Assignment 4

Team Members:

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Subject:

Software Development Concepts

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Professor:

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Assignment 4: Solution Explanation

Strategy/Algorithm to solve the puzzle

- Fill all the groups with only one cell first with the correct value. (i.e., =).
- Start from cell position 0,0 (i.e., 0th row and 0th column) and repeat the below steps until the last cell(i.e., (size - 1) row and (size - 1) column) is reached.
- Get the current cell character and its grouping.
- If the current cell character has = operator, continue to the next cell.
- Calculate the number of remaining cells to fill for the current group.
- If the number of remaining cells to fill is greater than 1, fill the cell normally by assigning a value from 1 to size. Before assigning a value, check whether it is unique in the same row and column. If assigned, increment the choices counter. If nothing works, reset the cell to 0 and backtrack to the previous cell for a different solution.
- If the number of remaining cells to fill is less than 1 (i.e., only one cell left in the group), check the operator, and calculate the correct value that solves the group. If the value to fill in is a valid value and unique in the same row and column, fill the value, increment the choices counter, and move to the next cell. If not, reset the cell to 0 and backtrack to the previous cell for a different solution.
- When the last cell is reached, return true to avoid further backtracking.

Steps to provide some degree of efficiency

- For grouping with only one cell (i.e., =), instead of trying all the possible values in that cell, I am directly adding the correct value into that cell.
- I calculate the number of cells left to be filled in the group to avoid brute-forcing the puzzle in the first place.
- When all the cells except the last cell in the group are filled then in case of any operation (+, -, * and /), instead of assigning a value in that cell and then solving the group, I check whether the value fits in the group. If yes, I move ahead. If not, I backtrack to the previous cell.
- For the last remaining cell in the case of Addition (+) and Multiplication (*), instead of trying all the possible values in that cell, I am calculating the remaining value and try to add it in the cell. If not possible, I backtrack to the previous cell.