A^* Algorithm

1. OPEN : {initial node} CLOSED : { }

   $f' = g + h'$, $g = 0 \Rightarrow f' = h'$

2. Repeat until goal is not found

   - If OPEN is empty, return with failure
   - Else
     - Pick node on OPEN with lowest f'
     - call that node BESTNODE
     - Remove that node from OPEN & place it in CLOSED

     - If BESTNODE is goal, return & quit
     - Else
       Generate successor of BESTNODE
       [Don't let BESTNODE to point to them yet]
       [As we need to check is any of them have already been generated - duplicate nodes]

     - for each successor
       (a) set SUCCESSOR to point back to BESTNODE [These backward link will make it possible to recover the path once a solution is found]

       (b) compute g(successor) = g(BESTNODE) + the cost of getting from BESTNODE to successor

(c) see if successor is same as any node on OPEN (already generate but not explored)

- If yes call that node OLD, add OLD to the list of BESTNODE's successors
- check whether it is cheaper to get to OLD via its current parent or to successor via BESTNODE
- If OLD is cheaper than throw successor and do nothing
- If successor is cheaper, then throw successor, then reset OLD's parent link to point to BESTNODE, record new cheaper path in g(OLD) & update f'(OLD)

(d) If successor was not on OPEN, see if it is on CLOSED. If so, call the node on CLOSED OLD and add OLD to the list of BESTNODE's successors

- check if the new path is better or OLD path is better as in 2(c). set parent link and g and f' value appropriately

Teacher's Signature.....

- If the new path is better than propogate improvement to the OLD's successors

[OLD point to its successors and then points to their successors until no successor is available or available node is on OPEN]

[For propagation do depth first search traversal starting at OLD, changing each node's g value and f' value, terminate when you reach node with no successor or a node to which an equivalent or better path is available.

↓

help algo to terminate if cycles in the graph

- During propagation at each node path is getting better than its path via original parent then reset the parent & continue propagation

(e) If successor was not already on either OPEN or CLOSED, then put it on OPEN, add it to the list of BESTNODE'S successors
compute $f'(\text{successor}) = g(\text{successor}) + h'(\text{successor})$