

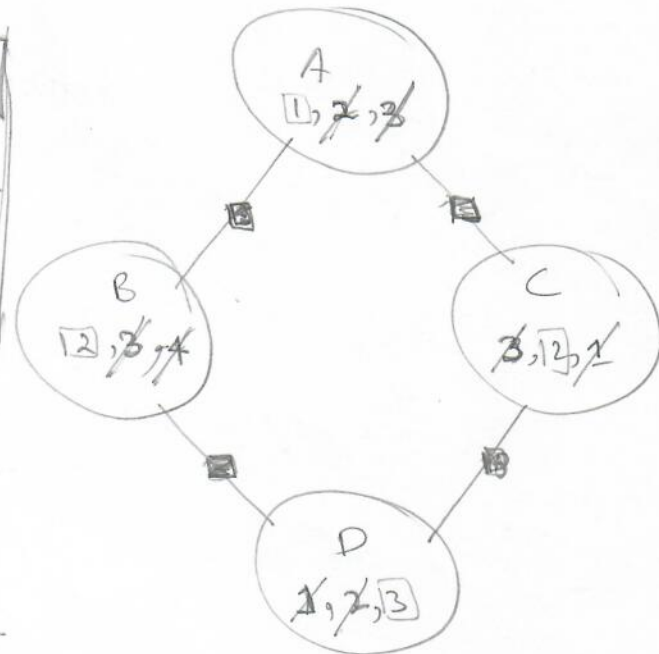
Constraint Satisfaction

(Q9) Arc-consistency in the entire CSP.

Initially, we consider all means (for ~~one~~ ^{can binary} constraint there will be two arcs). During the procedure as arc consistency is enforced & domain values reduce \rightarrow arcs will be added.

(Q9)

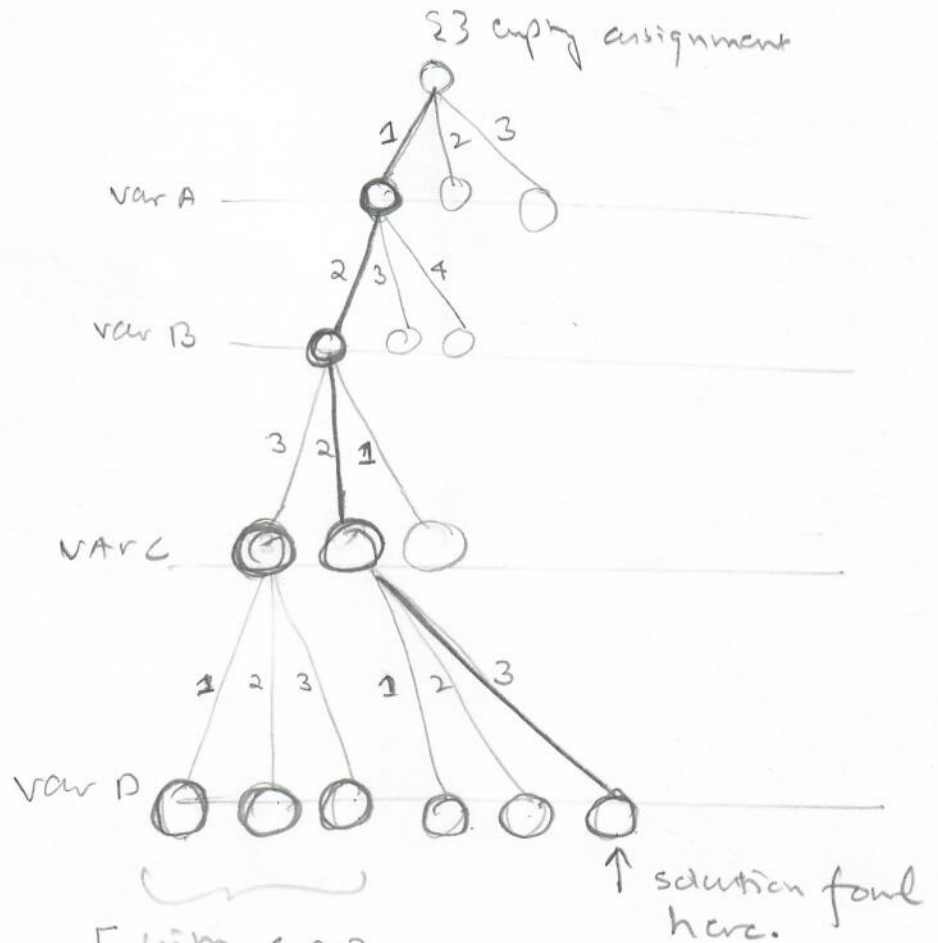
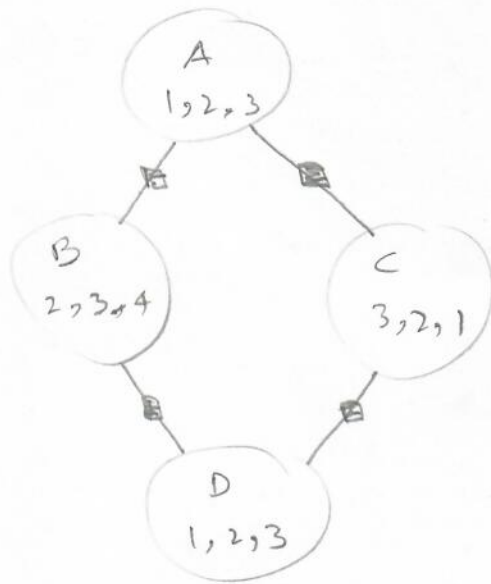
Arcs Examined	values deleted
$B \rightarrow A$	none
$D \rightarrow B$	$V_D(1), V_D(2)$
$C \rightarrow D$ (Because D lost values)	$V_C(3)$
$A \rightarrow C$ (As C lost a value)	$V_A(2), V_A(3)$
$B \rightarrow A$ (As A lost a value)	None
$B \rightarrow D$ (Edge created initially)	$V_B(3), V_B(4)$
$C \rightarrow A$ (edge created initially)	$V_C(1)$



