

Q1: Model the problem?* Variables: $x_i =$ The variables we used
("Q1", "Q2", "Q3", "Q4")* Domains: $D_i =$
(1, 2, 3, 4)* Constraints:no two queens are in the
same row, column, or diagonal.

$$\forall i \neq j \rightarrow ((x_i \neq x_j) \wedge (|x_i - x_j| \neq |i - j|)).$$

Q2: Step by step solution:using Backtracking:

* How to view a csp as a Search problem?

1- Initial state

2- Successor ~~state~~ function.

3- Goal-test.

4- path cost.

Step 1:

Q ₁	X	X	X
X	X		
X		X	
X			X

Q₁ = X

Step 2:

Q ₁	XX	X	XX
XX	XX	XX	
X	Q ₂	X	
XX	X	X	X

Q₂ = XX

Step 3:

Q ₁	XX	X	XX
XX	XX	XX	
X	Q ₂	XX	XX
XX	XX	X	XX

So the 4th queen has no possible position.



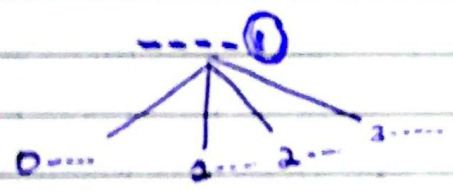
Now Steps:

..... ①

	x_0	x_1	x_2	x_3
0				
1				
2				
3				

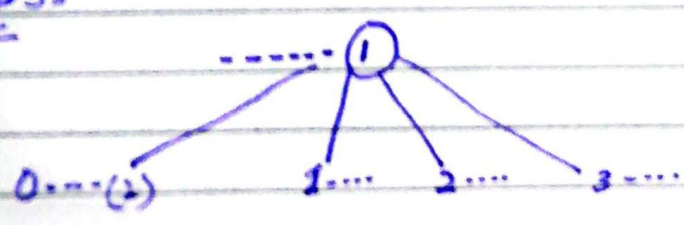
The initial state is the empty state, and it has 4 possible successors since there are 4 possible row to put the first queen on the board.

Step 1:



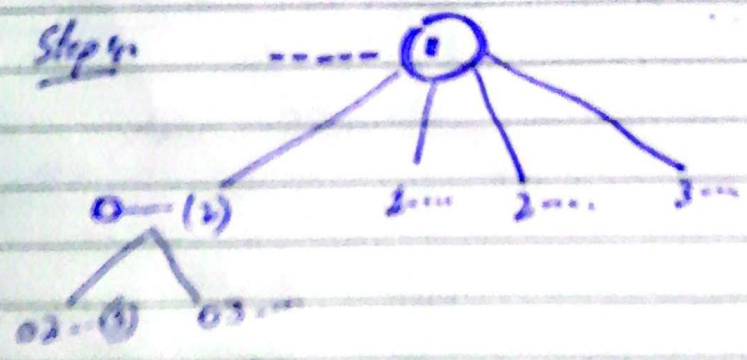
	x_0	x_1	x_2	x_3
0				
1				
2				
3				

Step 3:



	x_0	x_1	x_2	x_3
0	Q1	X	X	X
1	X	X		
2	X		X	
3	X			X

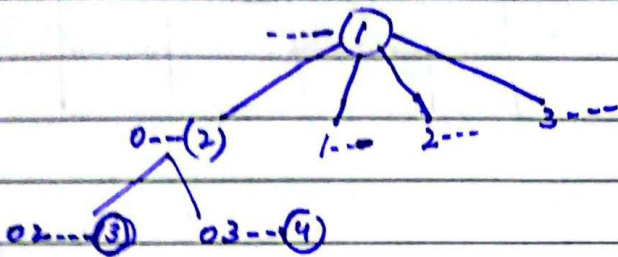
Step 4:



	x_0	x_1	x_2	x_3
0	Q1	X	X	X
1	X	X	X	
2	X	Q2	X	X
3	X	X		X

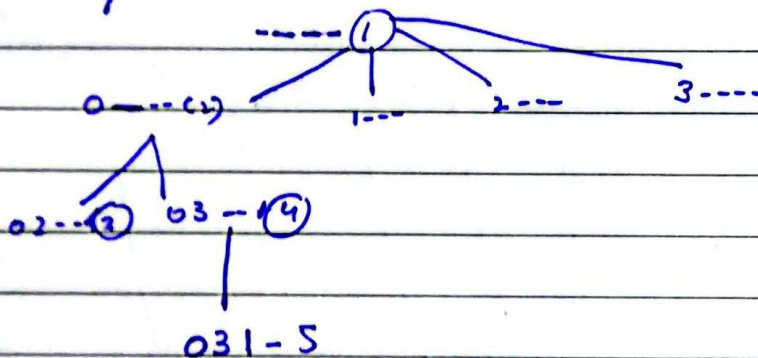
So the 4 queen plan is not possible go back track the position.

Step 5: Backtraced:



	x_0	x_1	x_2	x_3
0	Q_1	X	X	X
1	X	X		X
2	X	X	X	
3	X	Q_2	X	X

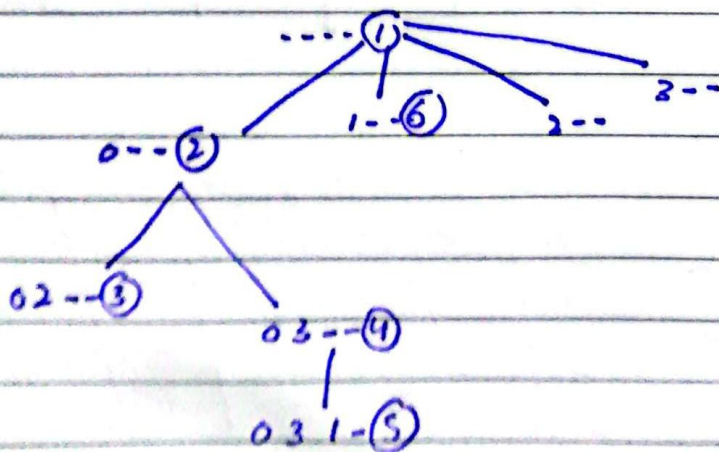
Step 6:



	x_0	x_1	x_2	x_3
0	Q_1	X	X	X
1	X	X	Q_3	X
2	X	X	X	X
3	X	Q_2	X	X

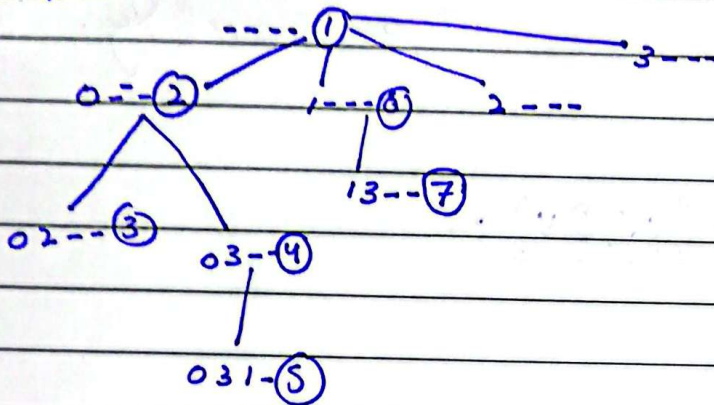
So it again not possible to queen 4 is put in here so go backtracked.

Step 7: Backtraced:



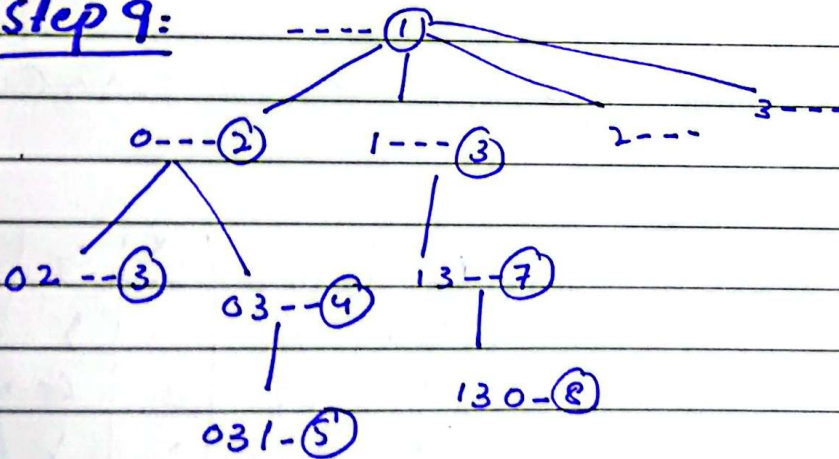
	x_0	x_1	x_2	x_3
0	X			
1	Q_1	X	X	X
2	X	X		
3	X		X	

