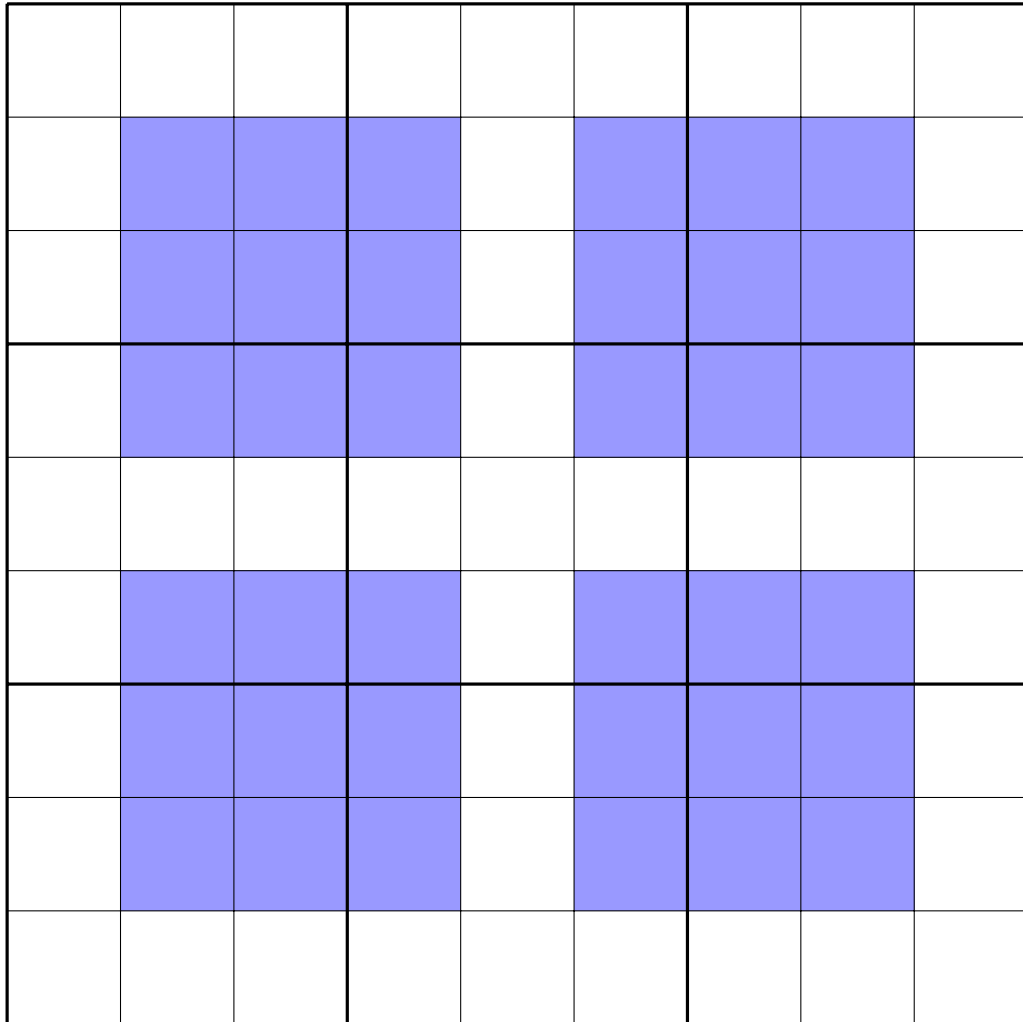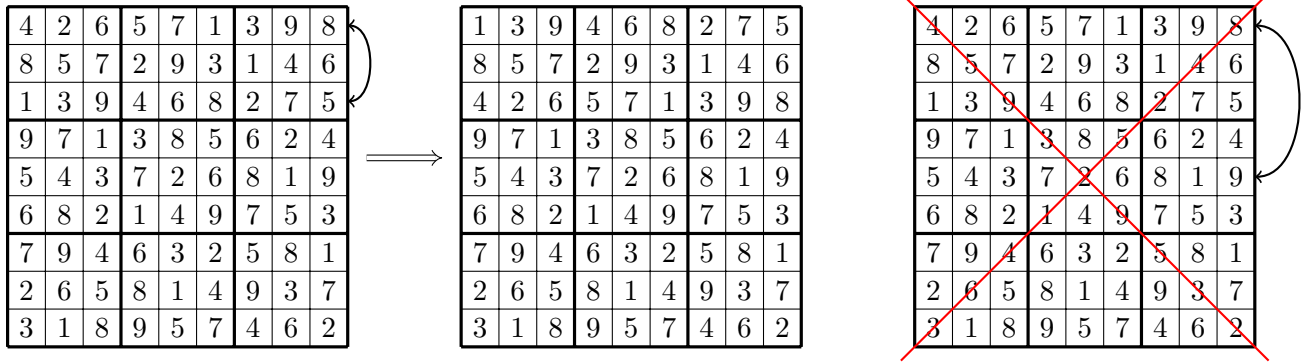# CS70 Puzzle Set #1

