Optimal Alphabetic Binary Tree

In many applications, the leaves of the tree have to be alphabetic (Dictionary)

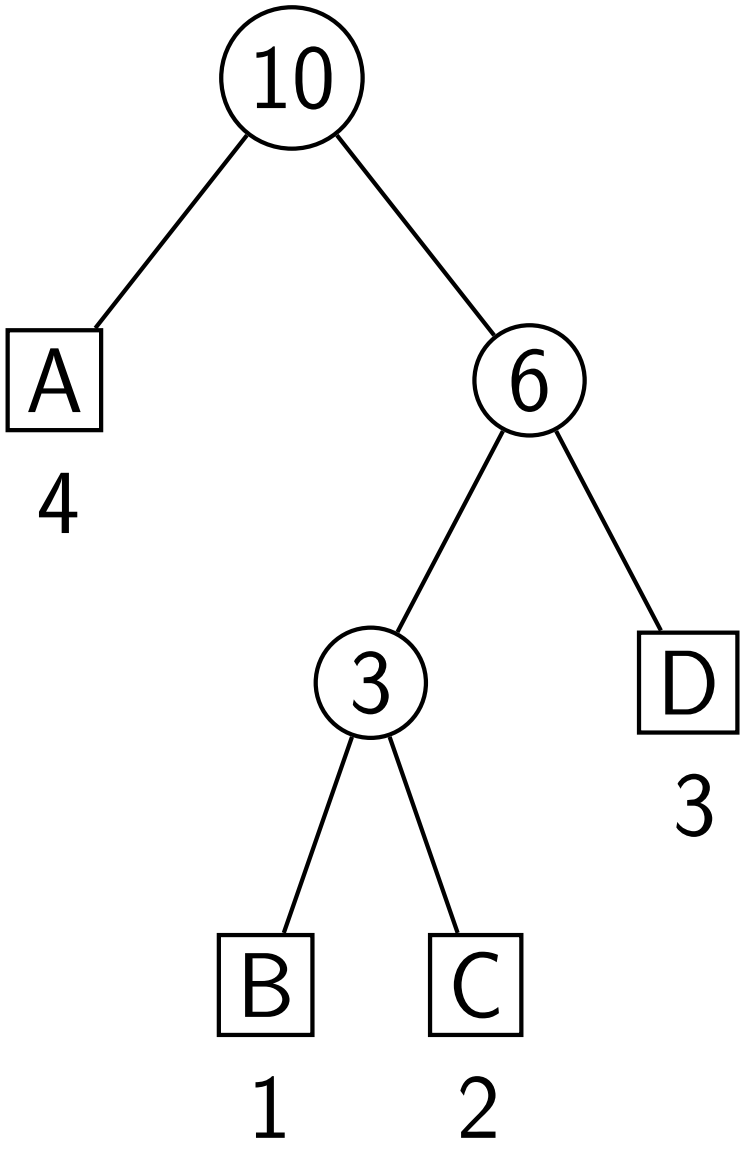
e.g. we cannot combine Q & Z

Optimal Alphabetic Binary Tree

Given a sequence of letters, how do we optimally code each letter in binary?

