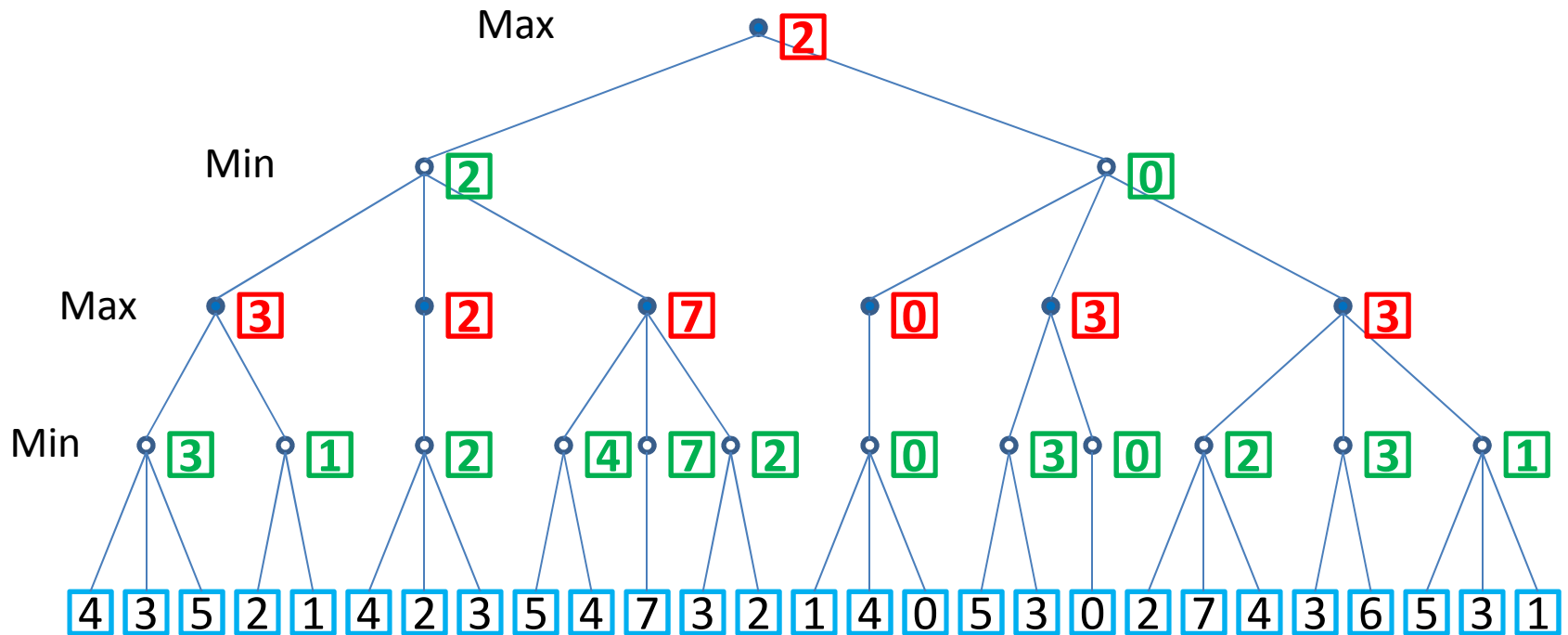


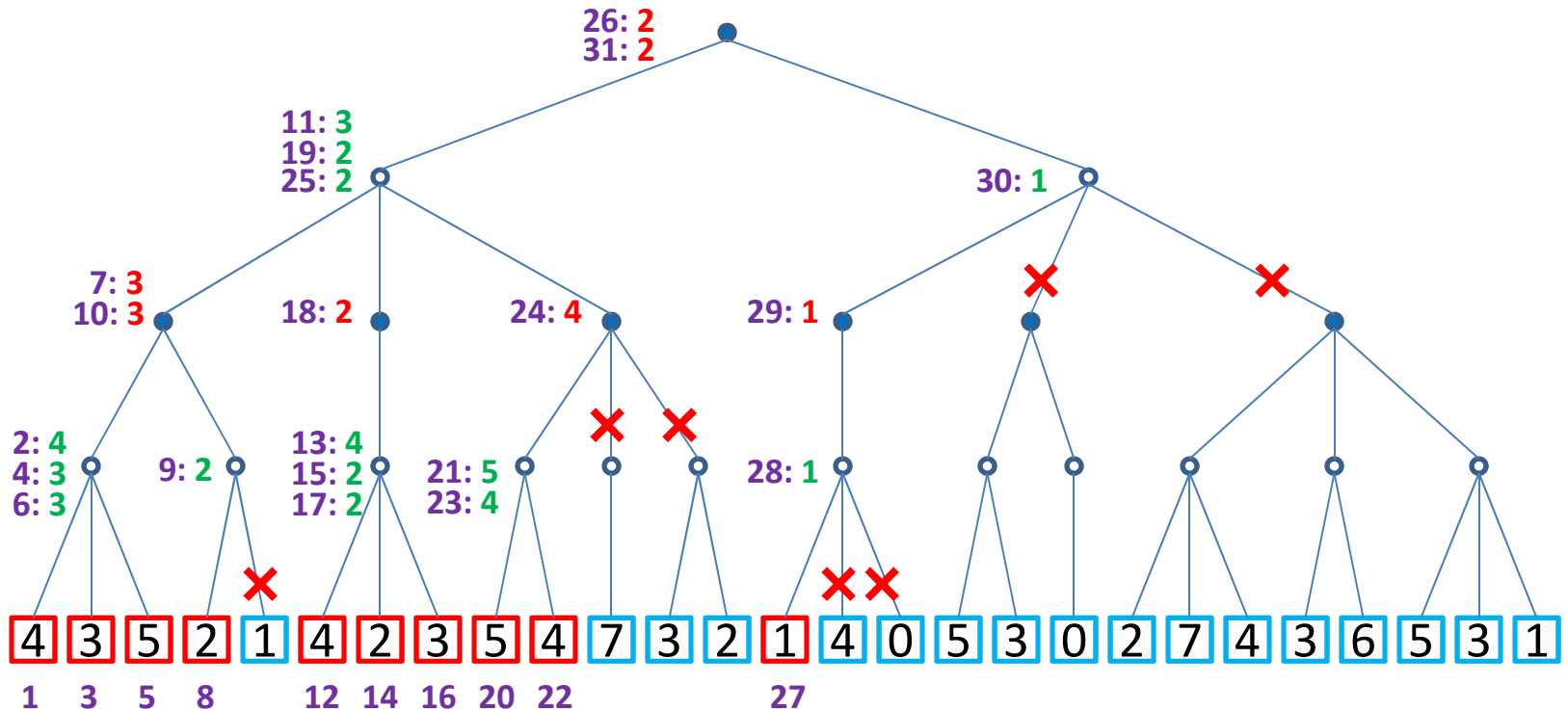
Exercises: Artificial Intelligence