Step 8:



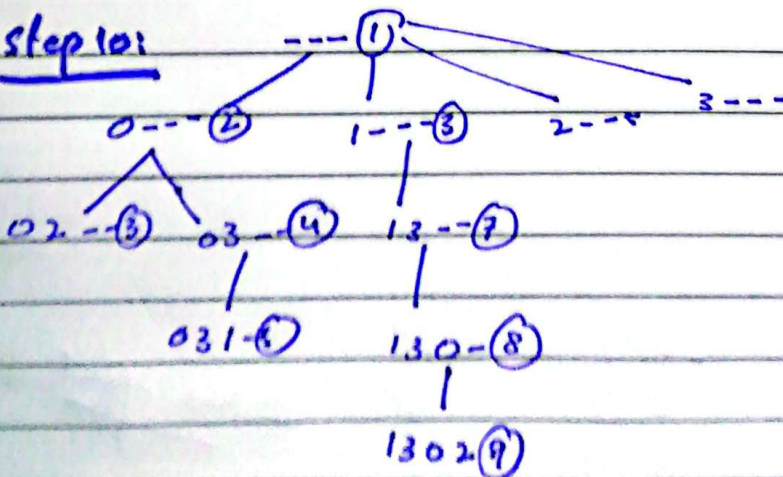
	x_0	x_1	x_2	x_3
0	X	X		
1	Q_1	X	X	X
2	X	X	X	
3	X	Q_2	X	X

Step 9:



	x_0	x_1	x_2	x_3
0	X	X	Q_3	X
1	Q_1	X	X	X
2	X	X	X	
3	X	Q_2	X	X

Step 10:



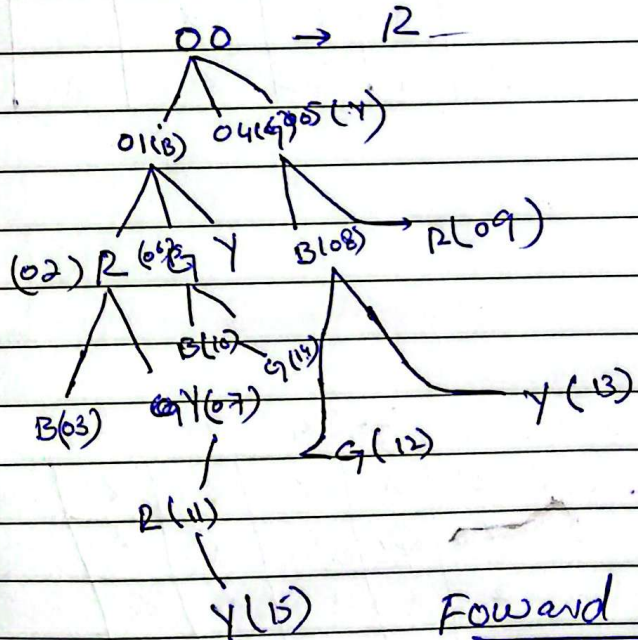
	x_0	x_1	x_2	x_3
0	X	X	Q_3	X
1	Q_1	X	X	X
2	X	X	X	Q_4
3	X	Q_2	X	X

At this point we are ~~at~~ reached a ~~goal~~ node and we stop searching.

Minimum Remaining values (MRV) :-

00	04	08	12
01	05	09	13
02	06	10	14
03	07	11	15

Color using in MRV using RBGY ✓ (Q1, Q2, Q3, Q4).



R	G	B ^X	G
B ^X	Y	R	Y
R	G	B	G ^X
B	Y ^X	R	Y

Forward checking :-

Now

Q ₁ = B	(01)	✓
Q ₂ = Y	(07)	✓
Q ₃ = B	(08)	✓
Q ₄ = G	(14)	✓

≠ No effect