

Q1: Model the problem?

* Variables: $x_i =$

The variables are used
("Q1", "Q2", "Q3", "Q4")

* Domains: $D_i = \{1, 2, 3, 4\}$

1 2 3 4
x x x

* Constraints:

no two queens are in the same row, column, or diagonal.

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

Q2: Step by step Solution:

using Backtracking:

- * How to view a CSP as a Search problem?
- * Initial state
- 2-Successor ~~heuristic~~ function.
- 3-Goal-test.
- 4-path cost.

Step 1:

Q_2	X	X	X
X	X		
X		X	
X			X

$$Q_1 = X$$

Step 2:

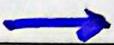
Q_1	XX	X	XX
XX	XX	XX	
X	Q_2	X	
XX	X	X	X

$$Q_2 = XX$$

Step 3:

Q_1	XX	X	XX
XX	XX	XX	
X	Q_2	XX	XX
XX	XX	XX	XX

So the 4th ~~the 4th~~ queen has no possible position.



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X₀ X₁ X₂ X₃

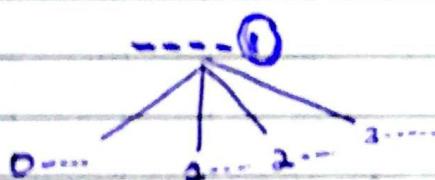
Now Step:

①

	X ₀	X ₁	X ₂	X ₃
0				
1				
2				
3				

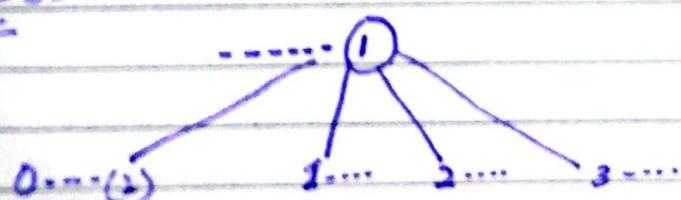
The initial state is the empty state, and it has 4 possible successors since there are 4 possible row to put the first queen on the board.

Step 1:



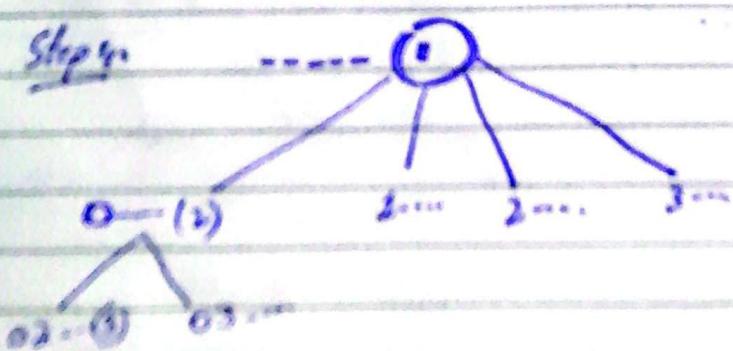
	X ₀	X ₁	X ₂	X ₃
0				
1				
2				
3				

step 2:



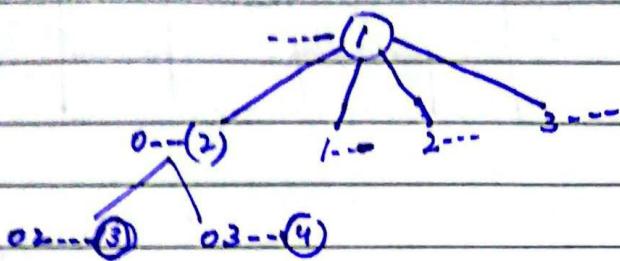
	X ₀	X ₁	X ₂	X ₃
0	Q ₁	X	X	X
1	X	X		
2	X		X	
3	X			X

Step 3:

