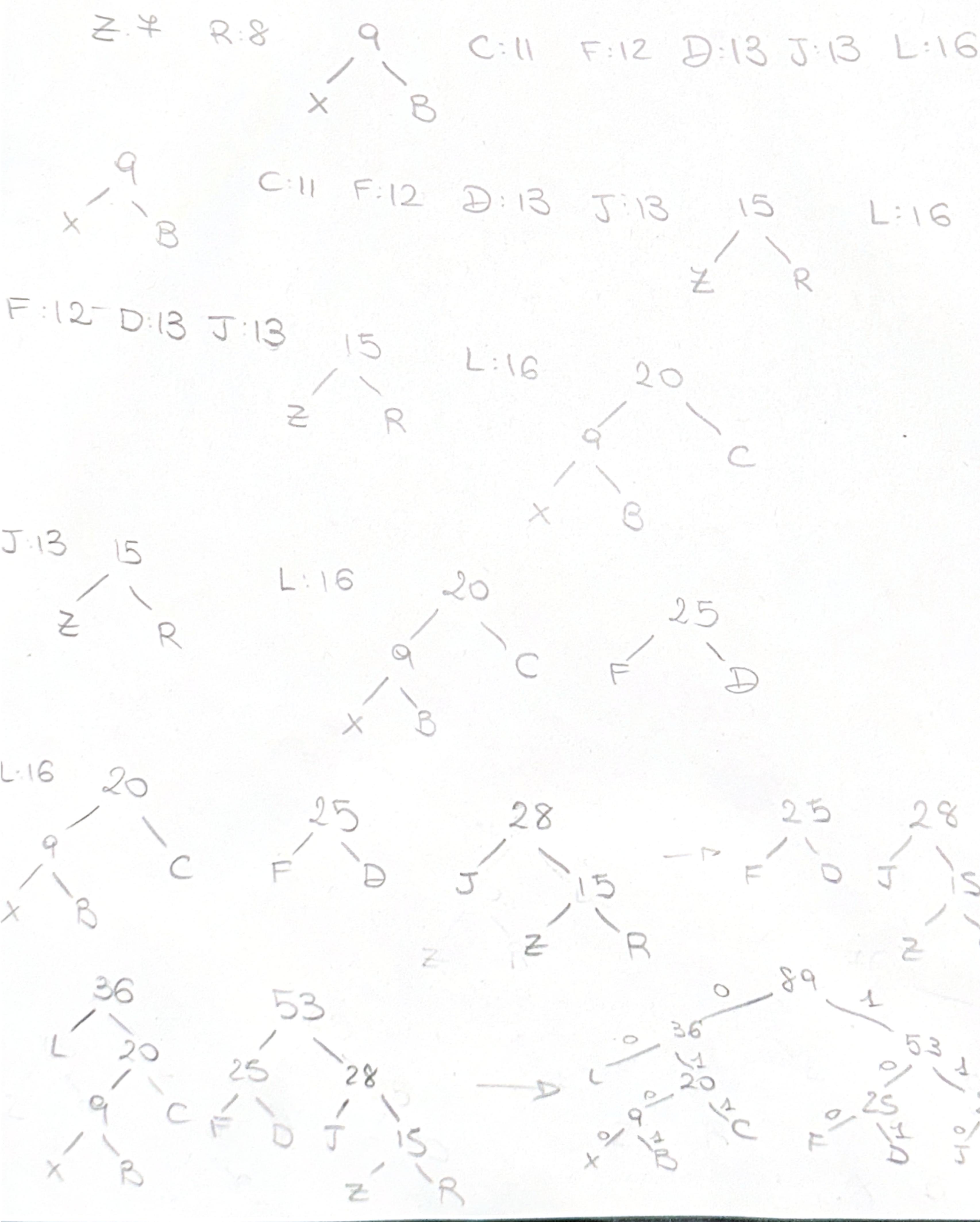
27/06/2022

① Sinistra 0 e destra 1
Codice di Huffman ottimo

B:5 C:11 D:13 F:12 J:13 L:18 R:8 X:4 Z:7

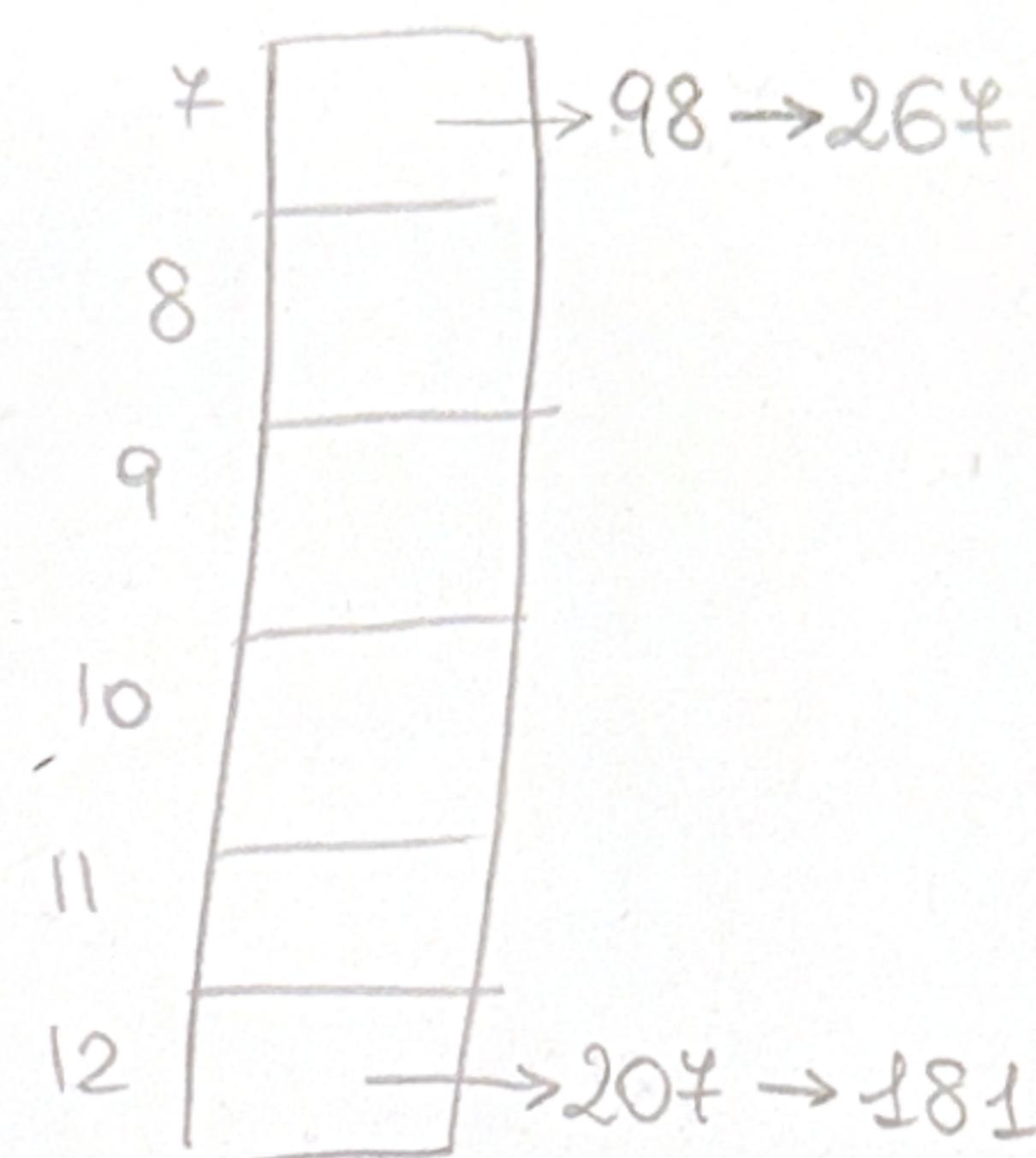
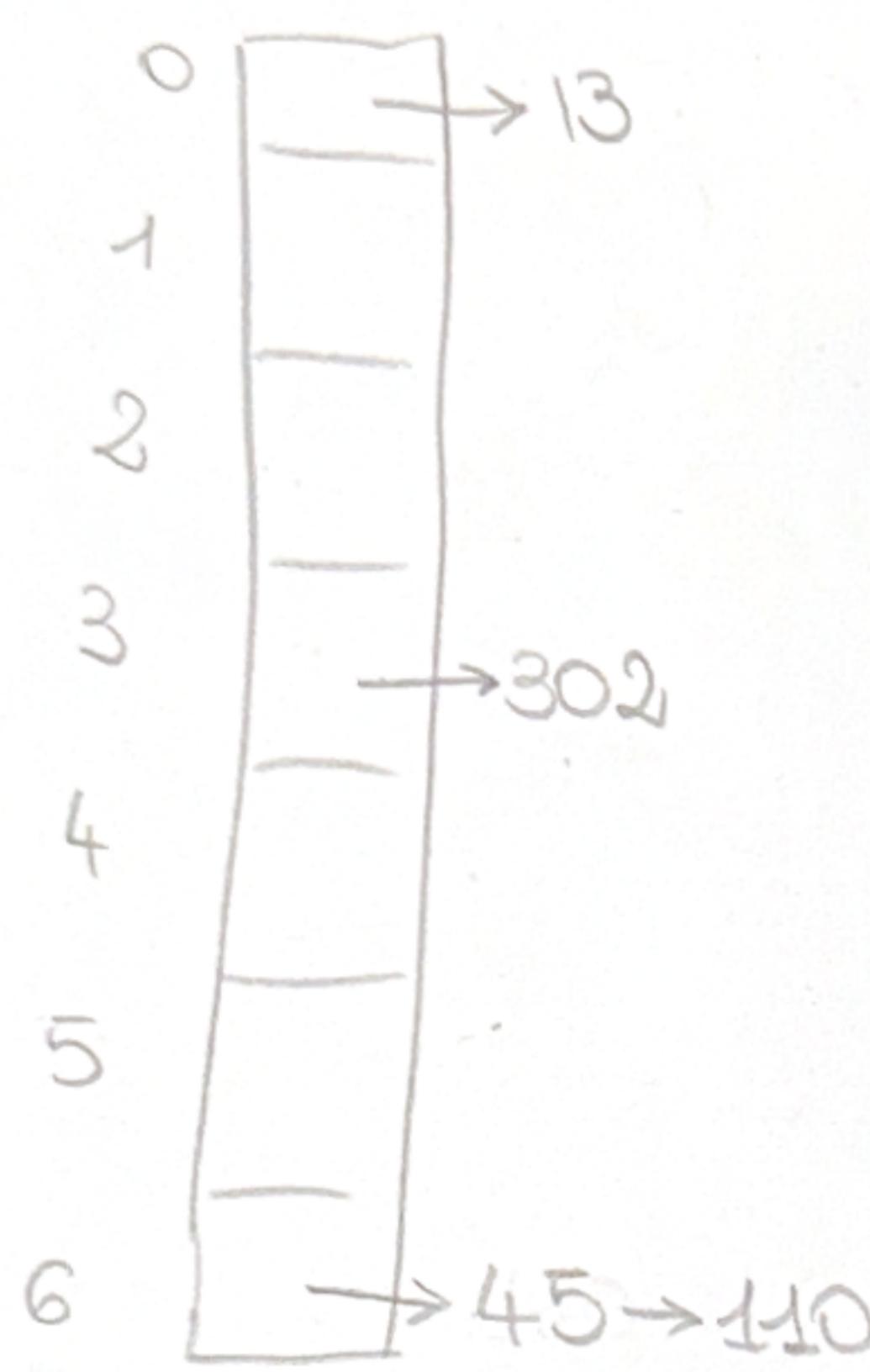
Ordine crescente

