Branch & Bound

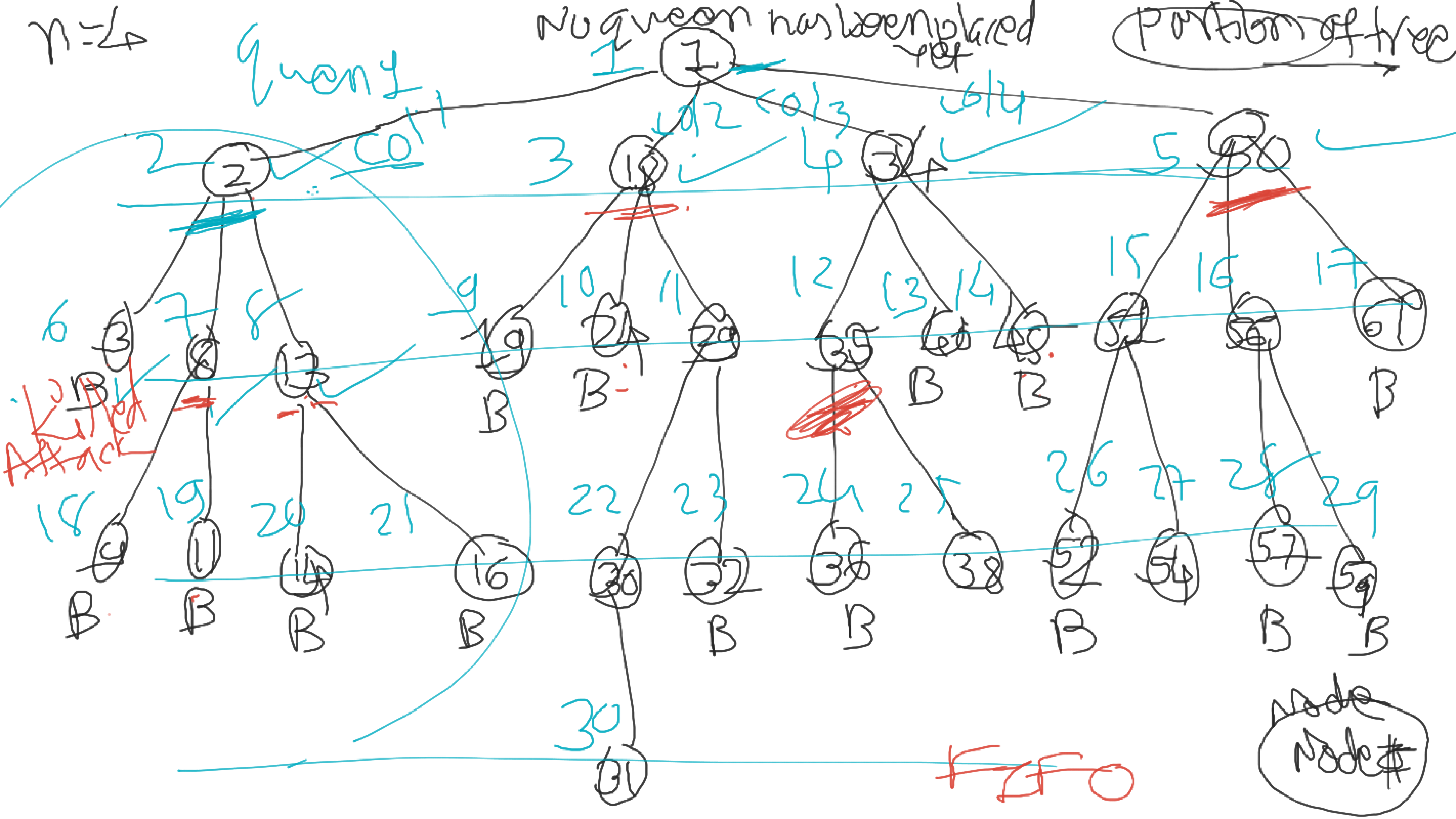
The term branch and bound refers to all state space search methods in which all children of E-node are generated before any other live node can become the E-node.

In BFS, in which the exploration of a new node cannot begin until the node currently being explored is fully explored.

In branch and bound terminology,
a BFS-like state space search
will be called FIFO
(first in first out)
search as the list of live nodes
is a first-in-first-out list (or queue).

A D-search like state space search will be called LIFO (Last In First Out) search as the list of live nodes is a last in first out list (or stack).

4-queen problem solution by B&B.
But it is not advised as lot of states are explored
Compare to backtracking


n=4
No queen has been placed yet
Portion of tree
Queen 1
col 1
col 2
col 3
col 4
Killed
Attack
FIFO
Node #

Initially there is only one live node, node#1. This represents the case in which no queen has been placed on the chessboard. This node becomes the E-node. It is expanded and its children, node#2, 18, 34, 50 are generated. These nodes represent a chessboard with queen#1 in row 1 and column 1, 2, 3, 4 respectively. The only live nodes now are node#2, 18, 34 & 50.

If the nodes are generated in this order, then the next E-node is node#2. It is expanded and node#3, 8 and 13 are generated.

Node#3 is immediately killed using the bounding function. Nodes 8 and 13 are added to the queue of live nodes. Node#8 becomes the next E-node. Nodes #19, 24, 29 are generated.

Nodes 19 and 24 are killed as a result of bounding functions.
Node 24 is added to the queue of live nodes. The E-node is node 34.

Backtracking is a suppersion search method for n queen.

Book Horowitz & Sahni
P. 399-400