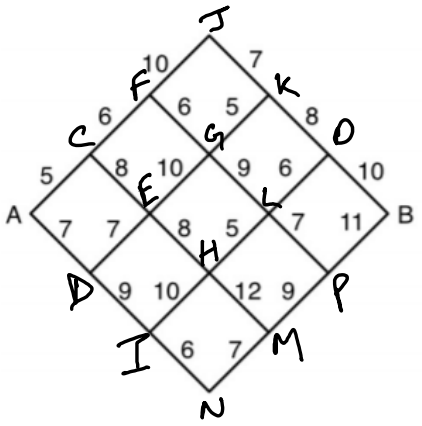
PS 2 Problem 1

Sunday, April 14, 2019 2:51 AM

a)



$J_B = 0$

$J_O = 10$ $\quad J_K = 8 + J_O = 18$ $\quad J_J = 7 + J_K = 25$

$J_P = 11$ $\quad J_M = 9 + J_P = 20$ $\quad J_N = 7 + J_M = 27$

$J_L = \min(6 + J_O, 7 + J_P) = \min(16, 18) = 16$

$u^*: L \to O$

$J_H = \min(5 + J_L, 12 + J_M) = \min(21, 32) = 21$

$u^*: H \to L$

$J_G = \min(5 + J_K, 9 + J_L) = \min(23, 25) = 23$

$u^*: G \to K$

$J_F = \min(10 + J_J, 6 + J_G) = \min(35, 29) = 29$

$u^*: F \to G$

$J_E = \min(10 + J_G, 8 + J_H) = \min(33, 29) = 29$

$u^*: E \to H$

$J_I = \min(10 + J_H, 6 + J_N) = \min(31, 33) = 31$

$u^* : I \to H$

$J_C = \min(6 + J_F, 8 + J_E) = \min(35, 37) = 35$

$u^* : C \to F$

$J_D = \min(7 + J_E, 9 + J_I) = \min(36, 40) = 36$

$u^* : D \to E$

$J_A = \min(5 + J_C, 7 + J_D) = \min(40, 43) = 40$

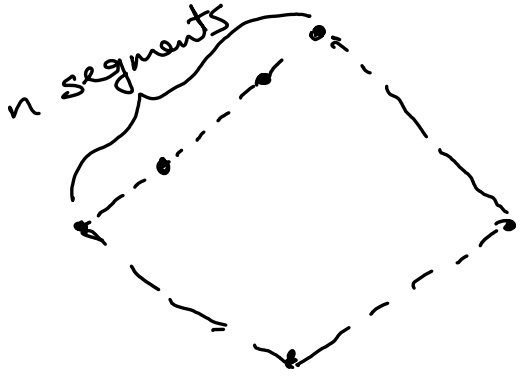
$u^* : A \to C$

Shortest path

$A \xrightarrow[5]{} C \xrightarrow[6]{} F \xrightarrow[6]{} G \xrightarrow[5]{} K \xrightarrow[8]{} O \xrightarrow[10]{} B$

Cost = 40

b) For DP, we need 1 computation per node (except terminal node $J=0$).



$\Rightarrow (n+1)$ nodes on each line & $(n+1)$ lines

Total # of nodes $= (n+1)^2$

DP evals $= (n+1)^2 - 1$ ← no eval for terminal node

$= n(n+2)$

$3 \times 5 = 15$

For exhaustive search, # computations is equal to # of possible routes.

Can think of this as a sequence of n up moves & n down moves

UUU DDD
UDUDUD
⋮

} $6C_3$ or $2nC_n$ routes

↑ # exhaustive search evals

∴ # DP evals $= n(n+2)$

exhaustive search evals $= 2nC_n$

$= \frac{(2n)!}{n!\,n!}$