X:4 B:5 Z:4 R:8 C:11 F:12 D:13 J:13 L:18

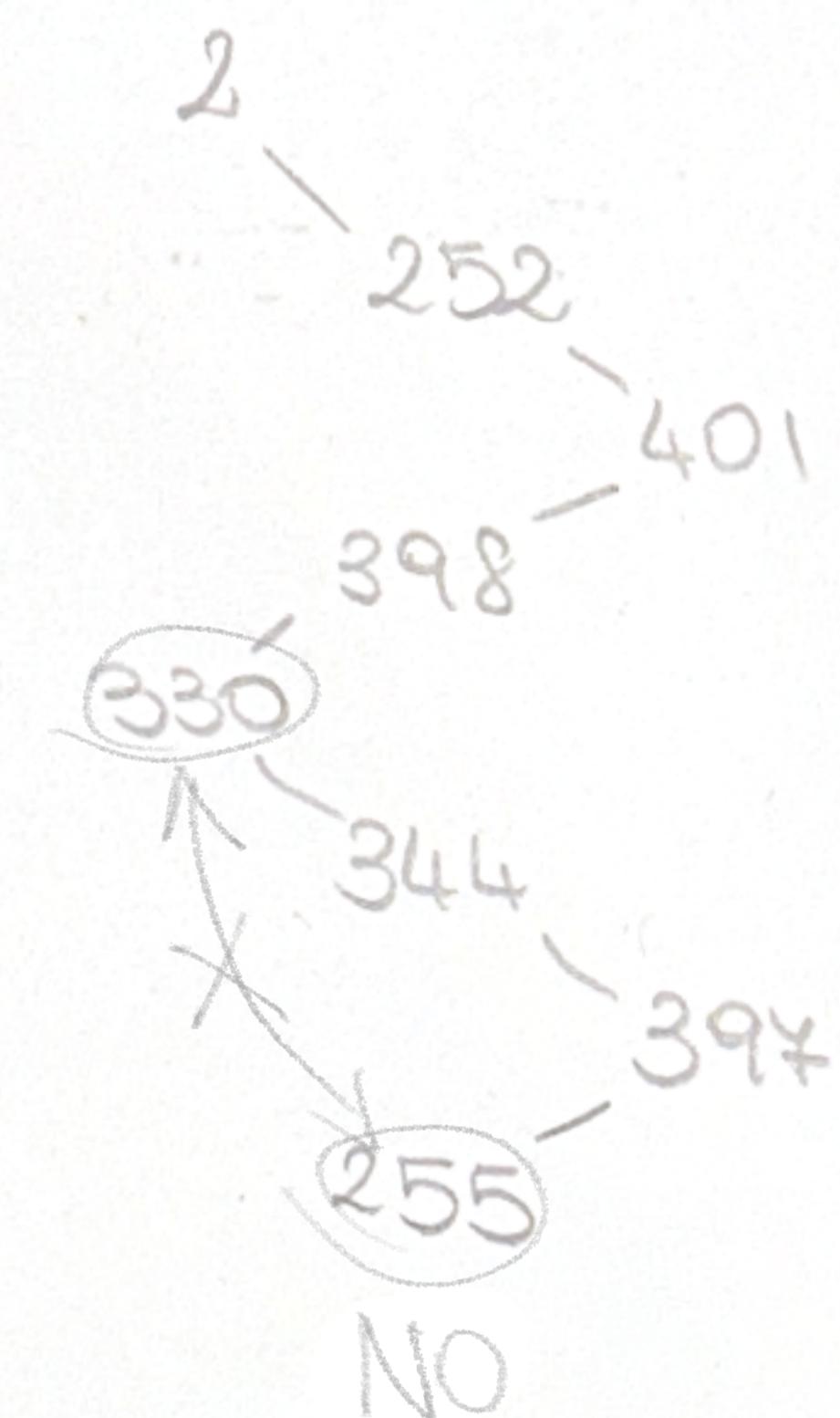
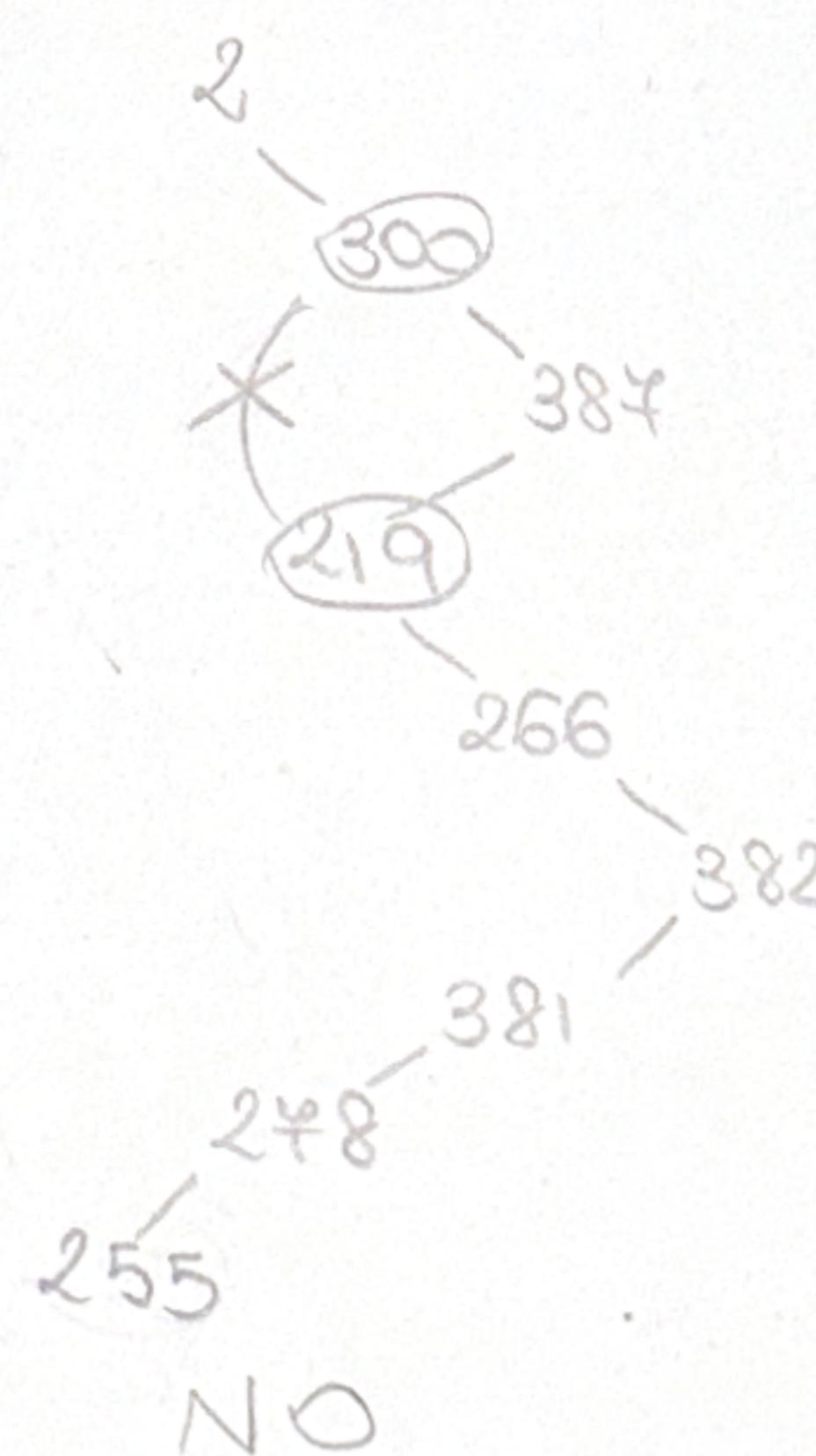
