Problem 1: [21] Search Algorithms
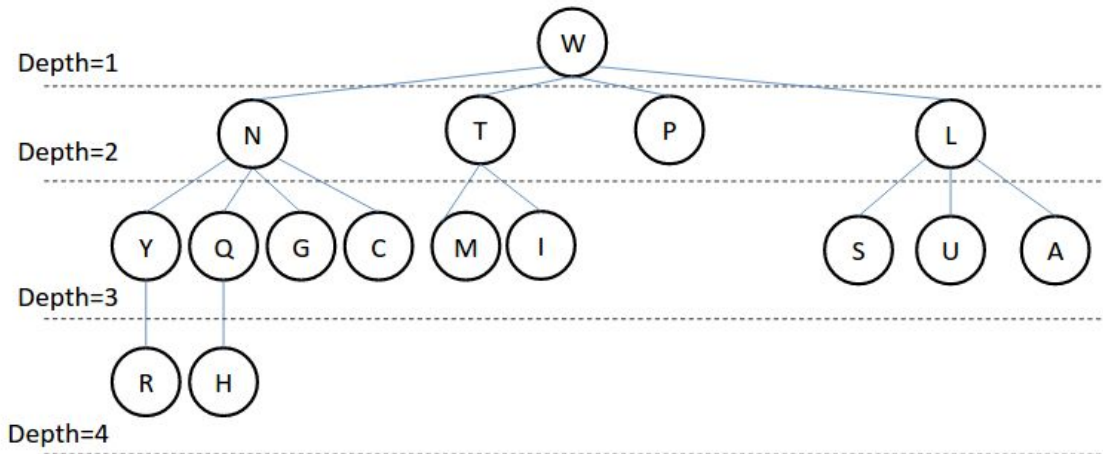
(a) [6]

       [+5] - List of states expanded: W-N-Y-R-I-B-M-D-J-S-H

       [+1] - The solution path is: W-N-Y-R-I-B-M-J-S-H

[-2] if half way right

       No need to show below calculation

Expanded	Frontier
	{W}
W	{N, T, P, L}
N	{Y, Q, G, C, T, P, L}
Y	{R, Q, G, C, T, P, L}
R	{I, O, U, K, Q, G, C, T, P, L}
I	{B, O, U, K, Q, G, C, T, P, L}
B	{M, O, U, K, Q, G, C, T, P, L}
M	{D, J, X, V, F, O, U, K, Q, G, C, T, P, L}
D	{J, X, V, F, O, U, K, Q, G, C, T, P, L}
J	{S, C, X, V, F, O, U, K, Q, G, C, T, P, L}
S	{H, C, X, V, F, O, U, K, Q, G, C, T, P, L}
H - Goal	

(b) [6]

[+2] for each depth tree

Either the tree or table is fine

Expanded	Frontier
	{W}
W	{N, T, P, L}
N	{T, P, L}
T	{P, L}
P	{L}
L	{}
W	{N, T, P, L}
N	{Y, Q, G, C, T, P, L}
Y	{Q, G, C, T, P, L}
Q	{G, C, T, P, L}
G	{C, T, P, L}
C	{T, P, L}
T	{M, I, P, L}

M	{I, P, L}
I	{P, L}
P	{L}
L	{S, U, A}
S	{U, A}
U	{A}
A	{}
W	{N, T, P, L}
N	{Y, Q, G, C, T, P, L}
Y	{R, Q, G, C, T, P, L}
R	{Q, G, C, T, P, L}
Q	{H, X, F, G, C, T, P, L}
H - Goal	

(c) [3]

[+1] - h(n) is **not** admissible.
[+2] - One counterexample is sufficient to show that a heuristic is not admissible. State Q, for example, is city-block distance 3 from the goal H, but the move distance is 1 since a knight can move in one step from Q to H, so h(Q) = 3 > h*(Q) = 1, violating the condition on an admissible heuristic.

[-1] If no proper explanation for why function is not admissible

(d) [6]

[+5] for table

Step	Frontier	Expanded
1	{W(3)}	W(-)
2	{L(3, W), N(3, W), P(5, W), T(5, W)}	L(W)
3	{C(3, L), I(3, L), N(3, W), A(5, L), P(5, W), S(5, L), T(5, W), U(7, L)}	C(L)
4	{I(3, L), N(3, W), A(5, L), F(5, C), J(5, C), P(5, W), S(5, L), T(5, W), U(7, L)}	I(L)
5	{N(3, W), A(5, L), B(5, I), F(5, C), J(5, C), P(5, W), R(5, I), S(5, L), T(5, W), U(7, L)}	N(W)
6	{G(3, N), A(5, L), B(5, I), F(5, C), J(5, C), P(5, W), Q(5, N), R(5, I), S(5, L), T(5, W), U(7, L), Y(7, N)}	G(N)
7	{A(5, L), B(5, I), D(5, G), F(5, C), J(5, C), P(5, W), Q(5, N), R(5, I), S(5, L), T(5, W), U(7, L), Y(7, N)}	A(L)
8	{H(3, A), B(5, I), D(5, G), F(5, C), J(5, C), P(5, W), Q(5, N), R(5, I), S(5, L), T(5, W), U(7, L), Y(7, N)}	H(A) - Goal

[+1] for Solution Path: W-L-A-H

[-2] If f values are wrong

Problem 2: [14] Meet Your Friend

(a) **[8]**

(i) **[+2]   State space:** States are all possible city pairs (i, j). The map is not the state space.

(ii) **[+2]   Successor function:** The successors of (i, j) are all pairs (x, y) such that Adjacent(x, i) and Adjacent(y, j).

(iii) **[+2] Goal:** Be at (i, i) for some i.

(iv) **[+2] Step cost function:** The cost to go from (i, j) to (x, y) is max(d(i, x), d(j, y)).

(b) [3]

(i) **[+1]** No

(ii) **[+1]** No

(iii) **[+1]** Yes

(c) [3]

[+1] Not admissible.

[+2] Consider a map with only two cities, 1 and 2. The first friend starts at 1, the second friend starts at 2, and there is a road connecting these two cities. Since the friends cannot meet on the road and one cannot wait at a city while the other travels, there is no solution for this particular case.

[-1] If no proper explanation for why function is not admissible