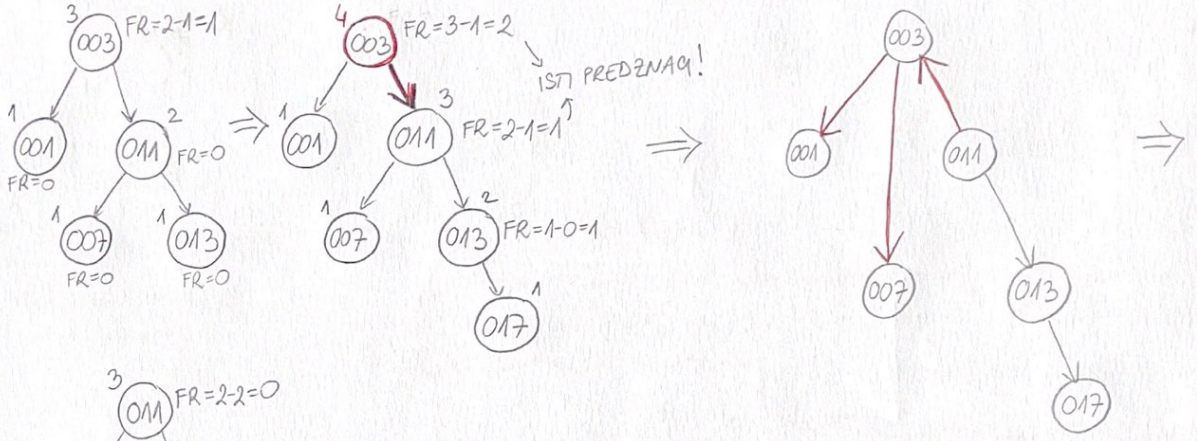
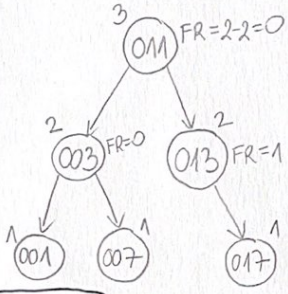
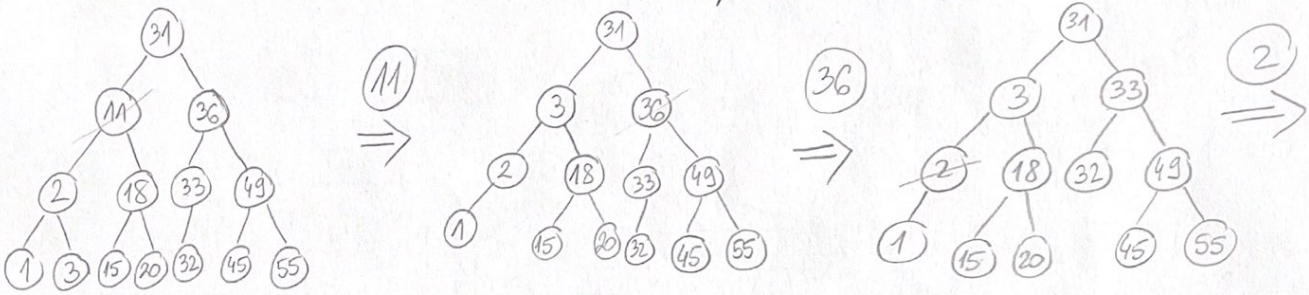
PRIMJER: DODATI U AVL STABLO: 17





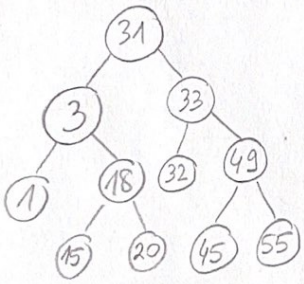
PRIMJER: DODATI U AVL STABLO: 31, 11, 3, 45, 18, 2, 1, 49, 55, 20, 15, 36, 33, 32

