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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:

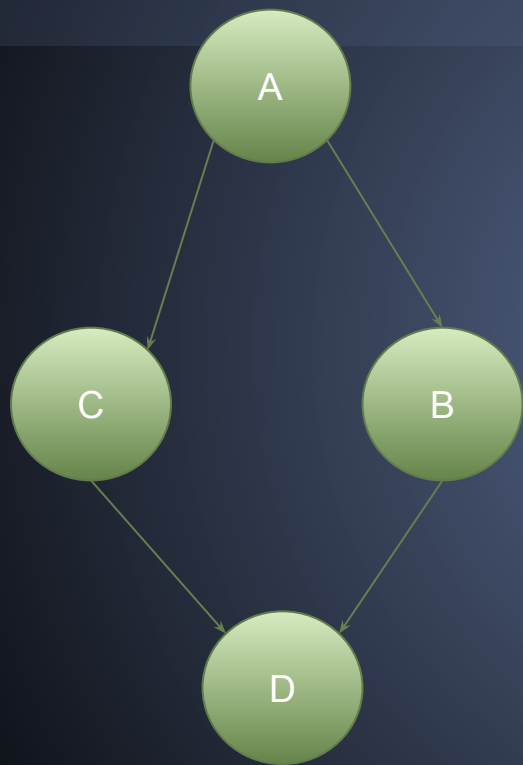
- Depth First Search

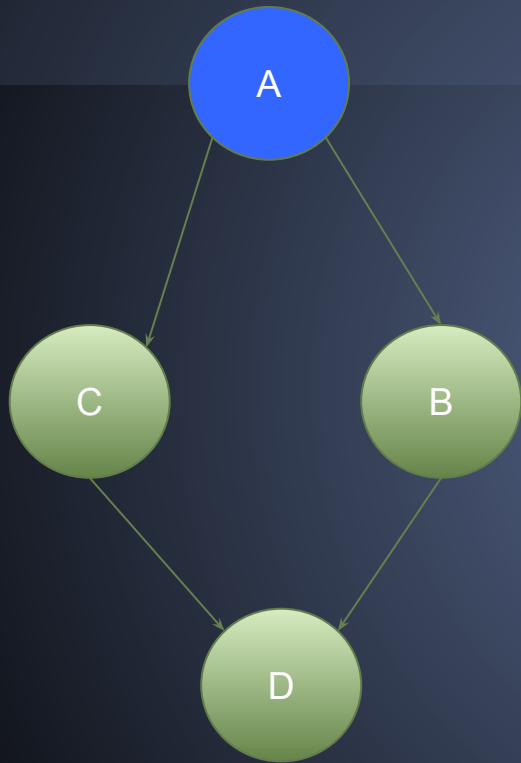
- Breadth First Search

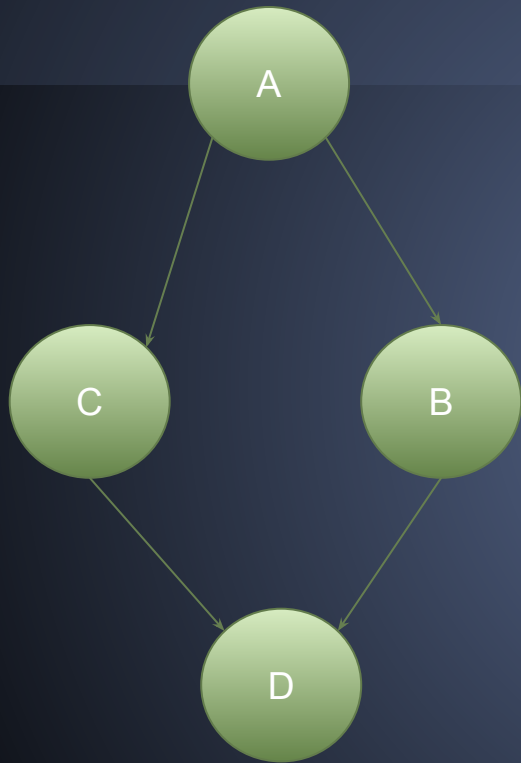
