课程尚未开始
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6. Graph & Search

九章算法IT求职面试培训 第6章

www.ninechapter.com

Outline

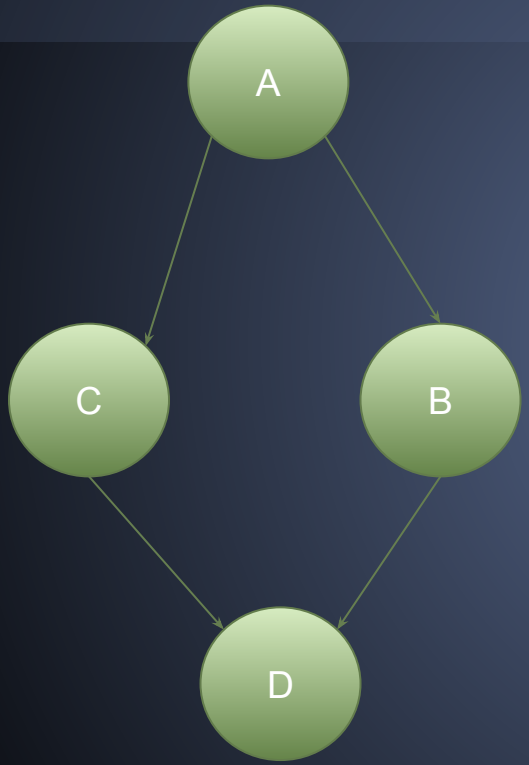
Graph:
- Clone graph
  - Copy List with Random Pointer
  - Topological sorting

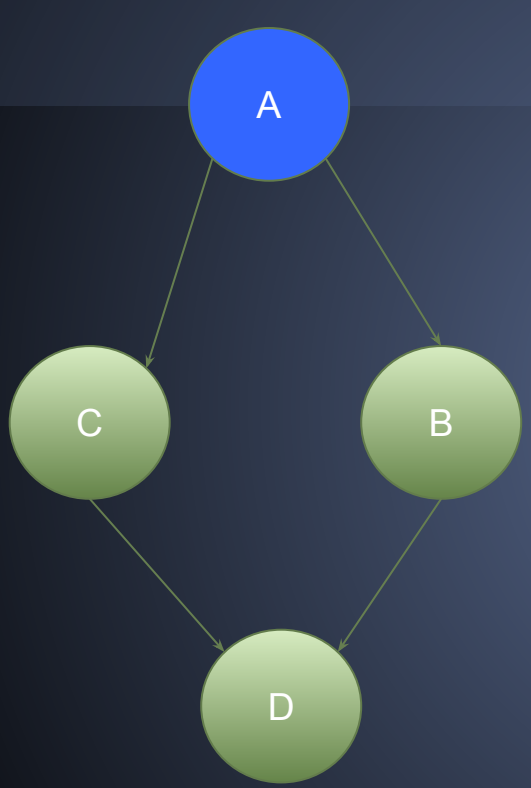
Search:
- Depth First Search
- Breadth First Search

Graph

Clone Graph

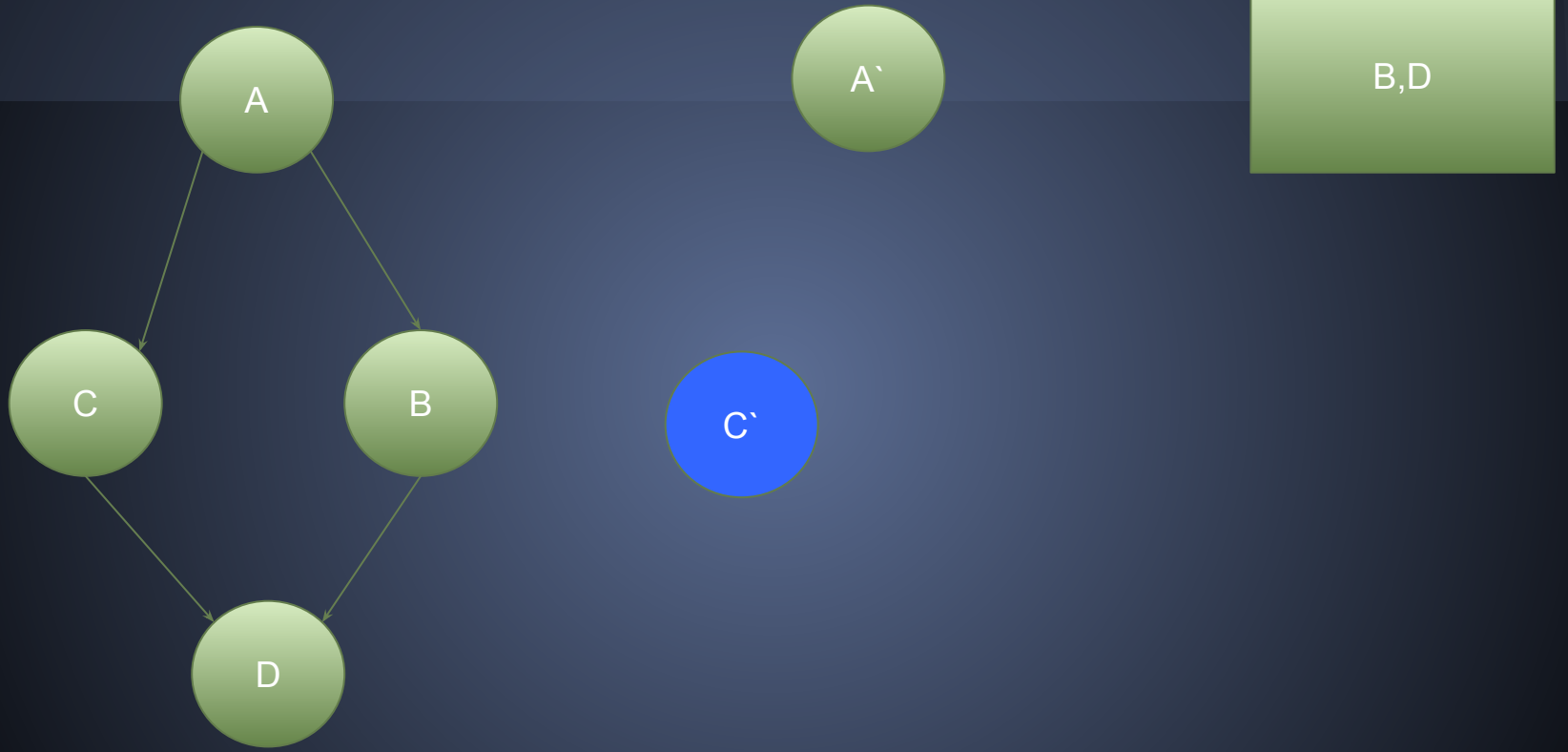
http://lintcode.com/en/problem/clone-graph/
http://answer.ninechapter.com/solutions/clone-graph/