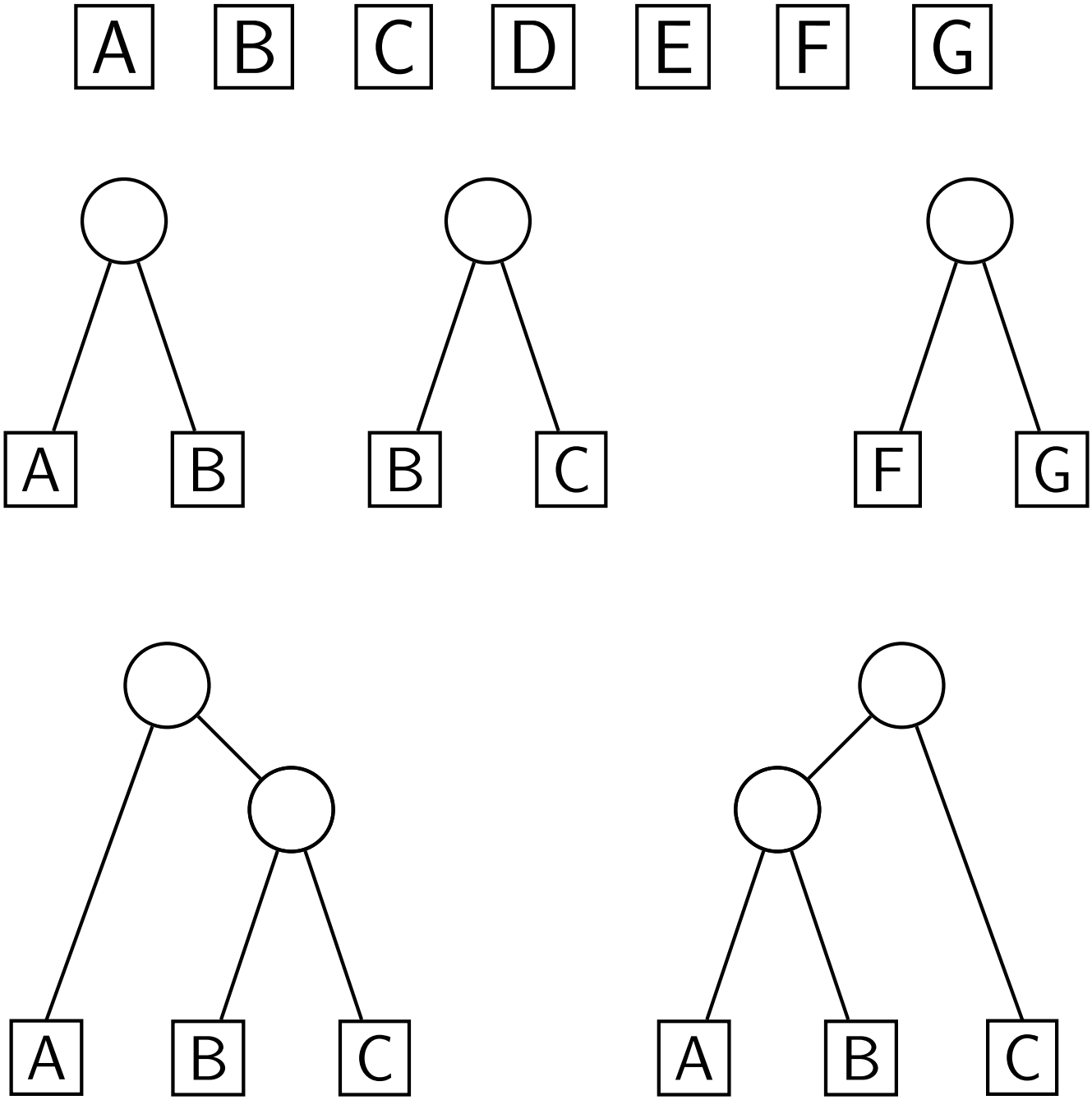
A	B	C	D
40%	10%	20%	30%

Example



$$\sum w_i l_i = 19$$

Dynamic Programming



Two conjectures

1. Combine the two square nodes

   with the minimum sum

2. Partition the sequence evenly

Counterexamples