Graph

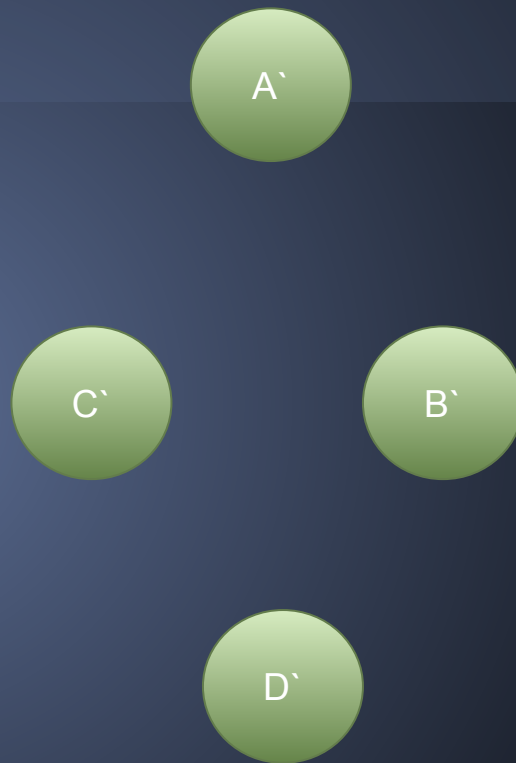
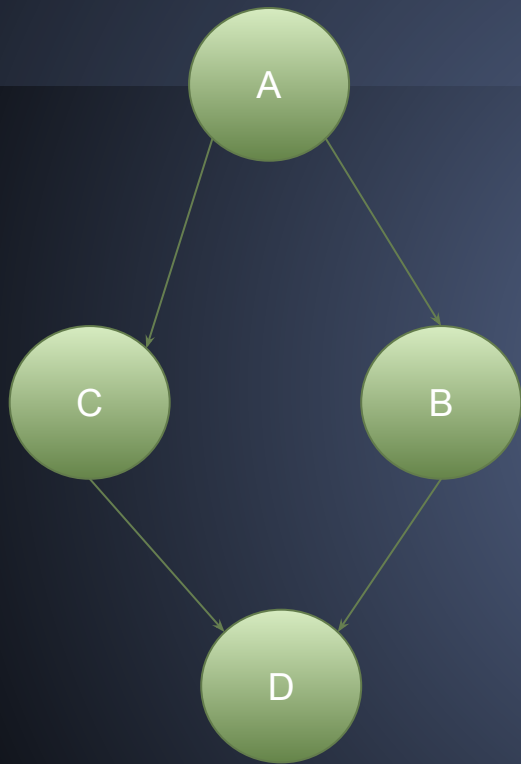
Clone Graph

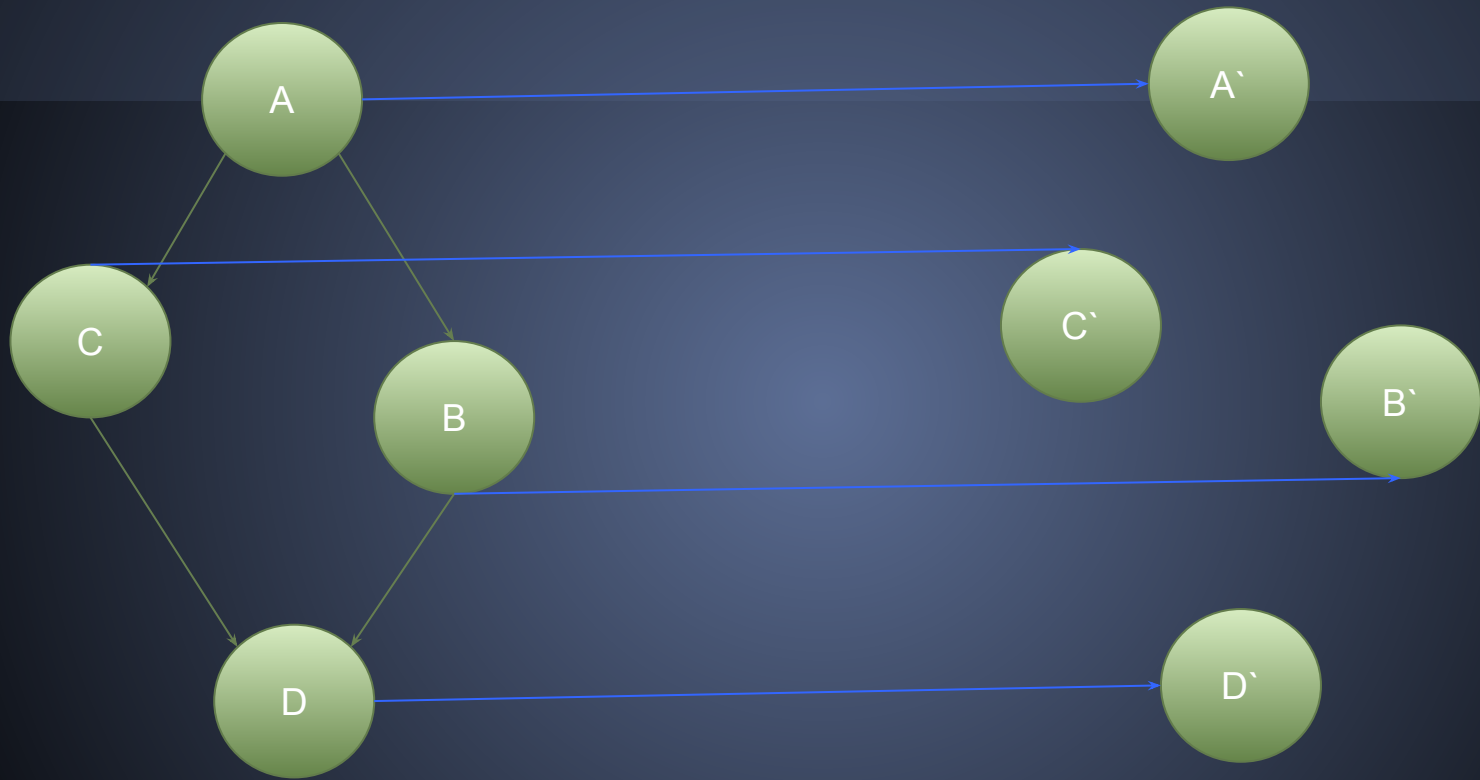
<https://oj.leetcode.com/problems/clone-graph/>
<http://answer.ninechapter.com/solutions/clone-graph/>