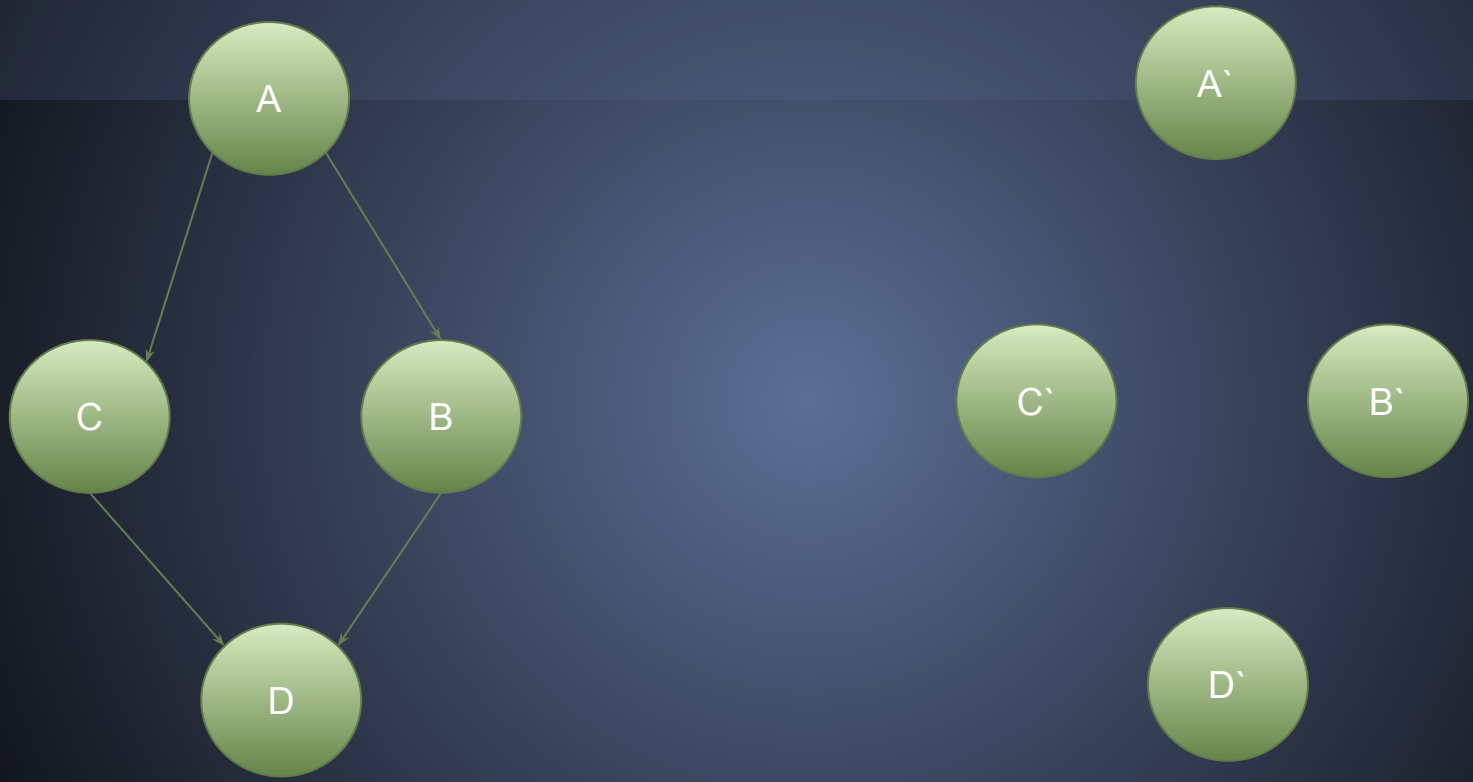

A
C
B
D

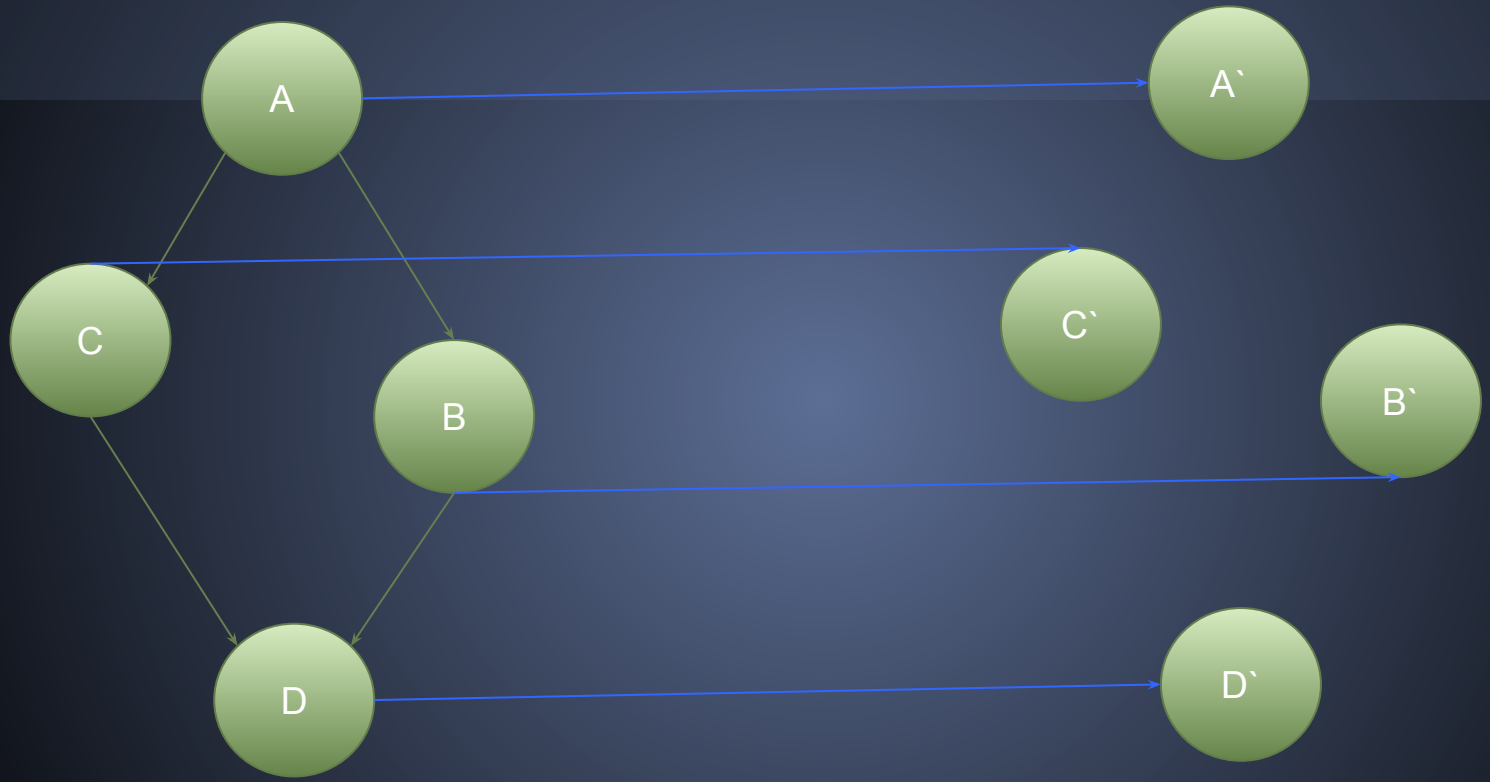


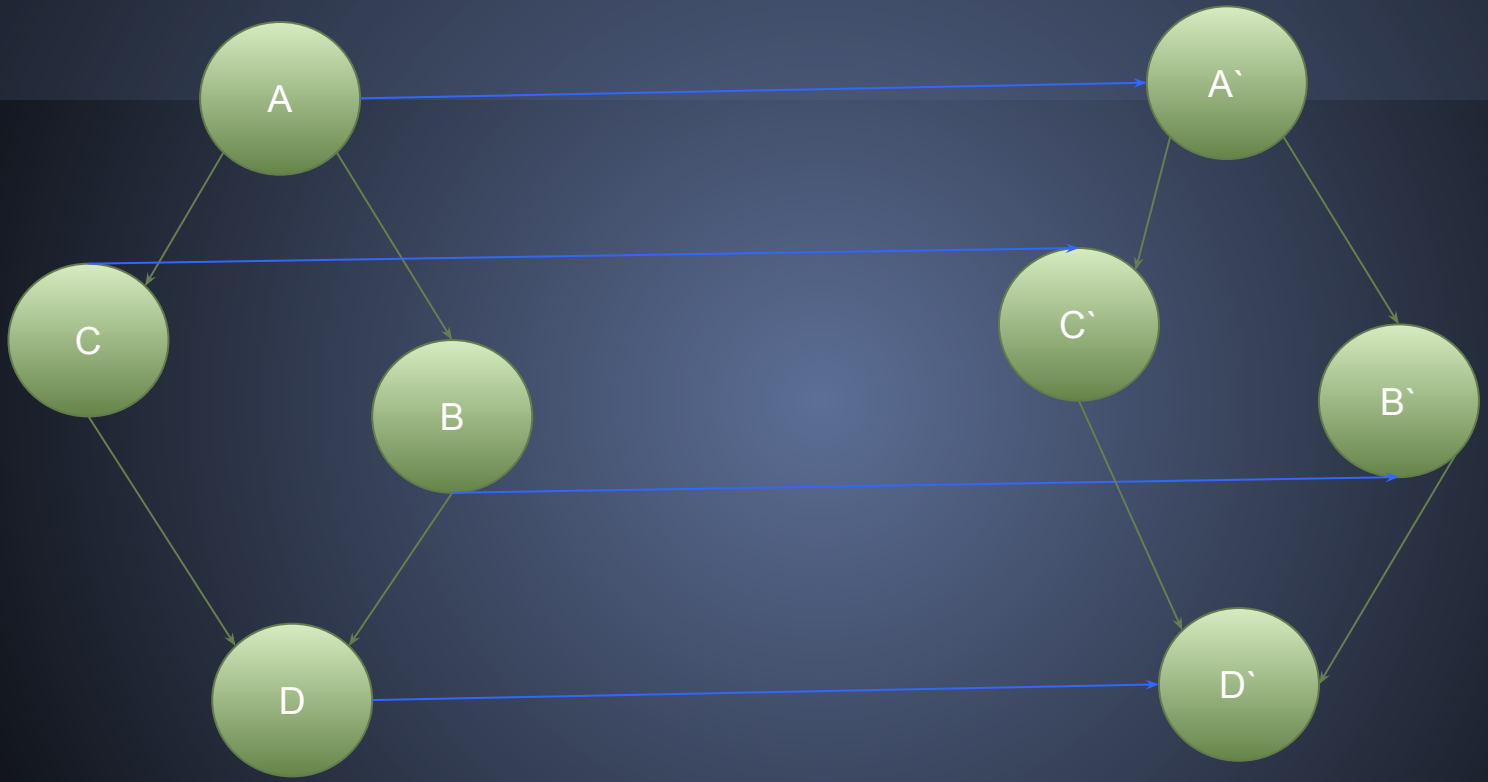
A`

C,B


A
C
B
D
A`
C`
B,D


A
C
B
D
A`
C`
B`
D`


A
A`
C
C`
B
B`
D
D`

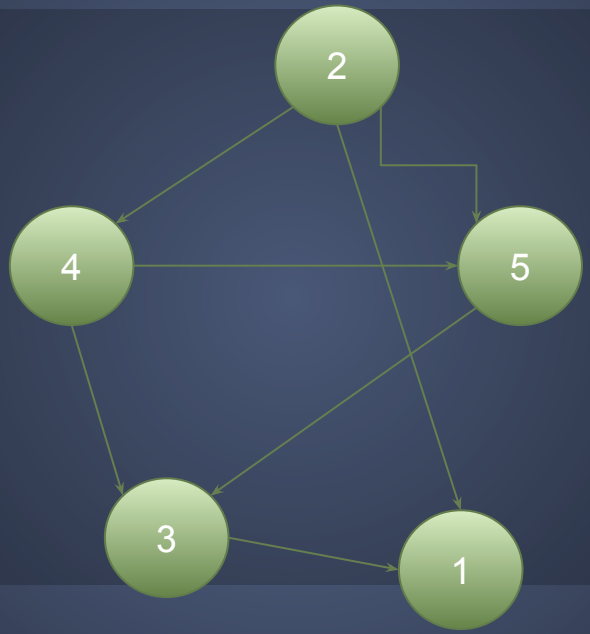

A
A`
C
C`
B
B`
D
D`

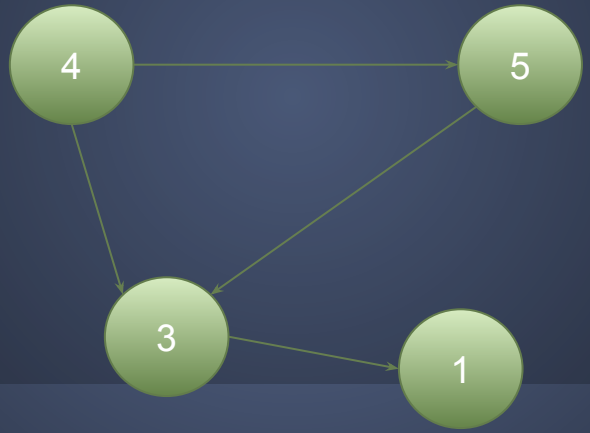
