COMP3411 Tutorial- Week 3
Constraint Satisfaction

2023 version 1.1

Question 1 - Cryptarithmetic

Cryptarithmetic is a type of mathematical puzzle where the numbers have been replaced with letters, or other symbols.

Solve the famous Cryptarithmetic problem and Provide not just the final answer, but also explain your reasoning along the way.

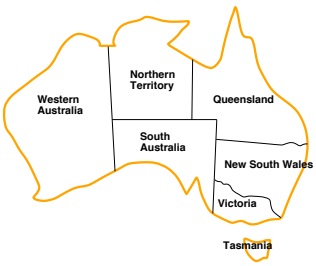
$$\begin{array}{cccccc} & S & E & N & D \\ + & M & O & R & E \\ \hline M & O & N & E & Y \end{array}$$

Variables:	Constraints:
D E M N O R S Y	$M \neq 0, S \neq 0$ (unary constraints)
Domains:	$Y = D + E$ *or* $Y = D + E - 10$, etc.
{0,1,2,3,4,5,6,7,8,9}	$D \neq E, D \neq M, D \neq N$, etc.

a) Can you identify any backtracking heuristics or enhancements that you may have (unknowingly) used when you solved the problem?

b) Are there any backtracking heuristics or enhancements that you would now use to solve the problem more efficiently?

Question 2 - Map Colouring



(Refer to lectures for week 3)

Use Forward Checking to show that the Australia map-colouring problem has no solution when we assign WA=green, V=Red, NT=Red.

If we apply Arc Consistency as well, can the inevitable failure be detected further up the tree? To check this, you can consider if we only assign WA=green and V=Red.

Present your answer to this question and discuss with others in the tutorial group.

Question 3 - 8-queens problem

Formulate the 8-Queens problem as a constraint satisfaction problem with 8 variables (one for each column) whose domain is the set of possible row positions. Then trace forward checking and domain splitting with arc consistency.