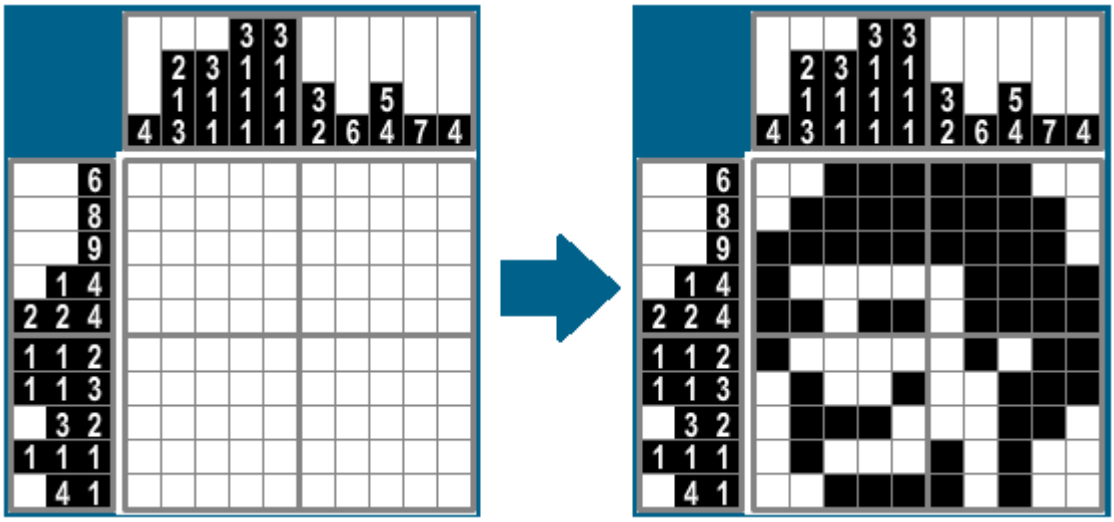
BLG435E, Artificial Intelligence, Fall 2017-2018
Assignment #2

Submission Type: An archive file including a softcopy report and the source codes for Q1 to be submitted using Ninova. Solutions for Q2 and Q3 must be **handwritten and scanned/photographed** in your report. Note that each student must work individually for this assignment. Team work is not accepted!

Q1) (50 pts) Pic-a-Pix is a block placing puzzle that forms a pixel-art picture when solved. Each puzzle consists of a blank grid with clues on the left of every row and on the top of every column. The objective is to reveal a hidden picture by determining which squares are painted in black and which squares should remain empty in such a way that their length and sequence corresponds to the clues and there is at least one empty square between adjacent blocks. An example puzzle and its solution are given below.



a) (20 pts) Formulate this problem as a CSP.

b) (30 pts) Select an algorithm to solve this problem. Show that the algorithm you selected finds a valid solution for the sample puzzle given above.

Important: Your solution can rely on existing algorithm implementations such as AIMA Online Code Repository or Simple AI library. However, you need to **explain** how the CSP algorithm you selected works in this problem with **sufficient explanations** in your **report**. Code usage without relevant references will be considered as Plagiarism.

Hint: Check this link for a tutorial on how to create and solve a constraint satisfaction problem using Simple AI library.

Q2) (20 pts) Represent the following sentences in either propositional logic (PL) or first-order logic (FOL). Indicate which logic you used (PL or FOL) for the sentences.

- "If a city which John visits includes a Mexican restaurant, he always eats Taco there."
- "Only one team from Turkey competed in the contest."

Q3) (30 pts) Three children Ayse, Baris, and Cem were playing "hide and seek" game in an apartment. When the parents went back home they saw that the vase in the living room is broken. Three children are the suspects, one of them broke the vase, but all of them say they did not do it. Ayse says that Baris was hiding in the living room but Cem was not there. Baris says he was hiding in the garden at that time and never entered into living room. Cem says Ayse and Baris were not in the garden. You are asked to resolve this puzzle and find who is guilty while assuming only the guilty child does not tell the truth.

a) **(15 pts)** Construct the knowledge-base in CNF by using the given facts.
b) **(15 pts)** Use resolution inference algorithm to find who is guilty.