Correct option: (i) solution exists $\{A=1, B=2, C=2, D=3\}$
AC-3 will find it.

(b) BT search. Starts from an empty assignment. Examines vars and values. DFS like process. Upon assignment check for violation of constraints. If violation is found then backtrack.

The search tree is below.



with C as 3
 D cannot be assigned
 Hence, will backtrack and
 try C as 2.

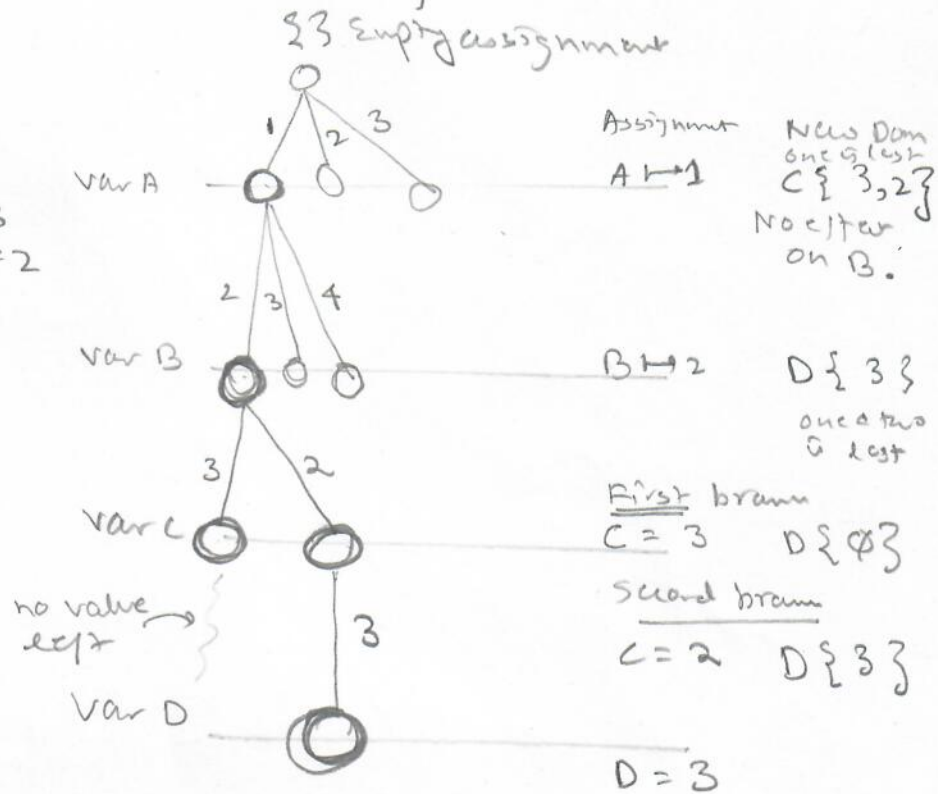
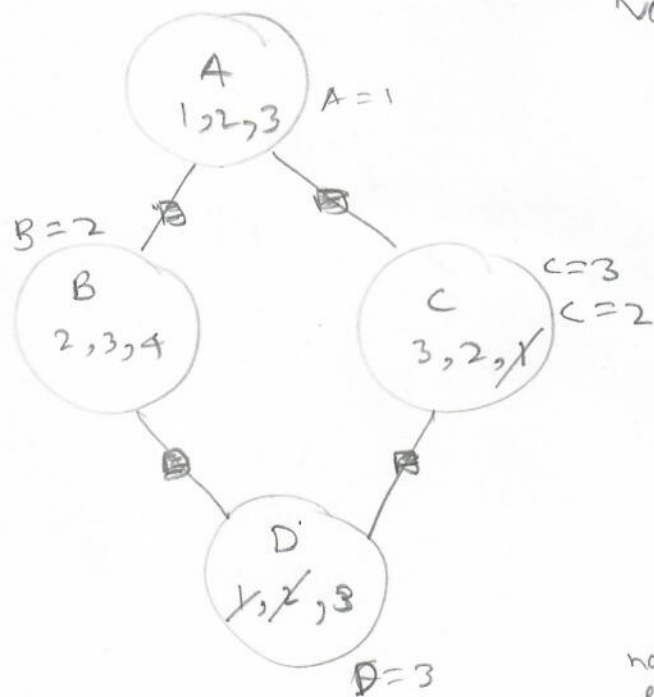
Note: Values are shown along the edges.

The darker nodes represent the assignments made.

Total 10 assignments made up until the solution is found (we need only one solution).

(C) BT with forward checking.

2. When a variable X is assigned, check the unassigned variable Y connected to X by a constraint. Delete from Y any value that is inconsistent with the value assigned for X .