Copy List with Random Pointer

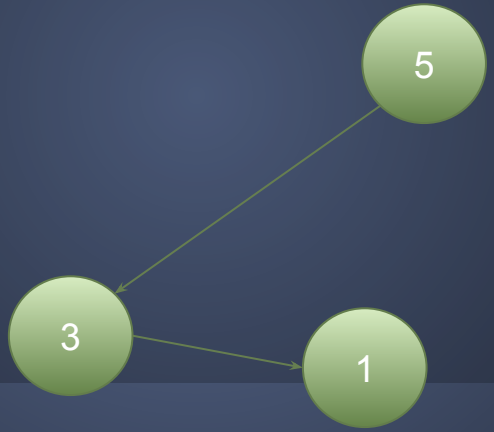
http://lintcode.com/en/problem/copy-list-with-random-pointer/
http://answer.ninechapter.com/solutions/clone-graph/

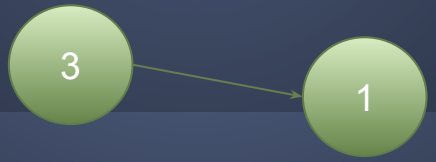
Topological Sorting

http://lintcode.com/en/problem/topological-sorting/
http://www.geeksforgeeks.org/topological-sorting/


2
4
5
3
1


4
5
3
1


5
3
1


3
1

1

BFS

Idea: 从某个点出发，找到其他所有的点。
Compare: Graph bfs vs Tree bfs

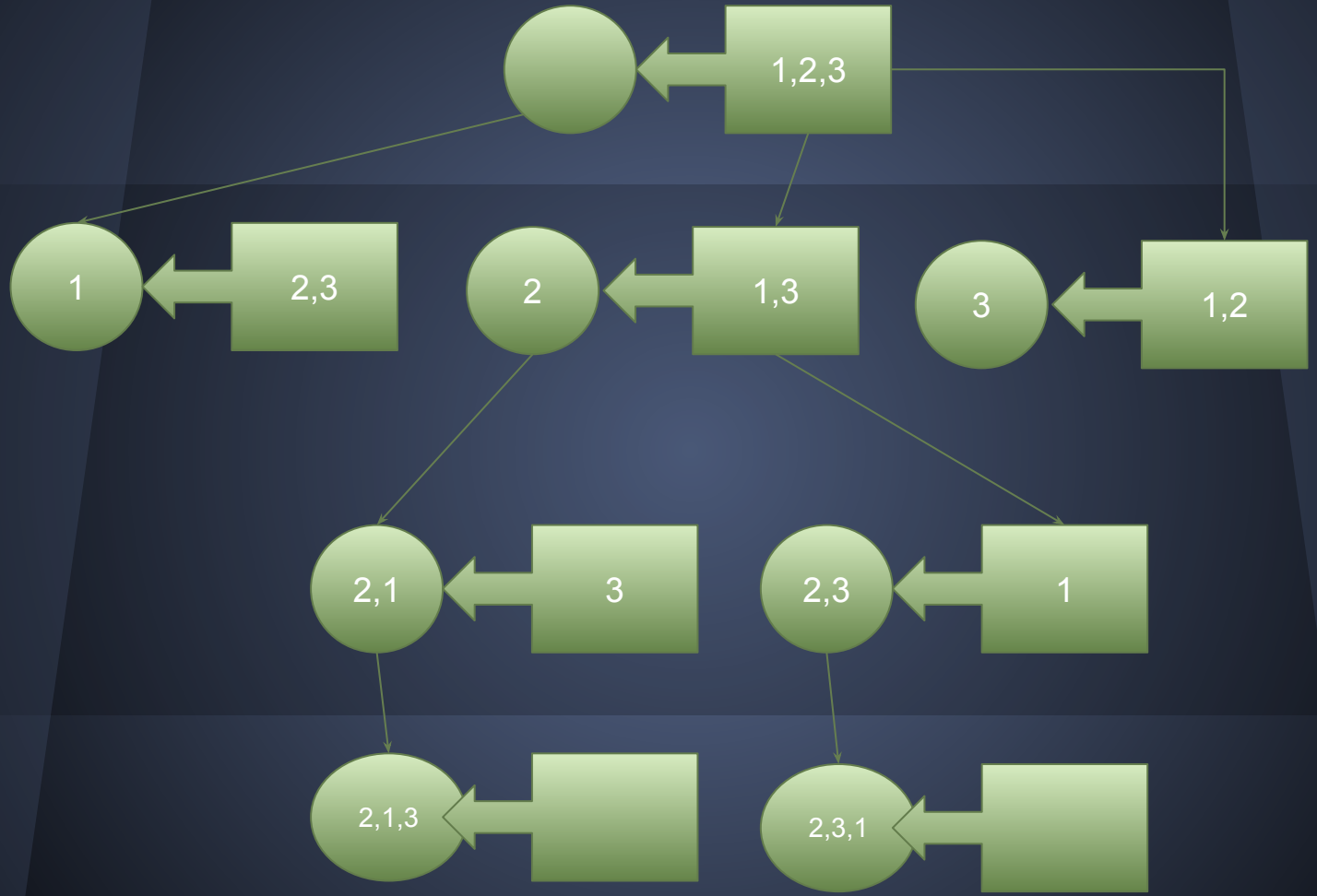
http://www.ninechapter.com/solutions/binary-tree-level-order-traversal/

