

## Tutorial 2:

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q.] 3 missionaries & 3 cannibals find themselves on one side of a river. But the missionaries are not sure what the cannibals are upto, so, the missionaries want to ensure that the no. of missionaries on either side is never less than the no. of cannibals on the same side. The boat only holds 2 people at a time.

How can everyone get across the river w/o the missionaries getting eaten?

(8, 38, m0) (1, 30, m8)

Step 1: Define the problem ↑ ↓

(8, 38, m0) (1, 31, m8)

Step 2: Define state. ↓

(m, c, b) boat  
 cannibals ↓ m1  
 missionaries ↓ m1

Step 3:

(8, 31, m1) (1, 38, m8)

↓ ↓

Initial State: [(8, 3, 3, L) (0, 0, 0, R)]

↓ ↓

Final State: [(0, 0, 0, L) (8, 3, 3, R)]

↓ ↓

(8, 38, m0) (1, 31, m8)

↓ ↓

(8, 35, m8) (1, 35, m0)

↓ ↓

(8, 38, m8) (1, 30, m0)

↓ ↓

### Clarification

→ moving from left to right

Step 4: ~~right hand~~ ~~moving from right to left~~ → moving from right to left

(3m, 3c, L) (Com, 0c, R)

(3m, 1c, L) (Com, 2c, R)

(3m, 2c, L) (Com, 1c, R)

(3m, 0c, L) (Com, 3c, R)

(3m, 1c, L) (Com, 2c, R)

(1m, 1c, L) (2m, 2c, R)

(2m, 2c, L) (1m, 1c, R)

(Com, 2c, L) (3m, 1c, R)

(Com, 3c, L) (3m, 0c, R)

(Com, 1c, L) (3m, 2c, R)

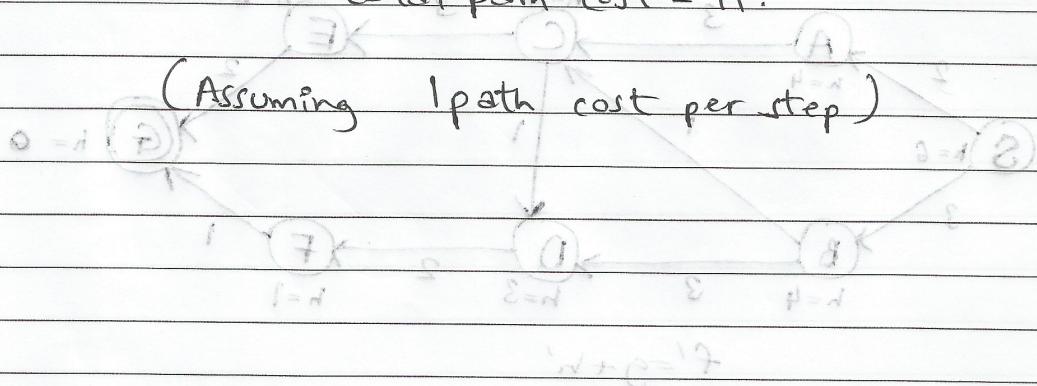
(Com, 2c, L) (3m, 2c, R)

(Com, 0c, L) (3m, 3c, R)

total moves done out on board is 11 steps

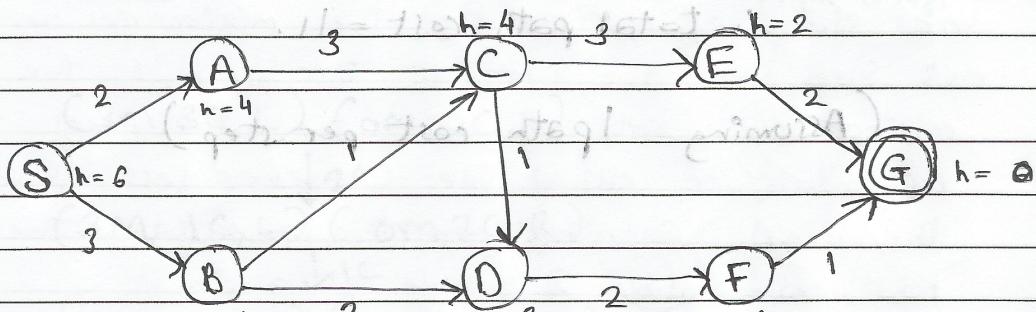
Ques 2) There are 11 steps.

∴ total path cost = 11.



city-state min f  
city-state max f

q.] Use A\* Algorithm on the graph given below to find the shortest path from Node S to G.



$$f' = g + h'$$

i.] OPEN  $\rightarrow$  Empty

CLOSED  $\rightarrow$  Empty

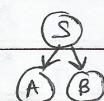
ii.] O  $\rightarrow$  S

$$C \rightarrow \text{Empty} \quad f'(S) = 0 + 6 = 6$$

(S)

iii.] O  $\rightarrow$  A, B

C  $\rightarrow$  S

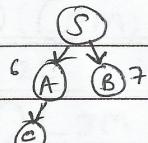


$$f'(A) = g + h' = 2 + 4 = 6$$

$$f'(B) = 3 + 4 = 7$$

iv.] O  $\rightarrow$  B, C

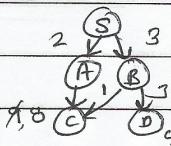
C  $\rightarrow$  S, A



$$f'(C) = 5 + 4 = 9$$

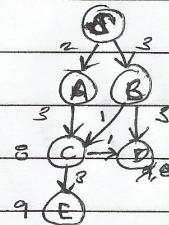
v.]  $O \rightarrow C, D$

$C \rightarrow S, A, B$



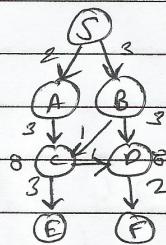
vi.]  $O \rightarrow D, E$

$C \rightarrow S, A, B, C$



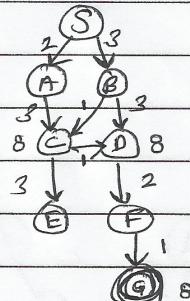
vii.]  $O \rightarrow E, F$

$C \rightarrow S, A, B, C, D$



viii.]  $O \rightarrow E, G$

$C \rightarrow S, A, B, C, D, \cancel{E}, F$



We have reached the final state in 8 steps.