

Exercises for week 6

1. Consider the graphs from Fig. 1. Apply the Sethi–Ullman algorithm to each of the graphs. Specify the moves with the following commands:

- *set*(j, n): place pebble j on node n .
- *remove*(j, n): remove pebble j from node n .
- *slide*(j, n, n'): slide pebble j from node n to node n' .

For the sizes of the trees and subtrees count binary nodes only.

(30 points)

2. For the following expressions sketch the derivation tree and determine the number of registers needed for the evaluation of the expression:

(a) $((500 + 60) - (90 * 30)) + 9 + 10 + 11$. (10 points)

(b) $-(((-x_1 + (-x_2)) * (-(-x_3 - x_4) * (-x_5))) / (x_6 * (-x_7 + x_8)))$.
(10 points)

(c) $-((a + b) * (c + d)) / ((e - f) * (g - h) - x)$. (10 points)

(d) $-((-(- - a_1 + (-b_3))) + ((-(x_9 + z) * (-a_3)) / ((m_4 + n_3) * -b)))$.
(10 points)

3. Consider the following declarations:

```
typedef int[11] vec;
typedef int* intp;
vec c;
int a;
intp b;
```

In the body of function main on the right-hand side of an assignment we have:

```
a + b* - c[2]
```

What MIPS code is generated? (30 points)

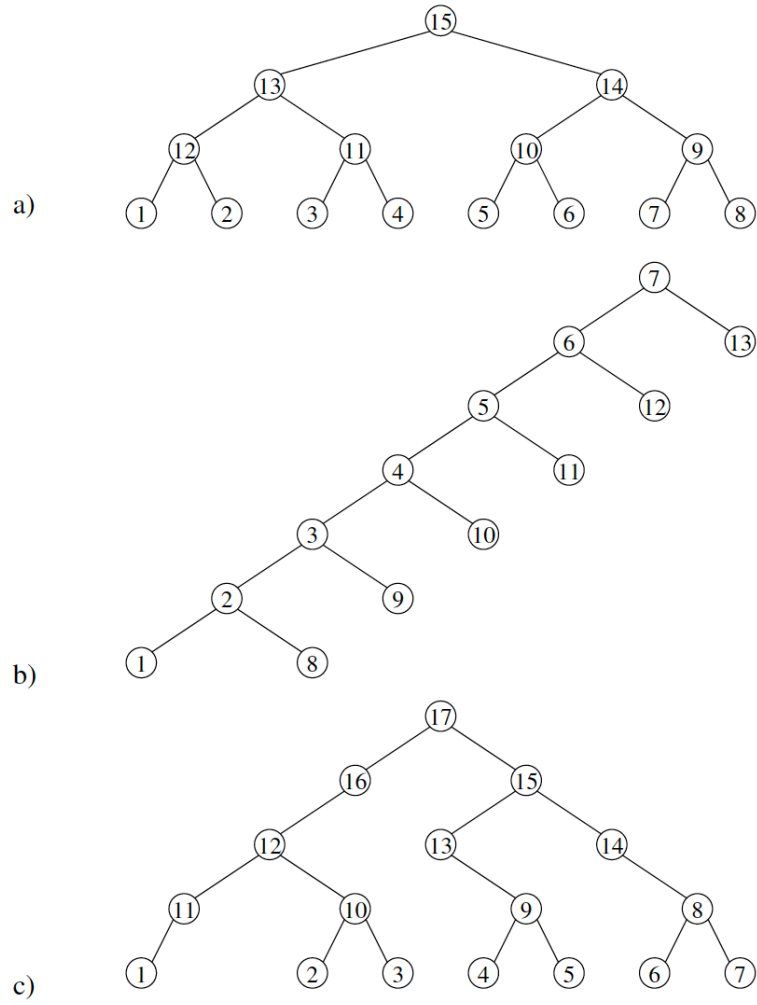


Figure 1: Example trees for the Sethi-Ullman-Algorithm