Search

Permutations

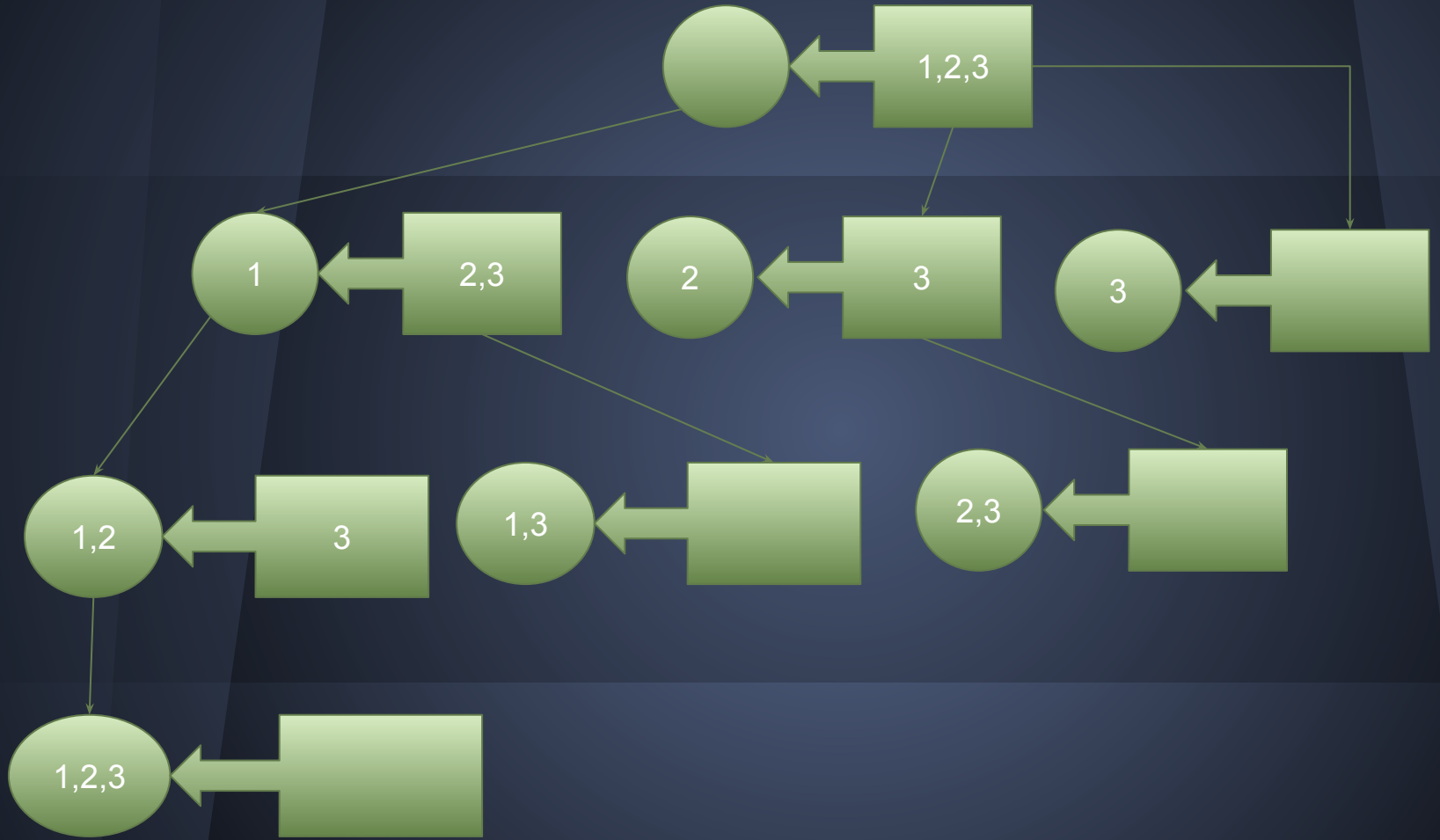
http://www.lintcode.com/en/problem/permutations/

