Logic for Computer Science

Assignment: Solving Sudokus

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1. Implement a Sudoku solver.

- You can use the given python script as a basis.
- Encode the problem into SAT and modify the script such that it generates the required constraints.
- The syntax to solve a Sudoku from the command line should be

```
python sudokub.py -s <input>.txt
```

- The output (on the standard output) should first contain the input Sudoku and then the solution in the following form:

```
sudoku
|1| | | |
| | | |3|
| | |2| |
| |2| | |

solution
|1|3|4|2|
|2|4|1|3|
|3|1|2|4|
|4|2|3|1|
```

  The output may contain additional information (as in the output of the given script).

- You can use the example Sudokus to test your code.

- Your program should at least be able to solve 9x9 Sudokus, you have extra points if it can solve 16x16 and 25x25 Sudokus.

2. Extend your Sudoku solver such that it can check if a given Sudoku has more than one solution.

- The syntax to run your program from the command line should be

  `python sudokub.py -u <input>.txt`

- The output of your program should be as described above, followed by either

  `solution is unique`

  or by

  `other solution`

  together with a different solution formatted as above.

3. Extend your Sudoku solver such that it can create Sudokus of variable size. The created Sudoku must have one, and only one solution.

- The syntax to create a Sudoku from the command line should be

  `python sudokub.py -c <size>`

  where `<size>` is a square number.

- Add an option that allows for creating Sudokus with only `<size>` -1 numbers, and that can be chosen with the following syntax:

  `python sudokub.py -cm <size>`

- The output (e.g. for command `python sudokub.py -cm 4`) should be of the form

```
generated sudoku
|1| | | |
| | | |3|
| | |2| |
| |2| | |
```

4. Write a report of a maximum of two pages that describes the encoding to SAT and the features of your program.

5. Grading system (see slides)

points	your program
10	works for 9x9 Sudokus, it is correct, and reasonably clean (my solution is +76 lines incl. comments and empty lines)
+1	checks if a Sudoku has more than one solution
+1	allows to create 9x9 Sudokus (with one and only one solution)
+1	creates Sudokus (with one and only one solution) with only eight numbers
+2	creates Sudokus fairly
+1	solves 16x16, 25x25 Sudokus
+1	allows to create 16x16, 25x25 Sudokus
+1	is in the 20% fastest to check if a 25x25 has more than one solution
+2	surprises us (positively)!

Cooperation is allowed, but all cooperation must be clearly referred to in the final report, and we will have **no tolerance at all for plagiarism** (writing together, reusing/sharing code).