MiniMax & Constraint Processing:
MiniMax Algorithm

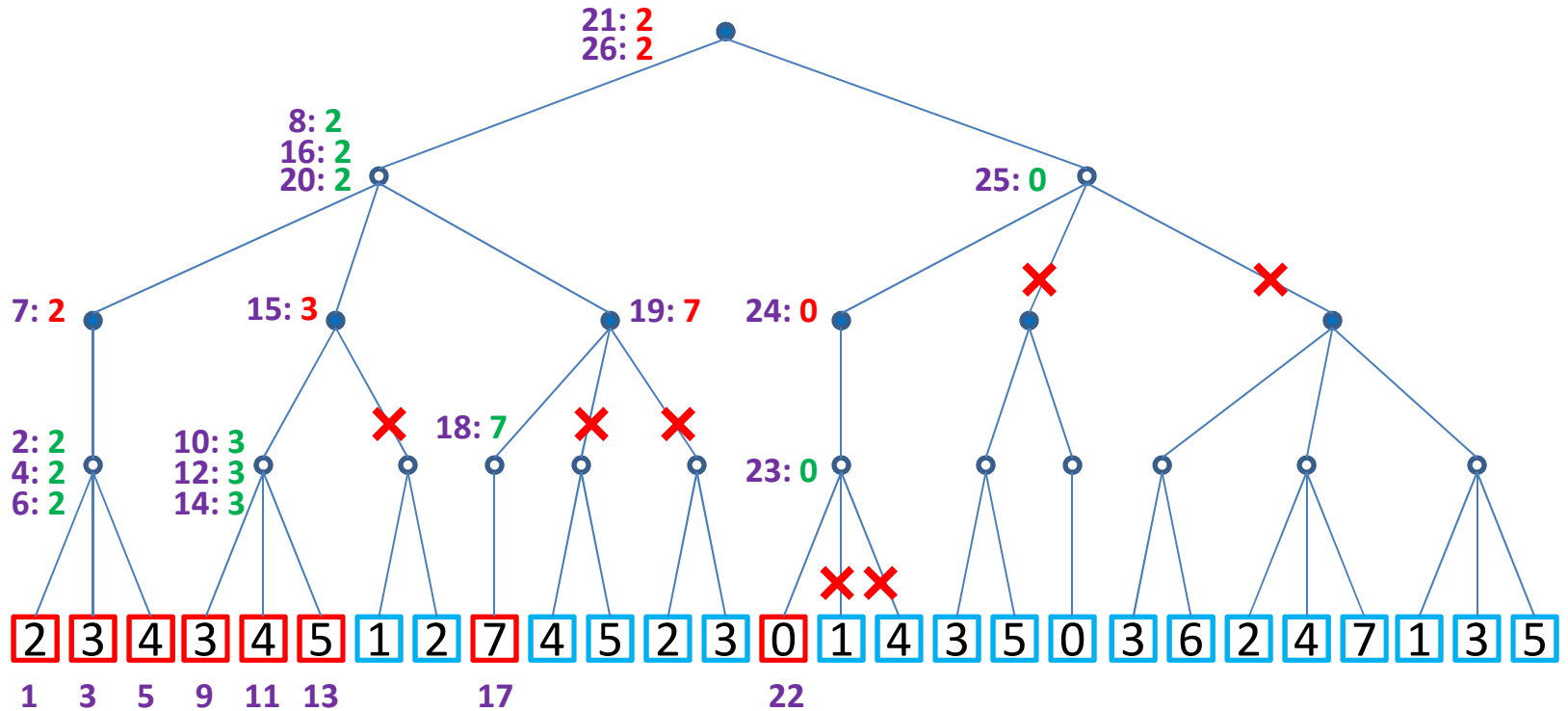
MiniMax without $\alpha\beta$ -pruning