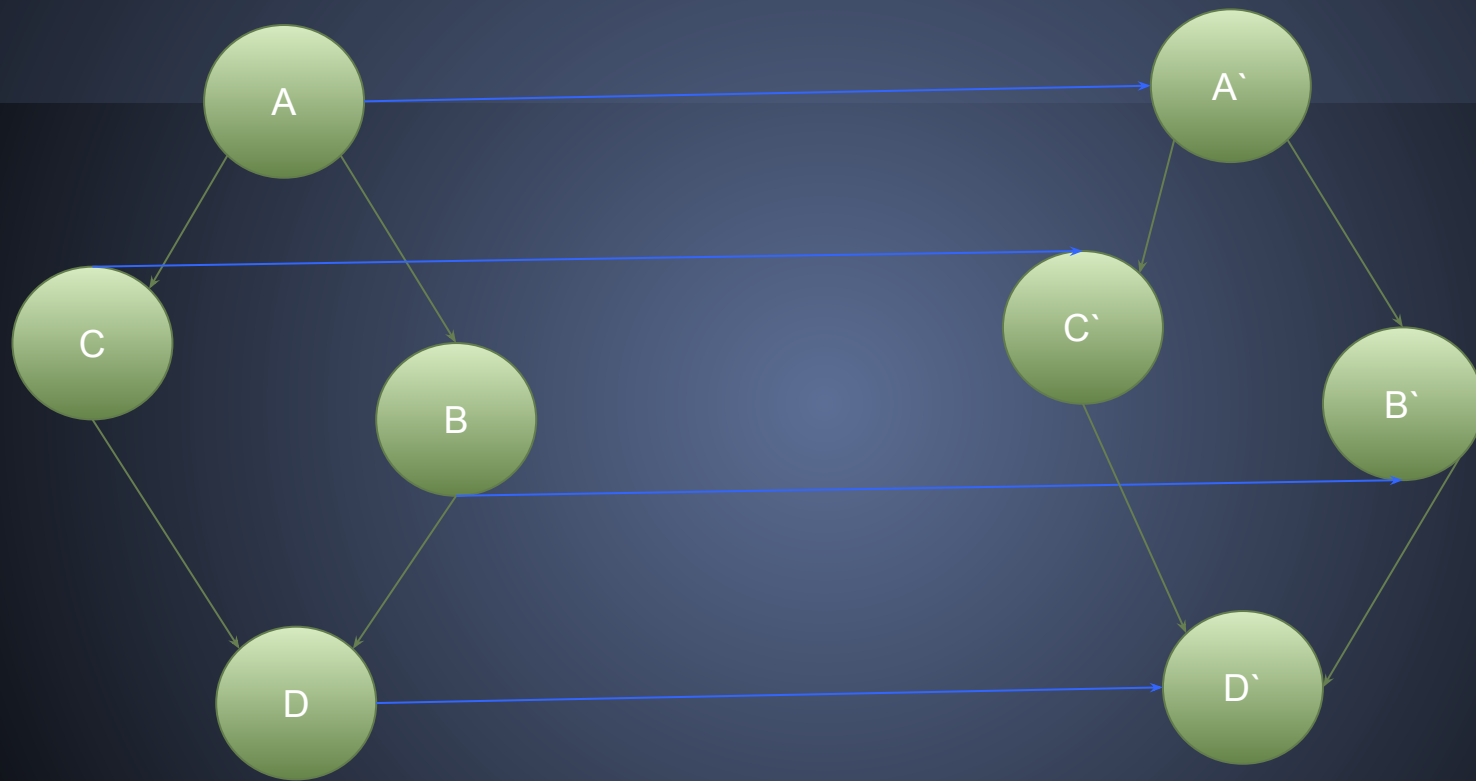












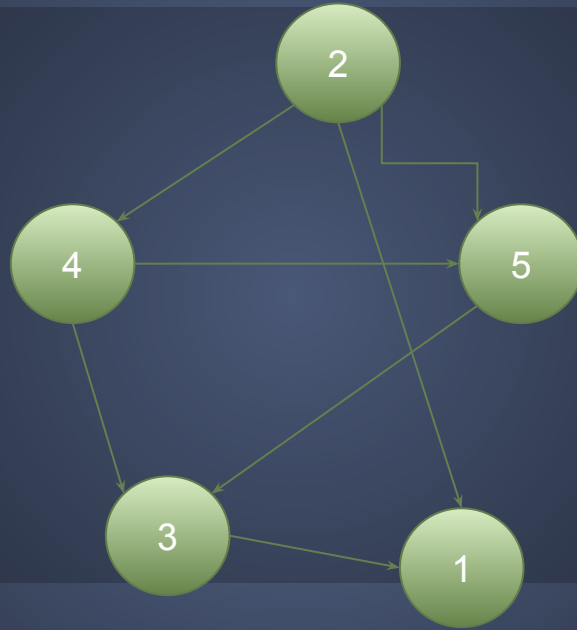
Copy List with Random Pointer

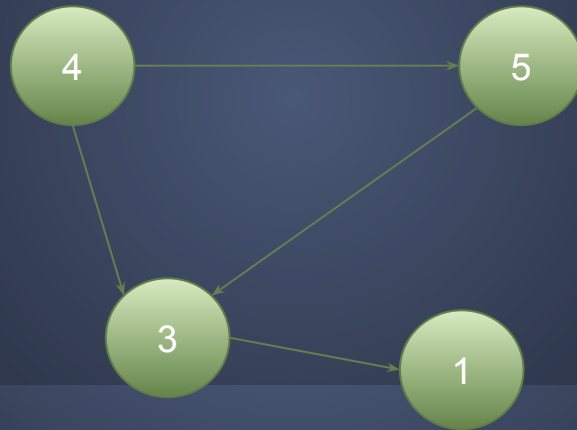
<http://lintcode.com/en/problem/copy-list-with-random-pointer/>

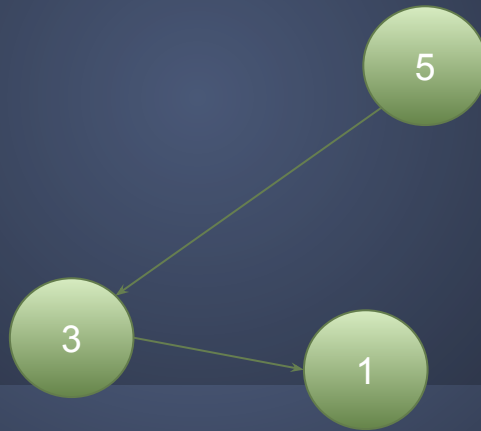
<http://answer.ninechapter.com/solutions/clone-graph/>

Topological Sorting

<http://www.geeksforgeeks.org/topological-sorting/>
<http://poj.org/problem?id=2367>