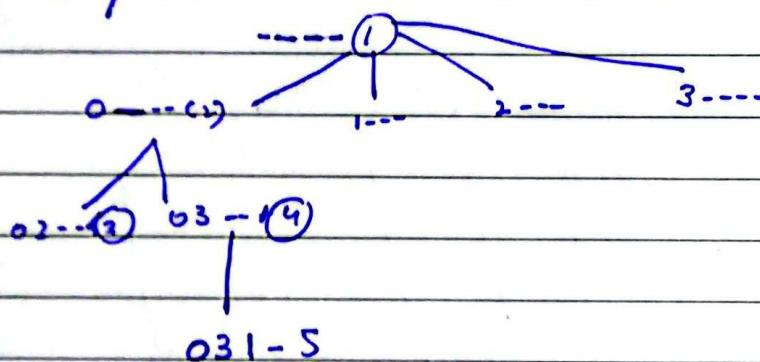


	X ₀	X ₁	X ₂	X ₃
0	Q ₁	X	X	X
1	X	X	X	
2	X	Q ₂	X	X
3	X	X		X

So the 4 queen plan is not possible
go backtrace the position.

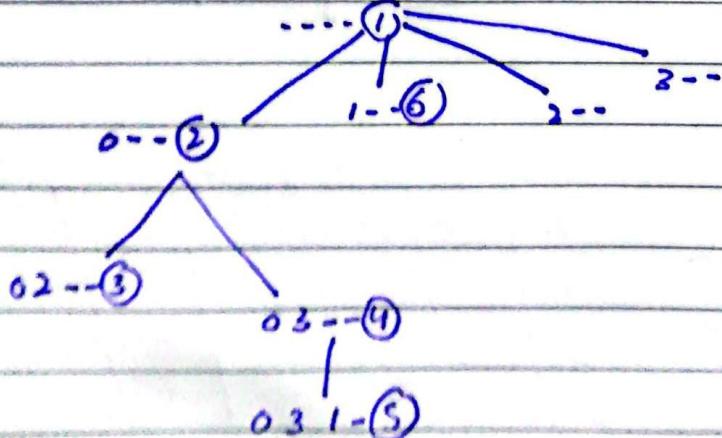
Step 5: Backtraced:

	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:

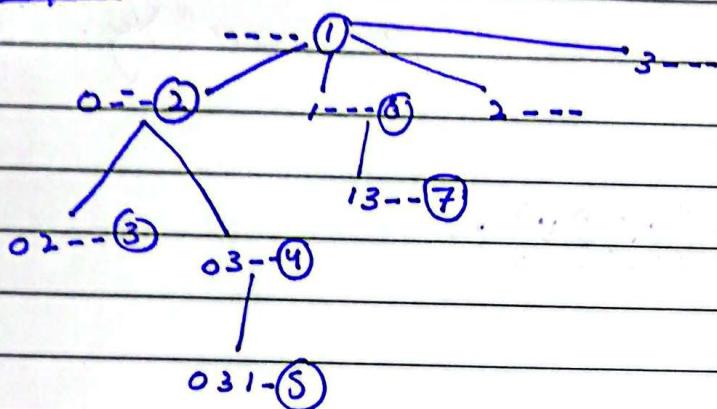
	x_0	x_1	x_2	x_3
0	Q ₁	X	X	X
1	X	X	Q ₃	X
2	X	X	X	X
3	X	Q ₂	X	X

So it again not possible
to queen q is fit in here so
go backtraced.

Step 7: Backtraced:

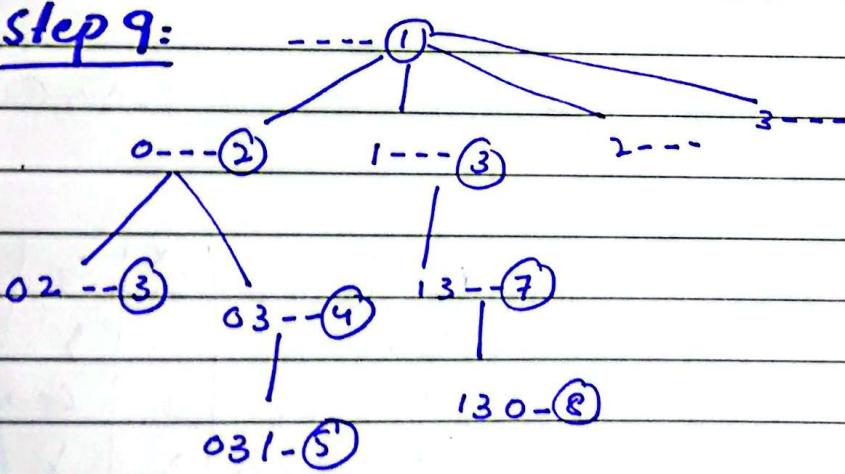
	x_0	x_1	x_2	x_3
0	X			
1	Q ₁	X	X	X
2	X	X		
3	X		X	