PRIMJER: IZ AVL STABLA IZBRISATI: 11, 36, 2

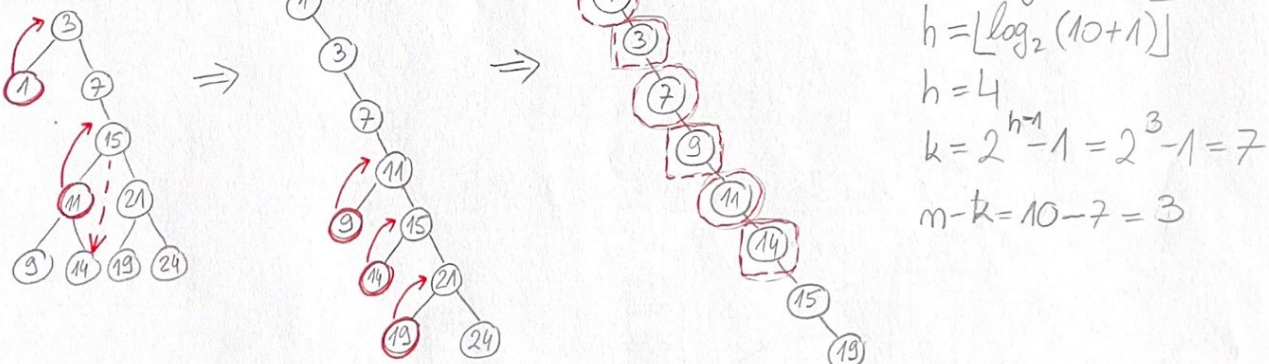


BRISANJE U NAJVEĆEG PRETHODNIKA

2 OPCIJE BRISANJA: - UZ NAJVEĆEG PRETHODNIKA
- UZ NAJMANJEG SljEDBENIKA



PRIMJER: DSW BALANSIRANJE



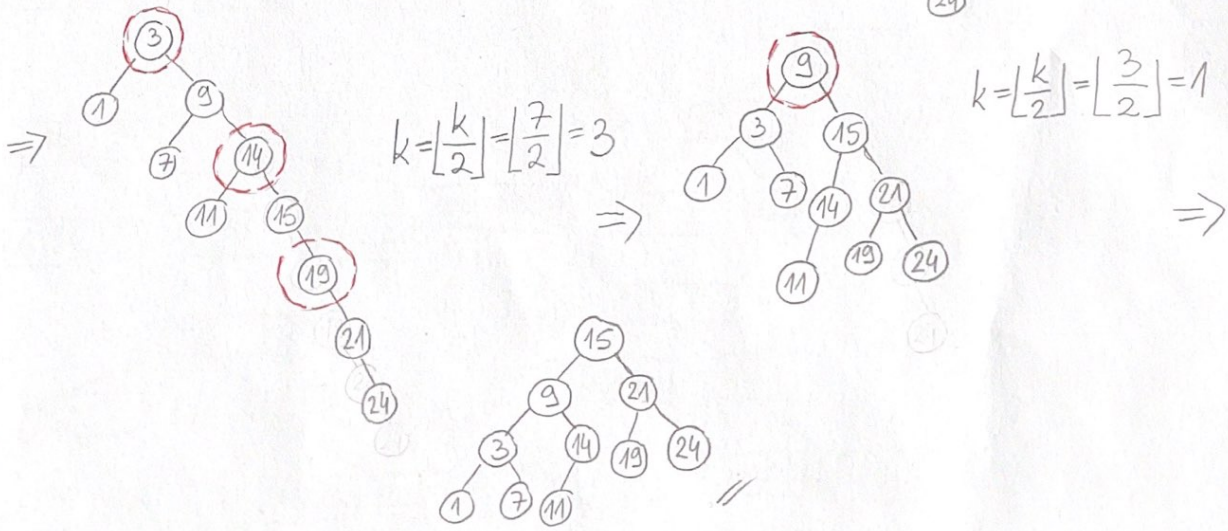
$h = \lfloor \log_2(n+1) \rfloor$

$h = \lfloor \log_2(10+1) \rfloor$

$h = 4$

$k = 2^{h-1} - 1 = 2^3 - 1 = 7$

$m - k = 10 - 7 = 3$

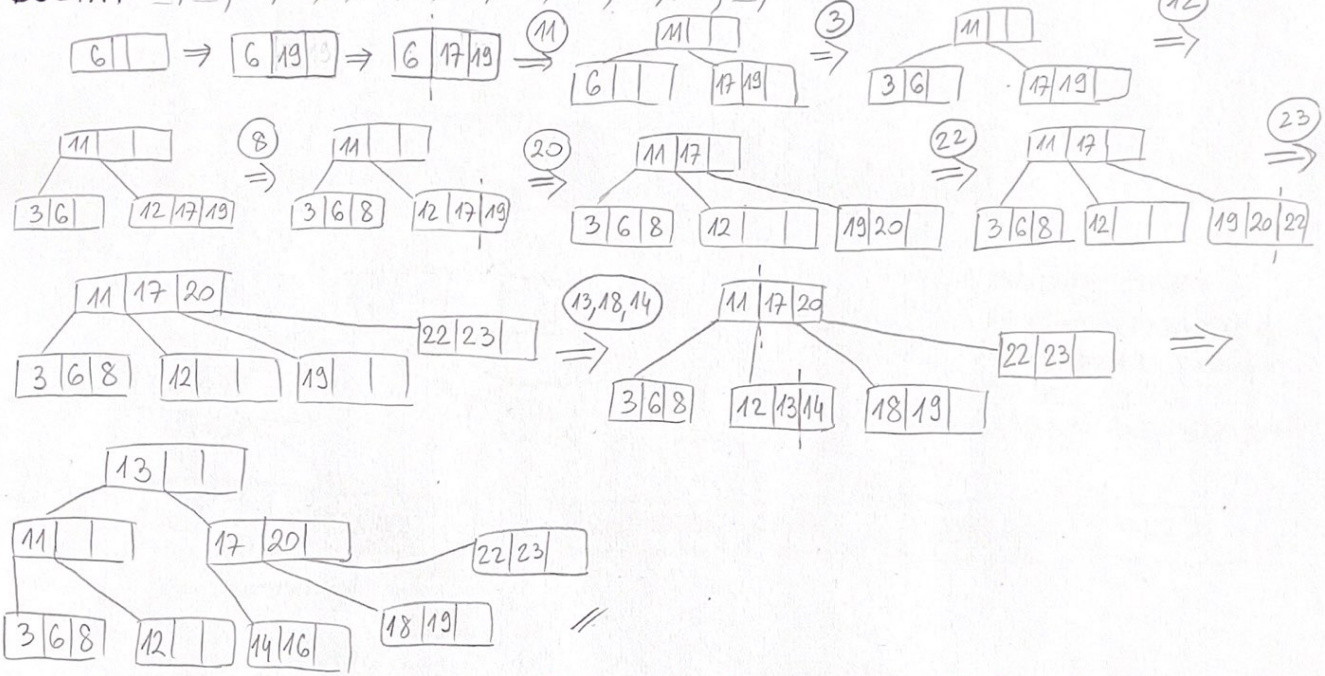


$k = \lfloor \frac{k}{2} \rfloor = \lfloor \frac{7}{2} \rfloor = 3$

$k = \lfloor \frac{k}{2} \rfloor = \lfloor \frac{3}{2} \rfloor = 1$

MI 2015 B-STABLO

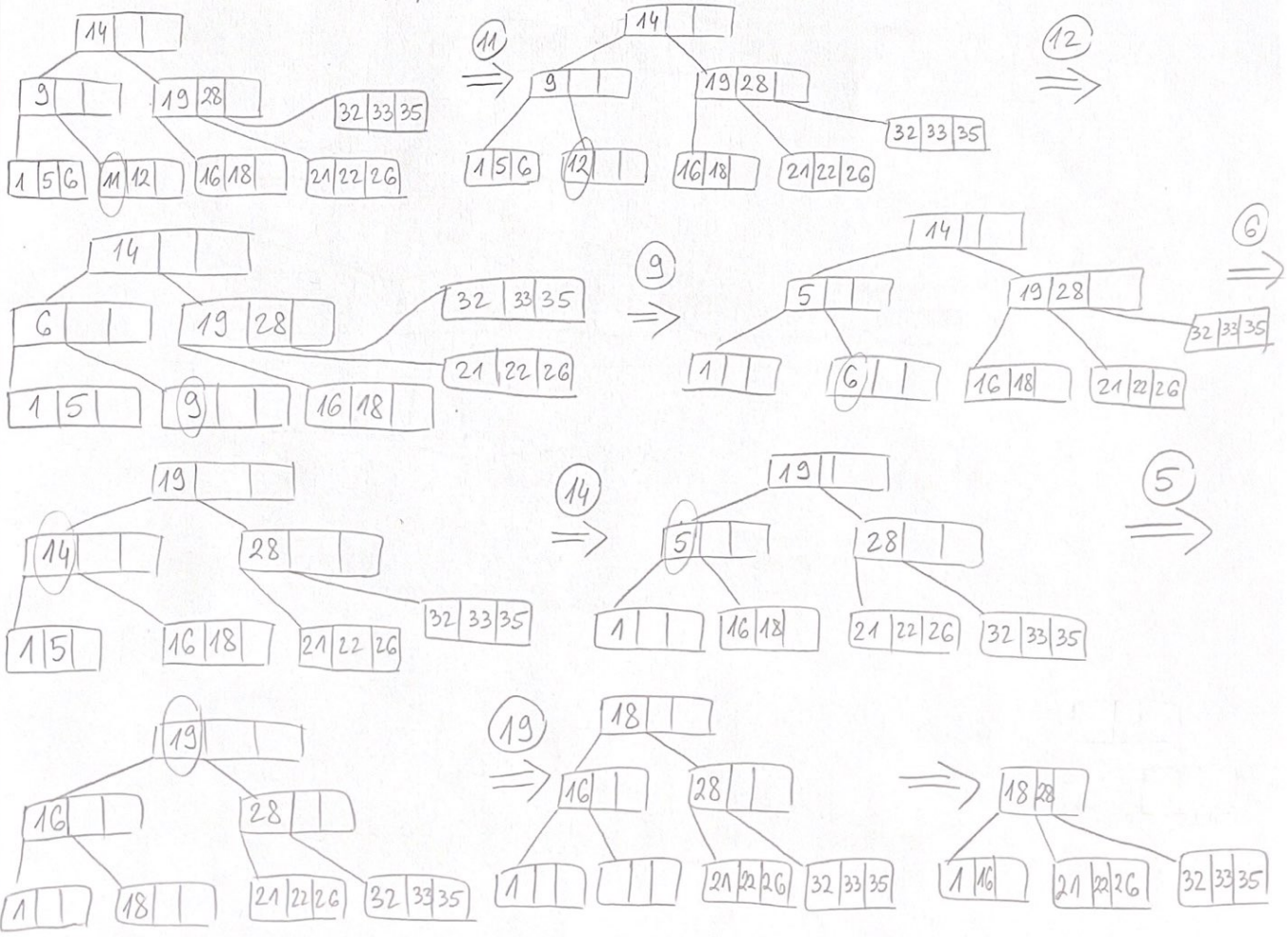
DODATI: 6, 19, 17, 11, 3, 12, 8, 20, 22, 23, 13, 18, 14, 16



MI 2016 B-STABLO

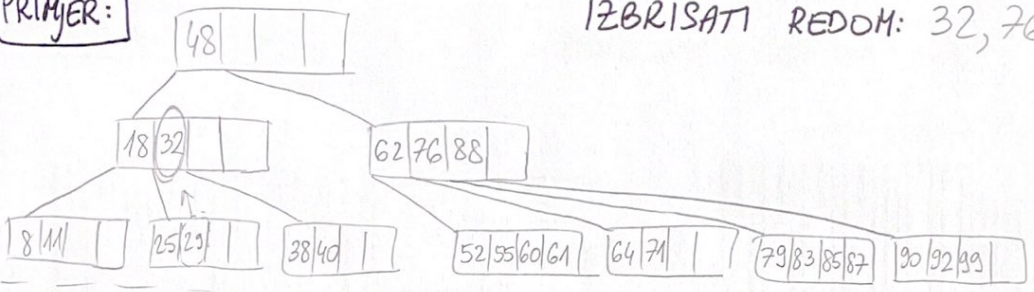
B-STABLO REDA 4: 1 ELEMENT = 50% POPUNJENOST

IZBRISATI: 11, 12, 9, 6, 14, 5, 19



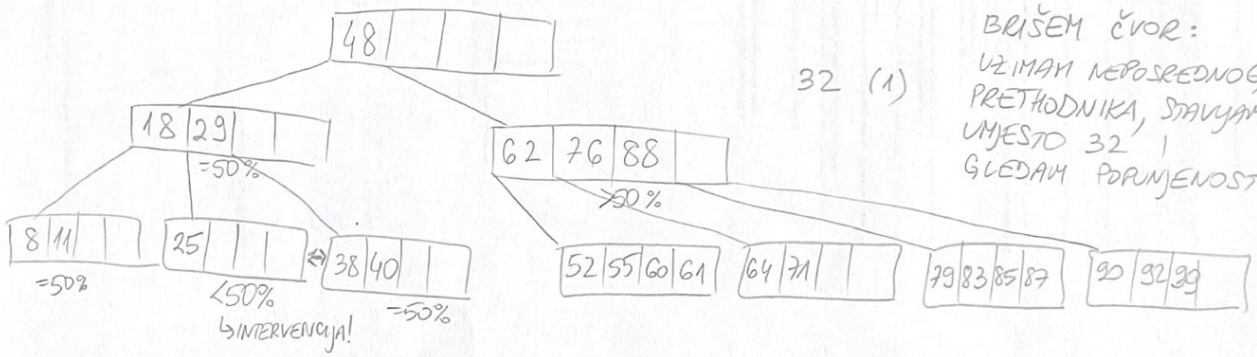
PRIMJER:

