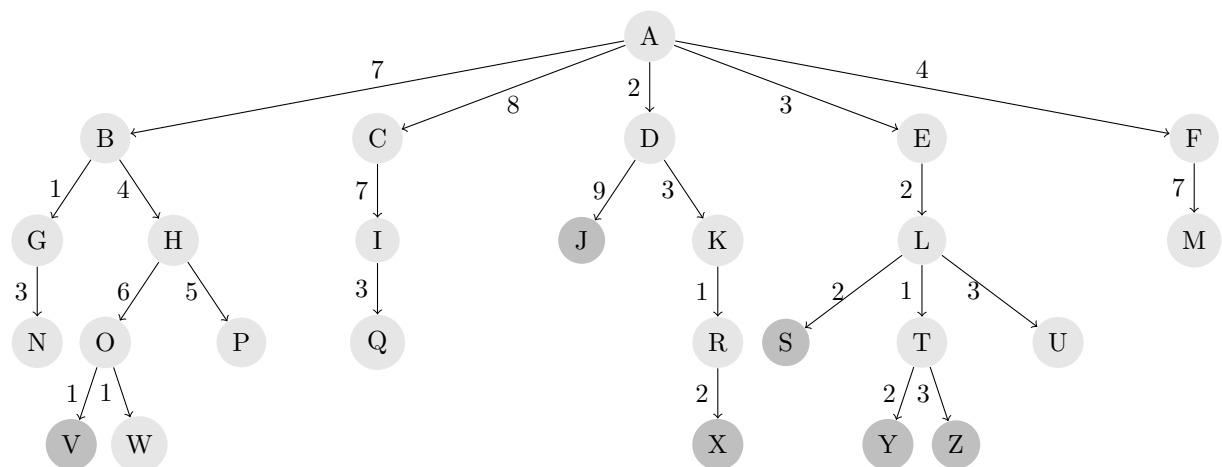# KI sheet

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1 Exercise 1

Determine for the following search strategies the order in which the nodes are expanded and the corresponding goal node. In case you can expand several nodes and the search strategy does not specify the order, choose the nodes in alphabetic sequence. In addition, compute for each search strategy the set of nodes that is actually kept in memory when the goal node is found (node A has depth zero).

1.1 Breadth First Search

Uses a FIFO Queue to queue the Nodes visited. Also there is a explored List to avoid circular searching.

node	frontier	explored
0	A	0
A	B, C, D, E, F	0
B	C, D, E, F, G, H	A
C	D, E, F, G, H, I	A, B
...	...	A, B, ...
J	K, L, M, N, O , P, Q	A, B, C, D, E, F, G, H, I

Algorithm 1 breadth-first-search

$node \leftarrow$ a node with STATE=problem.INITIAL-STATE

PATH-COST = 0

if problem.GOAL-TEST(node.STATE) **then**

  return node

end if

$frontier \leftarrow$ a FIFO queue with node as the only element

$explored \leftarrow$ an empty set

loop

  if EMPTY?(frontier) **then**

    return failure

  end if

  $node \leftarrow$ POP(frontier) /*chooses the shallowest node in frontier */

  node.STATE = explored

  for each action in problem.ACTIONS(node.STATE) **do**

    $child \leftarrow$ CHILD-NODE(problem, node, action)

    if child.STATE is not in explored or frontier **then**

      if problem.GOAL-TEST(child.STATE) **then**

        return child

      end if

      $frontier \leftarrow$ INSERT(child, frontier)

    end if

  end for

end loop

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node	frontier	explored
J	K, L, M, N, O , P, Q	A, B, C, D, E, F, G, H, I
...	...	A, B, ...
S	T, U, V, W, X	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R

node	frontier	explored
S	T, U, V, W, X	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R
...	...	A, B, ...
V	W, X, Y, Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V

node	frontier	explored
V	W, X, Y, Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V
...	...	A, B, ...
X	Y, Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V, W

node	frontier	explored
X	Y, Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V, W
...	...	A, B, ...
Y	Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V, W,X

node	frontier	explored
Y	Z	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V, W,X
...	...	A, B, ...
Z	empty	A, B, C, D, E, F, G, H, I, J, K ,L ,M, N, O, P, Q, R, S, T, U, V, W, X, Y