March 1, 2017

1. Fill in the Sudoku grid like a normal Sudoku grid; however, with the additional constraints that each of the blue shaded squares must also have one of each of the numbers 1 through 9
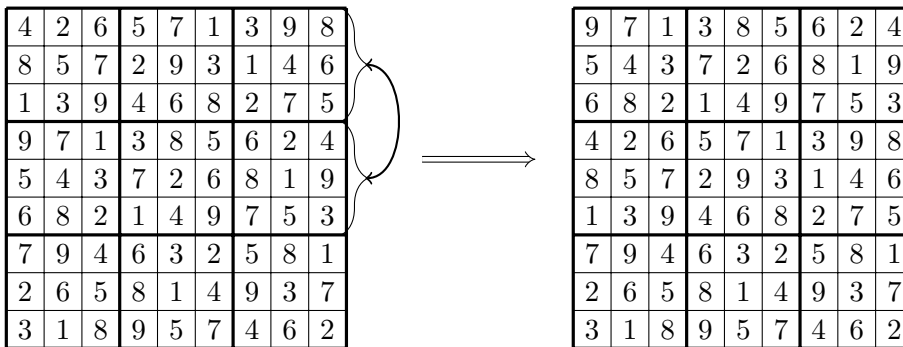
Something interesting of note for ordinary sudoku puzzles certain operations on the board will still maintain its validity as a solution.
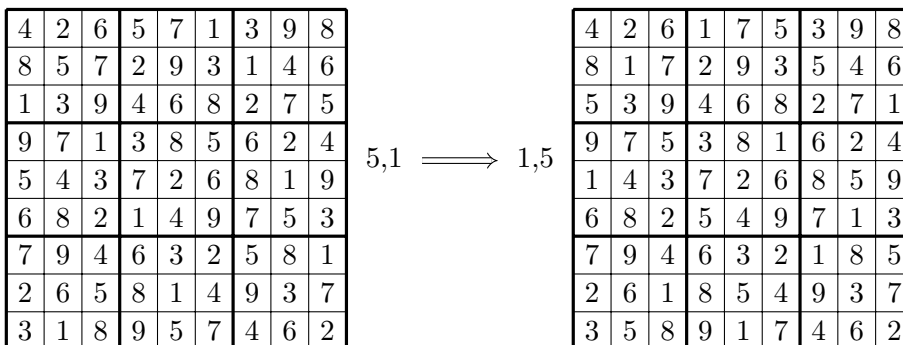
Here are a list of the operations one can use:

- Switching rows or columns within a box group:

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

$\implies$

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

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

(crossed out)

- Switching box groups row-wise or col-wise:

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

$\implies$

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

- Switching every number of one kind with another

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

$5,1 \implies 1,5$

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

2. Using the above mentioned operations turn the following sudoku puzzle solution into one that satisfies the constraints mentioned in the first problem.

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

3. Solve the following Sudoku puzzle with the same constraints as before:

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