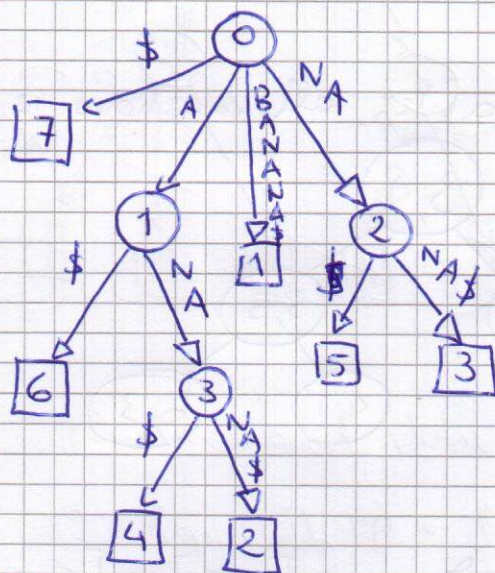


Exercise 1



• Position 1 \rightarrow suffix $\boxed{1}$'s leaf

⊛ - we have to find deepest ancestor that has a descendant leaf $< \boxed{1}$

- none in this case \rightarrow root

- output $\langle 0, 0, B \rangle$

• Position 2 \rightarrow suffix $\boxed{2}$'s leaf

- deepest ancestor with descendant leaf $< \boxed{2}$ is root

- output $\langle 0, 0, A \rangle$

• Position 3 \rightarrow suffix $\boxed{3}$'s leaf

- deepest ancestor with descendant leaf $< \boxed{3}$ is root

- output $\langle 0, 0, N \rangle$

• Position 4 \rightarrow suffix $\boxed{4}$'s leaf

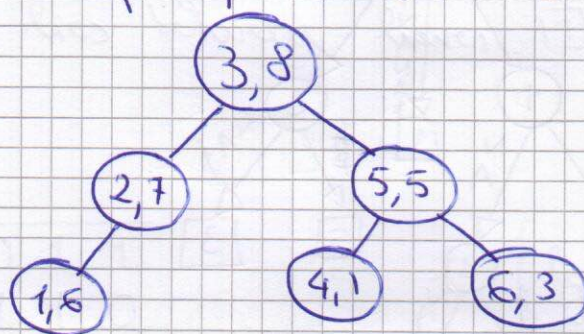
- deepest ancestor with descendant leaf $< \boxed{4}$ is



- we take minimum descending list $\rightarrow [2]$
- output $\langle 4-2, 3, \$ \rangle = \langle 2, 3, \$ \rangle$

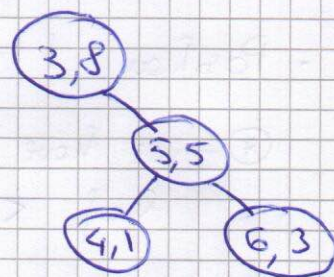
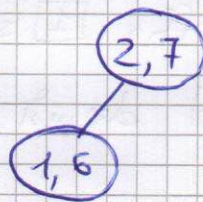
Exercise 2

The final tree after all insertions is



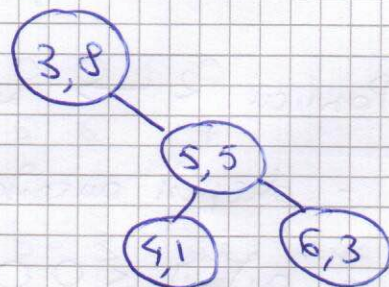
To determine the points in $[3,6] \times [6, +\infty)$ we proceed as follows,

Split $(T_{\leq 2}, T_{>2}) \Rightarrow$



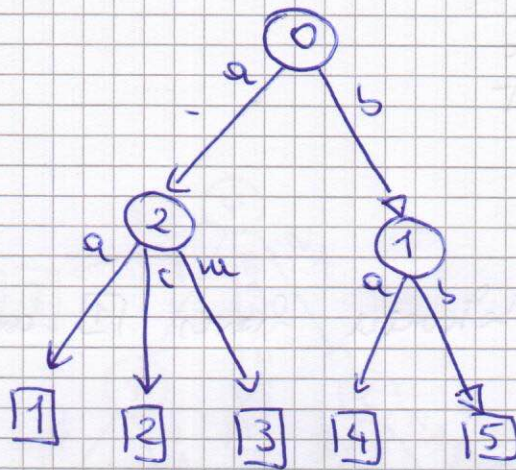
Split $(\text{---} T_{>2}$ in $T_{>2, \leq 6}$ and $T_{>2, < 6}$)

We are interested in $T_{>2, \leq 6}$:

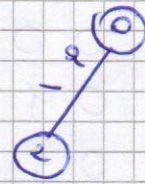


Now, in order to find the 2D-points with y -coordinate ≥ 6 we visit the max-tree and at every node if it is < 6 we don't do anything, if it is ≥ 6 its y -coordinate then we print it and return all both children (if any).
 In our example only $(3,8)$ is printed.

Exercise 3



- $P_1 = aaa \rightarrow$ 1^o downward phase leads to leaf $\boxed{1}$
 \rightarrow 2^o $\text{lcp}(\boxed{1}, P_1) = \text{lcp}(eaea, eae) = 1$
 \rightarrow 3^o upward reaches edge



and since the missing char was "b" but the pattern has an "e", then P is to the left of that subtree and thus it is smaller than any string in S'

- $P_2 = abb \rightarrow$ 1^o downward phase stops at node $\textcircled{2}$



because it does not find any edge labeled with "b". Hence it picks any descending leaf, say $\boxed{1}$.

- \rightarrow 2^o $\text{lcp}(\boxed{1}, P_2) = \text{lcp}(eaea, ebb) = 2$
 \rightarrow 3^o upward scan reaches again $\textcircled{2}$



and searches the position of "5" which is between the edges

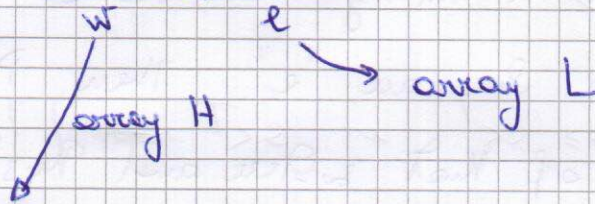


hence P2 lies between leaves 11 and 13

Exercise 4

11	0	1	0	1	1
14	0	1	1	1	0
16	1	0	0	0	0
17	1	0	0	0	1
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
31	1	1	1	1	1

$$l = \left\lceil \lg_2 \frac{n}{u} \right\rceil = \left\lceil \lg_2 \frac{32}{8} \right\rceil = 2$$



H = 0 0 1 0 1 0 1 1 1 0 1 0 0 1 0
 0 1 2 3 4 5 6 7

For PForDelta with box = 11 and b = 3 we have

- box 0 3 5 6 8 9 10 20

- sep 0 3 2 1 2 1 1 10

- 000 011 010 001 010 001 001 111 → 10