BFS

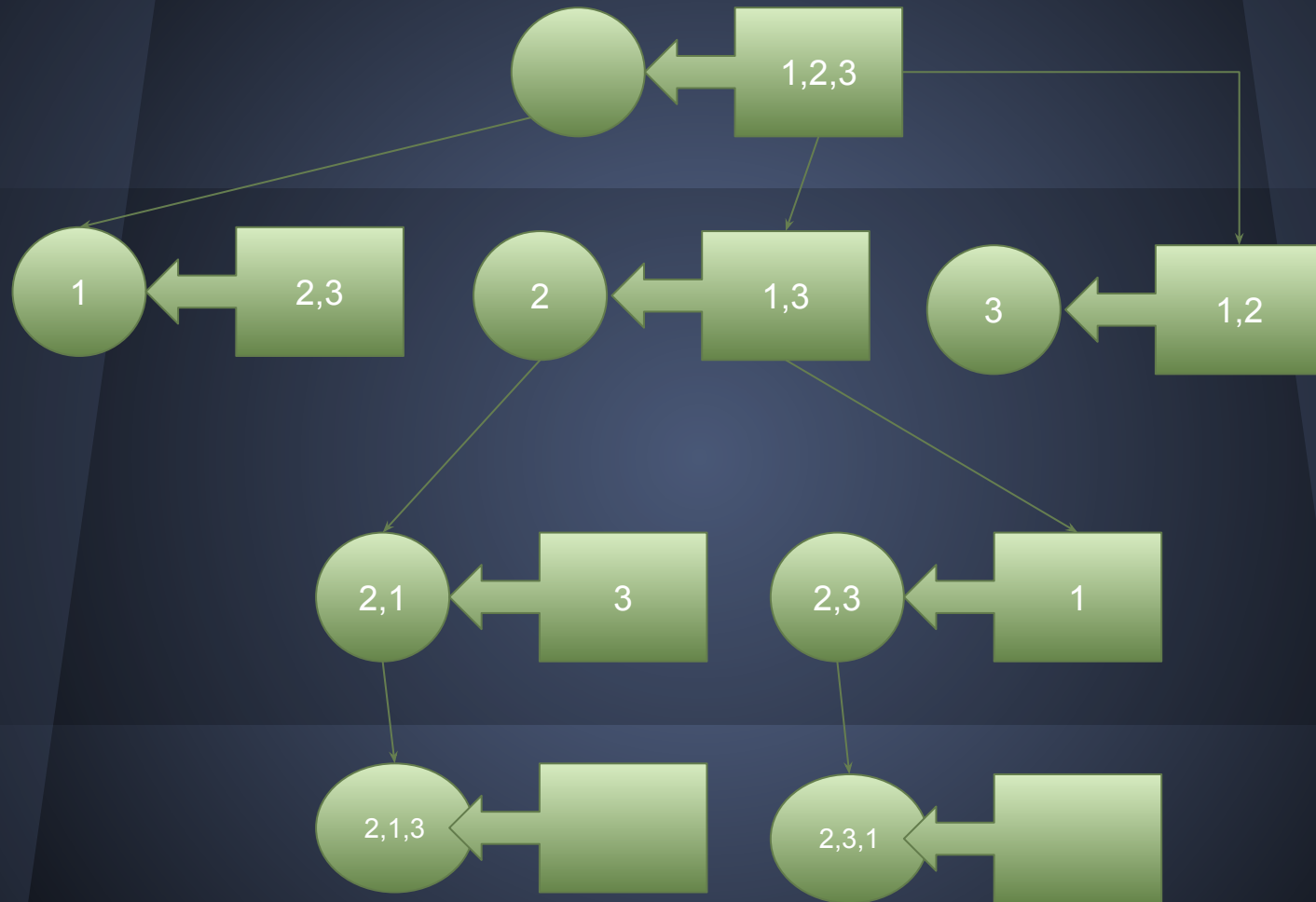
Idea: 从某个点出发, 找到其他所有的点。

Compare: Graph bfs vs Tree bfs([link](#))

