CODING SHUTTLE

Backtracking - 4

In This Lecture

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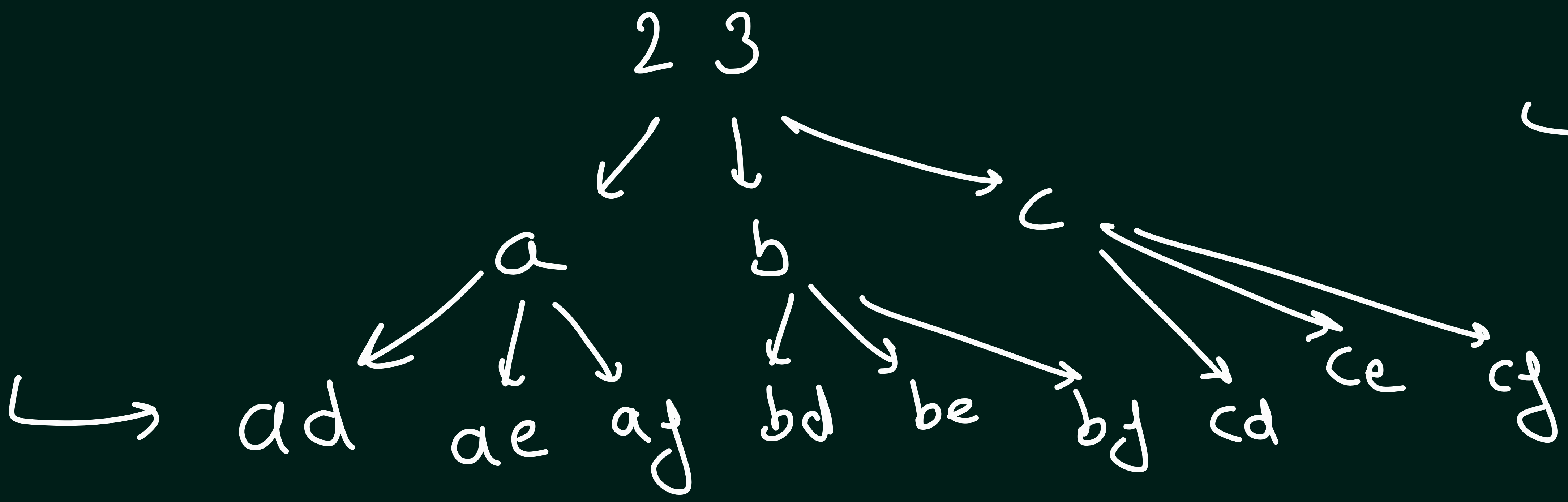
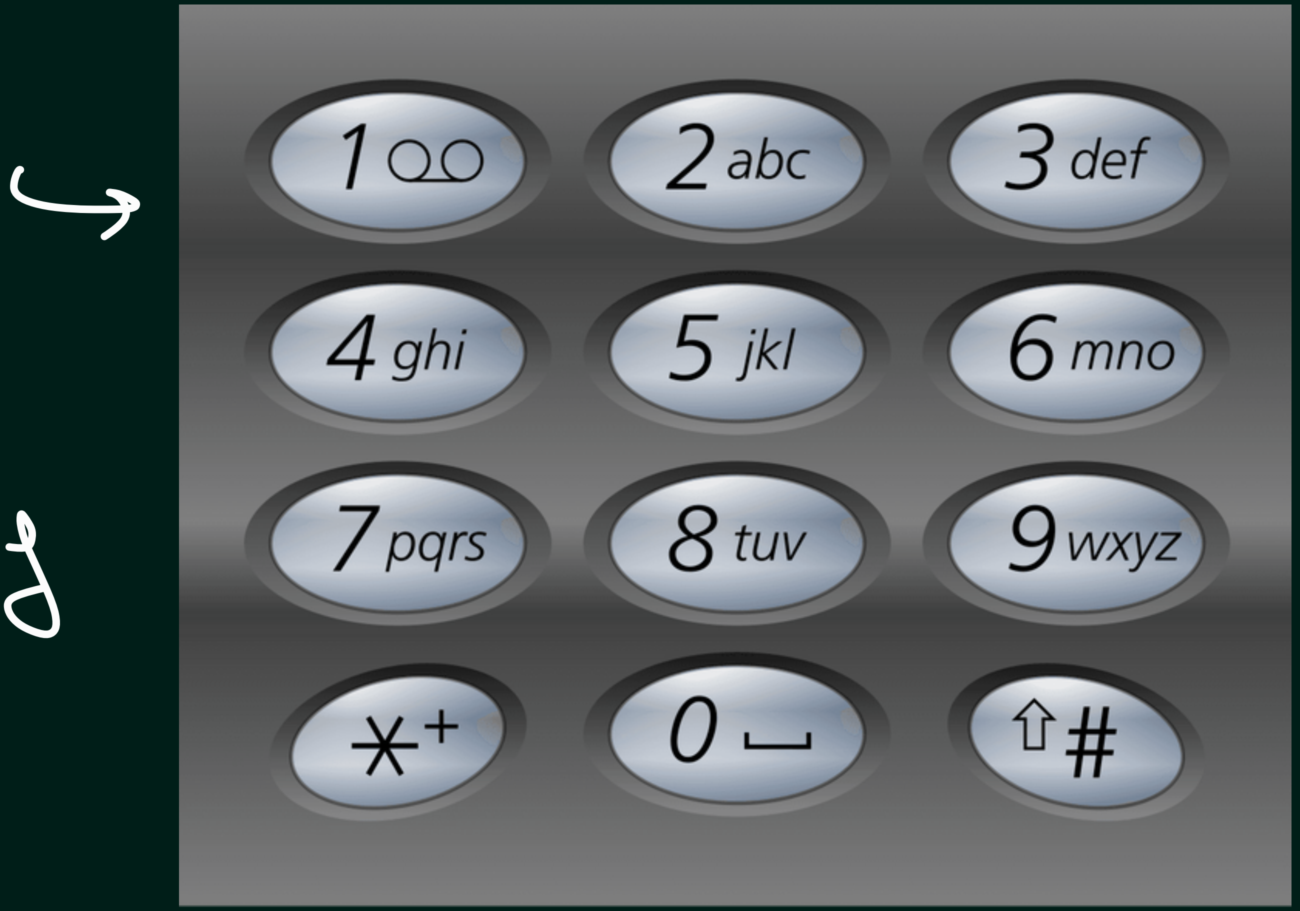
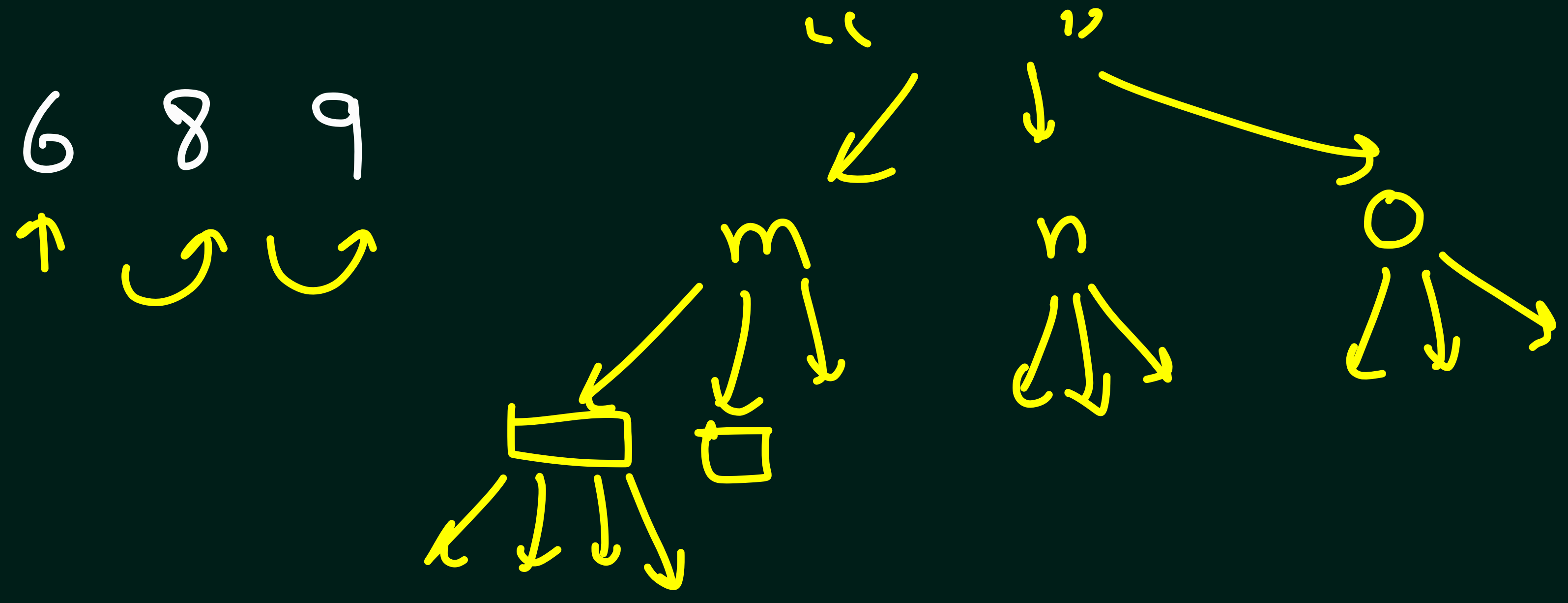
2. Sudoku Solver