IZBRISATI REDOM: 32, 76, 48, 25, 11

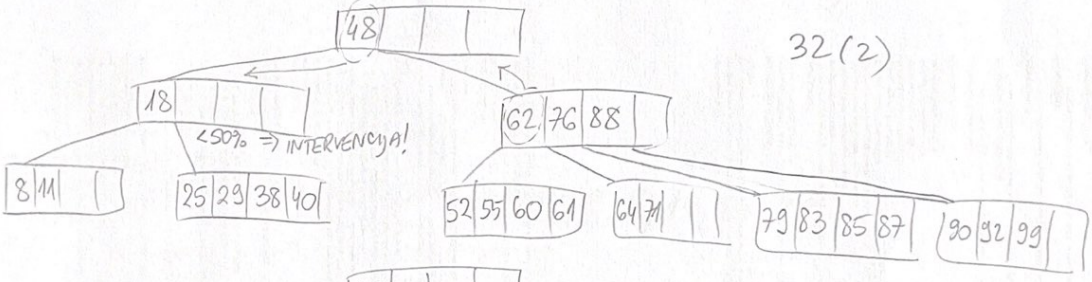


32 (1)

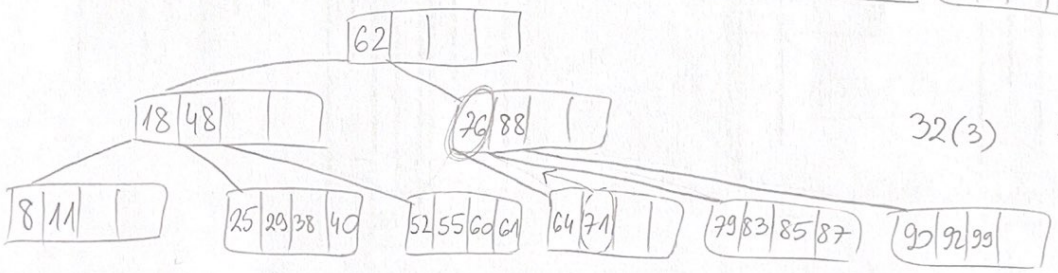
BRIŠEM ČVOR:
UZIMAM NEPOSREDNOG PRETHODNIKA, STAVLJAM UMJESTO 32 I GLEDAM POPUNJENOST



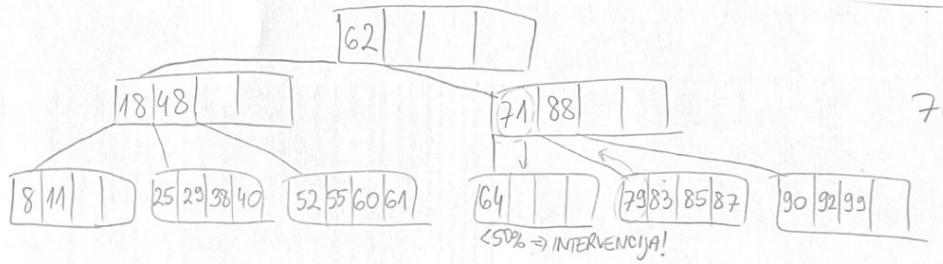
32 (2)



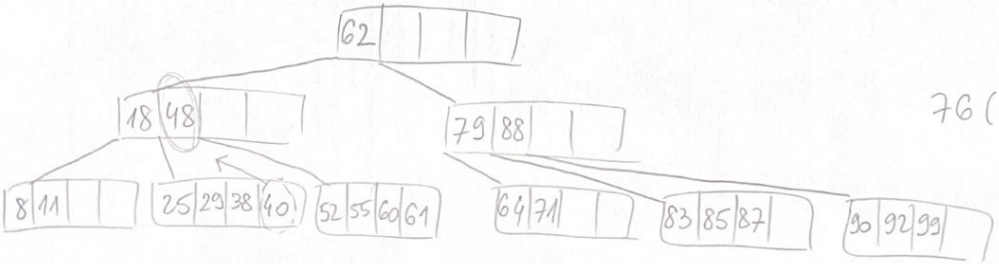
32 (3) SADA SU SVI ≥50%



76 (1)



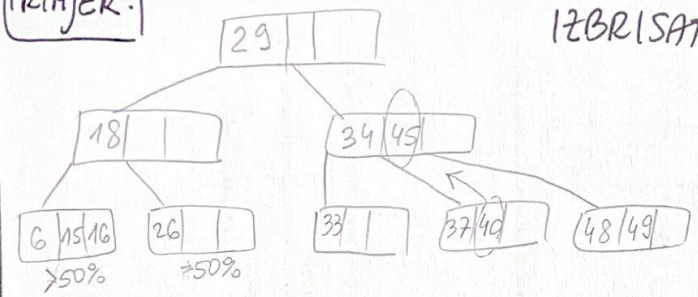
76 (2) SADA SU SVI OSIM KORIJENA ≥50%



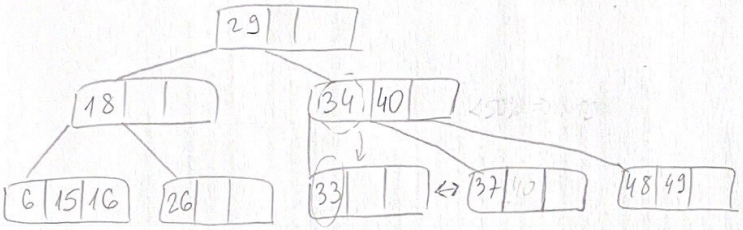
PRIMJER:

IZBRISATI REDOM: 45, 33

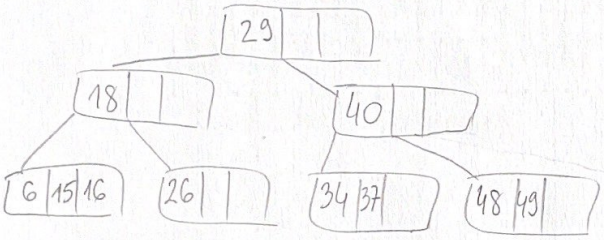
B-STABLO REDA 4, $m = 4$



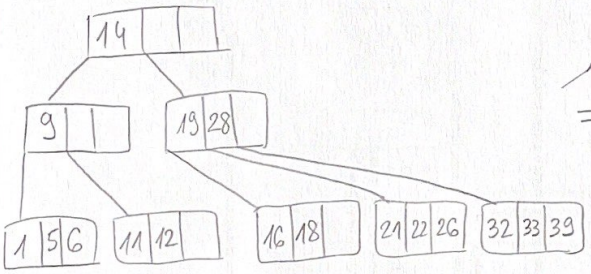
45



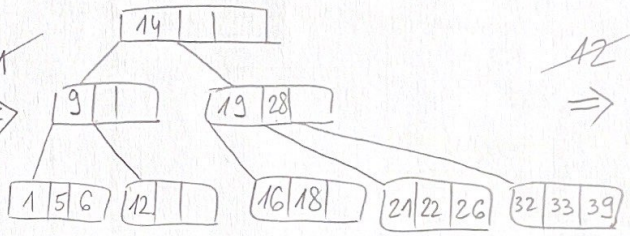
33



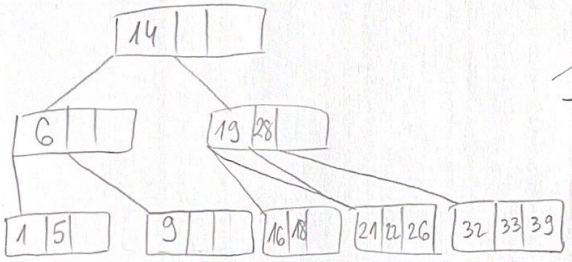
PRIMJER: IZBRISATI REDOM: 11, 12, 9, 6, 14, 5, 19