http://answer.ninechapter.com/solutions/permutations/


1,2,3
1
2,3
2
1,3
3
1,2
2,1
3
2,3
1
2,1,3
2,3,1

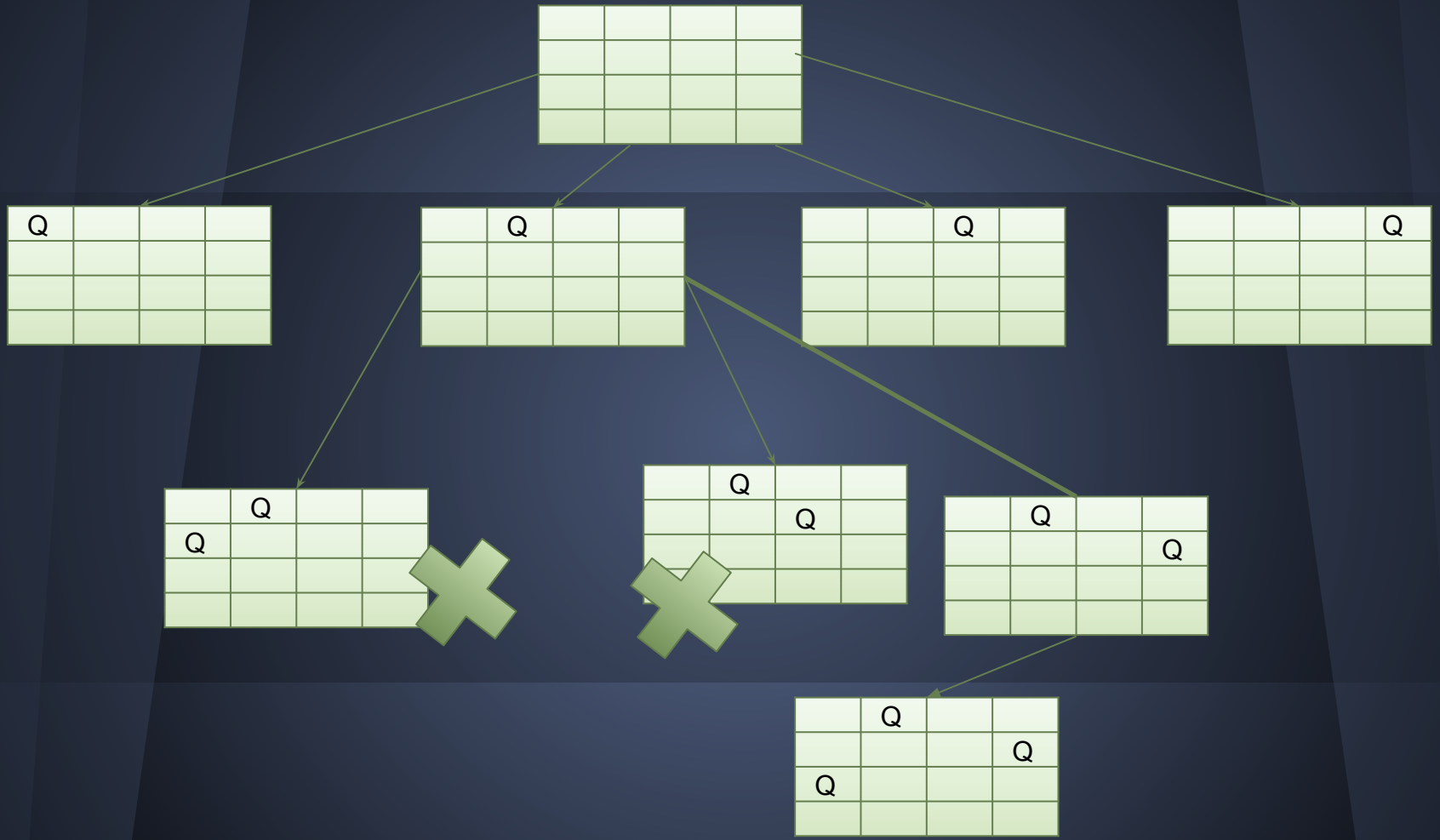
Subsets

http://www.lintcode.com/en/problem/subsets/
http://answer.ninechapter.com/solutions/subsets/


1,2,3
1
2,3
2
3
3
1,2
3
1,3
2,3
1,2,3

N Queens

http://lintcode.com/en/problem/n-queens/
http://answer.ninechapter.com/solutions/n-queens/