Smart Keypad Problem







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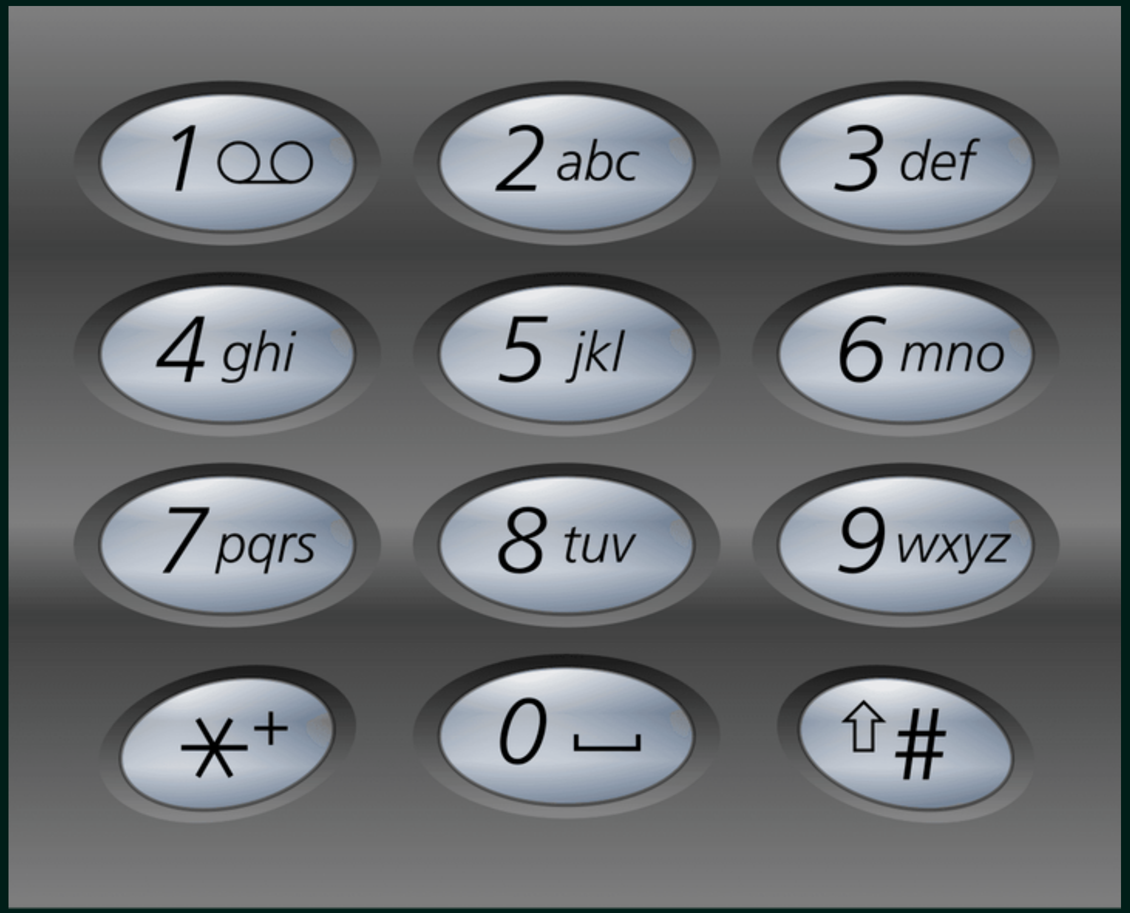
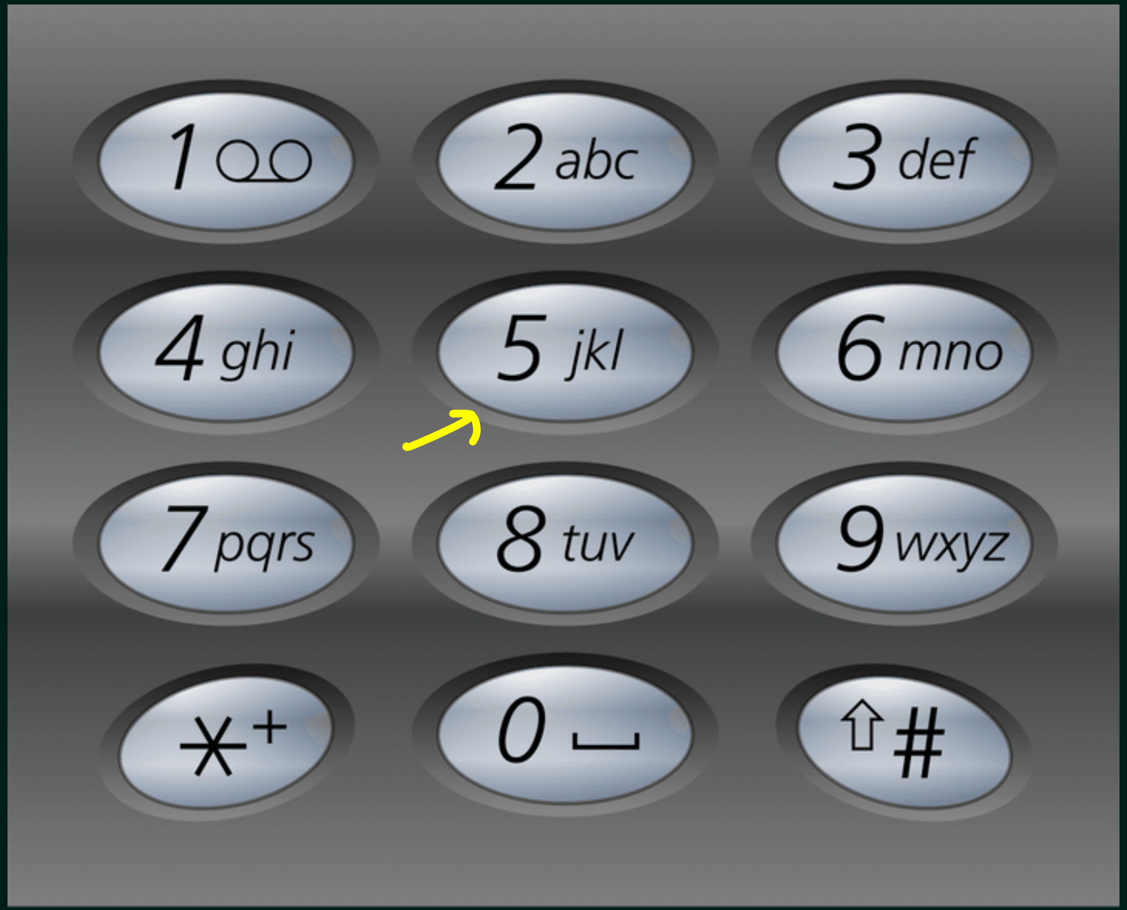
Smart Keypad Problem