Search

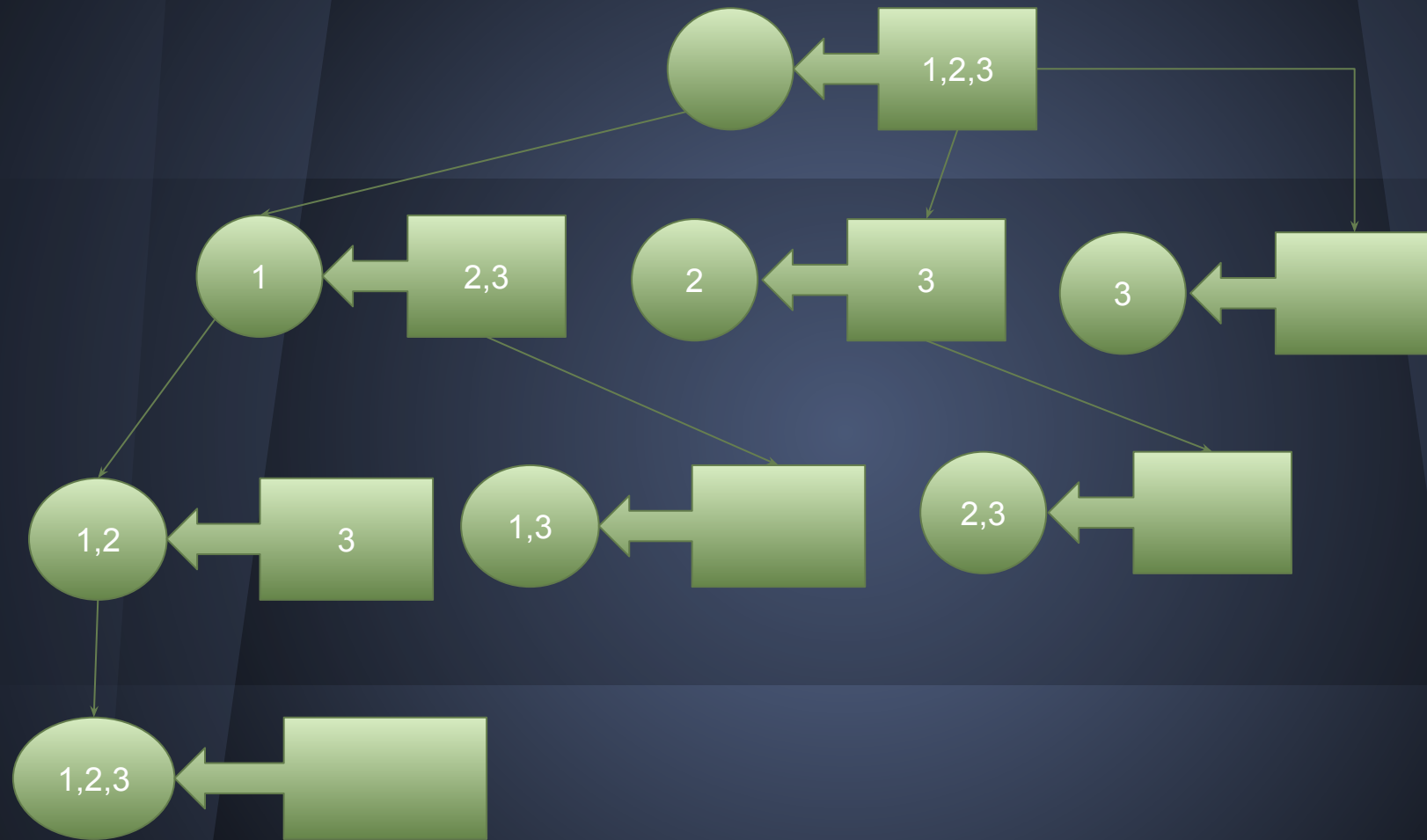
Permutations

<http://www.lintcode.com/en/problem/permutations/>
<http://answer.ninechapter.com/solutions/permutations/>



Subsets

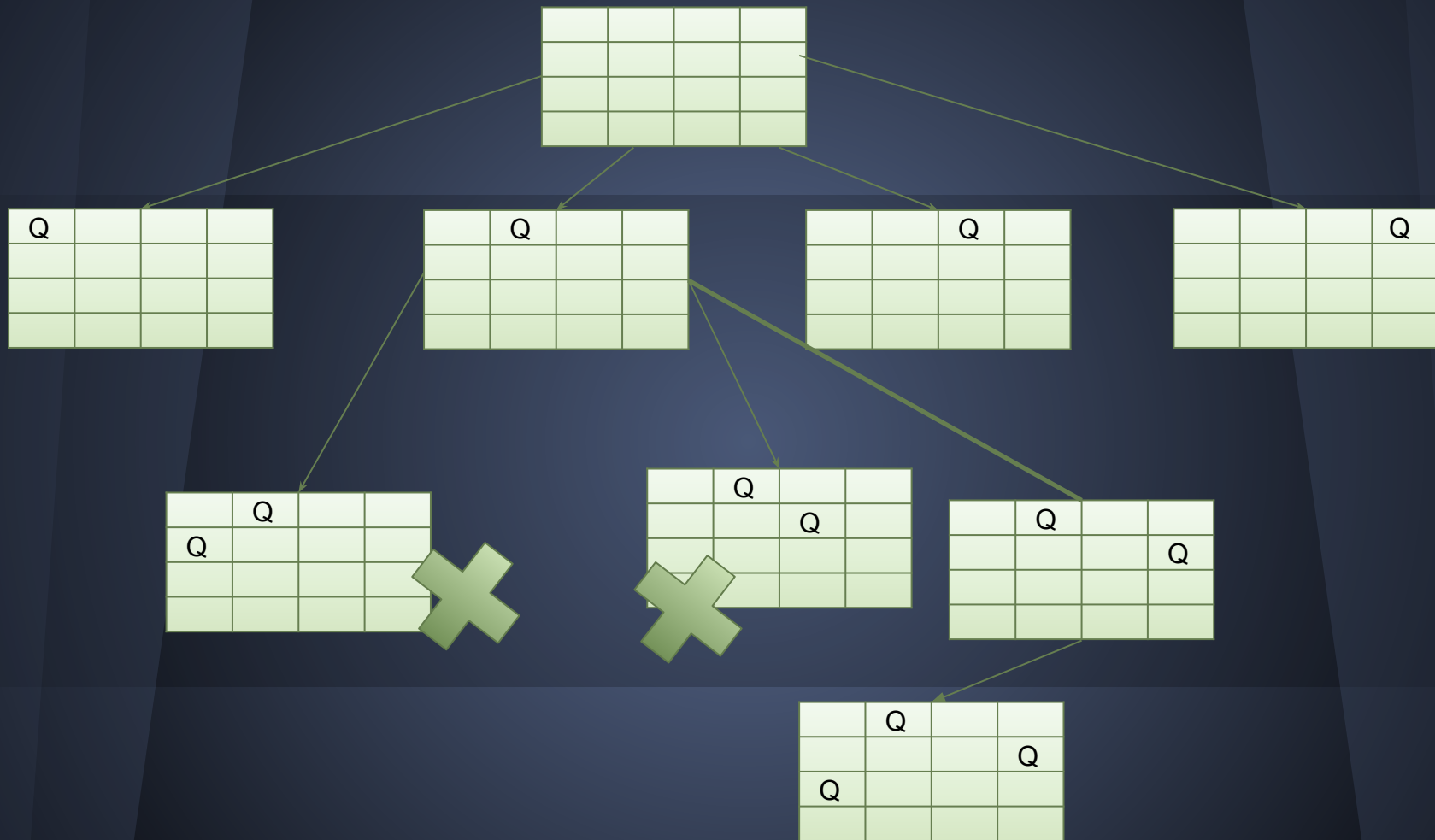
<http://www.lintcode.com/en/problem/subsets/>
<http://answer.ninechapter.com/solutions/subsets/>



N Queens


<http://lintcode.com/en/problem/n-queens/>

<http://answer.ninechapter.com/solutions/n-queens/>



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

$$X - Y = 0$$



A 4x4 grid of coordinate pairs (X, Y) is shown. A green diagonal line passes through the cells where X=Y, specifically (1,1), (2,2), (3,3), and (4,4).