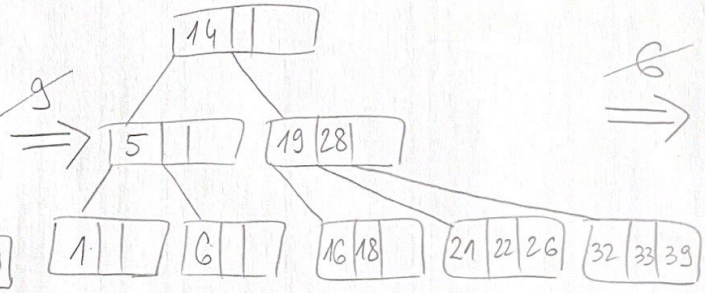
11 ⇒



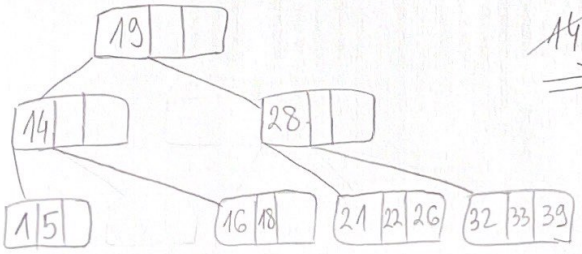
12 ⇒



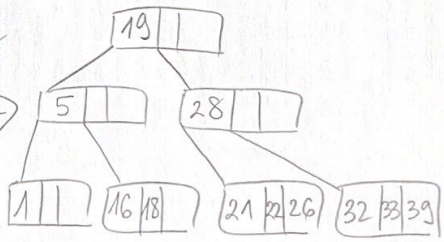
9 ⇒



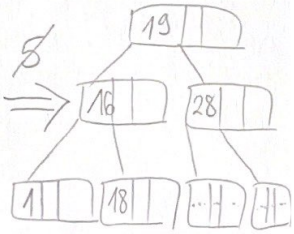
6 ⇒



14 ⇒



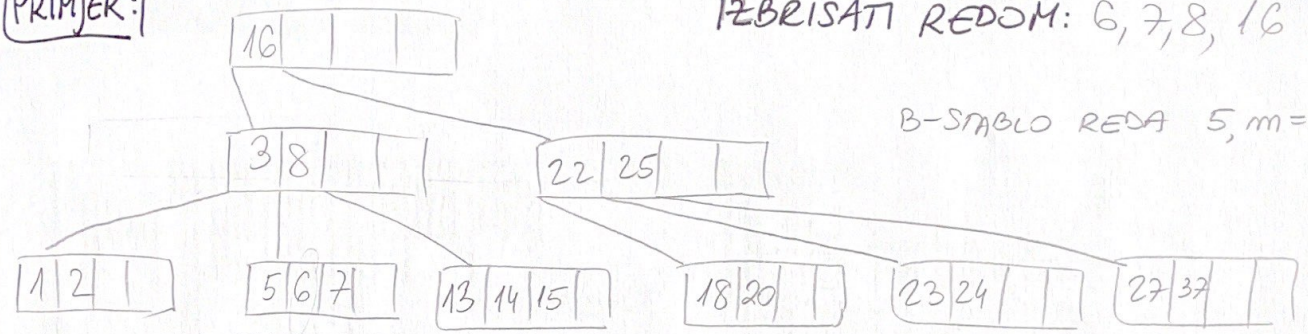
8 ⇒



PRIMJER:

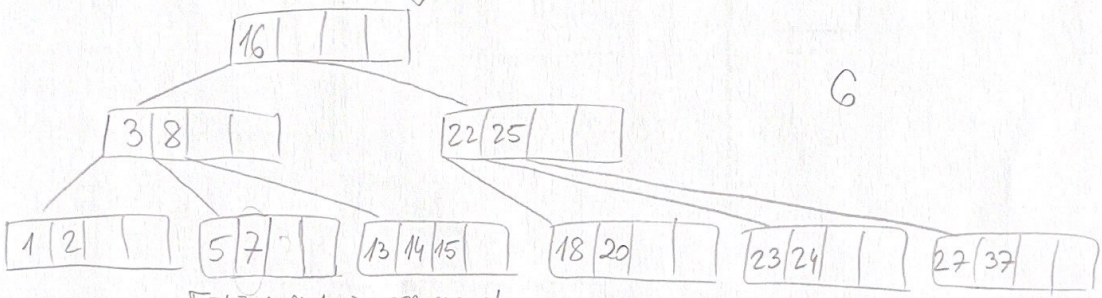
IZBRISATI REDOM: 6, 7, 8, 16

B-STABLO REDA 5, m=5



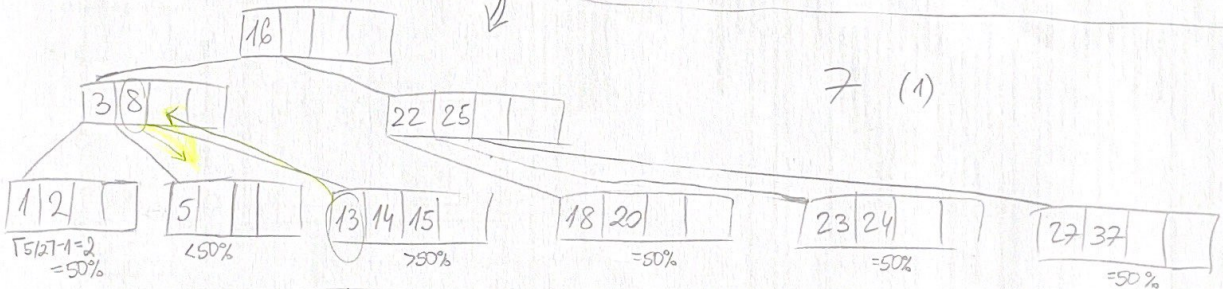
$\lceil 5/2 \rceil - 1 = 2 = 2$

6

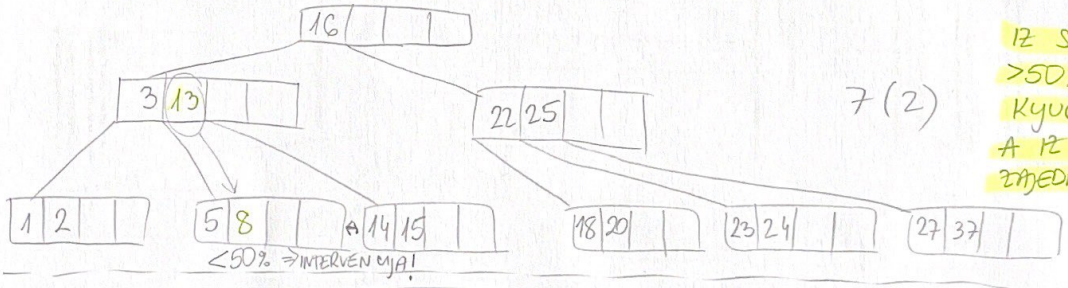


$\lceil 5/2 \rceil - 1 = 2 > 1 \Rightarrow$ INTERVENCIJA!

7 (1)

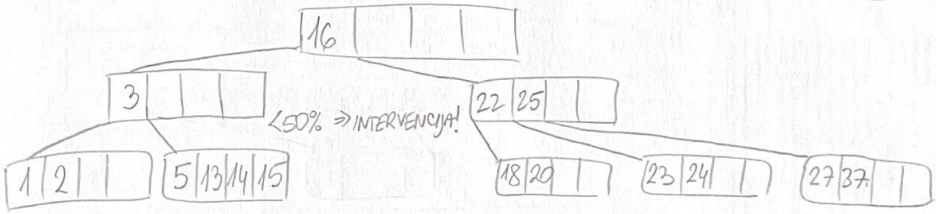


7 (2)



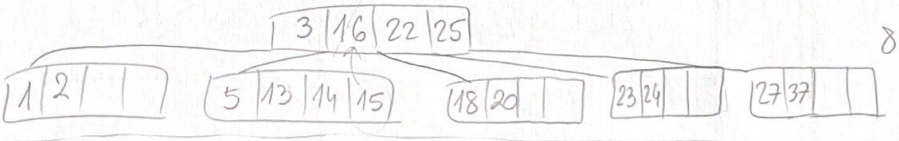
IZ SUSJEDA KOJI JE >50% PRECACITI KLJUČ U RODITELJA, A IZ RODITELJA UZETI ZAJEDNIČKI KLJUČ I STAVITI GA U ČVOR IZ KOJEG SMO IZBRISALI ELEMENT I OSTAVILI <50%

8 (1)

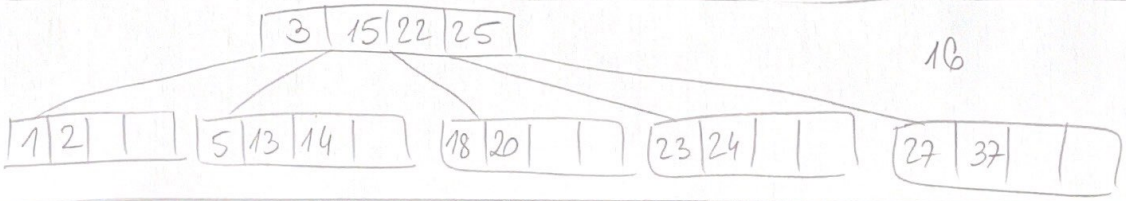


OBA SUSJEDA SU =50%
↳ SPOJI DESNOG SUSJEDA, ZAJEDNIČKI ČVOR IZ RODITELJA I LIST IZ KOJEG SMO IZBRISALI ELEMENT I OSTAVILI <50%

