

Problem 3:

Given a 9×9 incomplete sudoku, solve it such that it becomes valid sudoku.

Valid sudoku has the following properties.

1. All the rows should be filled with numbers(1 – 9) exactly once.
2. All the columns should be filled with numbers(1 – 9) exactly once.
3. Each 3×3 submatrix should be filled with numbers(1 – 9) exactly once.

def is_valid(grid, row, col, num):

```
    for i in range(9):
```

```
        if grid[row][i] == num:
```

```
            return False
```

```
    for i in range(9):
```

```
        if grid[i][col] == num:
```

```
            return False
```

```
    start_row = 3 * (row // 3)
```

```
    start_col = 3 * (col // 3)
```

```
    for i in range(3):
```

```
        for j in range(3):
```

```
            if grid[start_row + i][start_col + j] == num:
```

```
                return False
```

```
    return True
```

def solve_sudoku(grid):

```
    for row in range(9):
```

```
        for col in range(9):
```

```
            if grid[row][col] == '.':
```

```
                for num in range(1, 10):
```

```
                    if is_valid(grid, row, col, str(num)):
```

```
                        grid[row][col] = str(num)
```

```
                        if solve_sudoku(grid):
```

```
                            return True
```

