Case study 6

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Question 1)solve the puzzles

Solutions:

Note:
Before placing any number make sure, that this number is not present in the entire row,coumn and submatrix

Steps

1. Place 3 on the position 4,a
2. Place 1 on the position 4,d
3. Place 2 at 1,a
4. Place 4 at 1,d
5. Place 3 at 2,b
6. Place 4 at 3,b
7. Place 2 at 3,c
8. Place 1 at 2,c

Total steps reQuired=8

4	**3**	**2**	**4**	**1**
3	**1**	**4**	**2**	**3**
2	**4**	**3**	**1**	**2**
1	**2**	**1**	**3**	**4**
	a	**b**	**c**	**d**

9*9 puzzle

9	5	4			2		8		6
8		1	9			7			3
7				3			2	1	
6	9			4		5		2	
5			1				6		4
4	6		4		3	2		8	
3		6					1	9	
2	4		2			9			5
1		9			7		4		2
	a	b	c	d	e	f	g	h	i

Note:
Before placing any number make sure, that this number is not present in the entire row,coumn and submatrix

Steps

1. Place 3 at 9,c
2. Place 9 at 9,d
3. Place 1 at 9,f
4. Place 7 at 9,h
5. Place 2 at 8,a
6. place 6 at 8,d
7. place 8 at 8,e
8. place 5 at 8,g
9. place 4 at 8,h
10. place 8 at 7,a
11. place 7 at 7,b
12. place 6 at 7,c
13. place 5 at 7,e
14. place 5 at 7,f
15. place 9 at 7,i

16. place 8 at 6,b
17. place 7 at 6,c
18. place 6 at 6,e
19. place 3 at 6,g
20. place 1 at 6,i
21. place 3 at 5,a
22. place 2 at 5,b
23. place 7 at 5,d
24. place 9 at 5,e
25. place 8 at 5,f
26. place 5 at 5,h
27. place 5 at 4,b
28. place 1 at 4,d
29. place 9 at 4,g
30. place 7 at 4,i
31. place 7 at 3,a
32. place 5 at 3,c
33. place 2 at 3,d
34. place 4 at 3,e
35. place 3 at 3,f
36. place 8 at 3,i
37. place 3 at 2,b
38. place 8 at 2,d
39. place 1 at 2,e
40. place 7 at 2,g
41. place 6 at 2,h
42. place 1 at 1,a
43. place 8 at 1,c
44. place 5 at 1,d
45. place 6 at 1,f
46. place 3 at 1,h

Total steps required= 46

Solved puzzle:

9	5	4	3	9	2	1	8	7	6
8	2	1	9	6	8	7	5	4	3
7	8	7	6	3	5	4	2	1	9
6	9	8	7	4	6	5	3	2	1
5	3	2	1	7	9	8	6	5	4
4	6	5	4	1	3	2	9	8	7
3	7	6	5	2	4	3	1	9	8
2	4	3	2	8	1	9	7	6	5
1	1	9	8	5	7	6	4	3	2
	a	b	c	d	e	f	g	h	i

Question 2:

Solution 1:

- every location can have numbers {1,2,3,4,5,6,7,8,9}
- total position=81
- positions to be filled=47
- total combinations= 9^{47}
- check if the all the numbers placed are not present in their row,column and submatrix,if yes,then this is the solution
- otherwise repeat.

Solution 2:

- let take x at position 9,c
- elements in the row={5,4,2,8,6}
- elements in the column={9,1,4,2}
- elements in the sub matrix ={5,4,1,9}
- so according to the rule,Xf set= {3,7,8}
- X can be any number from their Xf set

9	5	4	X		2		8		6
8		1	9			7			3
7				3			2	1	
6	9			4		5		2	
5			1				6		4
4	6		4		3	2		8	
3		6					1	9	
2	4		2			9			5
1		9			7		4		2
	a	b	c	d	e	f	g	h	i

- Similarly, solve for all the positions and find set Xf for each postions
- Randomly place values at each postions from their respective Xf sets
- If it follows the rules, this is the solution
- Otherwise repeat and take different values for each positions from their respective Xf set

Solved puzzle:

9	5	4	3	9	2	1	8	7	6
8	2	1	9	6	8	7	5	4	3
7	8	7	6	3	5	4	2	1	9
6	9	8	7	4	6	5	3	2	1
5	3	2	1	7	9	8	6	5	4
4	6	5	4	1	3	2	9	8	7
3	7	6	5	2	4	3	1	9	8
2	4	3	2	8	1	9	7	6	5
1	1	9	8	5	7	6	4	3	2
	a	b	c	d	e	f	g	h	i

Solution 3:

- Create a function that checks if this matrix is a valid soduko or not,Keep hash maps for the rows ,columns and boxes/sub matrixes, if any number appears more than 1 then return false, otherwise return true
- Create a recursive function that takes the grid and the current rows and columns index
- Check some base cases. If the index is at the end of the matrix i-e i=N-1 and j=N then check if the grid is safe or not,if safe print the grid and return ture else return false. The other base case is when the value of column is N. The other base case is when the value of column is N ,then move to next row
- If the current index is not assigned then fill the element from 1 to 9 and recur for all the cases with the index of the next element,if the recursive call returns true then break the loop and return ture
- If the current index is assigned then call the recursive function with index of next element

Time complexity:

For every unassigned index there are 9 possibilties so the time complexity is (9^{n*n})

Space complexity:

To store the output array a matrix is needed