Q
Q
Q
Q
Q
Q
Q
Q
Q
Q

1, 1	1, 2	1, 3	1, 4
2, 1	2, 2	2, 3	2, 4
3, 1	3, 2	3, 3	3, 4
4, 1	4, 2	4, 3	4, 4

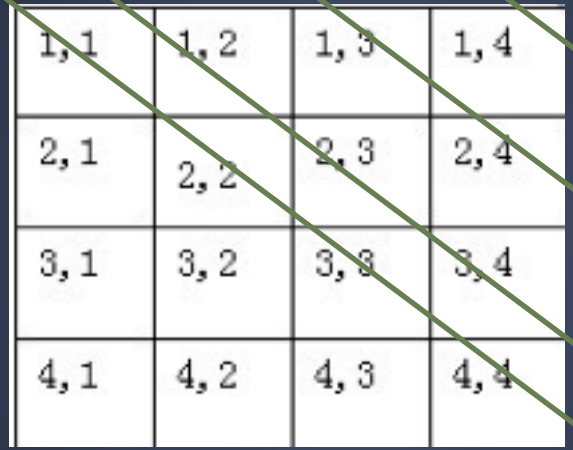
X – Y = 0

1, 1	1, 2	1, 3	1, 4
2, 1	2, 2	2, 3	2, 4
3, 1	3, 2	3, 3	3, 4
4, 1	4, 2	4, 3	4, 4

X – Y = -3

X – Y = -2

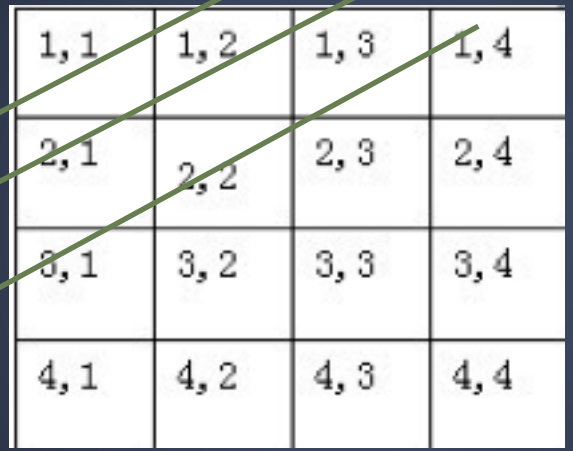
X – Y = 0 X – Y = -1



X+Y =2

X+Y =3

X+Y =4

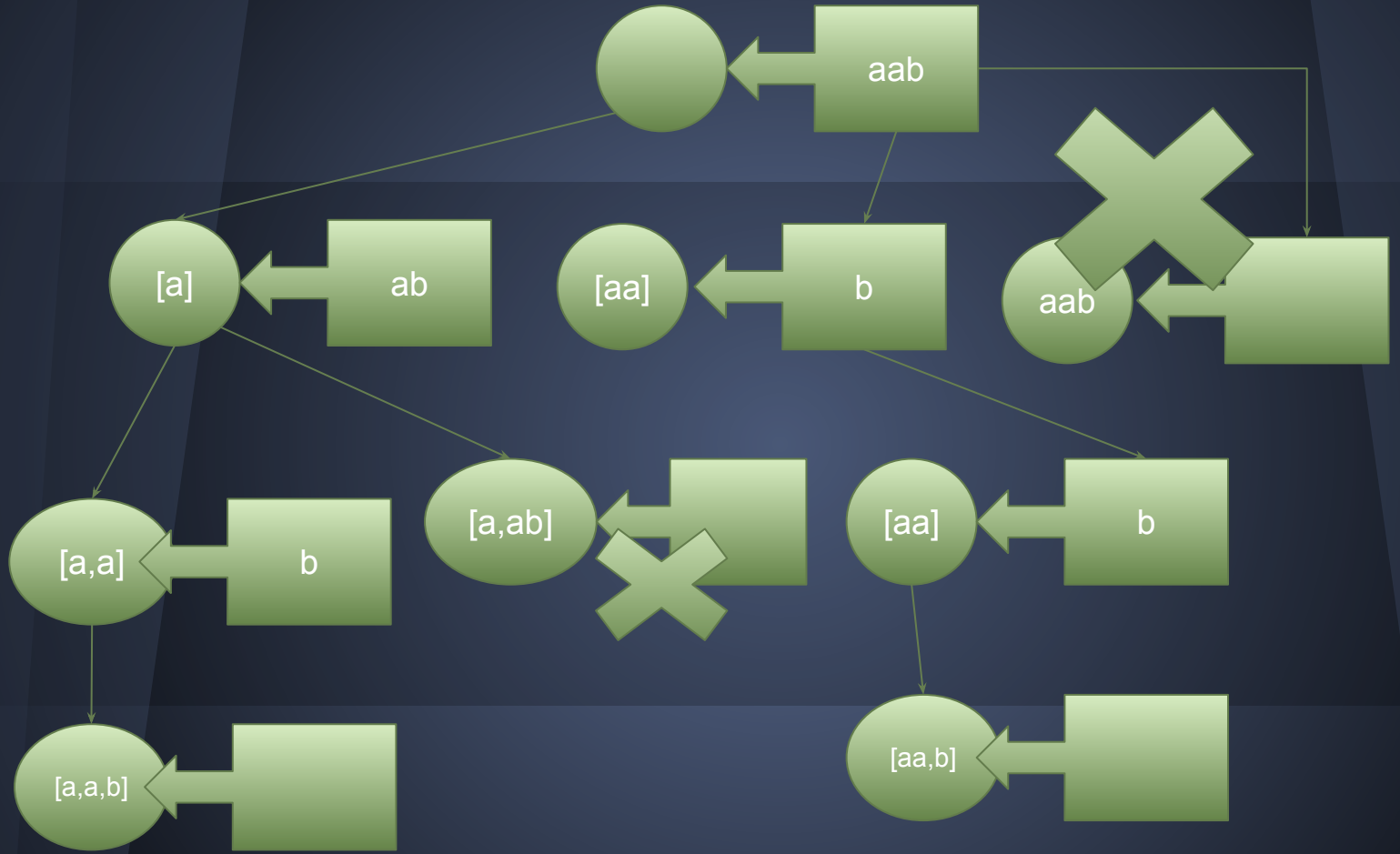


Subsets II

http://www.lintcode.com/en/problem/unique-subsets/
http://ninechapter.com/solutions/subsets-ii/