Hu-Tucker Algorithm

I Combination

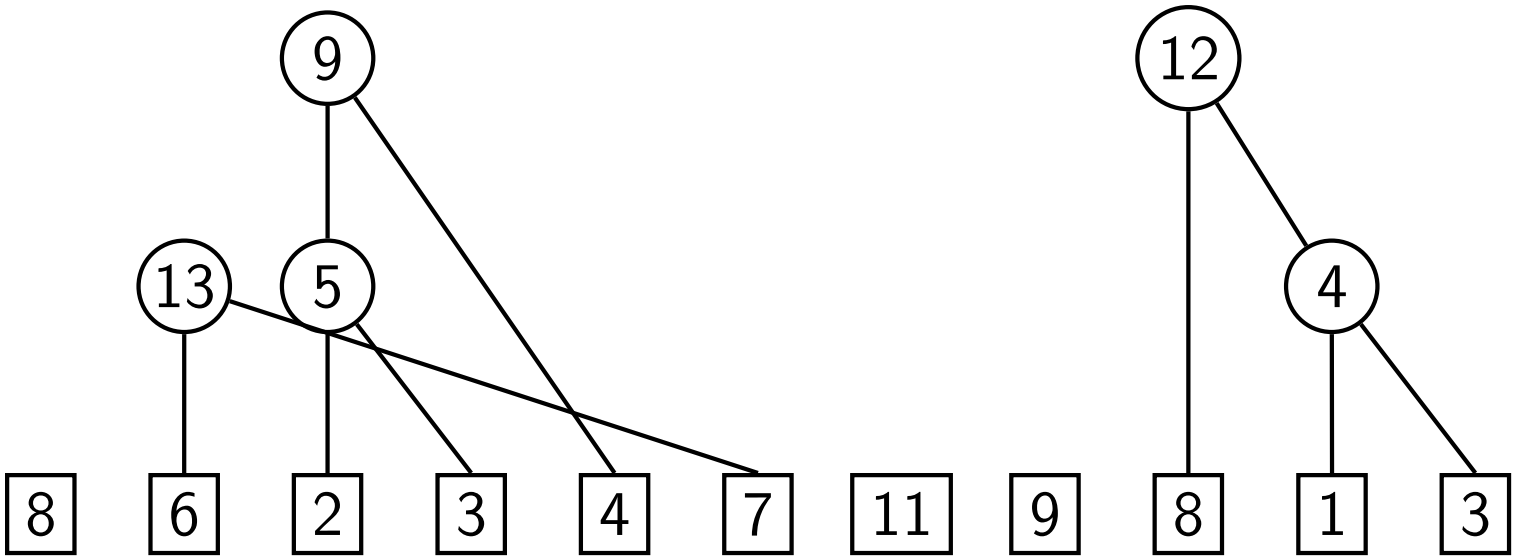
II Get Levels

III Reconstruction

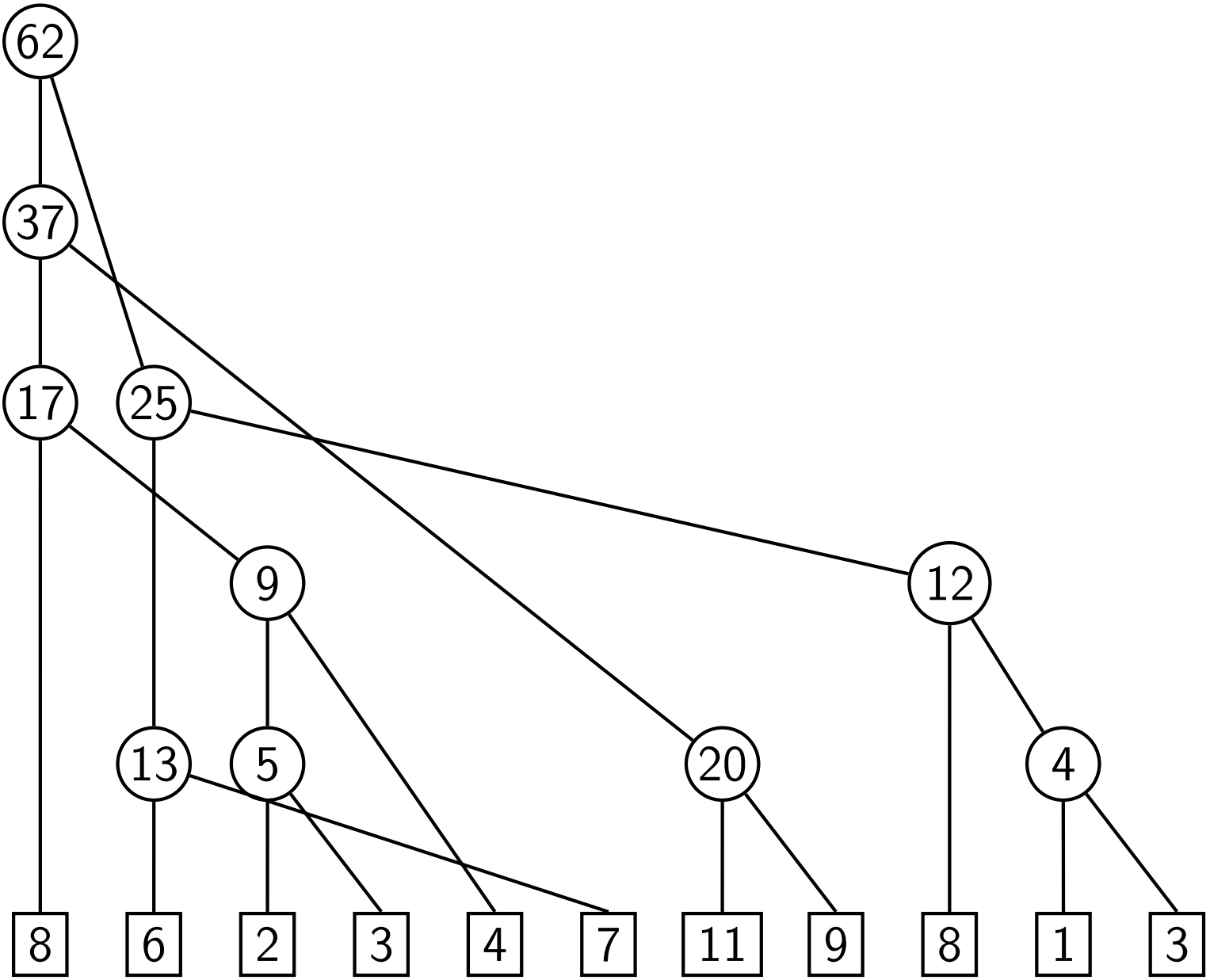
Compatability

Two nodes are compatible in the sequence if there is no square between the two nodes

