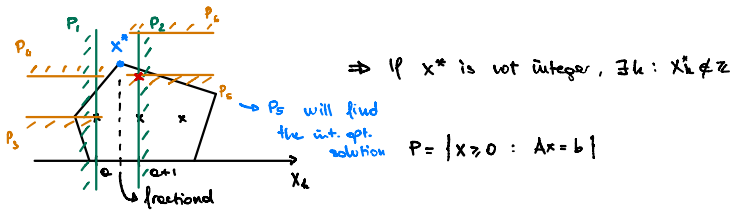


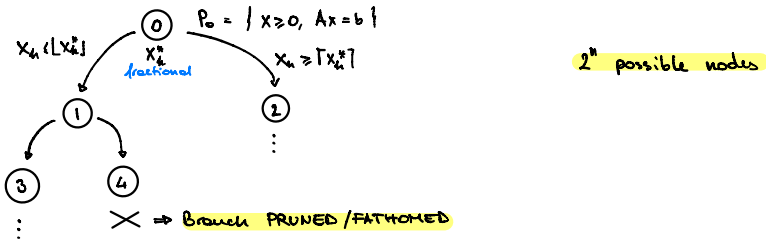
## Branch and Bound method



find the optimal integer solution in  $P_1$  and  $P_2$  and choose the best among those two

It's a recursive method

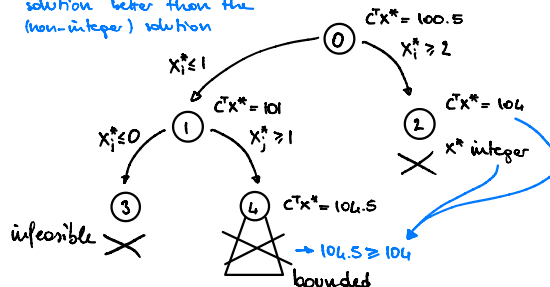
We can visualize this as a branching tree



Pruning criteria:

- $x^*$  integer
- LP relaxation infeasible
- $C^T x^* \geq$  any cost of an integer solution found in other branches (Bound)

$C^T x^* \leq C^T \bar{x}_i^* \rightarrow$  will not find an integer solution better than the (non-integer) solution



## Important considerations:

### 1) Choice of the fractional variable $x_k^*$

- Choose the variable which "means" the most in the problem
- Choose the variable with fractional part closer to 0.5 → in practical cases, there's almost no differences with random choice
  - ↳ to have consistent deep cuts and avoid numerical errors

### 2) Search strategy

- DFS: - reach faster a deep node → high chances of finding an integer solution
  - might require a lot of time to reach the "right" node
- BBF: - Guide the search using the best lower bound ( $cx^*$ )
  - Risk to not find soon an integer solution