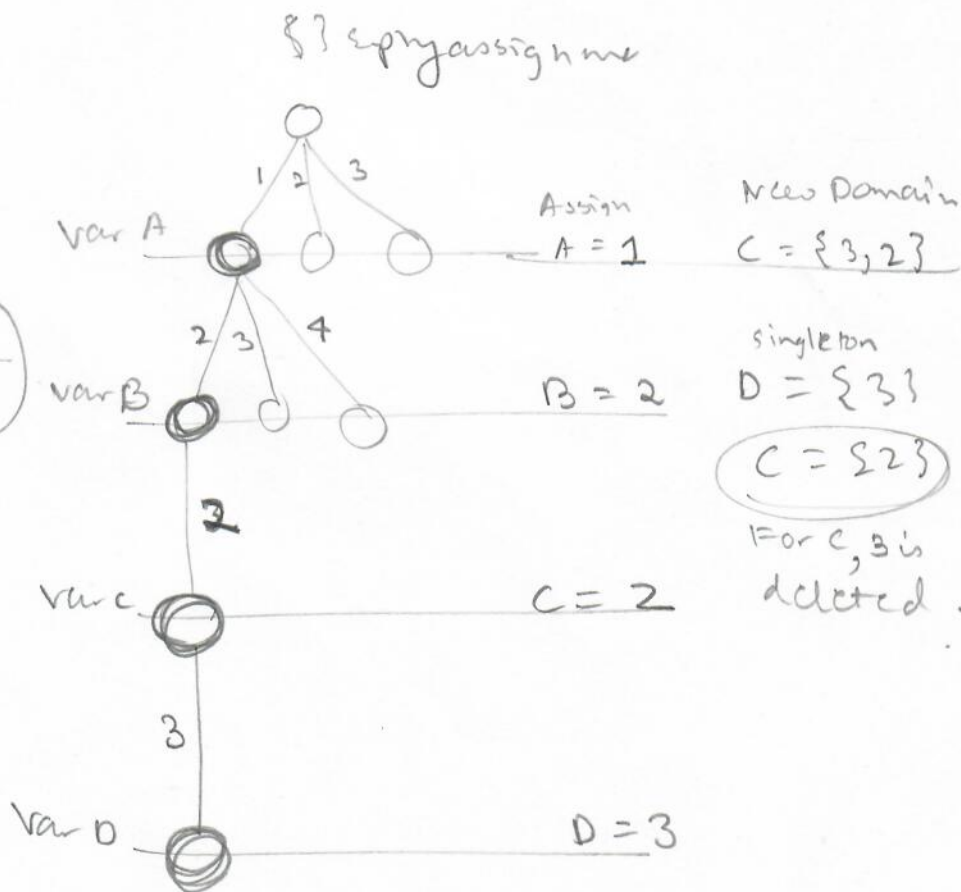
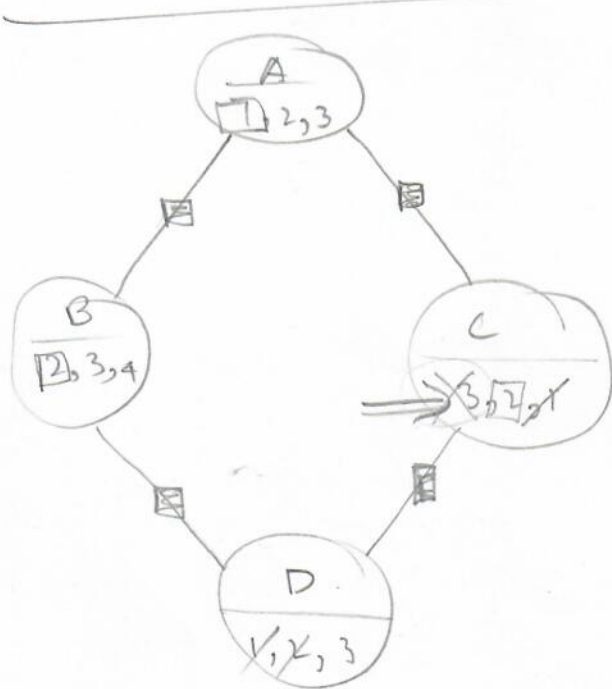
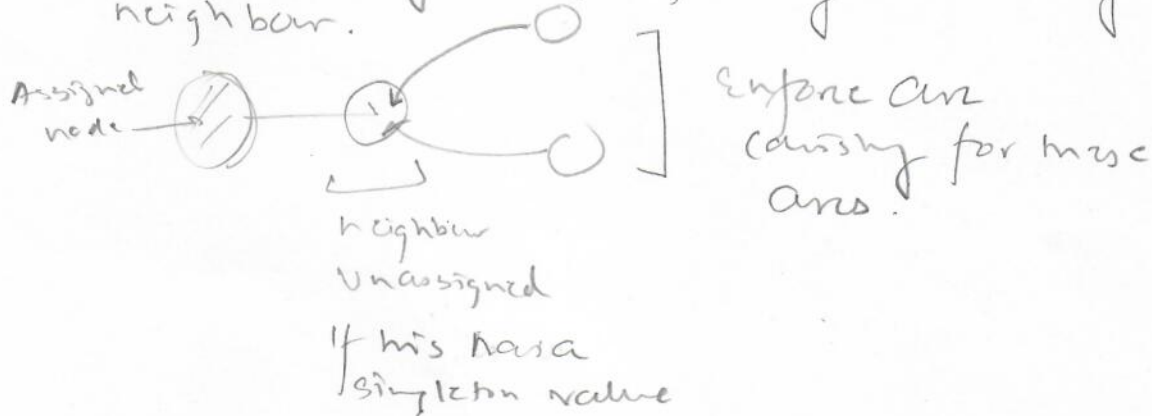
NOTE: Domain values \rightarrow assignment.

Total 5 assignments are made

Solⁿ found as $\{A=1, B=2, C=2, D=3\}$

(d) BT Search with a variant of forward search.

→ If fwd check eliminates values from a neighbour & it has only one possible value left, then arc consistency is enforced for any arcs coming into this neighbour.



Total 4 assignments are made.

Fewer than pure fwd check.