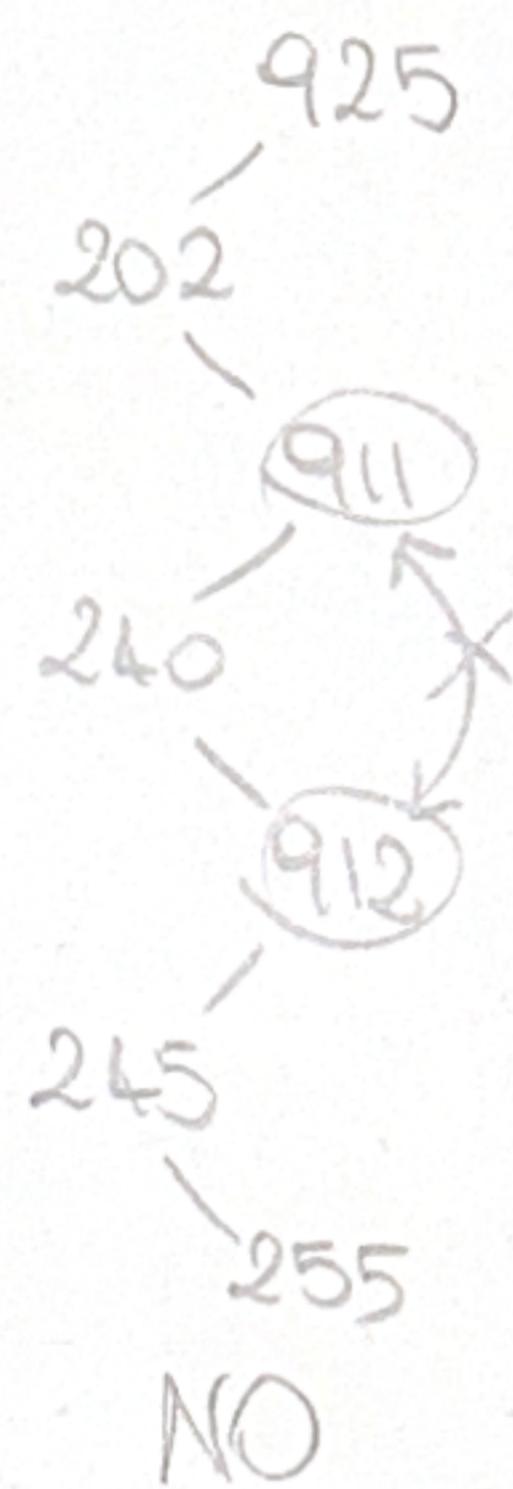
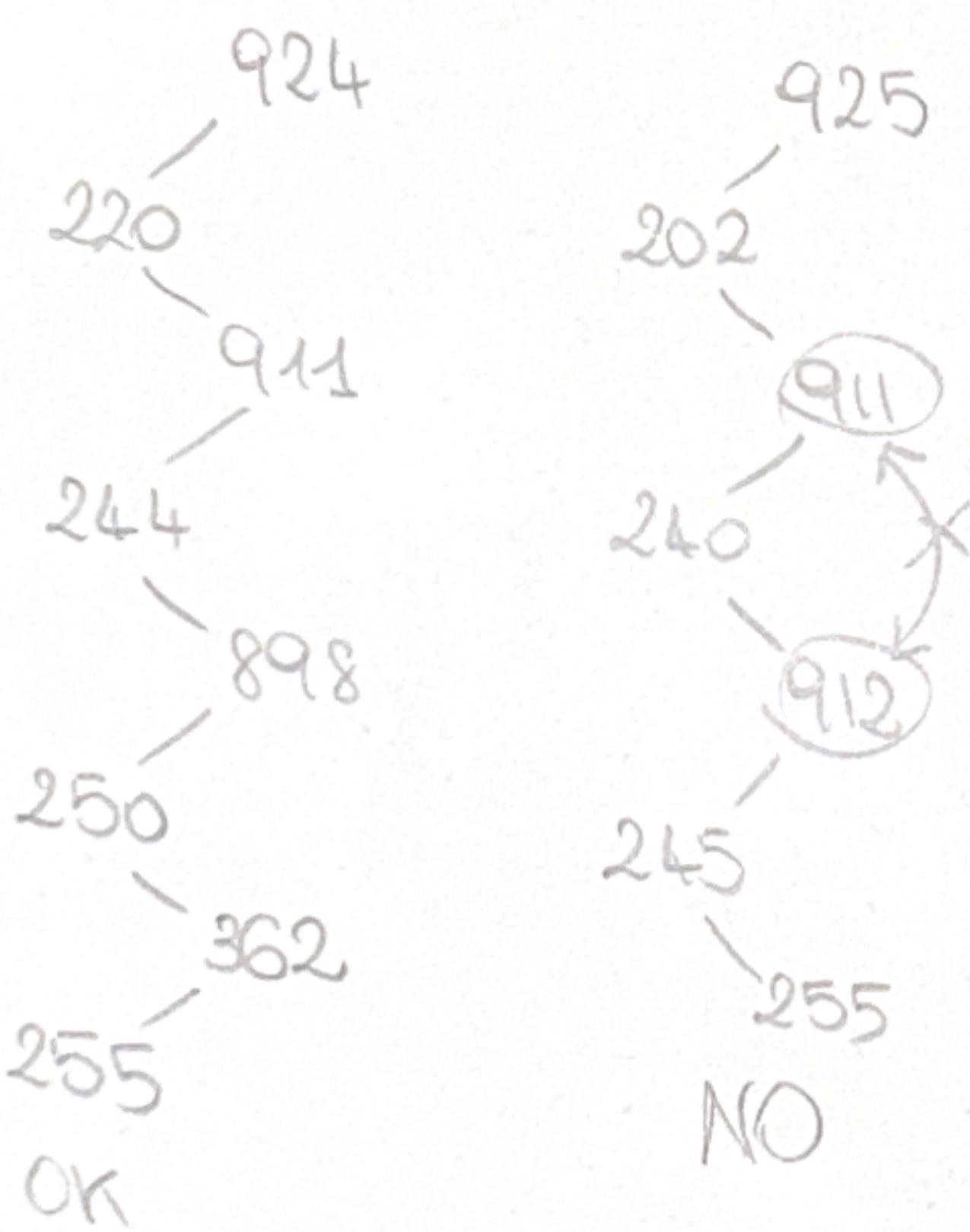