MiniMax with $\alpha\beta$ -pruning



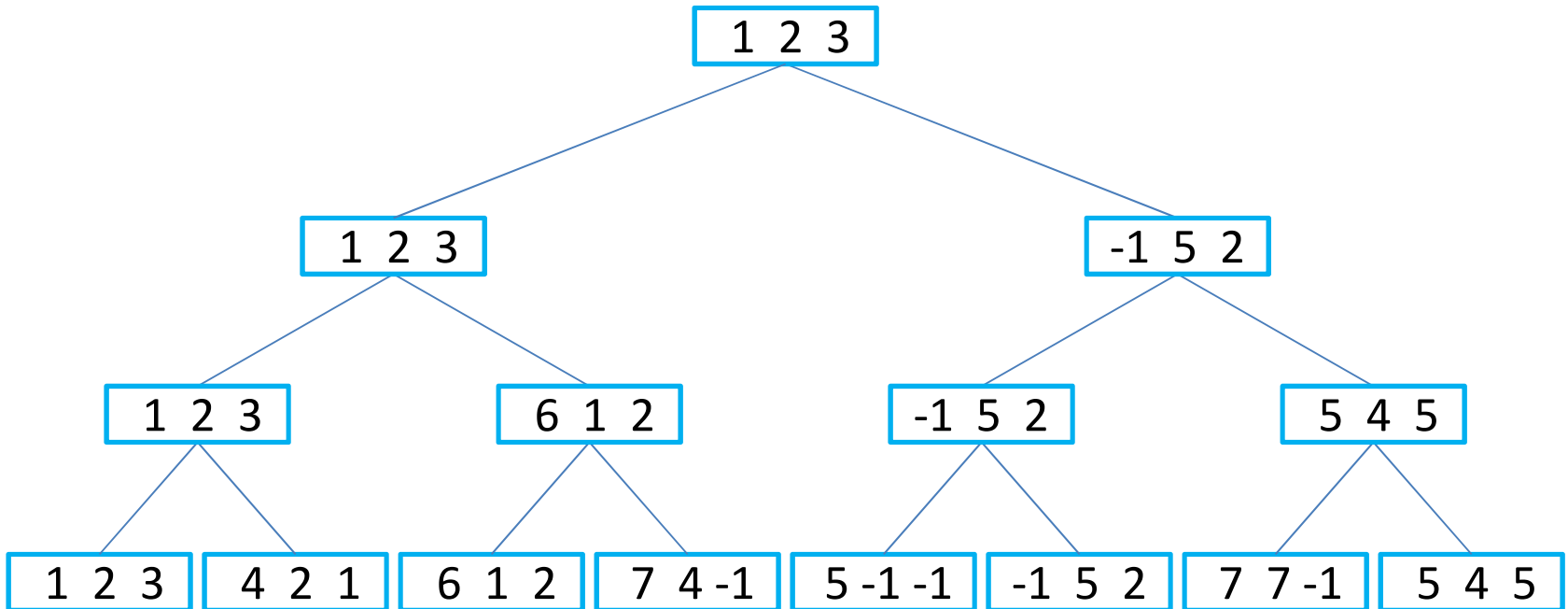
Reordering, MiniMax with $\alpha\beta$ -Pruning