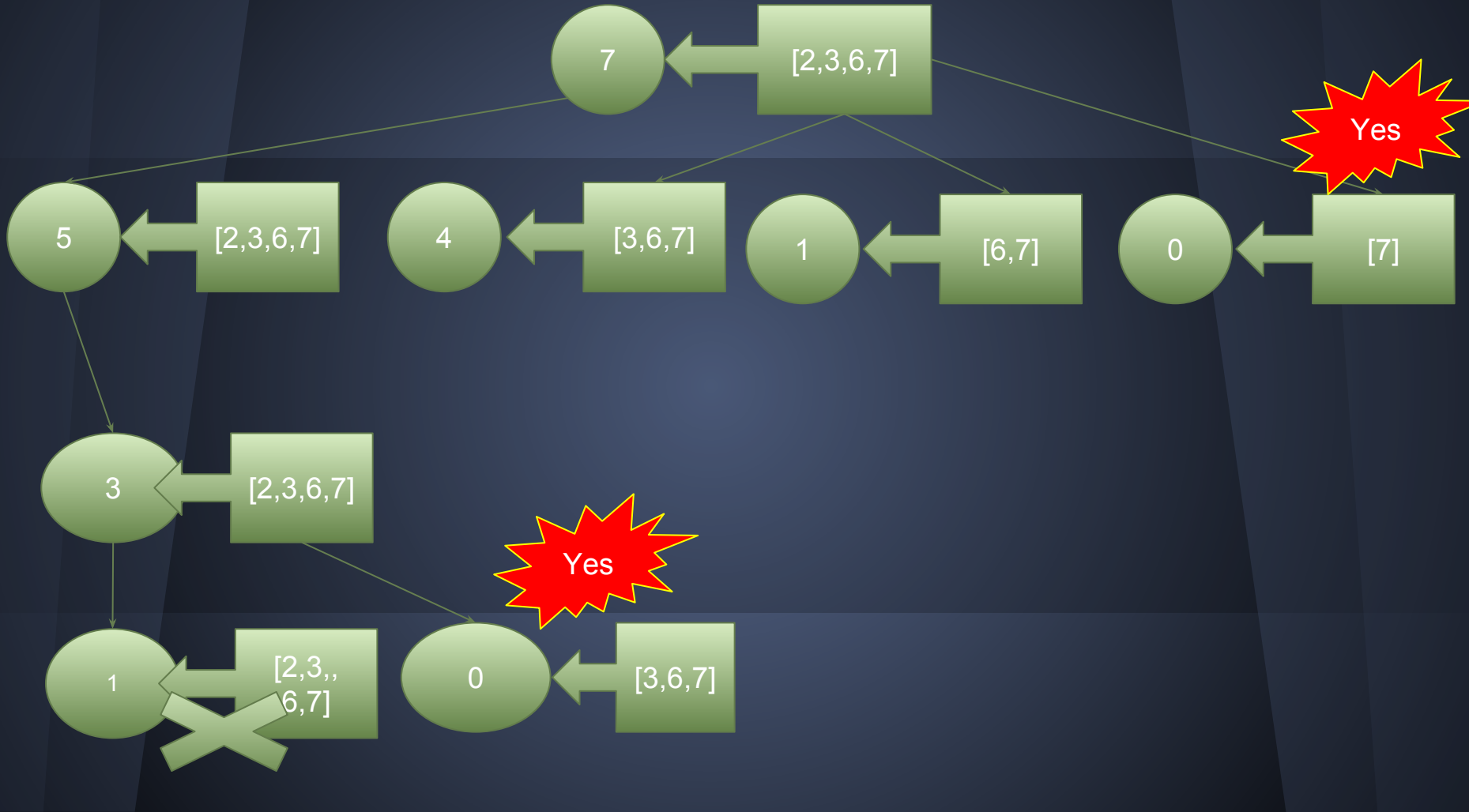
Palindrome Partitioning

http://lintcode.com/en/problem/palindrome-partitioning/
http://answer.ninechapter.com/solutions/palindrome-partitioning/


aab
[a]
ab
[aa]
b
aab
[a,a]
b
[a,ab]
[aa]
b
[a,a,b]
[aa,b]

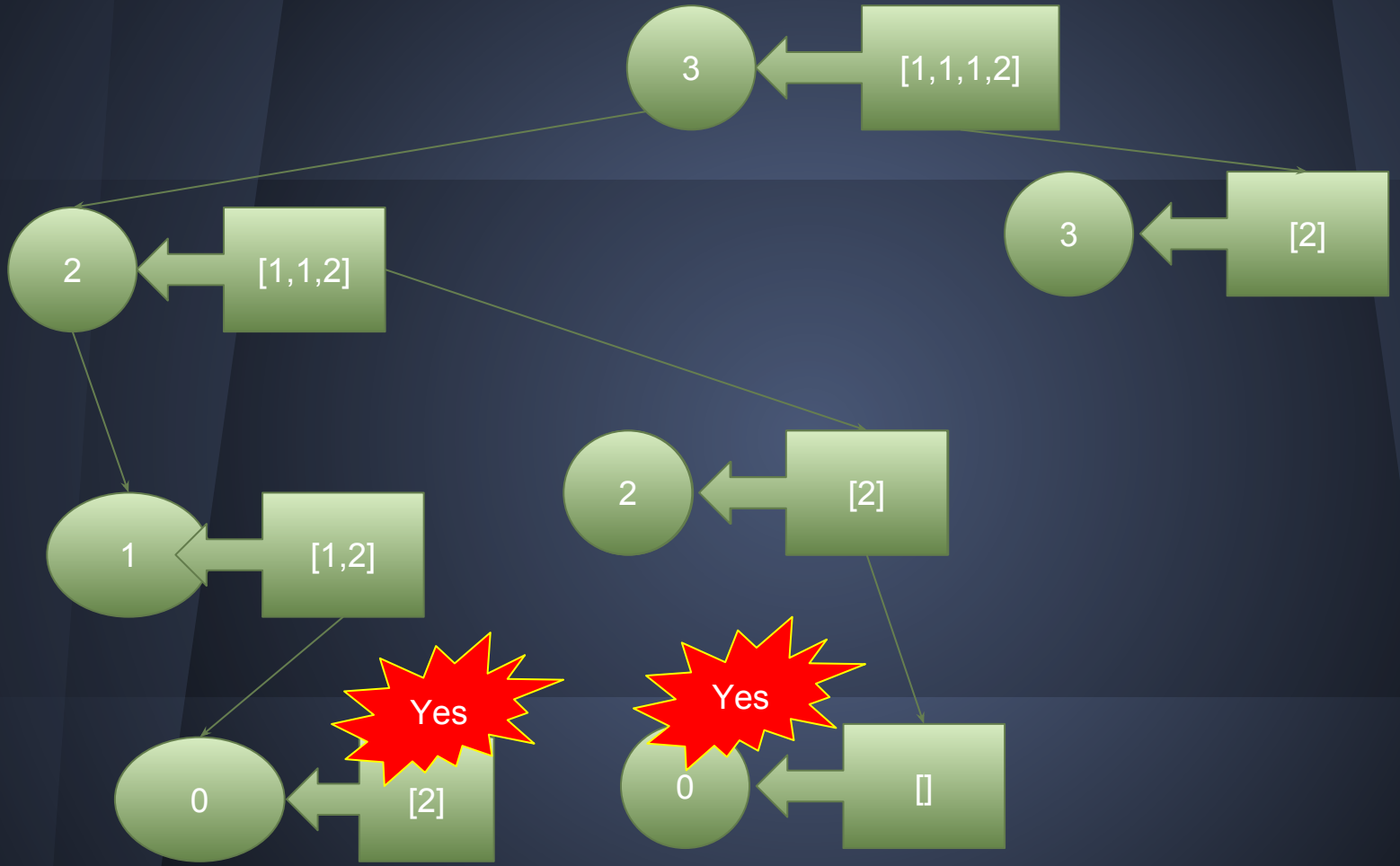
Combination Sum

http://lintcode.com/en/problem/combination-sum/
http://answer.ninechapter.com/solutions/combination-sum/


7
[2,3,6,7]
Yes
5
[2,3,6,7]
4
[3,6,7]
1
[6,7]
0
[7]
3
[2,3,6,7]
Yes
1
[2,3,,
6,7]
0
[3,6,7]

Combination Sum II

http://lintcode.com/en/problem/combination-sum-ii/http://www.ninechapter.com/solutions/combination-sum-ii/


3
[1,1,1,2]
2
[1,1,2]
3
[2]
1
[1,2]
2
[2]
Yes
0
[2]
Yes
0
[]

Word Ladder (BFS)

http://lintcode.com/en/problem/word-ladder/
http://answer.ninechapter.com/solutions/word-ladder/

Word Ladder II (BFS+DFS)

http://lintcode.com/en/problem/word-ladder-ii/
http://answer.ninechapter.com/solutions/word-ladder-ii/

Conclusion

DFS (O(2^n), O(n!)) (思想:构建搜索树+判断可行性)

1. Find all possible solutions
2. Permutations / Subsets

BFS (O(m), O(n))

1. Graph traversal (每个点只遍历一次)
2. Find shortest path in a simple graph