② Lineare Chaining

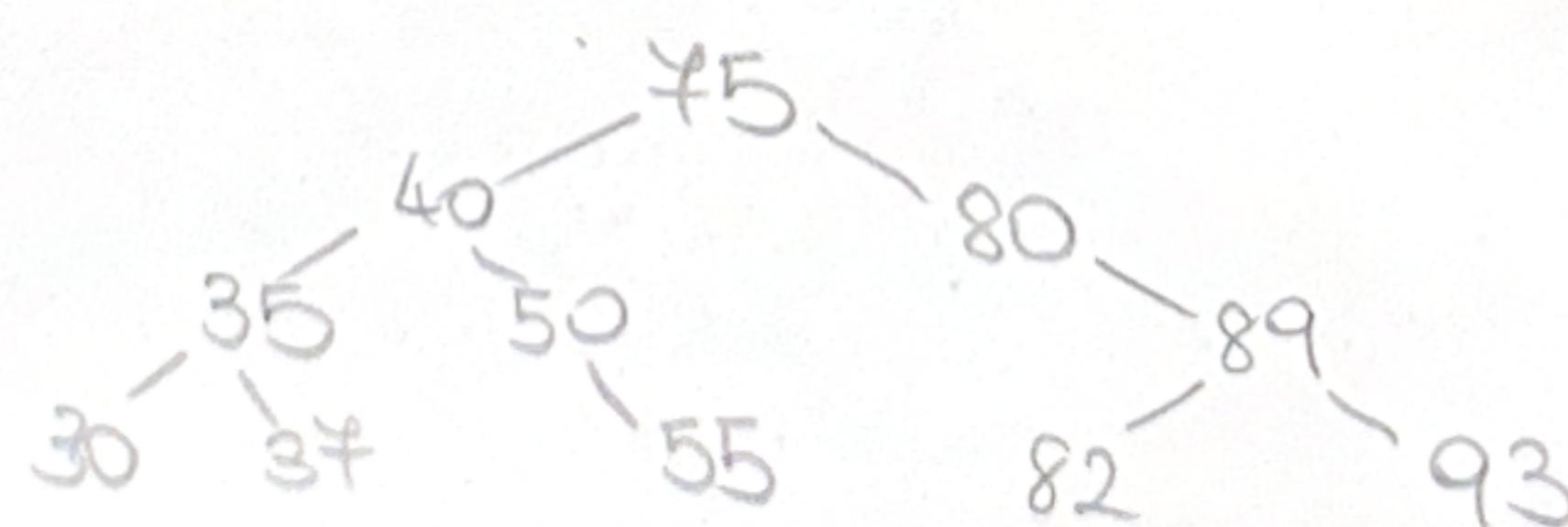
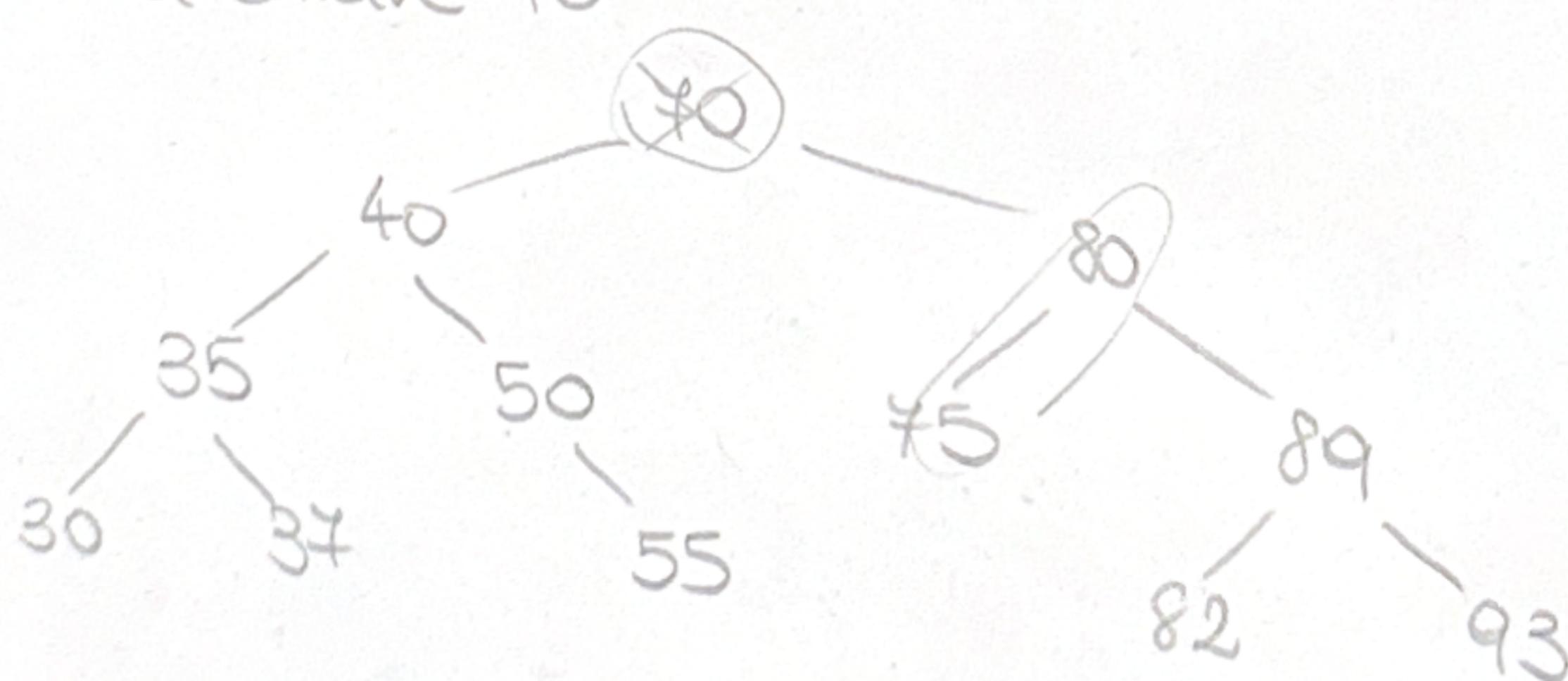
Tabella di hash dim. 13, sequenza: 13 81 26 \neq 302 98 110 45 20 \neq