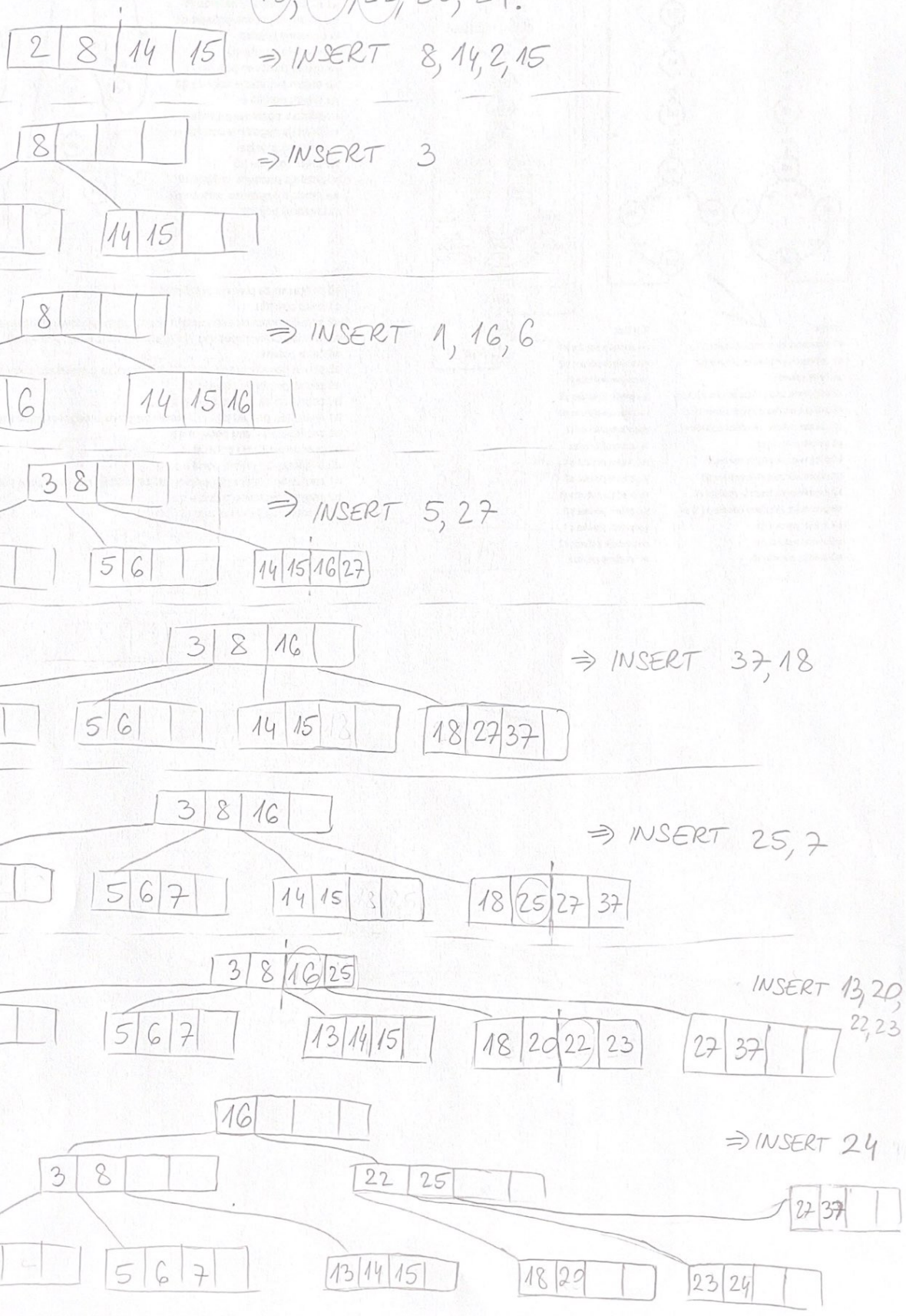
8 (2)



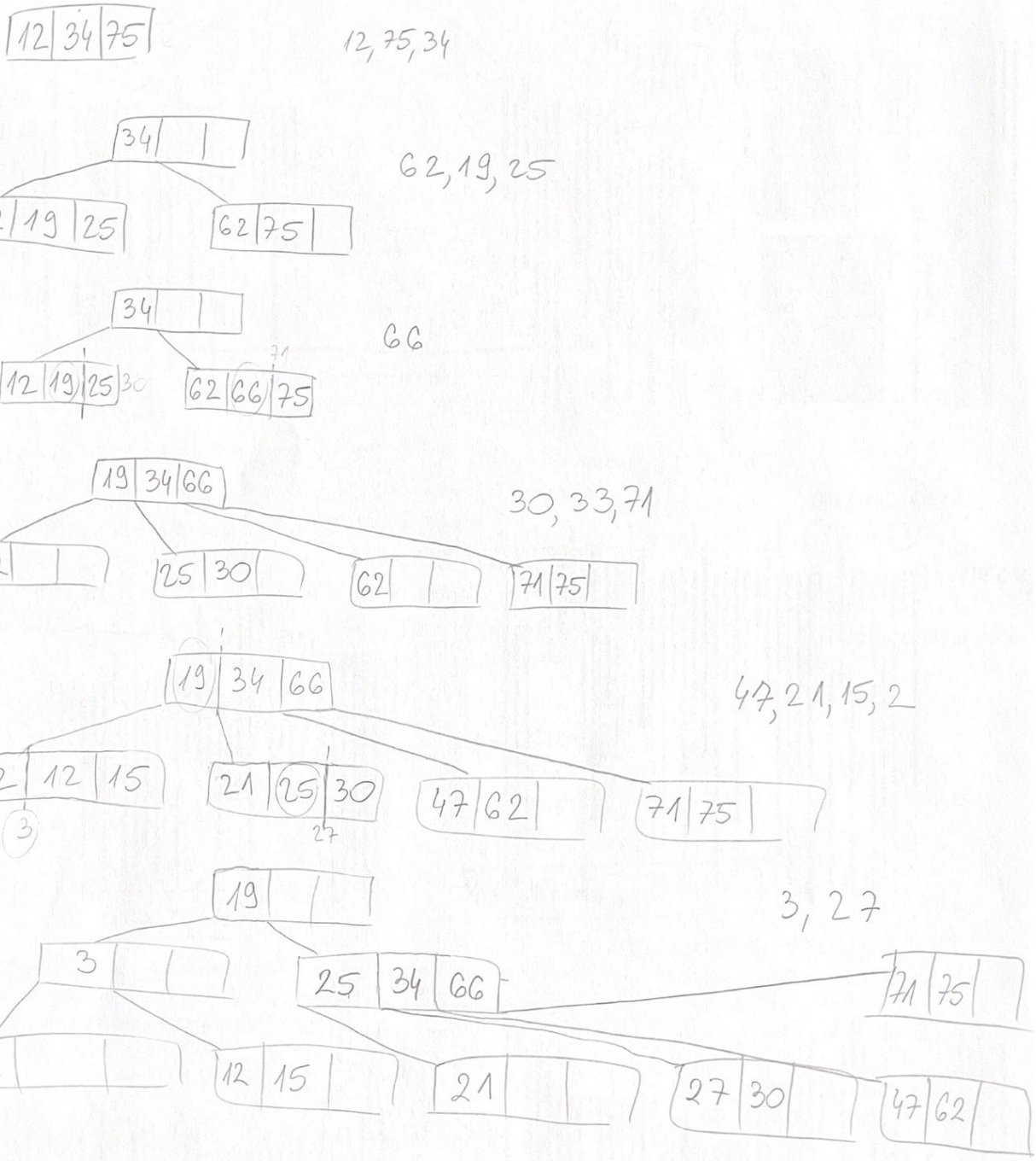
16



PRIMJER REDOM SE DODAJU: 8, 14, 2, 15, 3, 1, 16, 6, 5, 27, 37, 18, 25, 7, 13, 20, 22, 23, 24.

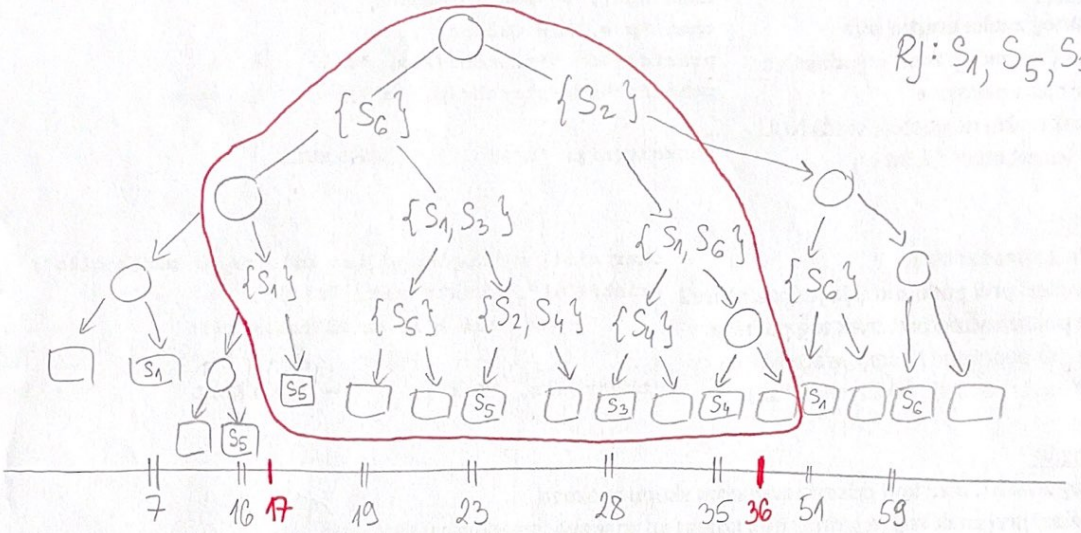


PRIMJER: DODAJEMO REDOM: 12, 75, 34, 62, 19, 25, 66, 30, 33, 71, 47, 21, 15, 2, 3, 27



PRIMJER: STABLO SEGMENTA

LINIJSKI SEGMENTI U RASPONU $X \in [17, 36]$?



