

Assignment 2

Team assignment: The assignment can have at-most 2 members.
Those who do the assignment individually get 5% extra marks.

Objective: Take a look at the game called Keen,
<https://www.chiark.greenend.org.uk/~sgtatham/puzzles/js/keen.html>
Understand the puzzle well. The aim is to find solutions to instances of the game.

Input: We use the following notation to represent a cell in the board (this is the notation used in Chess).

a6					f6
.					
.			d4		
a3				e3	
a2					
a1	b1	f1

A constraint will be denoted by (set of cells, constraint). For e.g.. $(\{a1,a2,b1,b2\}, 72x)$ says that the numbers in cells $\{a1,a2,b1,b2\}$ when multiplied together should be 72. Another e.g.. $(\{d4,d3,d2\}, 20+)$ says that the numbers in cells $\{d4,d3,d2\}$ when added together gives 20.

In this question, we will only consider boards of size 6x6. A board is now given by a set of constraints.

Board: $\{(\{a1,a2,b1\}, 50x), (\{e4,e5\}, 10+), \dots\}$

Your input to the algorithm will be a set of boards.

Board: $\{(\{a1,a2,b1\}, 50x), (\{e4,e5\}, 10+), \dots\}$
Board: $\{(\{c5,c6\}, 6+), (\{f2,f3,e3,d3\}, 15+), \dots\}$
..

Program: You should give two programs.

1. Solution: It should use Z3 to find solutions to the puzzles given as input. The program should output the solution in the following format.

```
[416352625413362541143625354136531264]
```

This means that in the solution, a1 cell will get 4, b1 will get 1, c1 will get 6, a2 will get 6, b2 will get 2 etc.

Since the input is a set of board positions, your output should be a set of solutions. For example.

```
[416352625413362541143625354136531264]
```

```
[654213162354413625245136531462326541]
```

...

2. Verification: You will have to write a program, which reads both the input file as well as a solution file and checks whether the solution is correct for all board positions.

Every team should also create at least 3 inputs: easy, hard, moderate or extreme.

Once the assignment is submitted, we will collect all the inputs from all teams into a common file. Then each of your programs will be run on this common file. The output is then verified for correctness using randomly chosen Verification programs. We will also note down the time each team takes for finding the solutions.

Submission deadline: **11th November 2018**

The name of the programs should contain your role numbers.