③ Cerco la chiave 255

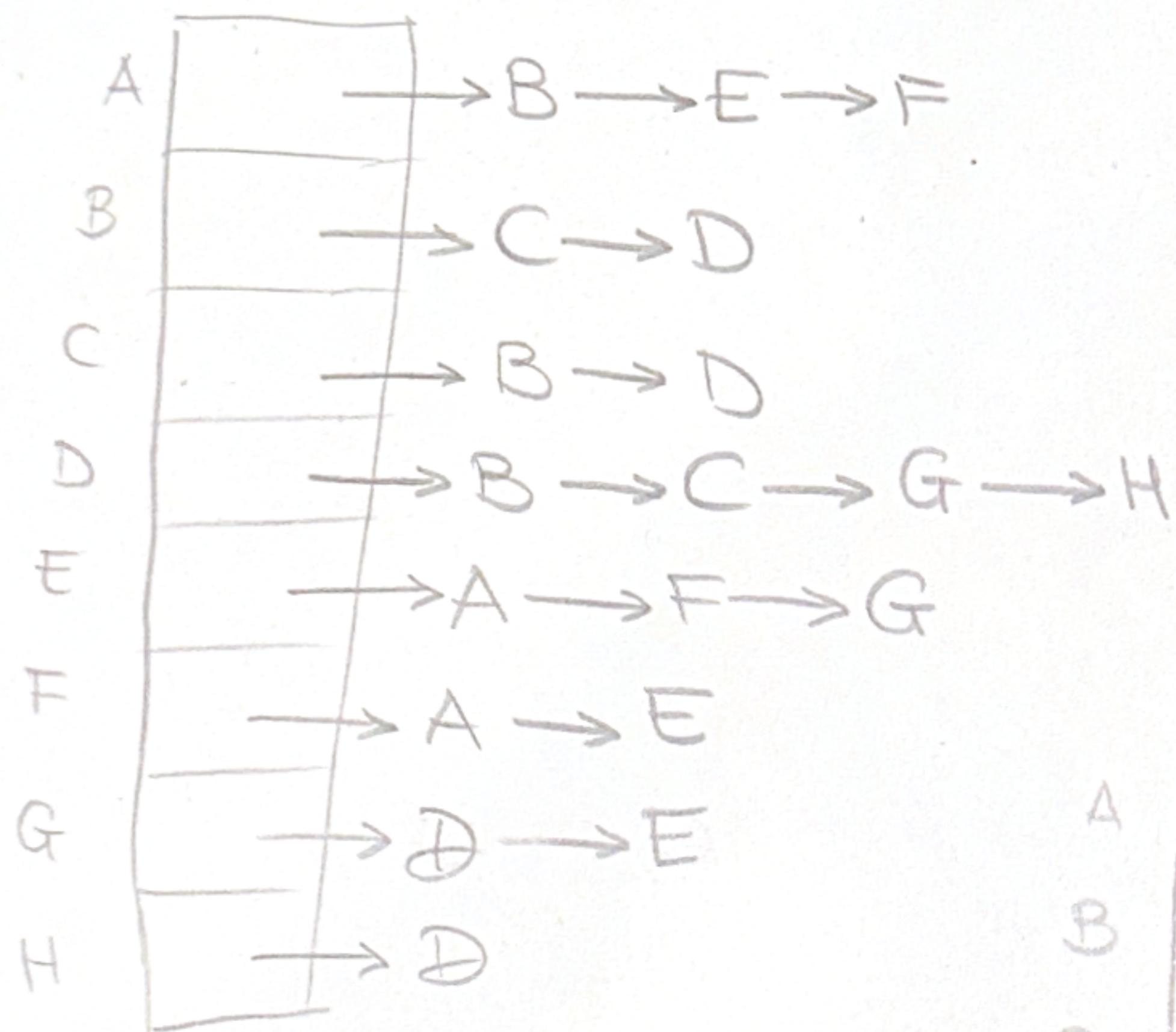
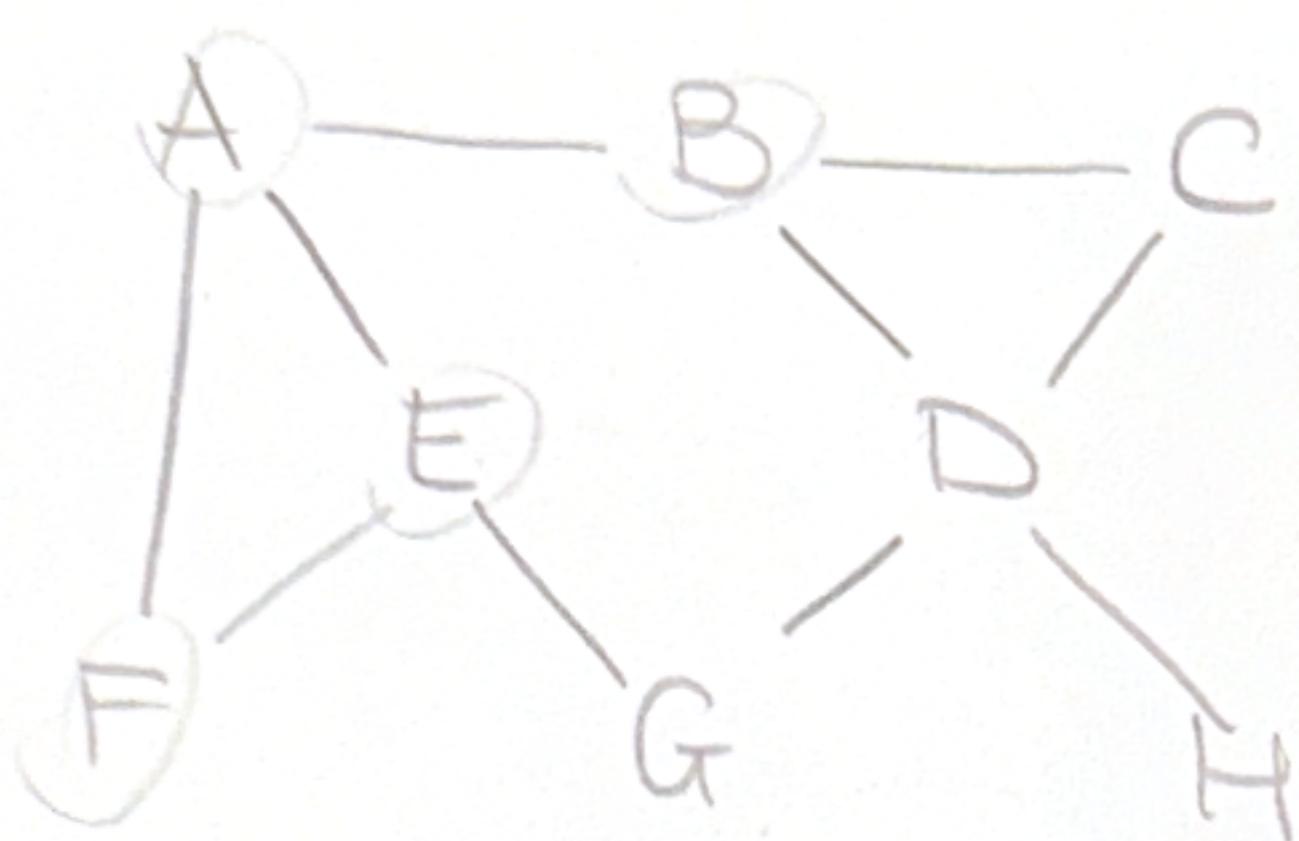