Step 8:



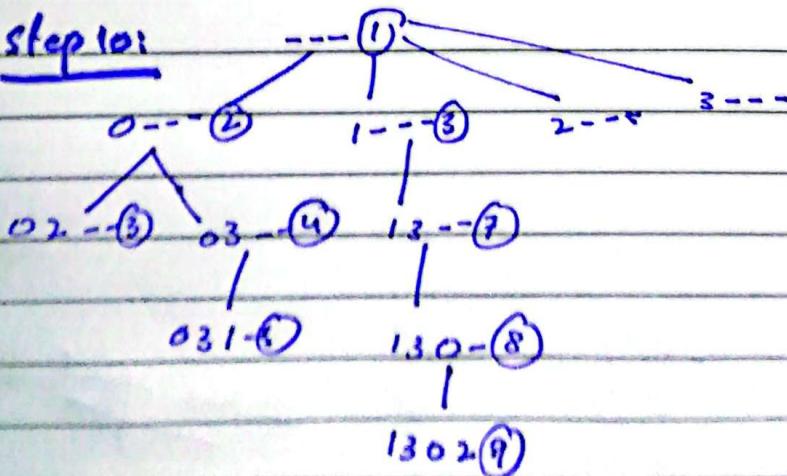
	x_0	x_1	x_2	x_3
0	X	X		
1	Q_1	X	X	X
2	X	X	X	
3	X	Q_2	X	X

Step 9:



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

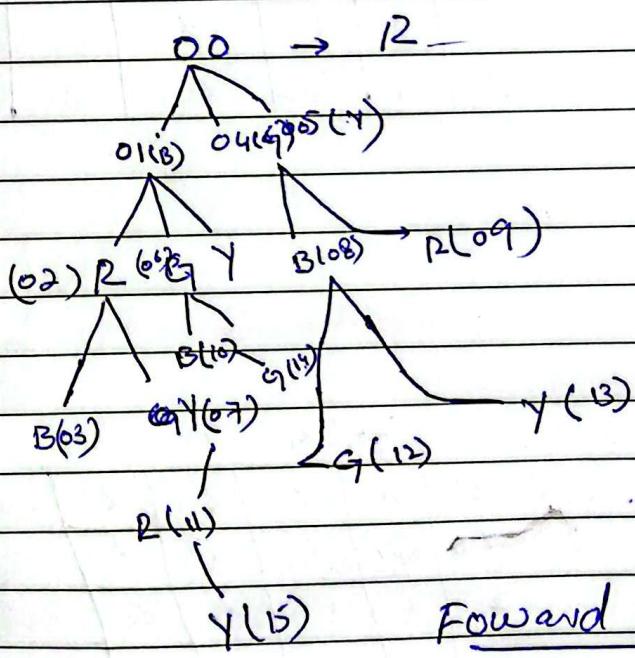


At this point we are at a reached a goal node and we stop searching.

Minimum Remaining values (MRV) :-

00	04	08	12
01	05	09	13
02	06	010	14
03	07	11	15

Color using in MRV using $PBGY \cup (Q_1, Q_2, Q_3, Q_4)$.



R	G	B	Y
B X	Y	12 Y	
12 G	B	G X	
B	y X	12	Y

Forward checking :-

$$\text{Now } Q_1 = B \quad (0'1) \quad \checkmark$$

$$Q_2 = Y \quad (0'7) \quad \checkmark$$

$$Q_3 = B \quad (0'8) \quad \dots \checkmark$$

$$Q_4 = G \quad (1'4) \quad \checkmark$$

~~NO effect~~