

Valid Sudoku

We must check rows, columns and 3×3 sub-boxes for duplicates among filled cells; the approach is hash sets for validation.

[Key Idea:]

Use 3 arrays of hash sets (or boolean arrays):

1. rows[9] \rightarrow track digits in each row.
2. cols[9] \rightarrow track digits in each column.
3. boxes[9] \rightarrow track digits in each 3×3 sub-box.

For each cell (i, j) :

- Skip if cell is '.'.

- Compute box Index = $(i/3) * 3 + (j/3)$ for the 3×3 box.

- Otherwise, add digit to respective sets.

[Complexity:]

- Time: $O(81) \rightarrow$ constant since board is fixed 9×9 .
- Space: $O(81)$ for storing sets.