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

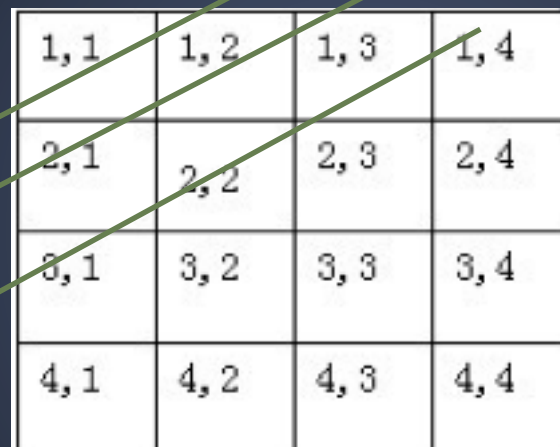
$$X - Y = 0$$
$$X - Y = -1$$
$$X - Y = -2$$
$$X - Y = -3$$

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

$$X+Y=2$$

$$X+Y=3$$

$$X+Y=4$$



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

Subsets II

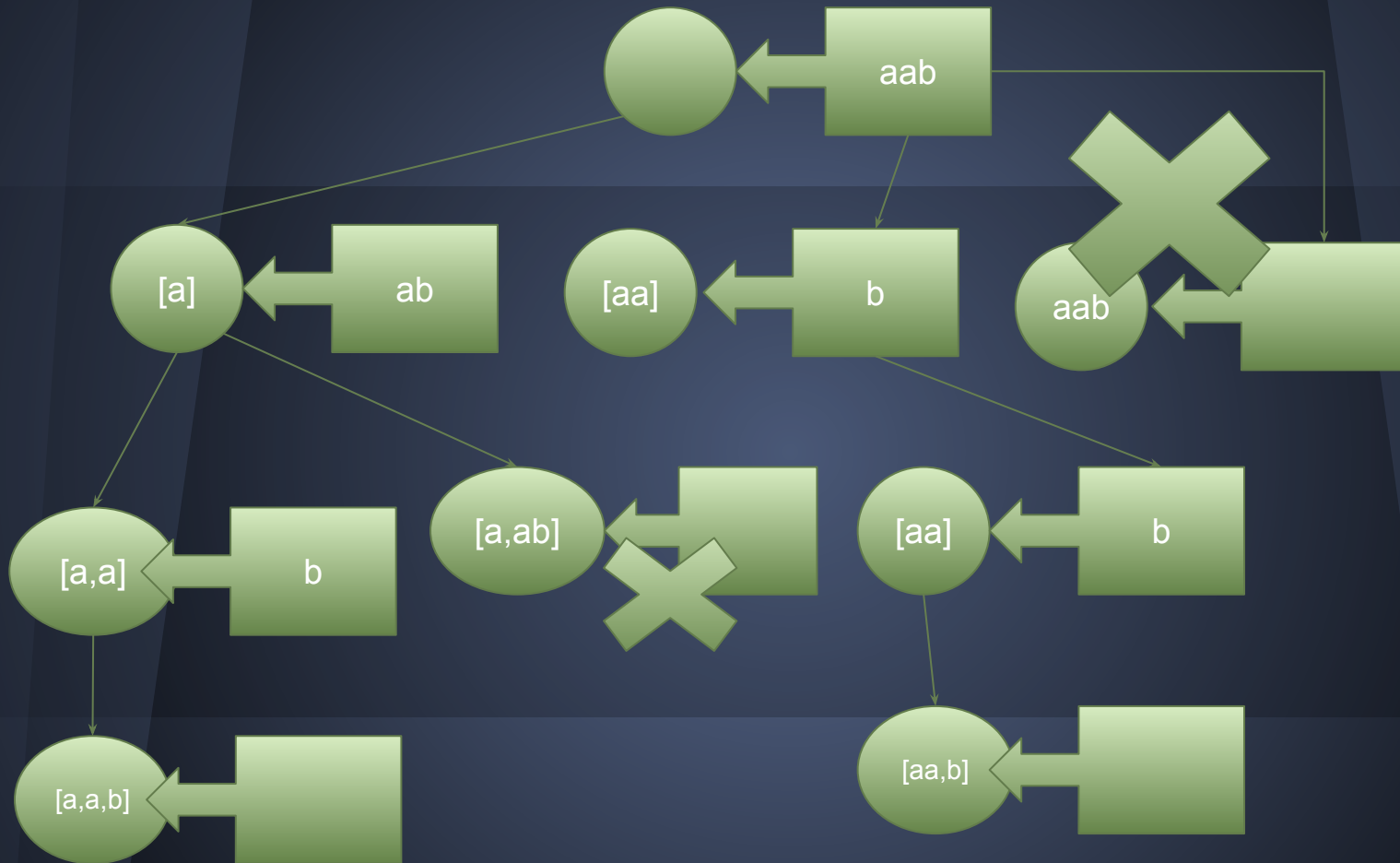
<http://www.lintcode.com/en/problem/unique-subsets/>