RJ: $S_1, S_5, S_3, S_6, S_2, S_4$ //

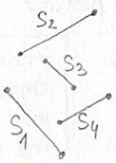
S_1 POKRIVA 7, $\langle 7,19\rangle$, $[19,28\rangle$, $[28,51\rangle$, 51 $\Rightarrow$ UKUPNO: $[7, 51]$
S_2 POKRIVA $[23,28\rangle$, $[28,+\infty\rangle$ $\Rightarrow$ UKUPNO: $[23, +\infty\rangle$
S_3 POKRIVA $[19,28\rangle$, 28 $\Rightarrow$ UKUPNO: $[19,28]$
S_4 POKRIVA $[23,28\rangle$, $[28,35\rangle$, 35 $\Rightarrow$ UKUPNO: $[23,35]$
S_5 POKRIVA 16, $\langle 16,19\rangle$, $[19,23\rangle$, 23 $\Rightarrow$ UKUPNO: $[16,23]$
S_6 POKRIVA $\langle -\infty, 28\rangle$, $[28,51\rangle$, $[51,59\rangle$, 59 $\Rightarrow$ UKUPNO: $\langle -\infty, 59]$

TRAŽIMO RASPON $[17, 36]$:
17 SE NALAZI IZMEĐU $\langle 16,19\rangle$,
36 SE NALAZI IZMEĐU $\langle 35,51\rangle$

PRIMJER: NACRTATI STABLO SEGMENATA:

$S_1 = (6,10) \times (19,2)$
$S_2 = (4,12) \times (19,20)$
$S_3 = (9,13) \times (13,11)$
$S_4 = (13,8) \times (22,12)$

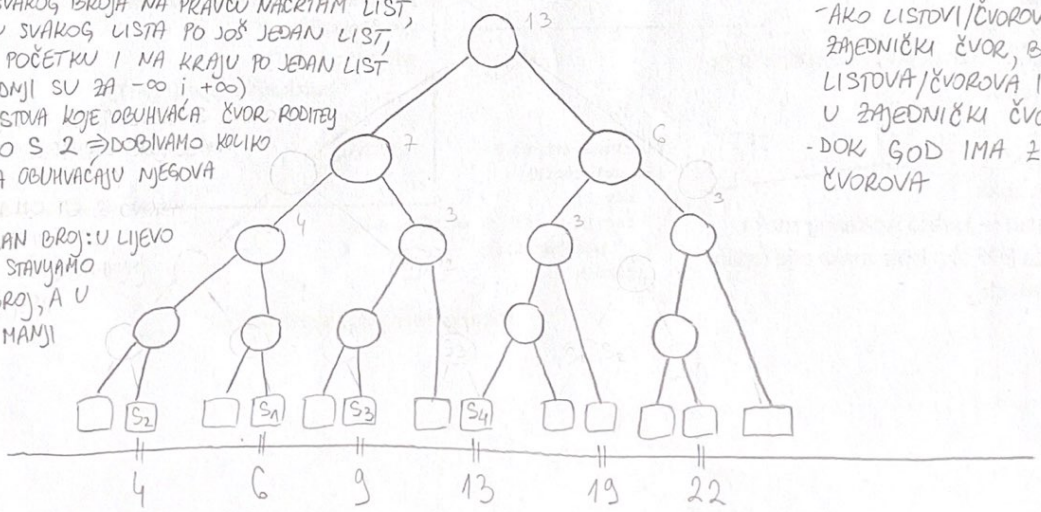
$S_i = (X_1, Y_1) \times (X_2, Y_2)$



$W_1 = [6:19] \times [10:2]$
$W_2 = [4:19] \times [12:20]$
$W_3 = [9:13] \times [13:11]$
$W_4 = [13:22] \times [8:12]$

$W_i = [X_1:X_2] \times [Y_1:Y_2]$

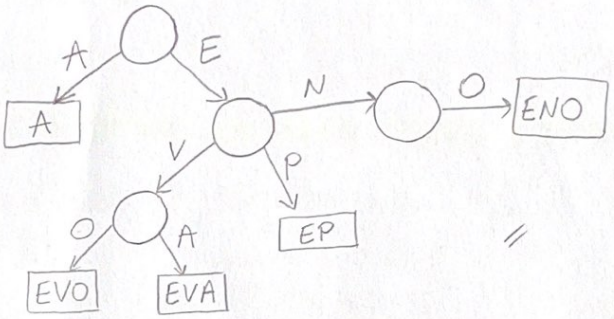
1° GLEDAMO SAMO RASPON X (Y ZANEMARUJEMO)
2° SVE BROJEVE IZ RASPONA X (BEZ DUPLIKATA) STAVLJAM NA BROJEVNI PRAVAC
3° IZNAD SVAKOG BROJA NA PRAVCU NACRTAM LIST, IZMEĐU SVAKOG LISTA PO JOŠ JEDAN LIST, TE NA POČETKU I NA KRAJU PO JEDAN LIST (TI ZADNJI SU ZA $-\infty$ i $+\infty$)
4° BROJ LISTOVA KOJE OBUHVAĆA ČVOR RODITELJ DIJELIMO S 2 $\Rightarrow$ DOBIVAMO KOLIKO LISTOVA OBUHVAĆAJU NJEGOVA DJECA.
↳ NEPARAN BROJ: U LIJEVO DIJETE STAVLJAMO VEĆI BROJ, A U DESNO MANJI



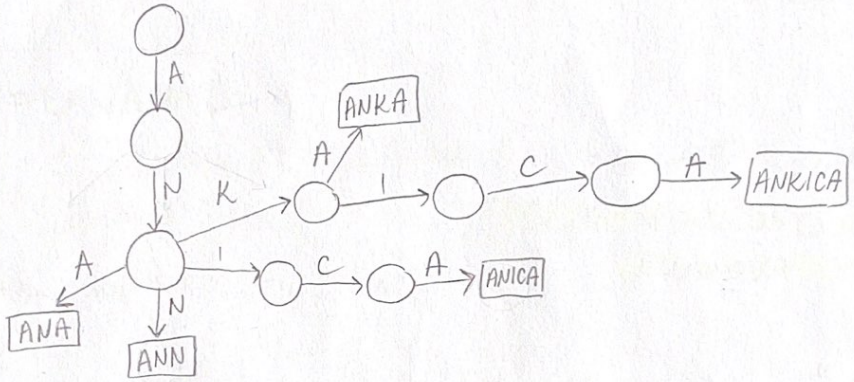
6° KORACI ZA NAR. S_1:
- U SVE LISTOVE KOJI SU U $[6,19]$ UPISUJEMO S_1
- AKO LISTOVI/ČVOROVI SA S_1 IMAJU ZAJEDNIČKI ČVOR, BRIŠEMO S_1 IZ LISTOVA/ČVOROVA I UPISUJEMO U ZAJEDNIČKI ČVOR. PONAVLJAMO
- DOK GOD IMA ZAJEDNIČKIH ČVOROVA

PRIMJER: TRIE (PREFIKSNO STABLO)

IZRADI PREFIKSNO STABLO ZA RIJEČI: "A", "EVO", "EVA", "EP", "ENO".

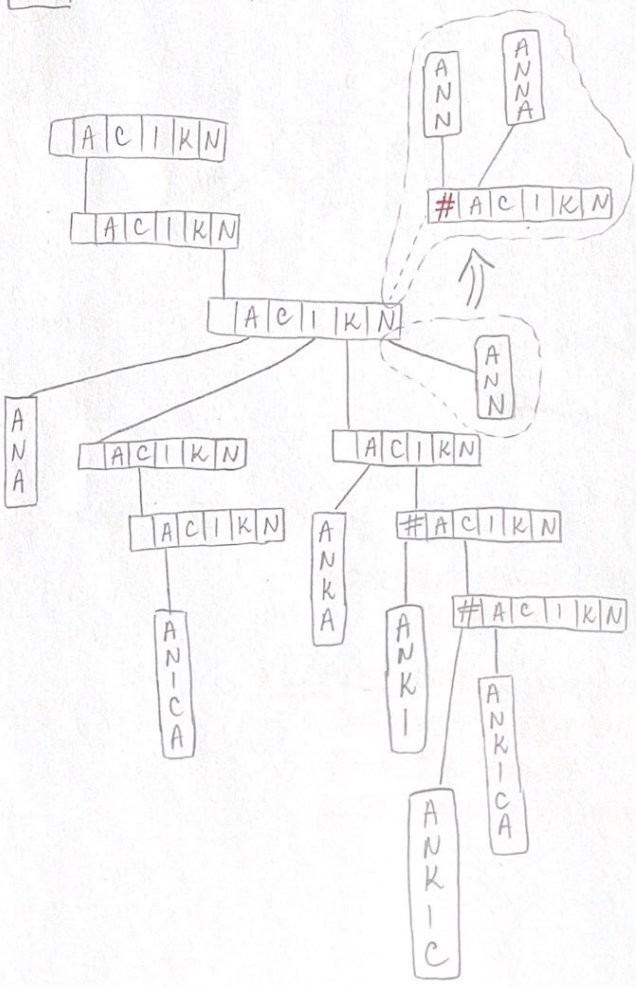


PRIMJER: IZRADI PREFIKSNO STABLO ZA RIJEČI: "ANA", "ANN", "ANICA", "ANKA", "ANKICA".