④ Si cancelli la chiave 40



⑤ Lista e matrice delle adiacenze

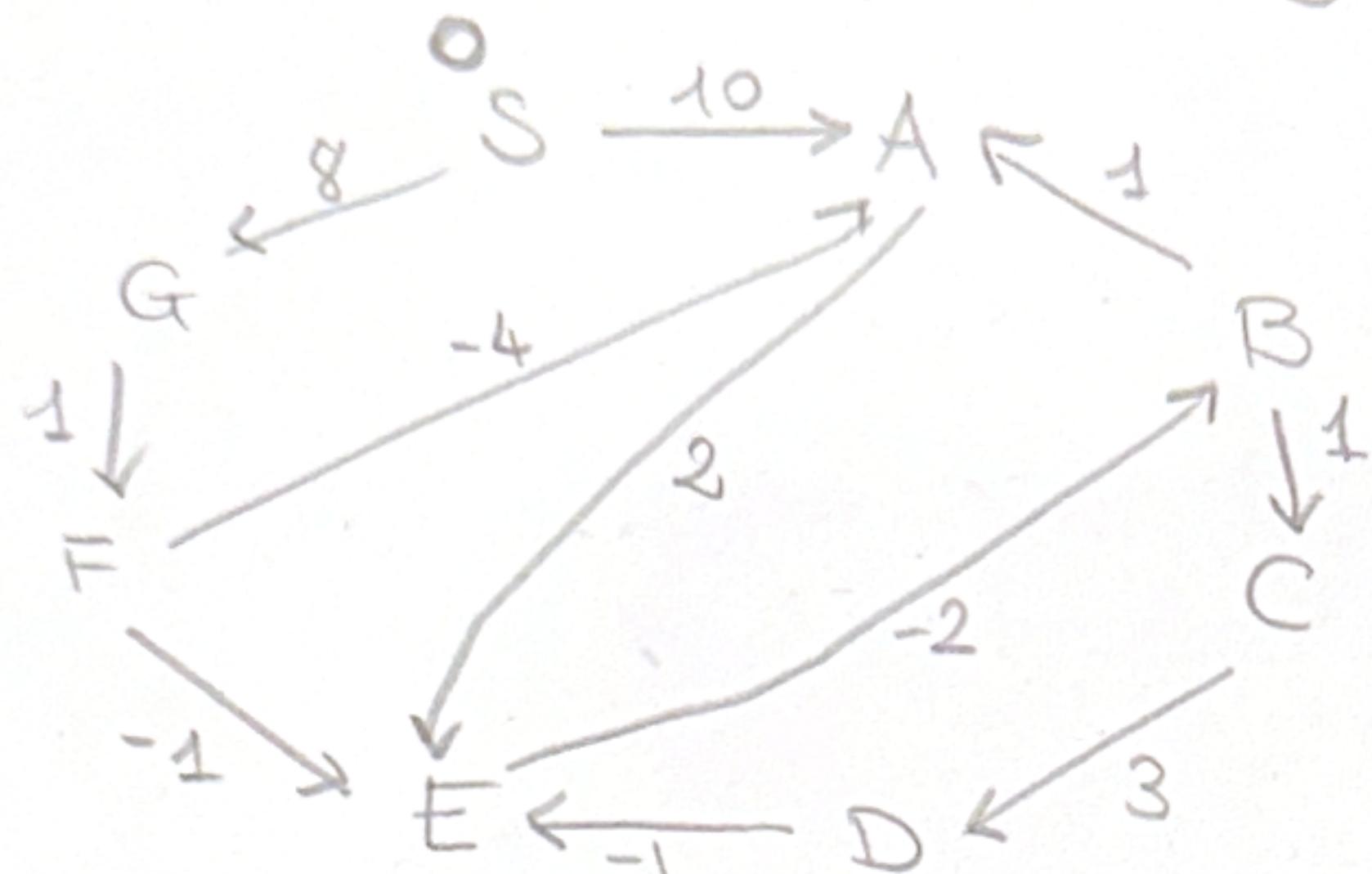
Visita in ampiezza a partire dal vertice A



A	B	C	D	E	F	G	H
A	0	1	0	0	1	1	0
B	0	0	1	1	0	0	0
C	0	1	0	1	0	0	0
D	0	1	1	0	0	0	1
E	1	0	0	0	0	0	1
F	1	0	0	0	1	0	0
G	0	0	0	1	1	0	0
H	0	0	0	1	0	0	0

0	0	A
1	E	F
2	D	G
3	H	

⑥ Bellman-Ford dal vertice S



Archi in ordine

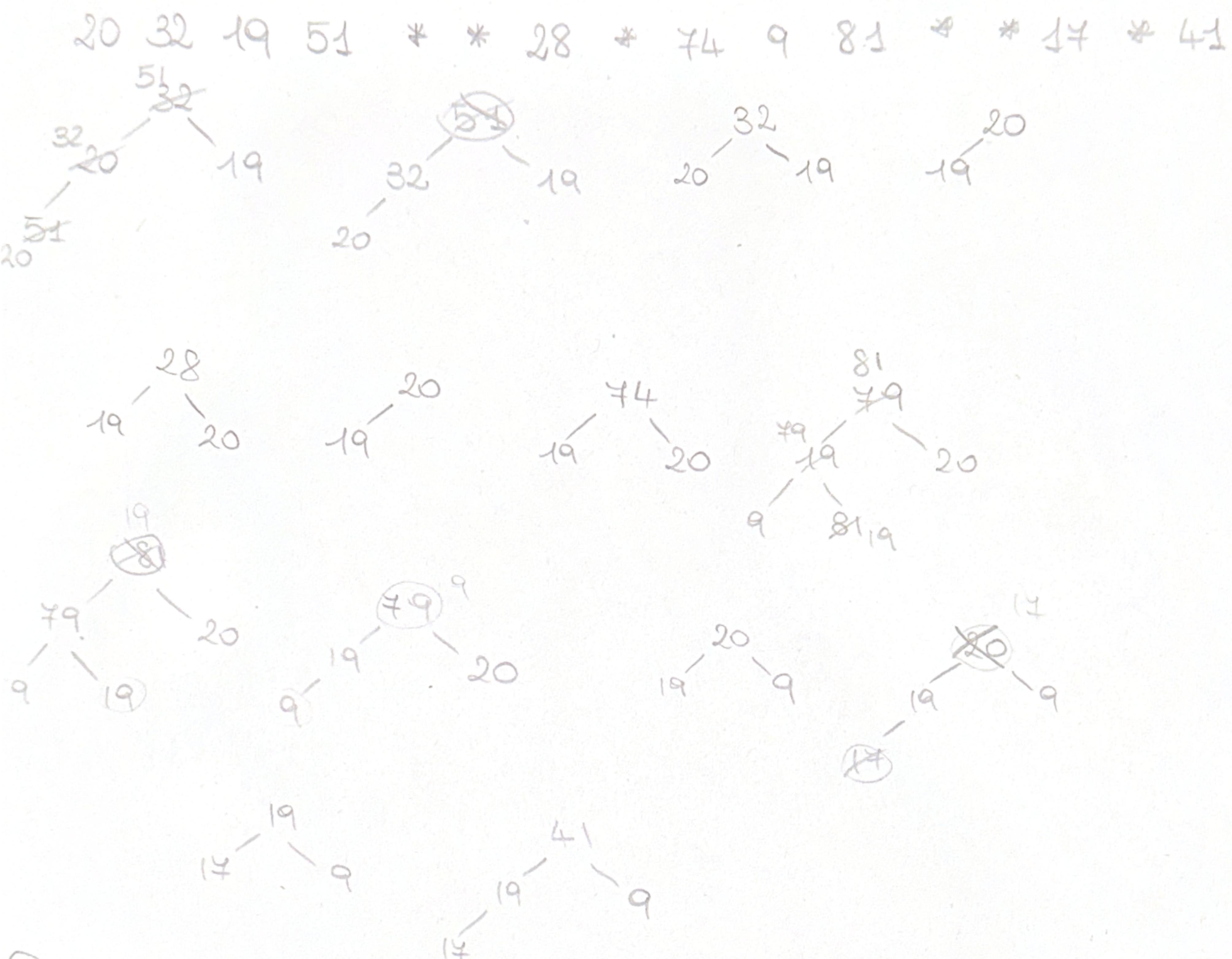
- A-E ▷ 2
- B-A ▷ 1
- B-C ▷ 1
- C-D ▷ 3
- D-E ▷ -1
- E-B ▷ -2
- F-A ▷ -4
- F-E ▷ -1
- G-F ▷ 1
- S-A ▷ 10
- S-G ▷ 8

