## **SOLUTION FILE**

1. Formulate 8 Queen's Problem as a CSP.

Let X be set of variables, D be set of domains and set of constraints.

$$X=[Q_1,Q_2, Q_3,Q_4,Q_5,Q_6,Q_7,Q_8]$$

$$\begin{split} &C_1\text{=<For all i=j=}(1,2,3,4,5,6,7,8),\ (Q_i,Q_j),i!\text{=j>}(\text{Not in the same column})\\ &C_2\text{=<For all i=j=}(1,2,3,4,5,6,7,8),\ Q_i!\text{=}Q_j\text{>}(\text{Not in the same row})\\ &C_3\text{=< For all i=j=}(1,2,3,4,5,6,7,8),\ |Q_i\text{-}Q_j|!\text{=}|i\text{-}j|\text{>}(\text{Not in the same diagonal}) \end{split}$$

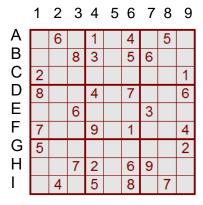
2. Formulate an empty Sudoku problem as a CSP

Let X be set of variables, D be set of domains and set of constraints.

X=81 variables

- A1, A2, A3, ..., I7, I8, I9
- Letters index row, top to bottom
- Digits index column, left to right

 $C_1 = <(A_i! = A_j, B_i! = B_j, C_i! = C_j, D_i! = D_j, E_i! = E_j, F_i! = F_j, G_i! = G_j, H_i! = H_j, I_i! = I_j), (i! = j) > (numbers in a row are not same)$ 



 $C_2 = <(A_i! = B_i! = C_i! = D_i! = E_i! = F_i! = G_i! = H_i! = I_i), (i = [1,2,3,4,5,6,7,8,9]) > (numbers in a column are not same)$ 

 $C_3$ =for each 3x3 block,  $\langle K_i!=K_j$  and  $L_i!=L_j$ , and  $K_i!=K_i$ , (i!=j)>

3. Solve the crypt arithmetic problems given in the slides and formulate the crypt arithmetic problem TWO+TWO=FOUR as CSP.

• SEND + MORE MONEY		S	9
		E	5
		N	6
		D	7
		M	1
		О	0
		R	8
		Υ	2

• TWO	Set of Variables, X=F,T,O,W,U,R
+ TWO	
<u>FOUR</u>	Set of Domains, D={0,1,2,3,4,5,6,7,8,9}
	Set of Constraints:
	$C_1 = \langle F! = 0, T! = 0 \rangle$
	$C_2 = \langle F! = T, F! = O, F! = W, F! = U, F! = R, T! = O, T! = W, T! = U, T! = R,$
	C <sub>1</sub> = <f!=0,t!=0>, C<sub>2</sub>=<f!=t,f!=o,f!=w,f!=u,f!=r,t!=o,t!=w,t!=u,t!=r, O!=W,O!=U,O!=R,W!=U,W!=R,U!=R&gt;,</f!=t,f!=o,f!=w,f!=u,f!=r,t!=o,t!=w,t!=u,t!=r, </f!=0,t!=0>
	$C_3 = $