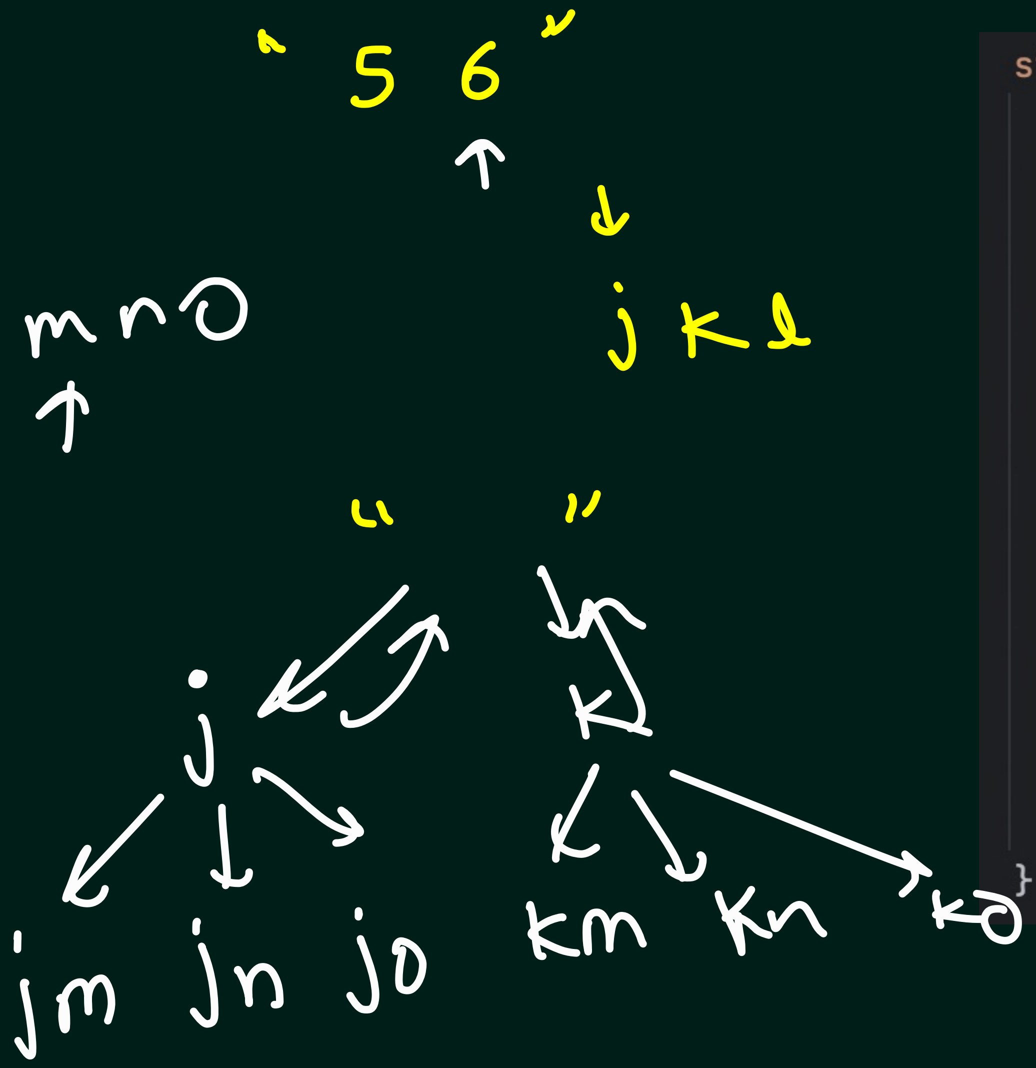
" 4 5 9 "