Exercises: Artificial Intelligence

MiniMax & Constraint Processing:
MiniMax Algorithm for 3 Players

MiniMax For 3 Players

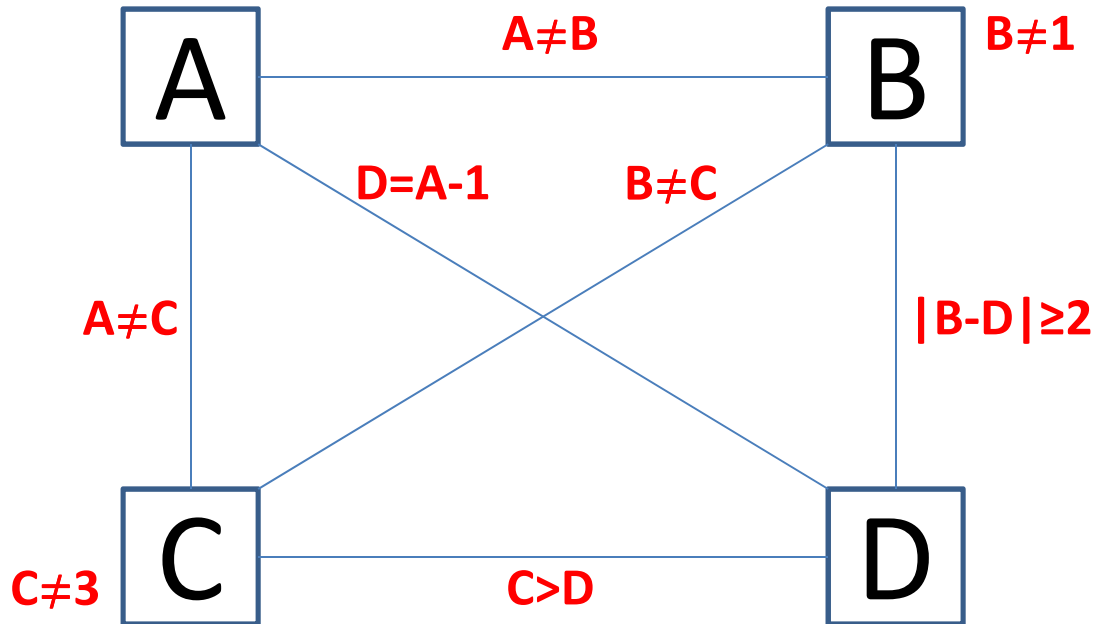


Exercises: Artificial Intelligence

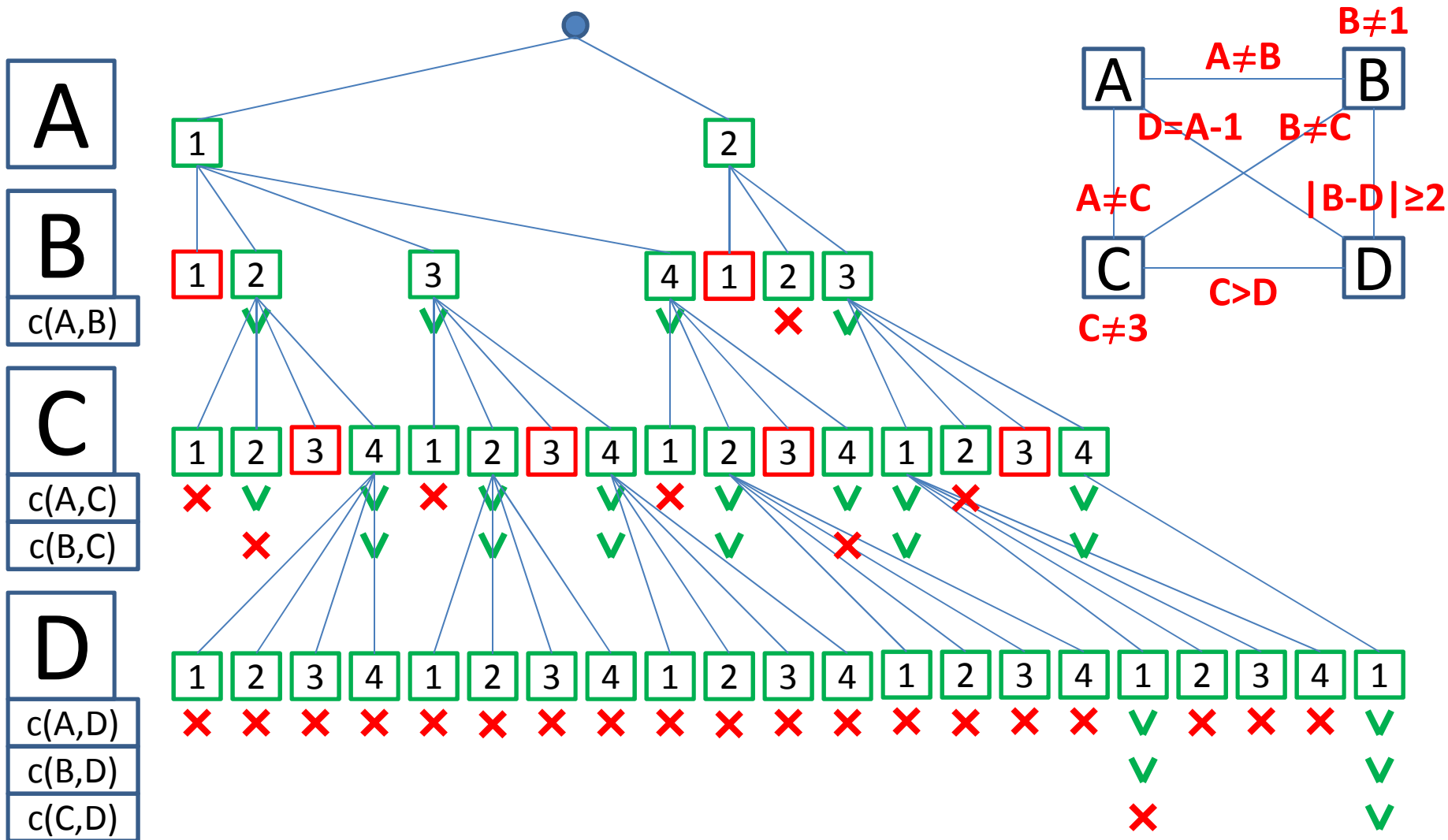
MiniMax & Constraint Processing:
The 4 Houses problem