	P_0	P_1	P_2	P_3	P_4	P_5	P_6
A	8	10	10	5	5	5	5
B	8	8	10	10	5	5	5
C	8	8	8	11	14	6	6
D	8	8	8	14	14	9	9
E	8	8	12	8	+	+	+
F	8	9	9	9	9	9	9
G	8	8	8	8	8	8	8
S	0	0	0	0	0	0	0

uguali

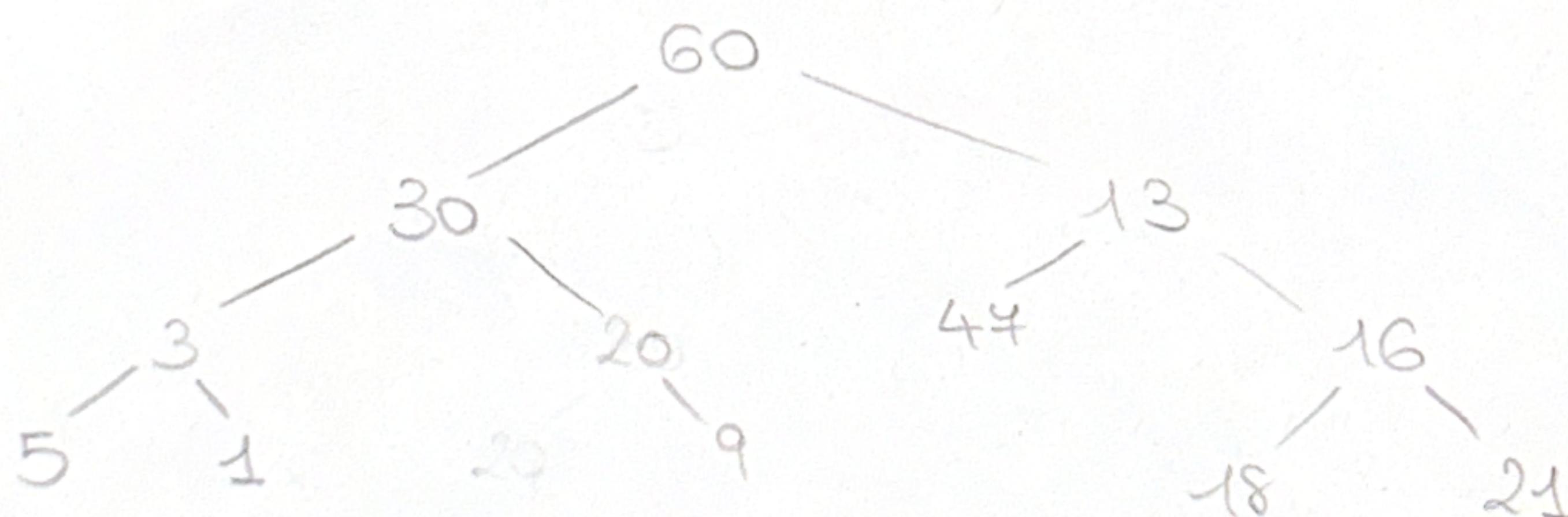
02/09/2022

① Inserimento in coda e estrazione con cancellazione del max



②

IN-ORDER	5	3	1	30	20	9	60	44	13	18	16	21	BAC
PRE-ORDER	60	30	3	5	1	20	9	13	44	16	18	21	ABC
POST-ORDER	5	1	3	9	20	30	44	18	21	16	13	60	BCA