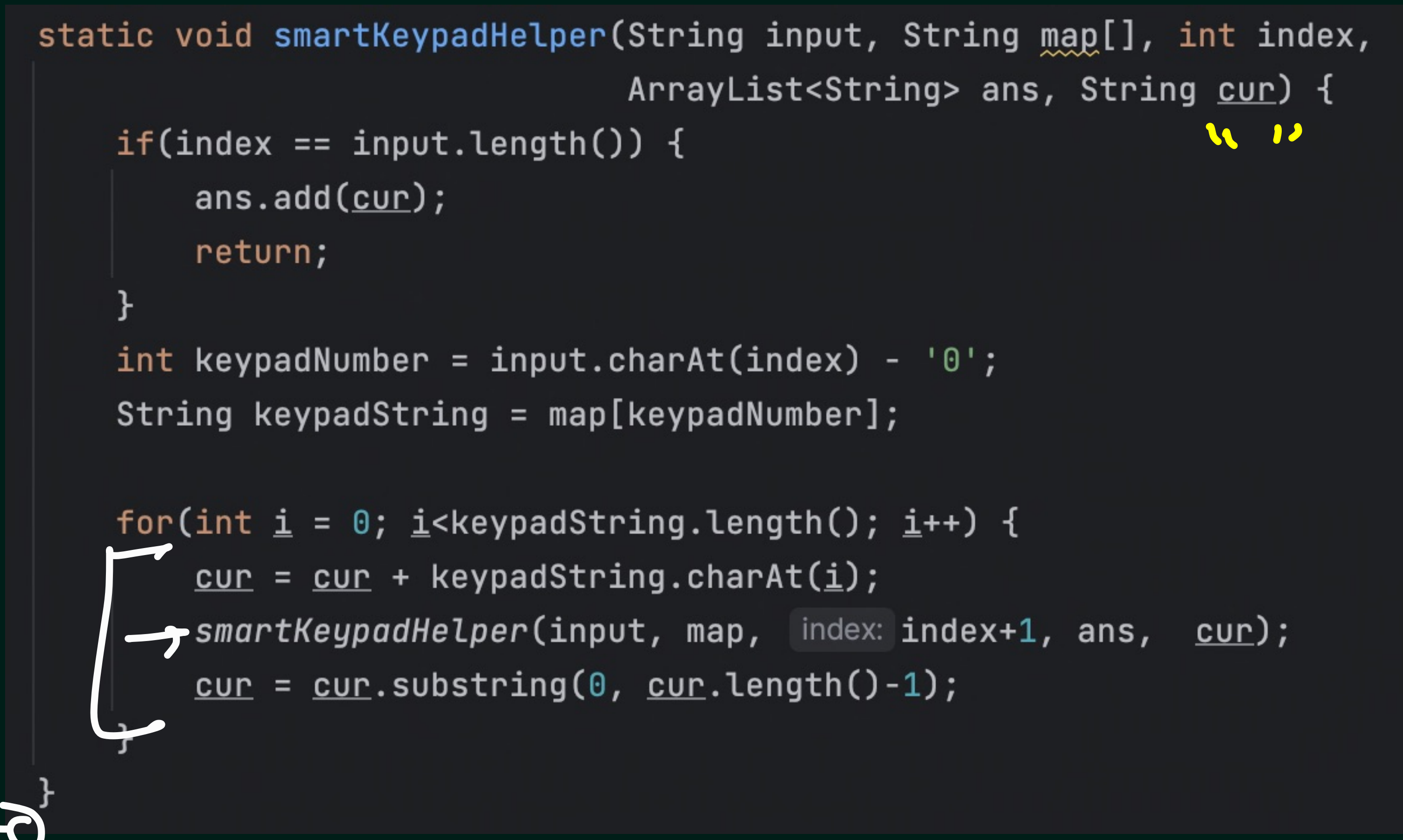
$$\begin{array}{cccc} 0 & 1 & 2 & \overset{\uparrow}{3} \end{array}$$



Smart Keypad Problem







```
static void smartKeypadHelper(String input, String map[], int index,
                              ArrayList<String> ans, String cur) {
    if(index == input.length()) {
        ans.add(cur);
        return;
    }
    int keypadNumber = input.charAt(index) - '0';
    String keypadString = map[keypadNumber];

    for(int i = 0; i<keypadString.length(); i++) {
        cur = cur + keypadString.charAt(i);
        smartKeypadHelper(input, map, index: index+1, ans,  cur);
        cur = cur.substring(0, cur.length()-1);
    }
}
```

[jm, jn, jo

Sudoku Solver

Write a program to solve a Sudoku puzzle by filling the empty cells.

	0	1	2	3	4	5	6	7	8
0	5	3	1	2	7	4	6	9	8
1	6	2	4	1	9	5	7		
2		9	8					6	
3	8	0	0	0	6	0			3
4	4			8		3			1
5	7				2				6
6		6					2	8	
7				4	1	9			5
8					8			7	9