*POTREBNA SLOVA: A, C, I, K, N

RAZINE	1	2	3	4	5	6
	A	N	A			
	A	N	N			
	A	N	K	A		
	A	N	I	C	A	
	A	N	K	I	C	A



PRIMJER: SUFIKSNO POLJE

$S = ACCA\$$

SUFIKSI: $S_1 = ACCA\$$, $S_2 = CCA\$$, $S_3 = CA\$$, $S_4 = A\$$, $S_5 = \$$

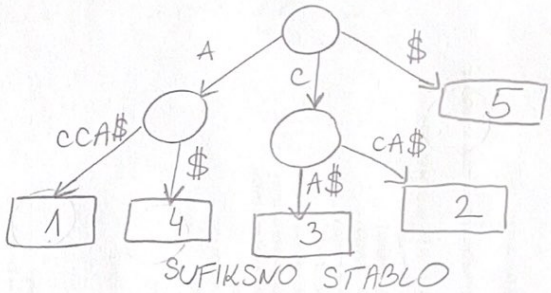
$\$$ JE ABECEDNO VEĆI OD ZNAKOVA ABECEDE IZ S

ABECEDNO POREDANI SUFIKSI NIZA S:

$S_1 = ACCA\$$
$S_4 = A\$$
$S_3 = CA\$$
$S_2 = CCA\$$
$S_5 = \$$

→ SUFIKSNO POLJE

$SA = [1, 4, 3, 2, 5]$



SUFIKSNO STABLO

PRIMJER:

$S = BANANA\$$

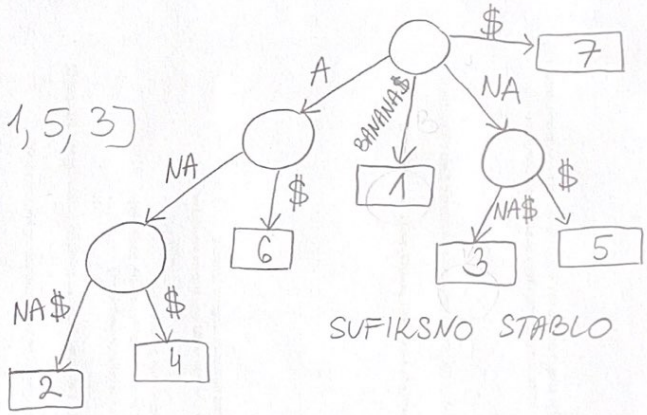
SUFIKSI: $S_1 = BANANA\$$, $S_2 = ANANA\$$, $S_3 = NANA\$$, $S_4 = ANA\$$, $S_5 = NA\$$, $S_6 = A\$$, $S_7 = \$$

$\$$ JE ABECEDNO MANJI OD ZNAKOVA ABECEDE IZ S

ABECEDNO POREDANI SUFIKSI NIZA S:

$S_7 = \$$
$S_6 = A\$$
$S_4 = ANA\$$
$S_2 = ANANA\$$
$S_1 = BANANA\$$
$S_5 = NA\$$
$S_3 = NANA\$$

$SA = [7, 6, 4, 2, 1, 5, 3]$



SUFIKSNO STABLO

PRIMJER: $S = ANANAS$

$S_1 = ANANAS$, $S_2 = NANAS$, $S_3 = ANAS$, $S_4 = NAS$, $S_5 = AS$, $S_6 = S$

$S_1 = ANANAS$
$S_3 = ANAS$
$S_5 = AS$
$S_2 = NANAS$
$S_4 = NAS$
$S_6 = S$

$SA = [1, 3, 5, 2, 4, 6]$

$SA = ISA$

$LCP = [0, 3, 1, 0, 2, 0]$

→ KORISTITI 0-5 INDEKSE!

→ LCP: GLEDAM U KOLIKO ZNAKOVA SE POKLAPA S PRETHODNIKOM I PIŠEM U LCP POLJE!

PRIMJER: BWT

ULAZNI NIZ S = BANANA, FORMIRATI bwt(S)!

1° DODAJ STOP ZNAK $ ⇒ S' = BANANA$

2° KONSTRUIRAJ BWT MATRICU OD S' KAO LISTU SVIH MOGUĆIH RAZLIČITIH ROTACIJA S'

BANANA$
$BANANA
A$BANAN
NA$BANA
ANA$BAN
NANA$BA
ANANA$B

3° SORTIRAJ BWT MATRICU UZLAZNIM ABECEDNIM PORETKOM

⇒ $ JE ABECEDNO MANJI OD BILO KOJEG SLOVA U RJEČNIKU!

→ TO JE NIZ bwt(S)!

$ BANANA
A$ BANAN
ANA$ BAN
ANANA$ B
BANANA $
NA$ BANA
NANA$ BA

4° KOPIRATI POSLJEDNJE ZNAKOVE ⇒ bwt(S) JE NIZ POSLJEDNJIH ZNAKOVA U SVAKOM RETKU SORTIRANJE MATRICE BWT(S)

BWT(BANANA) = ANNB$AA //

PRIMJER: SIMPLEX

$$\max \; (15x_1 + 10x_2 = P) \quad \text{uz} \quad \begin{matrix} 2x_1 + x_2 \leq 10 \\ x_1 + 3x_2 \leq 10 \\ x_1, x_2 \geq 0 \end{matrix}$$

(1°) • TO TURN THE i-SYSTEM INTO e-SYSTEM, ADD SLACK VARIABLES TO THE LEFT SIDE OF THE PROBLEM CONSTRAINT INEQUALITIES

$$2x_1 + x_2 + s_1 = 10$$
$$x_1 + 3x_2 + s_2 = 10$$
$$-15x_1 - 10x_2 + P = 0$$

→ MOVE TERMS ON THE LEFT OF THE OBJECTIVE

(2°) • FILL THE MATRIX WITH COEFFICIENTS FROM STEP (1°) TO GET THE INITIAL SIMPLEX TABLEAU.
LABEL ROWS IN TABLEAU WITH BASIC VARIABLES s_1, s_2 IN SUCH A WAY THAT THE INTERSECTION ELEMENT OF THE SAME LABEL ROW AND COLUMN IS 1:

	x_1	x_2	s_1	s_2	P	
s_1	2	1	1	0	0	10
s_2	1	3	0	1	0	10
P	-15	-10	0	0	1	0

(3°) • THE COLUMN WITH THE MOST NEGATIVE INDICATOR IS **PIVOT COLUMN**. THE LABEL OF THAT COLUMN IS CALLED **ENTERING VARIABLE**.
DIVIDE EACH ELEMENT IN THE LAST COLUMN WITH CORRESPONDING POSITIVE ONES IN THE PIVOT COLUMN. THE ROW IN WHICH THE SMALLEST QUOTIENT IS OBTAINED IS CALLED THE **PIVOT ROW**. THE LABEL OF THAT ROW IS CALLED THE **EXITING VARIABLE**.

PIVOT ROW → ENTERING VARIABLE

	x_1	x_2	s_1	s_2	P		
s_1	(2)	1	1	0	0	(10)	$\Rightarrow \frac{10}{2} = 5$
s_2	(1)	3	0	1	0	(10)	$\Rightarrow \frac{10}{1} = 10$
P	-15	-10	0	0	1	0	

EXITING VARIABLE

PIVOT ELEMENT

PIVOT COLUMN (-15 IS THE MOST NEGATIVE INDICATOR)

PIVOT ELEMENT IS IN THE INTERSECTION OF THE PIVOT ROW AND THE PIVOT COLUMN!

PIVOT $(1,1) = 2 \Rightarrow$ ENTERING VARIABLE IS x_1, EXITING VARIABLE IS s_1

ODABIR RETKA: $\operatorname{argmin}_{i \in \{1,2\}} \left\{ \frac{10}{2}, \frac{10}{1} \right\} = 1 \Rightarrow$ 1. REDAK IMA PIVOT ELEMENT

(4°) PERFORM PIVOT OPERATION: R = ROW

	X_1	X_2	S_1	S_2	P	
S_1	(2)/2	1/2	1/2	0/2	0/2	10/2
S_2	1	3	0	1	0	10
P	-15	-10	0	0	1	0

$\frac{R_1}{2} \to R_1$ (SVAKI ELEM. IZ PRVOG REDA PODIJELITI S 2)

$\sim$

	X_1	X_2	S_1	S_2	P	
S_1	(1)	0.5	0.5	0	0	5
S_2	1	3	0	1	0	10
P	-15	-10	0	0	1	0

$-1R_1 + R_2 \to R_2$

$15R_1 + R_3 \to R_3$

$\sim$

	X_1	X_2	S_1	S_2	P	
S_1	1	0.5	0.5	0	0	5
S_2	-1+1	-0.5+3	-0.5+0	0+1	0+0	-5+10
P	15-15	15·0.5-10	15·0.5+0	0+0	0+1	15·5+0

$=$

	X_1	X_2	S_1	S_2	P	
S_1	1	0.5	0.5	0	0	5
S_2	0	(2.5)	-0.5	1	0	5
P	0	-2.5	7.5	0	1	75

NEW PIVOT COLUMN

NEW PIVOT ROW

(5°) OPTIMAL (HAS NO NEGATIVE FACTORS IN THE BOTTOM ROW)? ⇒ STOP
NOT OPTIMAL (HAS NEGATIVE FACTORS IN THE BOTTOM ROW)? ⇒ REPEAT THE WHOLE PROCEDURE FROM (2°), (3°) AND (4°)

THIS CASE IS NOT OPTIMAL ⇒ PIVOT (2, 2) = 2.5 ⇒ ENTERING VARIABLE IS X_2, EXITING VARIABLE IS S_2

PERFORM PIVOT OPERATION:

	X_1	X_2	S_1	S_2	P	
S_1	1	0.5	0.5	0	0	5
S_2	0/2.5	(2.5)/2.5	-0.5/2.5	1/2.5	0/2.5	5/2.5
P	0	-2.5	7.5	0	1	75

$\frac{R_2}{2.5} \to R_2$

$\sim$

	X_1	X_2	S_1	S_2	P	
S_1	1	0.5	0.5	0	0	5
S_2	0	(1)	-0.2	0.4	0	2
P	0	-2.5	7.5	0	1	75

$-0.5R_2 + R_1 \to R_1$

$2.5R_2 + R_3 \to R_3$

$\sim$

	X_1	X_2	S_1	S_2	P	
S_1	0+1	-0.5·1+0.5	-0.5·(-0.2)+0.5	-0.5·0.4+0	0+0	-0.5·2+5
S_2	0	1	-0.2	0.4	0	2
P	0+0	2.5·1-2.5	2.5·(-0.2)+7.5	2.5·0.4+0	0+1	2.5·2+75

$=$

	X_1	X_2	S_1	S_2	P	
X_1	1	0	0.6	0.2	0	4
X_2	0	1	-0.2	0.4	0	2
P	0	0	7	1	1	80

4·15 + 2·10 = +80 !