<http://ninechapter.com/solutions/subsets-ii/>

Palindrome Partitioning

<http://lintcode.com/en/problem/palindrome-partitioning/>

<http://answer.ninechapter.com/solutions/palindrome-partitioning/>



Combination Sum

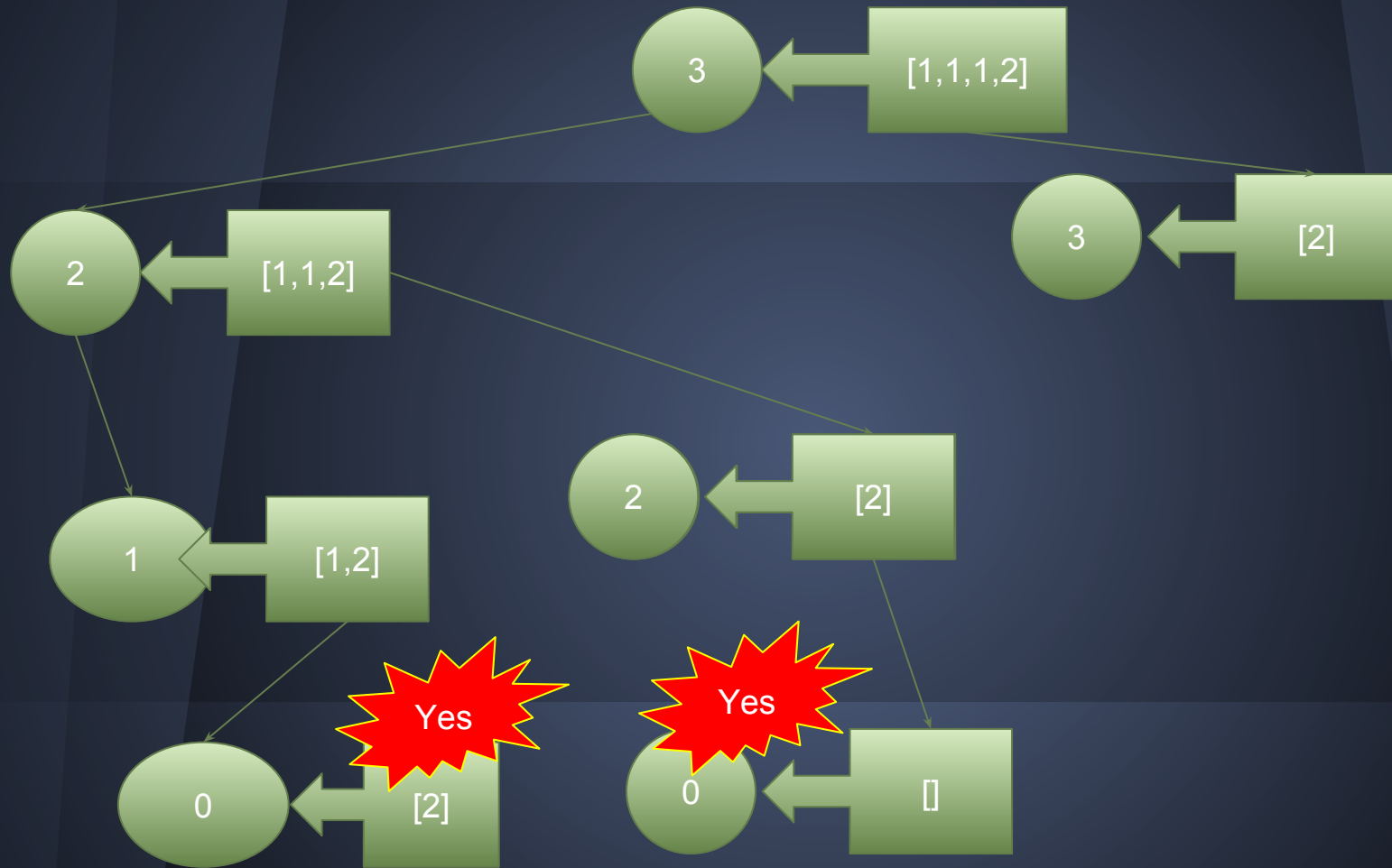
<http://lintcode.com/en/problem/combination-sum/>
<http://answer.ninechapter.com/solutions/combination-sum/>



Combination Sum II

<https://oj.leetcode.com/problems/combination-sum-ii/>

<http://www.ninechapter.com/solutions/combination-sum-ii/>



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