$(7, 4)$

$\downarrow$

$\rightarrow (2, 1)$

row $\rightarrow$ 4 / 3

col $\rightarrow$ 6 / 3

gridRow = $4/3 = 1$

grid col = $6/3 = 2$

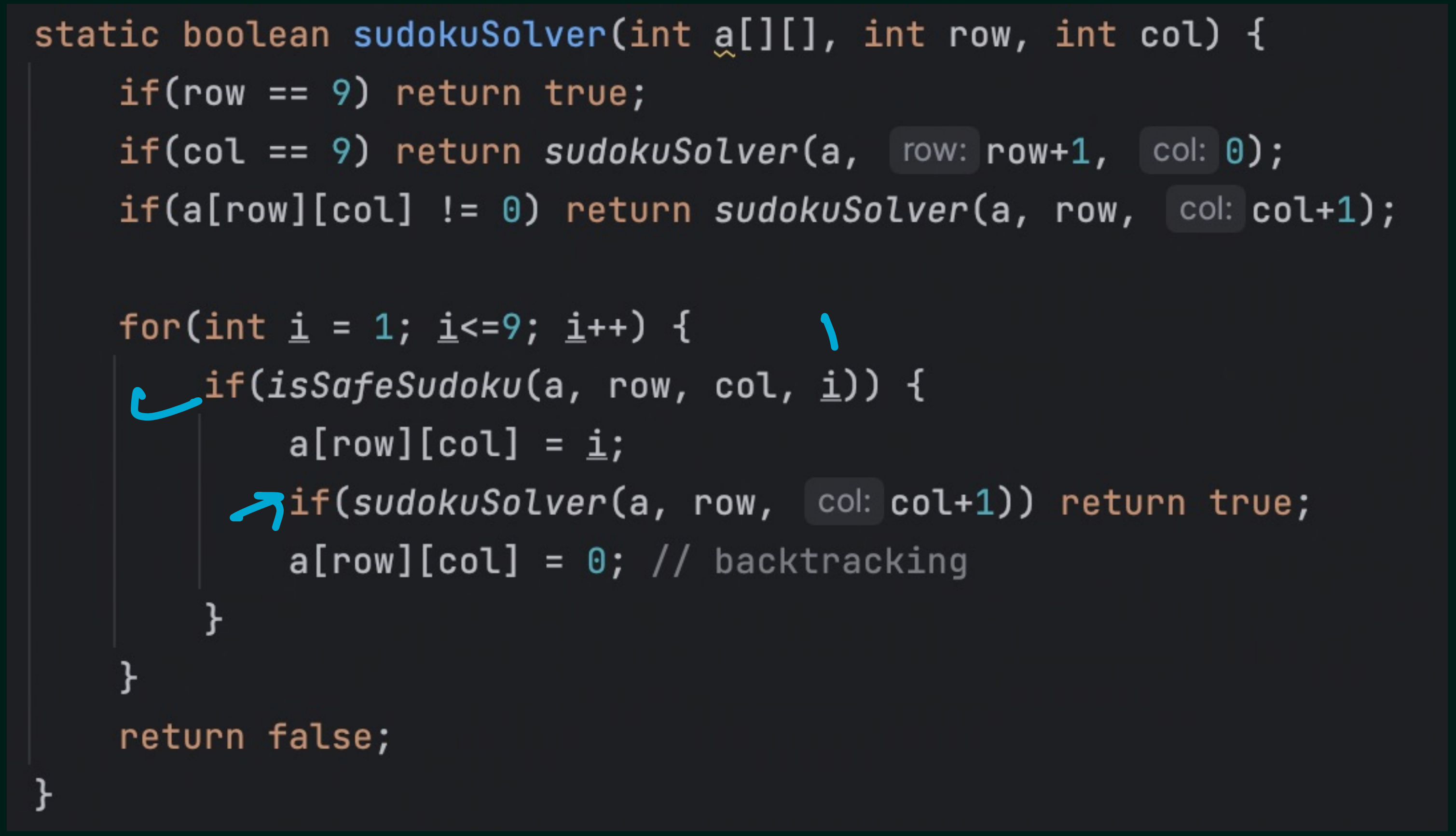
$j(0 \xrightarrow{1} 2)$

$j(0 \rightarrow 2)\{$

$3 * 2 + 1 \rightarrow 7$

$3 * 1 + 0 \rightarrow 3.$

Sudoku Solver



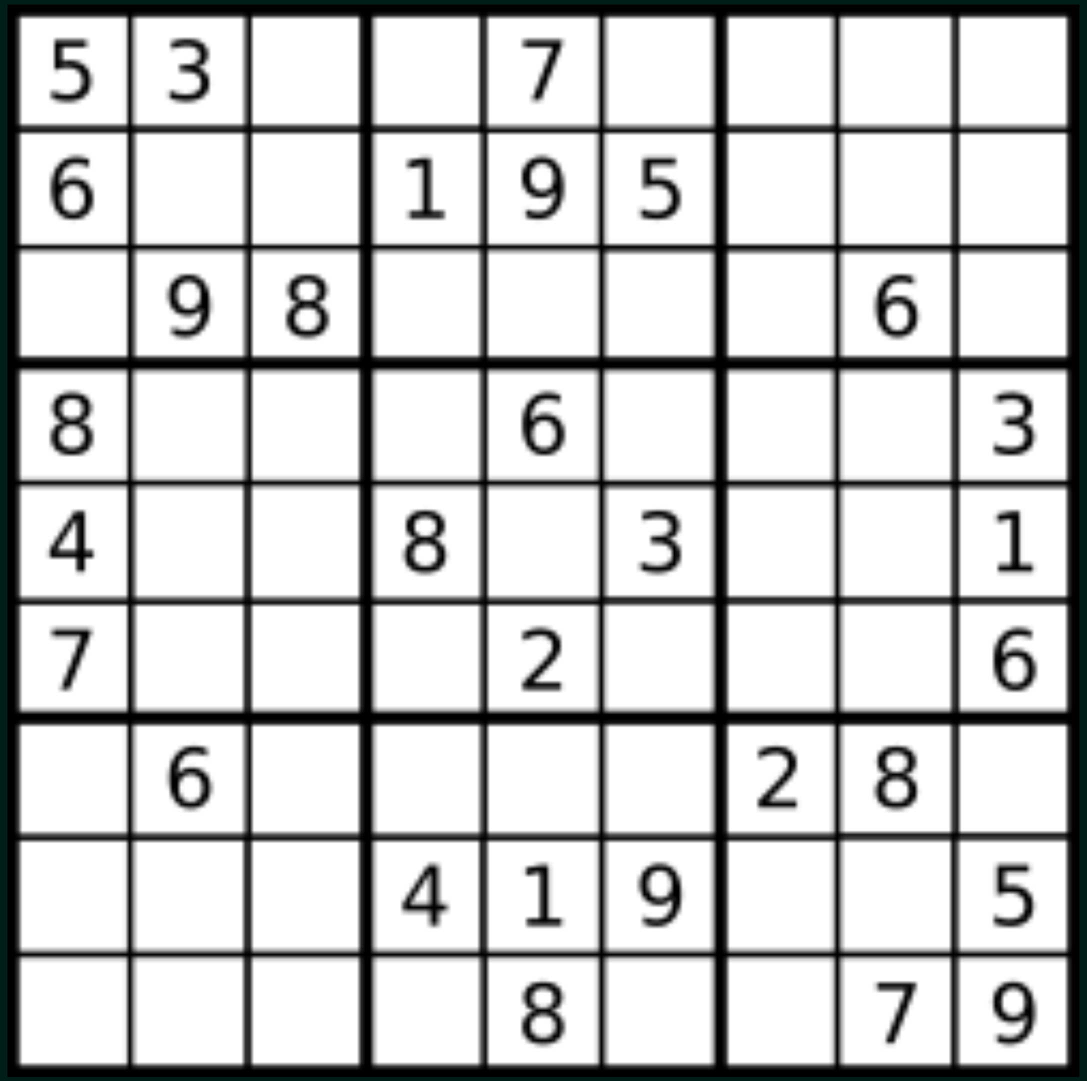
```java
static boolean sudokuSolver(int a[][], int row, int col) {
    if(row == 9) return true;
    if(col == 9) return sudokuSolver(a, row: row+1, col: 0);
    if(a[row][col] != 0) return sudokuSolver(a, row, col: col+1);

    for(int i = 1; i<=9; i++) {
        if(isSafeSudoku(a, row, col, i)) {
            a[row][col] = i;
            if(sudokuSolver(a, row, col: col+1)) return true;
            a[row][col] = 0; // backtracking
        }
    }
    return false;
}
```

$$\begin{tikzcd}
(0,0) \arrow[d] \\
(0,1) \arrow[d] \\
(0,2) \arrow[d] \\
(0,3) \arrow[d, bend left] \\
(0,4) \arrow[u, bend right]
\end{tikzcd}$$

5	3	1	2	7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

CODING SHUTTLE

Sudoku Solver



5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9