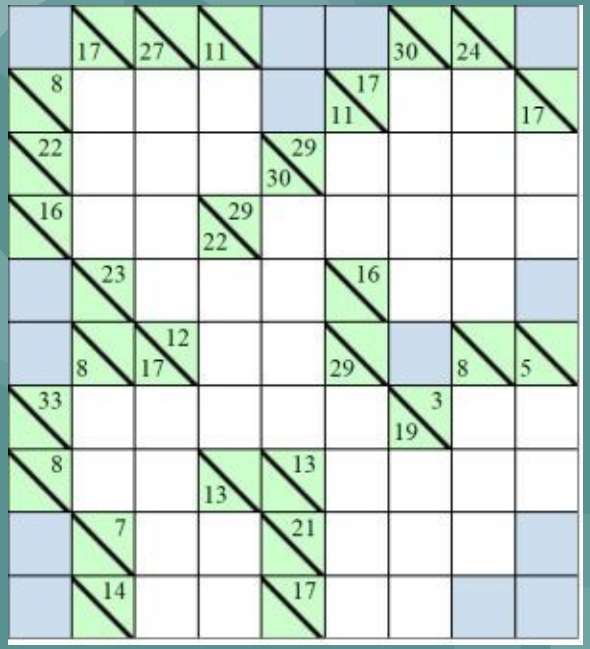
Kakuro Solver

Kakuro as a Constraint satisfaction problem

Kakuro Puzzle Game

- One of the most popular puzzle games in the world
- Fill the numbers in the blanks such that the Sum is equal to the number on top or left
- We will be using a standard kakuro puzzle 1-9 only allowed
- Numbers can’t be repeated



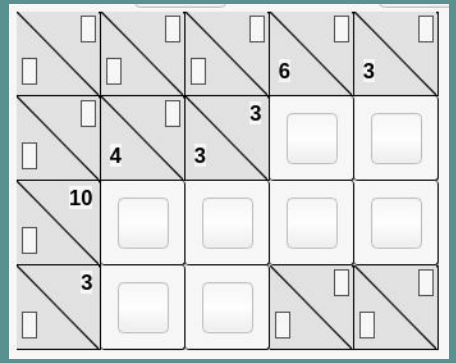
Constraint satisfaction problems
CSPs

A special subset of search problems

- State is defined by variables X_i with values from a domain D

- Goal test is a set of constraints specifying allowable combinations of values for subsets of variables

Eg: Map Coloring, Task Scheduling



- For this project we ignore the top row and column
- Numbering starts from 0 at the top left
- Each sum given to us and the subsequent empty squares position form the constraint
  Eg: 10, (4, 5, 6, 7) is a constraint of the above puzzle
- The position [0, 1, 10, 11] are blanks. They just have a face value of a null square.

Input:

- Rows and columns excluding the first
- All the blanks position
- All the constraints

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. . _ _
_ _ _ _
_ _ . .
```

Output:

- Solved puzzle :

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.  .2 1
3 1 4 2
1 2 .  .
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Recurrence relation for the Backtracking Algorithm:

$$T(N \times M) = 9 \times T(N \times M - 1) + O(1)$$

The Time Complexity is $O(9^{N \times M})$

The Space Complexity is $O(N \times M)$