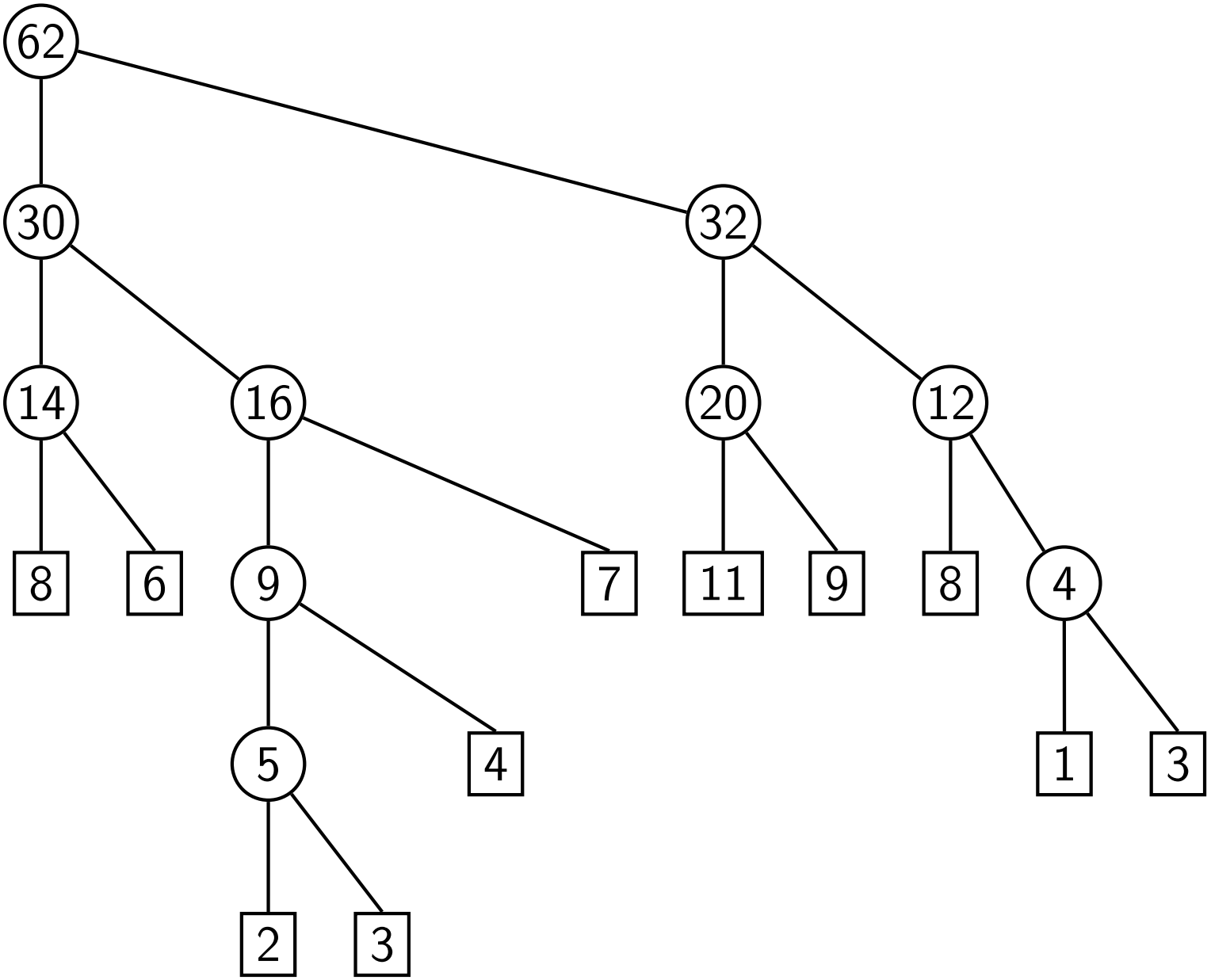
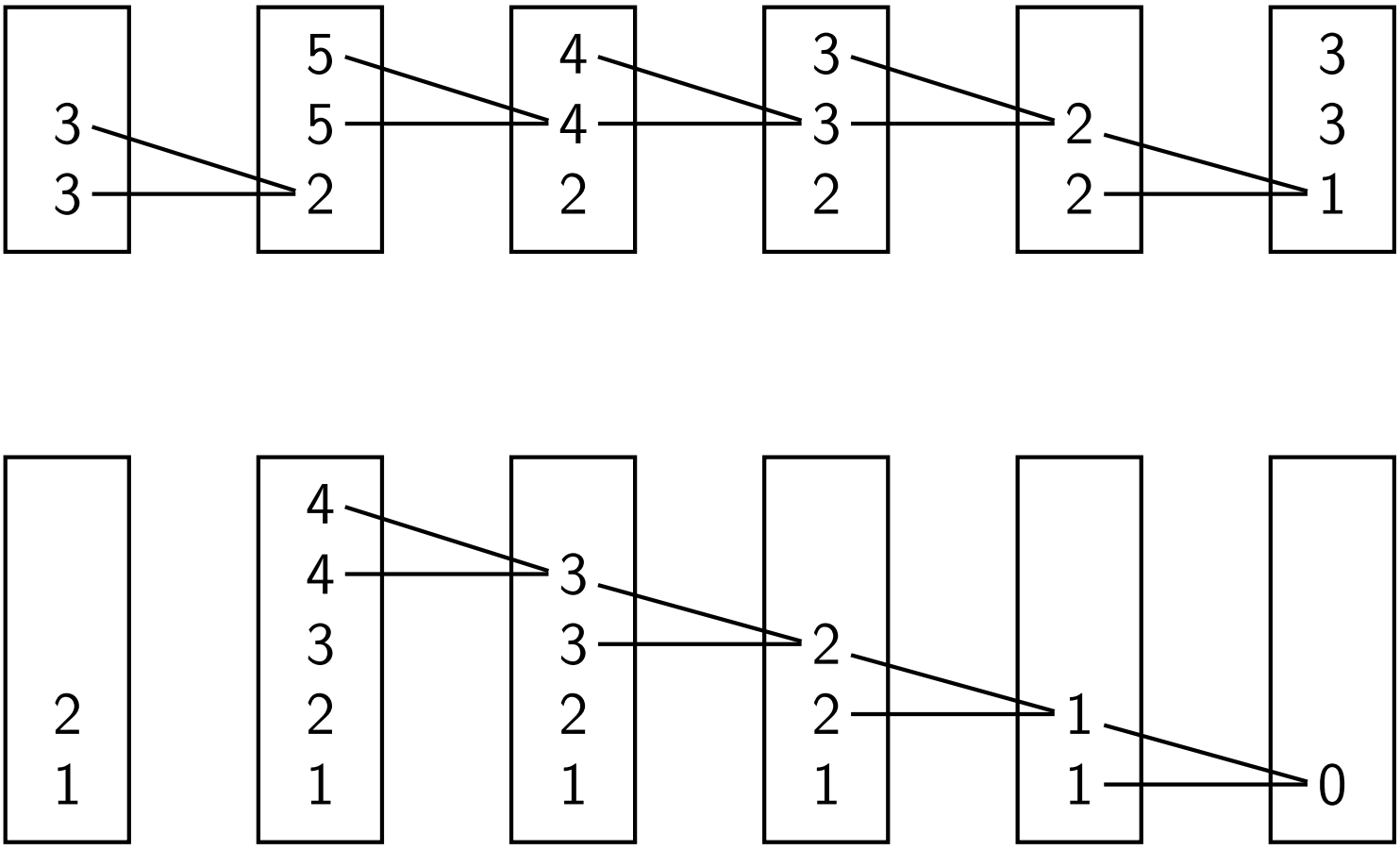
Example (Combination)



Example (Get Levels)



Example (Reconstruction)



Example (Reconstruction Stack)