SVI SU ≥ 0 ⇒ STOP! ⇒ MAX P = 80

ZA $X_1 = 4$, $X_2 = 2$ //

PRIMJER: SIMPLEX

$$\max \quad 7x_1 + 6x_2 = P \quad \text{uz} \quad \begin{aligned} 2x_1 + x_2 &\leq 3 \\ x_1 + 4x_2 &\leq 4 \\ x_1, x_2 &\geq 0 \end{aligned}$$

(1°) LP U STANDARDNU FORMU:

$$\min \quad -7x_1 - 6x_2 + P = 0 \quad \text{uz} \quad \begin{aligned} 2x_1 + x_2 + s_1 &= 3 \\ x_1 + 4x_2 + s_2 &= 4 \end{aligned}$$

(2°) POPUNI MATRICU S KOEFICIJENTIMA:

	x_1	x_2	s_1	s_2	P	
s_1	(2)	1	1	0	0	3
s_2	1	4	0	1	0	4
P	−7	−6	0	0	1	0

PIVOT ELEMENT

- $\operatorname{argmin}\{\frac{3}{2}, \frac{4}{1}\} = 1 \Rightarrow$ U 1. RETKU JE PIVOT ELEMENT
- REDAK S NAJNEGATIVNIJIM BROJEM JE PIVOT COLUMN $\Rightarrow 1$

PIVOT$(1,1) = 2 \Rightarrow$ ULAZNA VARIJABLA JE x_1, IZLAZNA VARIJABLA JE s_1

(3°) PERFORM PIVOT OPERATION: R=RED

	x_1	x_2	s_1	s_2	P		
s_1	(2)	1	1	0	0	3	$\frac{R_1}{2} \to R_1'$
s_2	1	4	0	1	0	4	$-1 \cdot R_1' + R_2 \to R_2$
P	−7	−6	0	0	1	0	$7 \cdot R_1' + R_3 \to R_3$

$\sim$

	x_1	x_2	s_1	s_2	P	
s_1	1	0.5	0.5	0	0	1.5
s_2	−2+1	−0.5+4	−0.5+0	0+1	0+0	−1.5+4
P	14−7	3.5−6	3.5+0	0+0	0+1	10.5+0

$=$

	x_1	x_2	s_1	s_2	P	
s_1	1	0.5	0.5	0	0	1.5
s_2	−1	(3.5)	−0.5	1	0	2.5
P	7	−2.5	3.5	0	1	10.5

- $\operatorname{argmin}\{\frac{1.5}{0.5}, \frac{2.5}{3.5}\} = 2 \Rightarrow$ 2. REDAK SADRŽI PIVOT ELEMENT
- 2. STUPAC SADRŽI NEGATIVAN FAKTOR

U ZADNJEM RETKU JOŠ IMA NEGATIVNIH FAKTORA $\Rightarrow$ NASTAVI DALJE

PIVOT$(2,2) = 3.5 \Rightarrow$ ULAZNA VARIJABLA JE x_2, IZLAZNA JE s_2

	x_1	x_2	s_1	s_2	P		
s_1	1	0.5	0.5	0	0	1.5	$-0.5 \cdot R_2' + R_1 \to R_1$
s_2	−1	(3.5)	−0.5	1	0	2.5	$\frac{R_2}{3.5} \to R_2'$
P	7	−2.5	3.5	0	1	10.5	$2.5 \cdot R_2' + R_3 \to R_3$

$\sim$

	x_1	x_2	s_1	s_2	P	
s_1	$\frac{8}{7}$	0	$\frac{4}{7}$	$-\frac{1}{7}$	0	$\frac{8}{7}$
s_2	$-\frac{2}{7}$	1	$-\frac{1}{7}$	$\frac{1}{3.5}$	0	$\frac{5}{7}$
P	$\frac{44}{7}$	0	$\frac{22}{7}$	$\frac{5}{7}$	1	$\frac{86}{7}$

NE PIŠEM U MATRICU!

U ZADNJEM RETKU SVI $\geq 0 \Rightarrow$ STOP!

$f_{max} = \frac{86}{7}$,

ZA $x_1 = \frac{8}{7}$, $x_2 = \frac{5}{7}$ //

tableau = [[$\frac{8}{7}$, 0, $\frac{4}{7}$, $-\frac{1}{7}$, 0],
[$-\frac{2}{7}$, 1, $-\frac{1}{7}$, $\frac{1}{3.5}$, 0],
[$\frac{44}{7}$, 0, $\frac{22}{7}$, $\frac{5}{7}$, 1]];

Solution = [[$\frac{8}{7}$, $\frac{5}{7}$, 0, 0]]

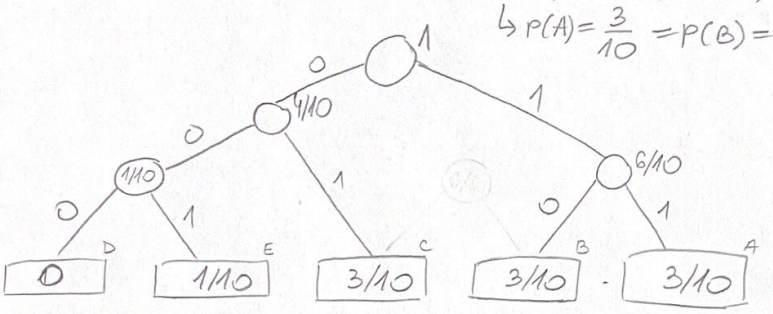
PRIMJER: HUFFMAN

IZVORNI ALFABET = {A, B, C, D, E}

a) ENKODIRAJ ULAZNI NIZ ~~ABCAABE~~ ABCABCABCE HUFFMANOM I IZRAČUNAJ FAKTOR KOMPRESIJE.

ABCABCABCE ⇒ 10 SLOVA, 3×A, 3×B, 3×C, 1×E, 0×D

↳ $P(A) = \frac{3}{10} = P(B) = P(C)$ ↘ $P(E) = \frac{1}{10}$, $P(E) = 0$



- U LISTOVE REDAM PO VJ. (NAJMANJA DO NAJVEĆA)
- SPAJAM DVIJE NAJMANJE VJ.!

- OD KORIJENA STABLA, SVAKI ČVOR KOJI IMA DVOJE DJECE, LIJEVO PIŠEM 0, DESNO PIŠEM 1
- ZA SVAKI ZNAK IDEM OD KORIJENA I GLEDAM BINARNI KOD (NE UZIMAM VRIJEDNOST VJEROJATNOSTI U KORIJENU)

D: 000 B: 10
E: 001 A: 11
C: 01

POČETNI NIZ: 111001111001111001001

FAKTOR KOMPRESIJE: KOLIKO BITOVA IMAM U CIJELOM NIZU?

$3*6+3 = 21$ BIT

3×ABC (6 BITOVA U ABC) (3 BITA U E)

(3 ZNAKA PO 2 BITA) (2 ZNAKA PO 3 BITA)

↳ $3\times2 + 2\times3 = 12$

TABLICA = SVI ZNAKOVI + NJIHOVI BINARNI KODOVI = 40 + 12 = 52

↳ 5 ZNAKOVA (A, B, C, D, E) · 8 (SVAKO SLOVO IMA 8 BITOVA PO ASCII VRIJEDNOSTIMA)

UKUPNO POSLANO BITOVA ↖

UKUPNO = ENKODIRANI NIZ + TABLICA = 21 + 52 = 73

DUŽINA NEENKODIRANOG NIZA = $10 * 8 = 80$

10 ZNAKOVA, PO ASCII 8 BITOVA

$$\text{FAKTOR KOMPRESIJE} = \frac{\text{DUŽINA NEENKODIRANOG}}{\text{UKUPNO}} = \frac{80}{73} = 1{,}0959$$

b) DEKODIRAJ DOLAZNI TOK 01110111

- KAKO ČITAM BITOVE, TAKO IDEM PO STABLU; KADA DOĐEM DO LISTA, PIŠEM GA I VRAĆAM SE NA KORIJEN

CACA