Constraint Processing

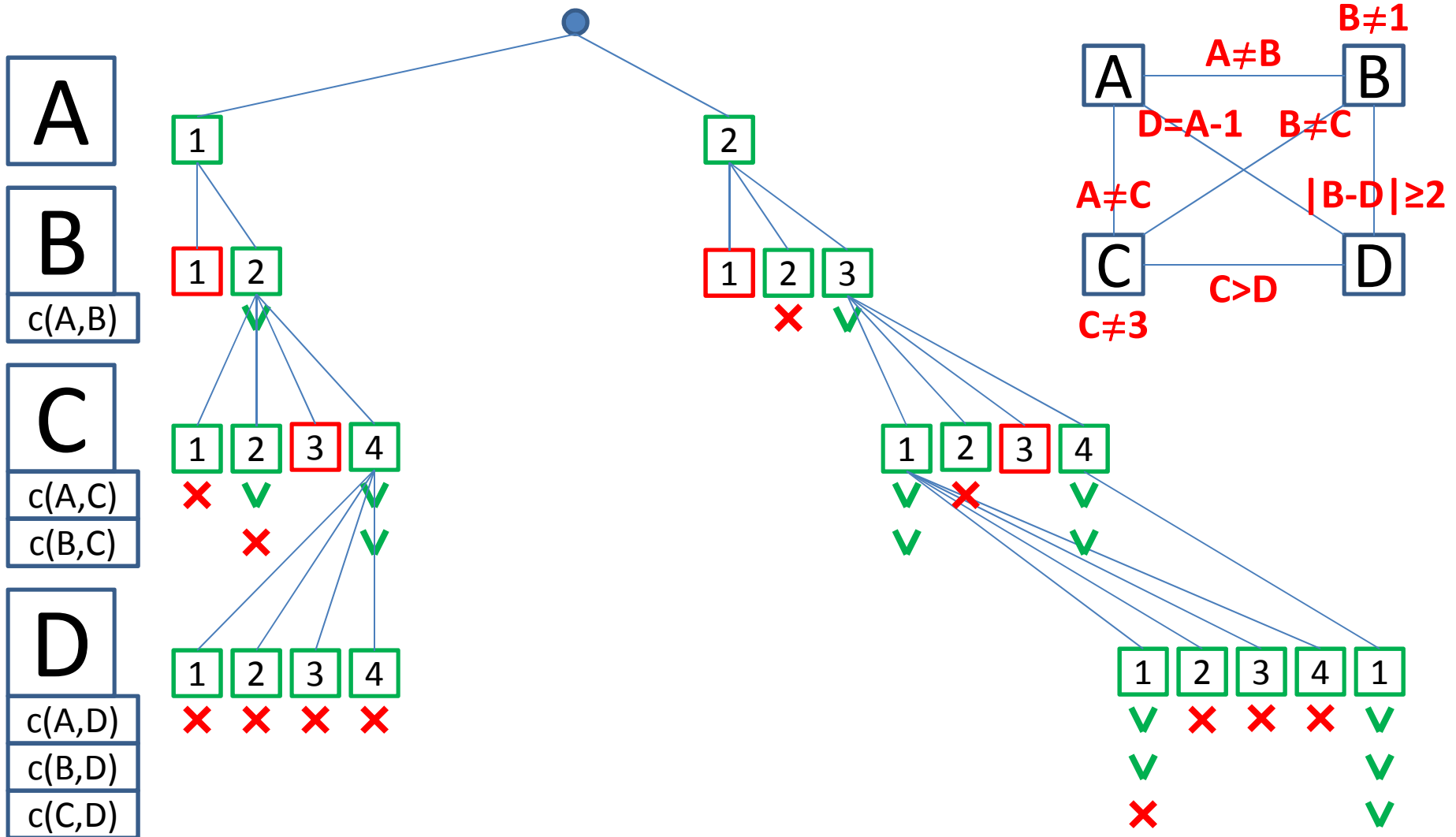
- Problem representation:



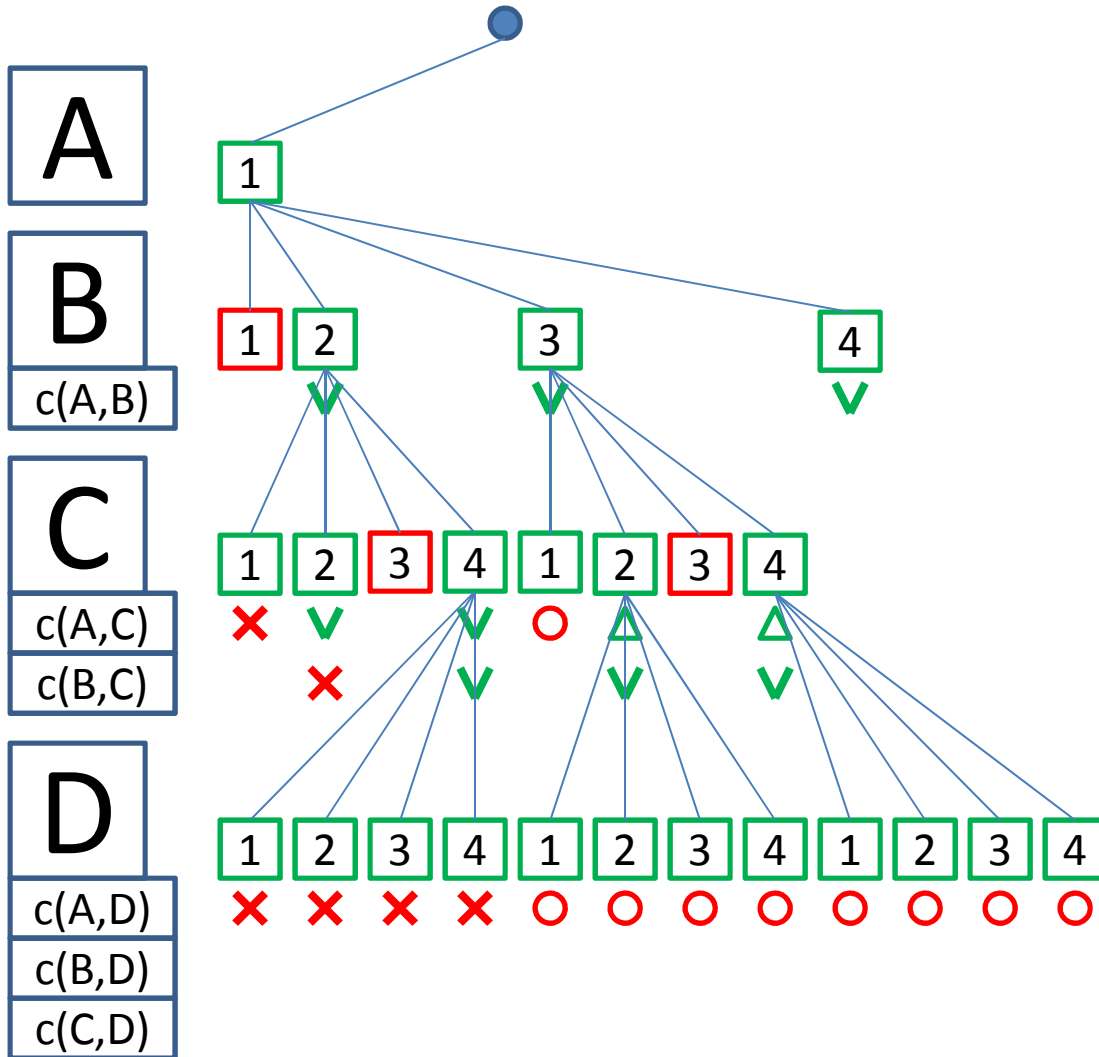
Constraint Processing: Backtracking



Constraint Processing: Backjumping



Constraint Processing: Backmarking



	1	2	3	4	Backup
A	0	1	1	1	1
B	0	1	1	1	1
C	1	2	0	2	2
D	1	1	1	1	2

Constraint Processing: Backmarking

A

B

$c(A,B)$

C

$c(A,C)$

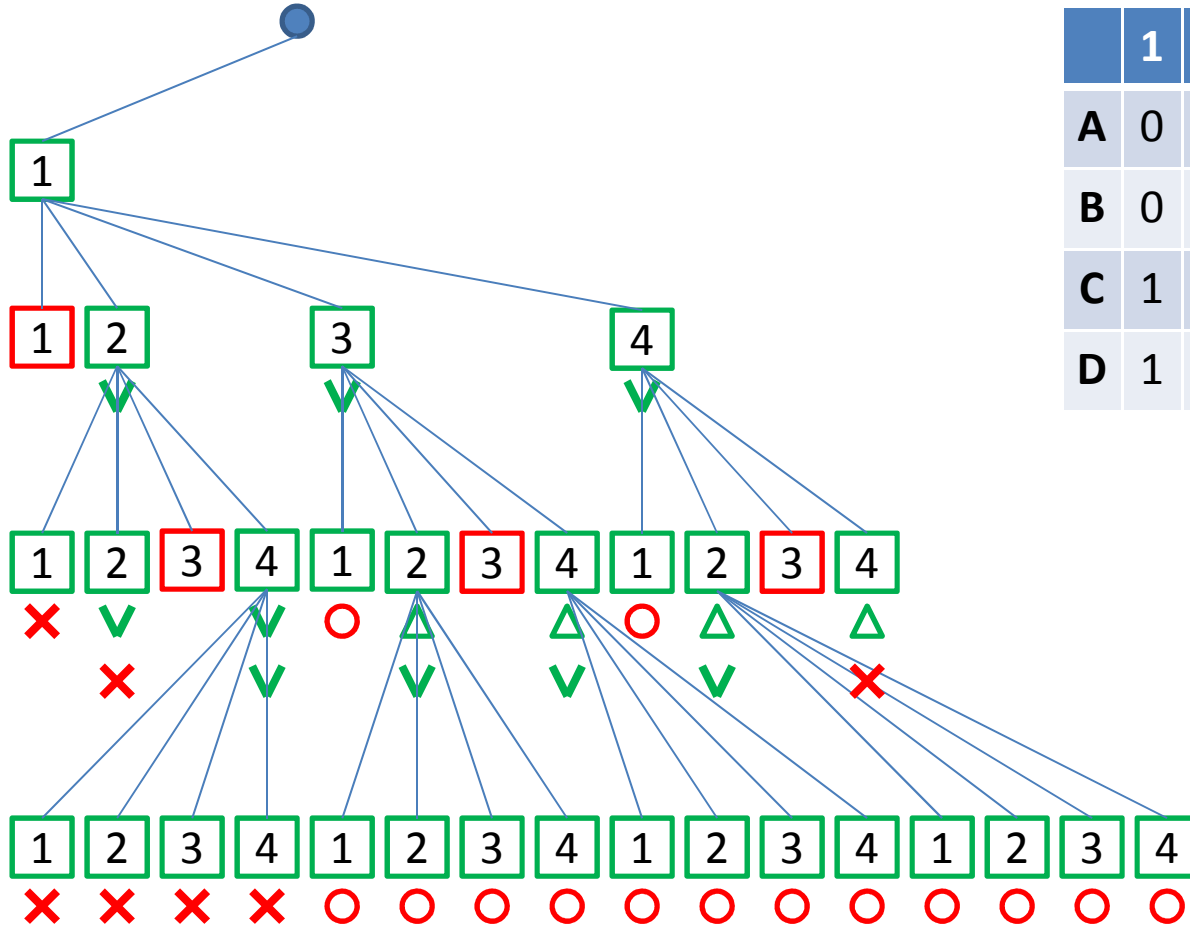
$c(B,C)$

D

$c(A,D)$

$c(B,D)$

$c(C,D)$



	1	2	3	4	Backup
A	0	1	1	1	1
B	0	1	1	1	1
