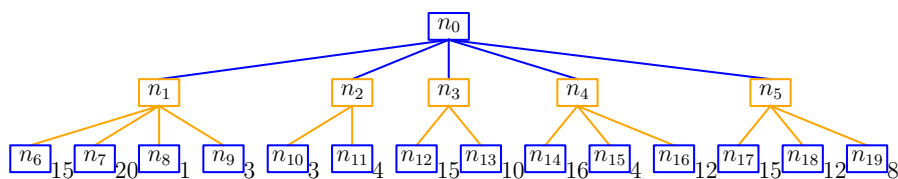


## project 3: minmax computations

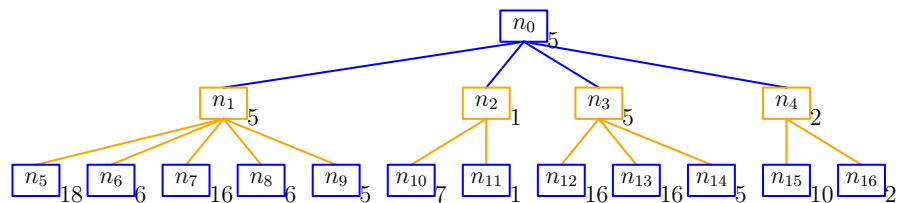
### task 3.1: plain vanilla minmax

Implement the minmax algorithm and use your implementation to compute  $mmv(n_0)$  for the following tree where payoffs for leaf nodes are given by the numbers attached to the leafs



### task 3.2: minmax with ties

Now, consider the following tree where minmax values have already been computed for all its nodes



Observe that  $n_1$  and  $n_3$  both have a minmax value of 5 but the best possible outcome (from the point of view of  $MAX$ ) in the subtree below  $n_1$  is 18 whereas in the tree below  $n_3$  it is just 16. This would suggest  $MAX$  should move to  $n_1$ .

How would you have to modify your minmax implementation such that it can keep track of “better alternatives” in case of ties?

Would you really have to do this in practice? After all,  $MIN$  is supposed to play without fault ...

Explain both your answers.