③ 33 263 109 144 | 100 113 86 159 58

Tabella di hash, dim = 23

Open addressing con double hashing

$$h_1 = K \% 23 \quad h_2 = 1 + K \% 94$$

0	
1	
2	58
3	
4	
5	
6	144

7	
8	100
9	
10	33
11	263
12	86
13	

14	
15	159
16	
17	109
18	
19	
20	

21	113
22	

$$263 \rightarrow 10 \text{ NO} \rightarrow 11$$

$$K = 263$$

$$i = 263 \% 23 = 10$$

$$j = 1 + 263 \% 94 = 1 + 69 = 70$$

$$i_{\text{NEW}} = (10 + 70) \% 23 = 11$$

$$K = 58$$

$$i = 58 \% 23 = 12$$

$$j = 1 + 58 \% 94 = 59$$

$$i_{\text{NEW}} = (12 + 59) \% 23 = 2$$

$$86 \rightarrow 17$$

$$K = 86$$

$$i = 86 \% 23 = 17$$

$$j = 1 + 86 \% 94 = 87$$

$$i_{\text{NEW}} = (17 + 87) \% 23 = 12$$

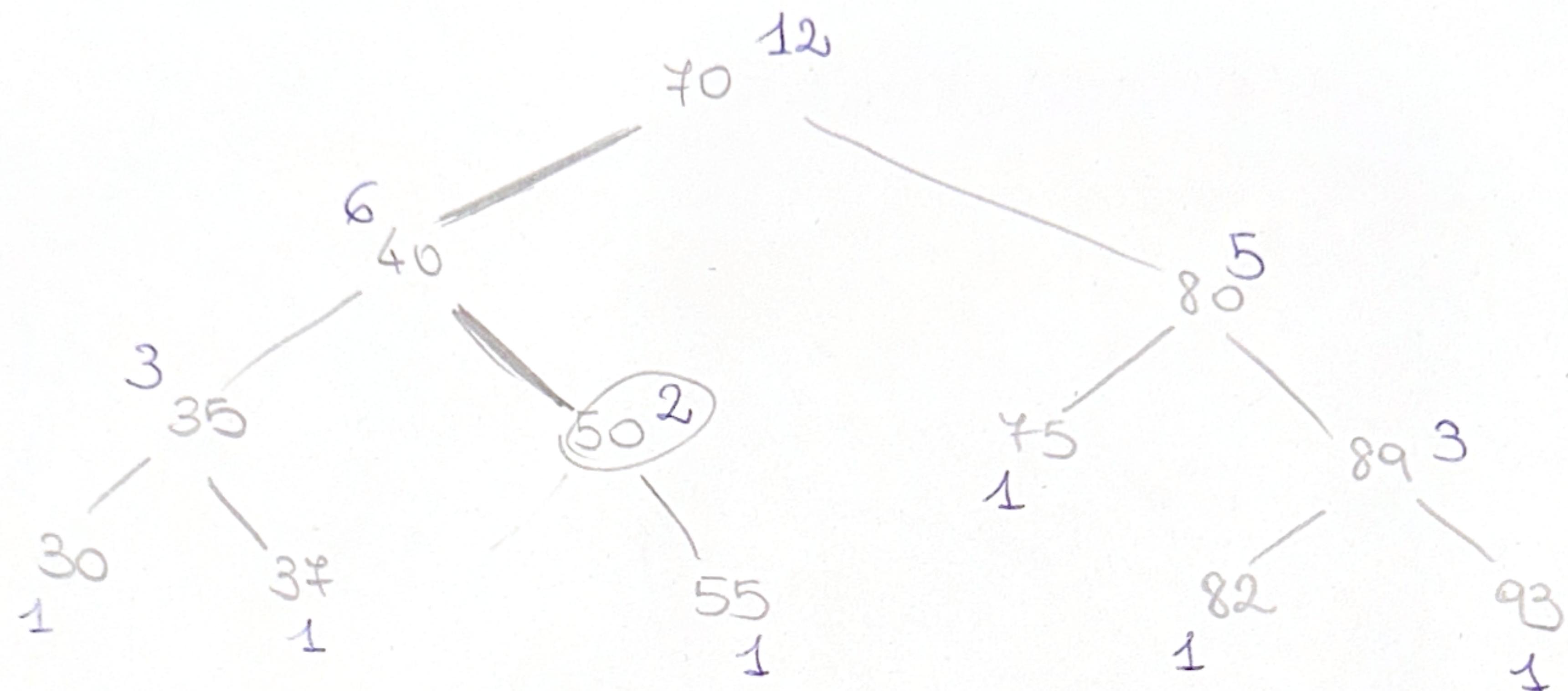
$$K = 159$$

$$i = 159 \% 23 = 21$$

$$j = 1 + 159 \% 94 = 63$$

$$i_{\text{NEW}} = (21 + 63) \% 23 = 15$$

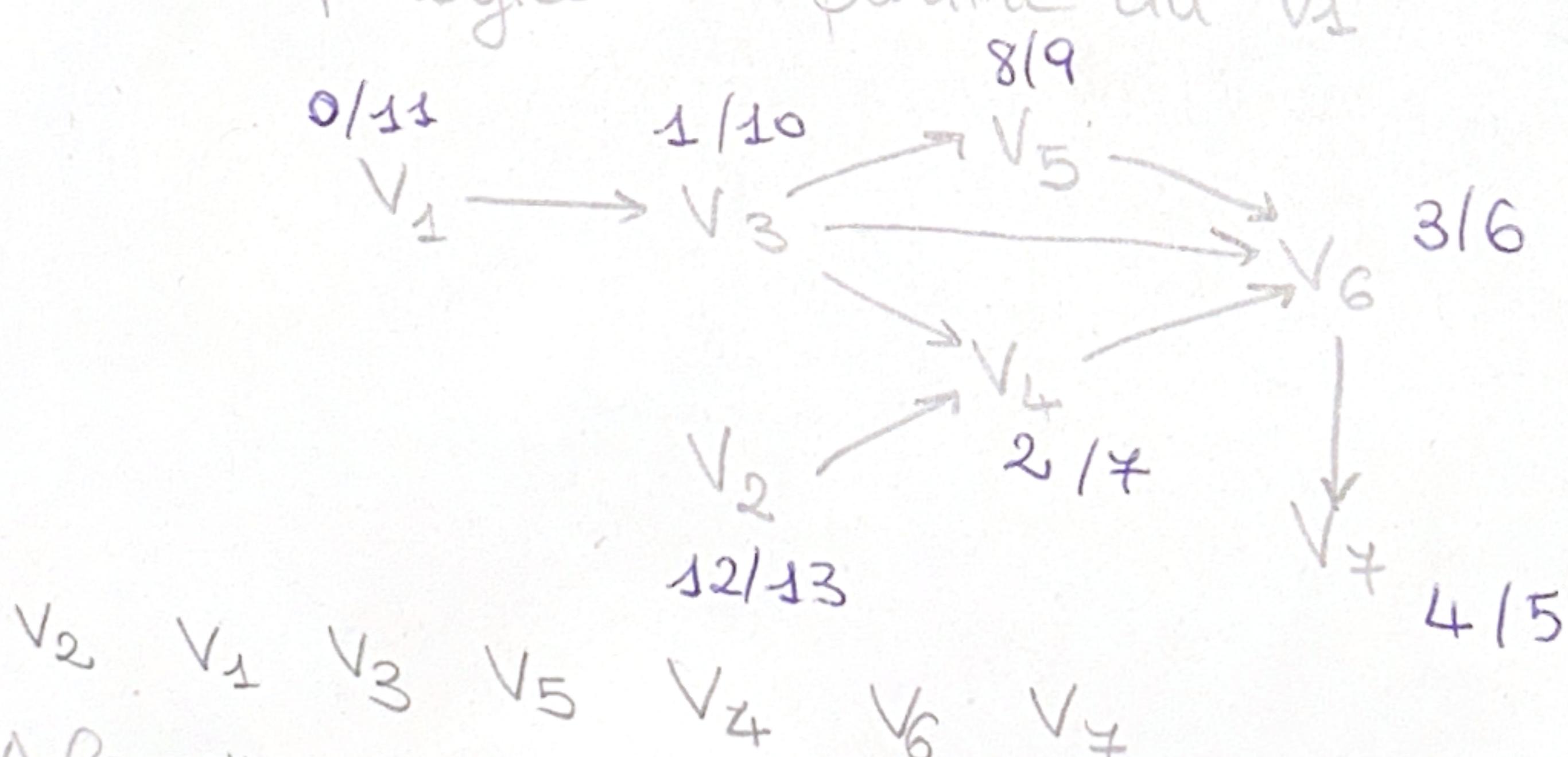
④ Order-Statistic BST



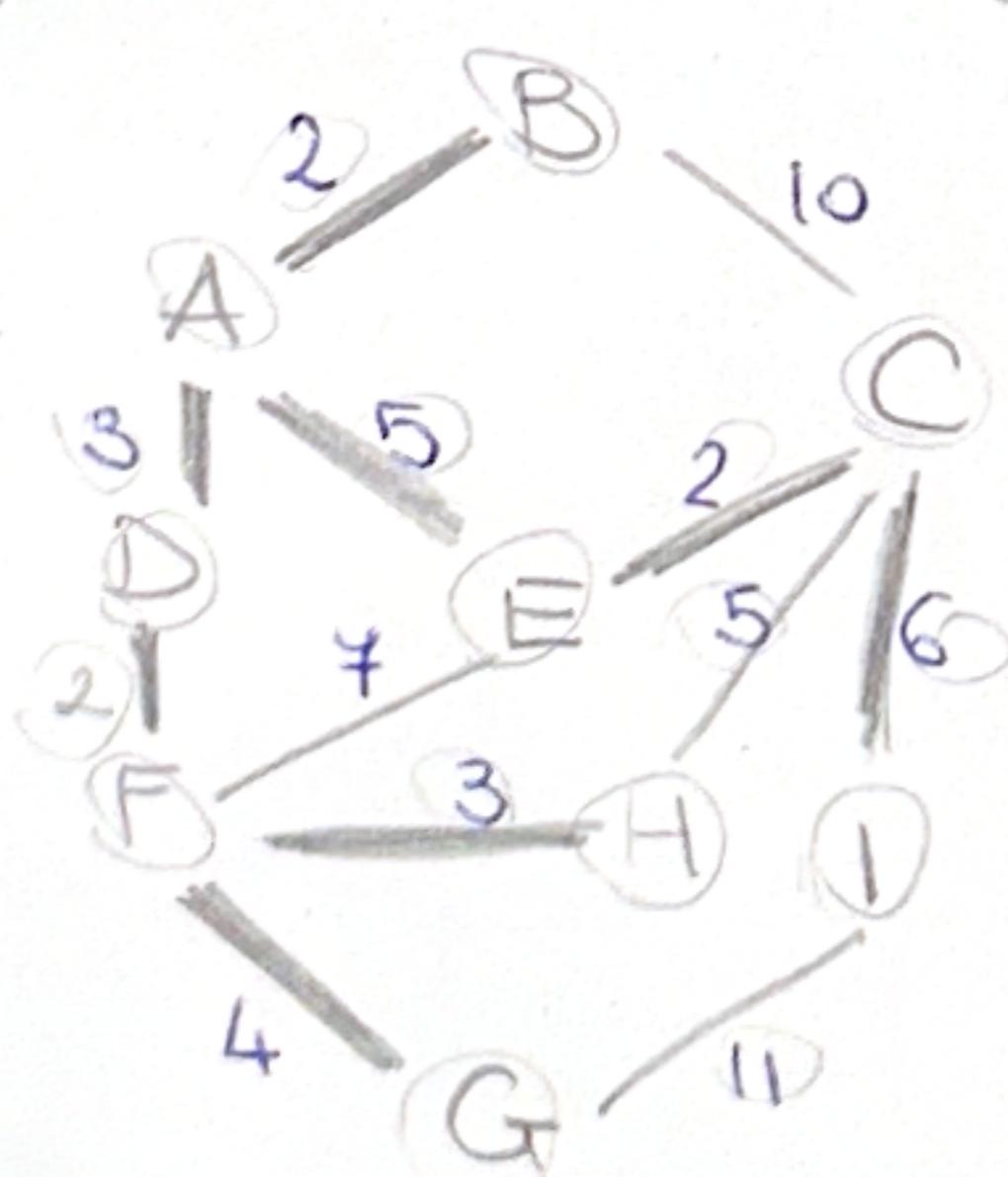
Ricerca delle 4^a chiave $K=4$

- (1) $t=6 > K \rightarrow (70, 40)$
- (2) $K=4, t=3 < K \rightarrow K=4-3-1=0 \rightarrow (40, 50)$
- (3) $K=0, t=0 = K \rightarrow \text{TROVATA} \rightarrow \text{NODO } 50$

⑤ Ordine topologico a partire da V_1



⑥ Algoritmo di Kruskal



(D,F NON specificato,
assumo 2)

$$\text{Peso minimo} = 2+2+2+3+3+4+5+6 = 27$$

$A, B : 2$	$P_1 :$
$C, E : 2$	$A, B \quad C, E$
$D, F : 2$	D, F Tutti scelti
$A, D : 3$	$P_2 :$
$F, H : 3$	$A, D \quad F, H$
$F, G : 4$	Tutti scelti
$A, E : 5$	$P_3 :$
$C, H : 5$	F, G
$C, I : 6$	Scelto
$E, F : 7$	
$G, I : 11$	
$P_4 :$	$A, E \quad C, H$ Scelgo A, E
$P_5 :$	C, I scelto