C	1	2	0	2	2
D	1	1	1	1	3

Constraint Processing: Backmarking

A

B

$c(A,B)$

C

$c(A,C)$

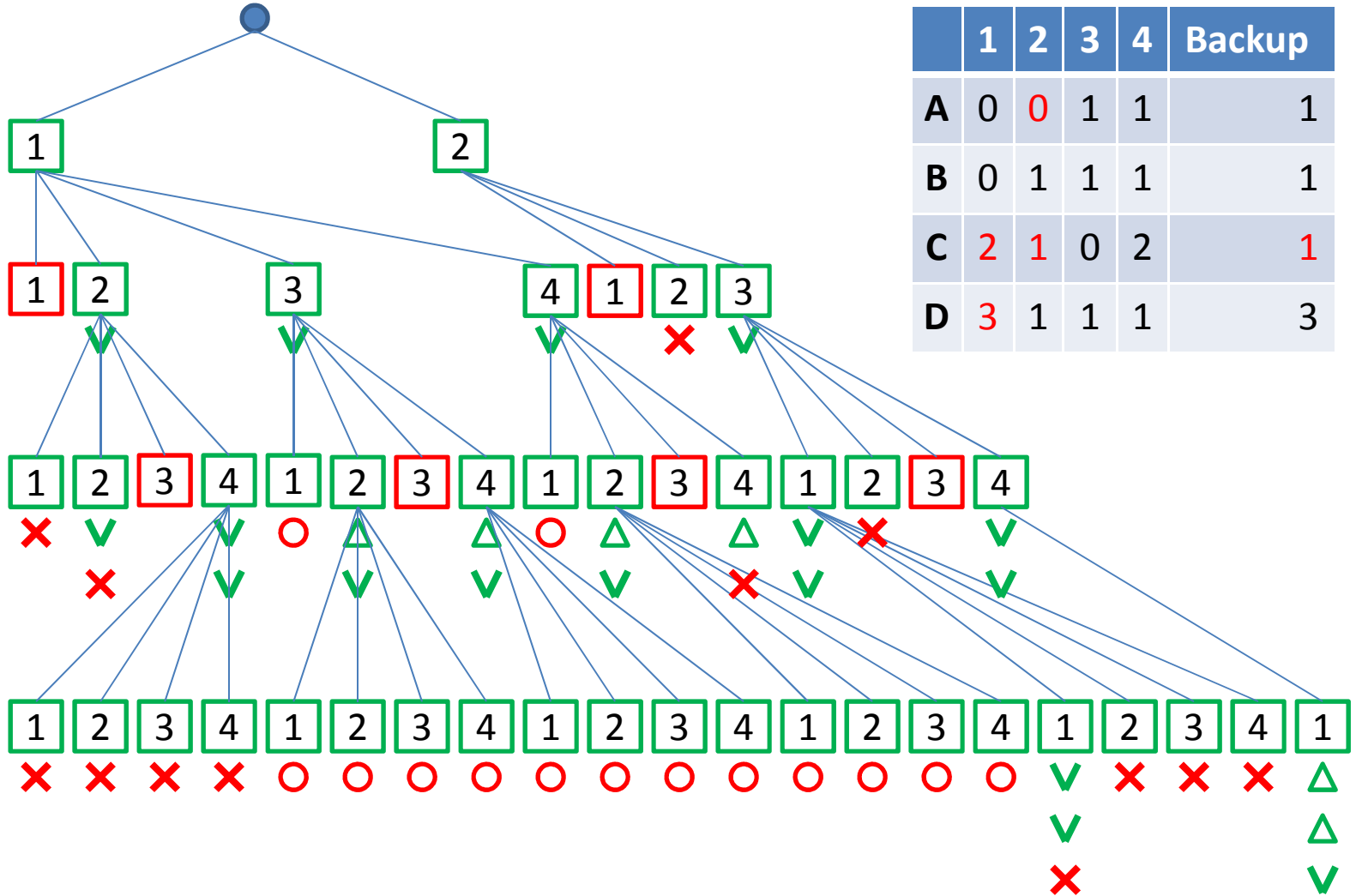
$c(B,C)$

D

$c(A,D)$

$c(B,D)$

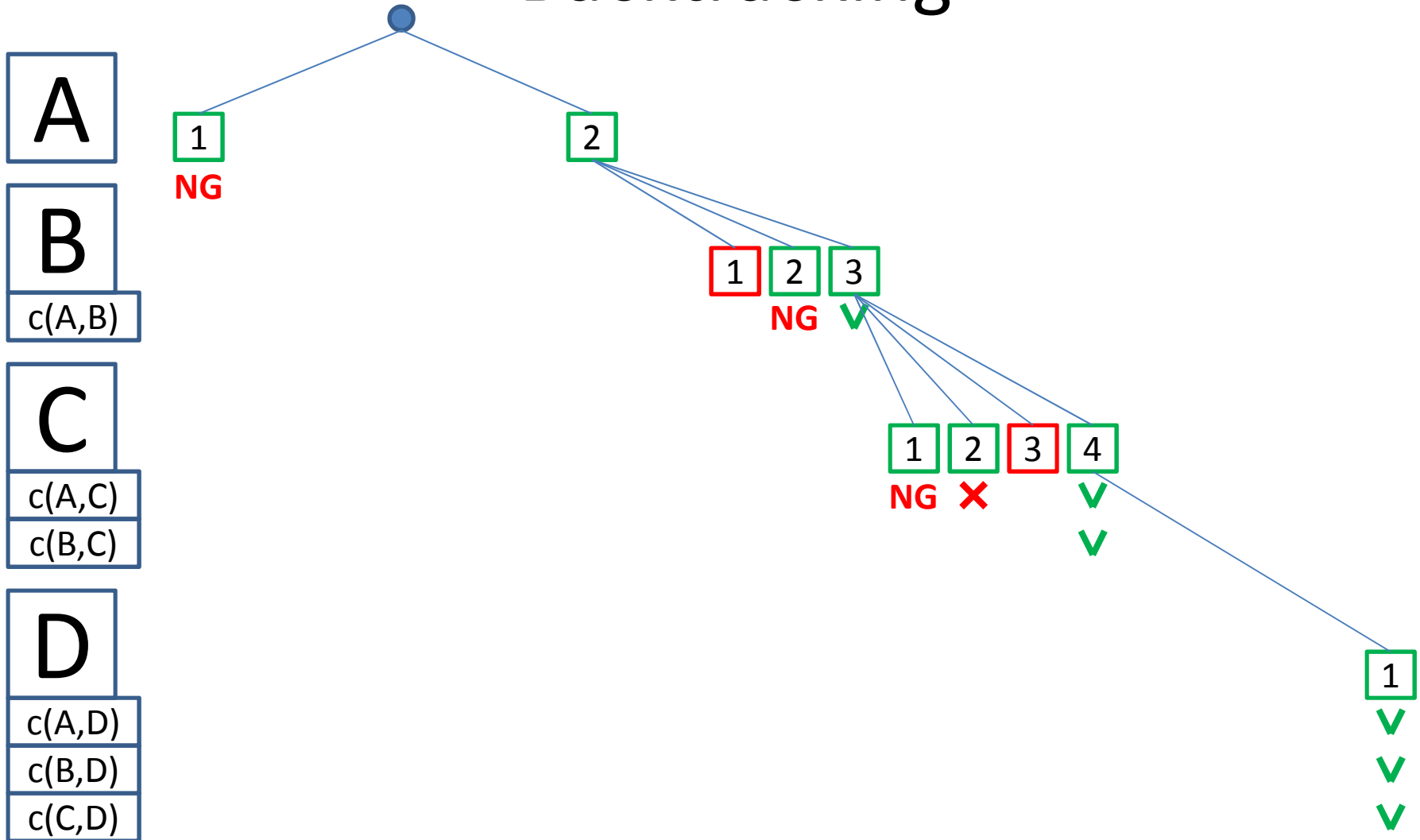
$c(C,D)$



Constraint Processing: No-goods

- $\{A=1\}$: No-good
 - No value for D such that $A = D + 1$
- $\{A=2, B=2\}$: No-good
 - A and B should have different houses
- $\{A=2, B=3\}$: Not a no-good: $\{A=2, B=3, C=4, D=1\}$
- $\{A=2, B=3, C=1\}$: No-good
 - $A = D + 1$, thus $D = 1$, but $C = 1$
- $\{A=2, B=4\}$: No-good
 - $A = D + 1$, thus $D = 1$, thus $C = 3$, but C cannot be 3

Constraint Processing: Intelligent Backtracking



Efficiency

<i>All (One solution)</i>	Opened Nodes	Checks
Standard Backtracking	28 (13)	142 (56)
Backjumping	21 (8)	93 (30)
Backmarking	28 (13)	79 (34)
Intelligent Backtracking	6 (4)	16 (9) + NG