



Question 6

6.1) Random

6.1.1) Random pieces of queens are placed on the board and each queen can capture another. Using the objective function we will minimize the amount of queens that can capture each other. Thus the objective function will be the number of queens that can attack at least one other queen. The state would be the current location of each queen on the board, where  $r = \text{row}$ ,  $c = \text{column}$ , thus  $(r, c)$  can be used to represent the whole board, for instance  $(2, A)$  where  $(2, A)_u$  is one queen and  $(3, B)_v$  another. also 4 Queens, 4 columns ( $4^4 = 256$  states)

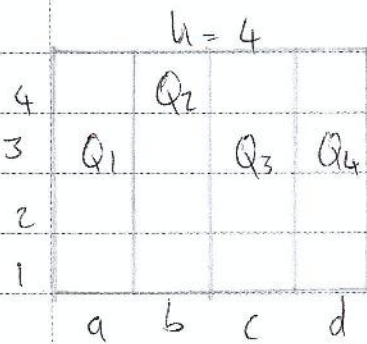
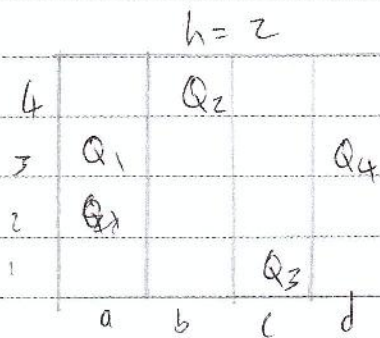
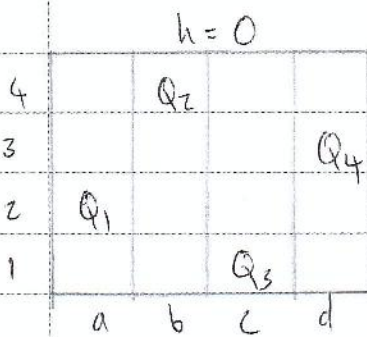
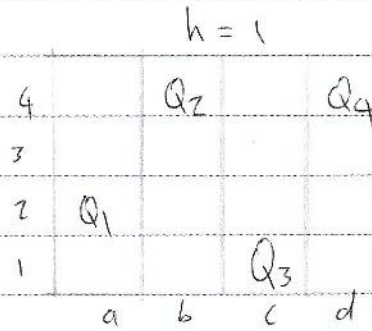
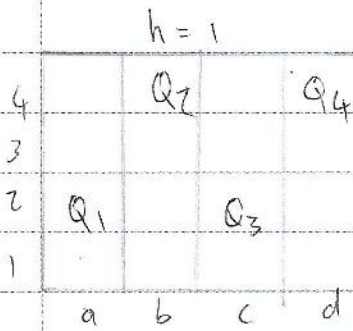
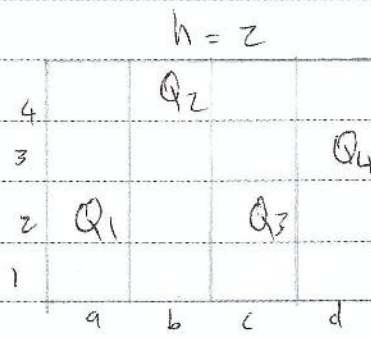
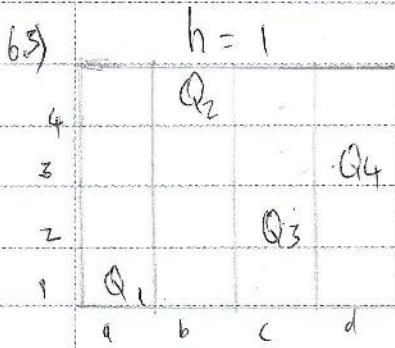
$$q_{uv} = \begin{cases} 1 & \text{if } q_u \text{ is an element of } A \text{ that } q_u \text{ attacks } q_v \\ 0 & \text{otherwise} \end{cases}$$

objective function  $o(b) = \sum_{u=1}^4 (q_{uv}) = Q_1(1, A), Q_2(3, B), Q_3(2, C), Q_4(3, D)$

4				
3		Q <sub>2</sub>		Q <sub>4</sub>
2			Q <sub>3</sub>	
1	Q <sub>1</sub>			
	a	b	c	d

h = 3

6.2) Evaluation:  $h(n) = \text{number of attacks} = Q_2(3, B) \text{ attacks } Q_3(2, C)$   
 $= 3$   
 $= Q_3(2, C) \text{ attacks } Q_4(3, D)$   
 $= Q_2(3, B) \text{ attacks } Q_4(3, D)$



$O(b) = \text{worst} = 4$

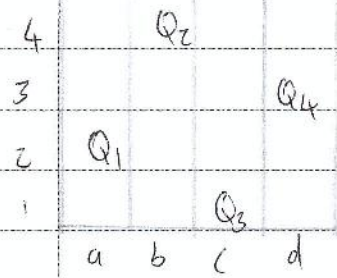
$O(b) = \text{best} = 0$

6.4  $h = 0$

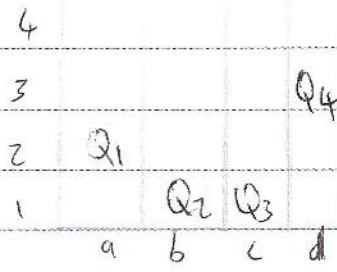


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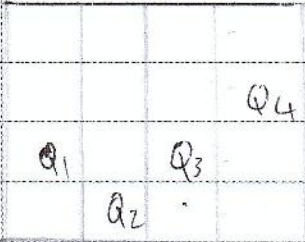
6.4)  $h=0$   
 $q(b)=0$



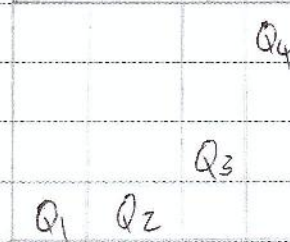
$h=2$   
 $q(b)=2$



$h=4$



$h=2$



No improvements

6.5)

