NCKU Programming Contest Training Course

Course 5

2014/02/15

施冠榕

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http://myweb.ncku.edu.tw/~f74991081/Course5.zip

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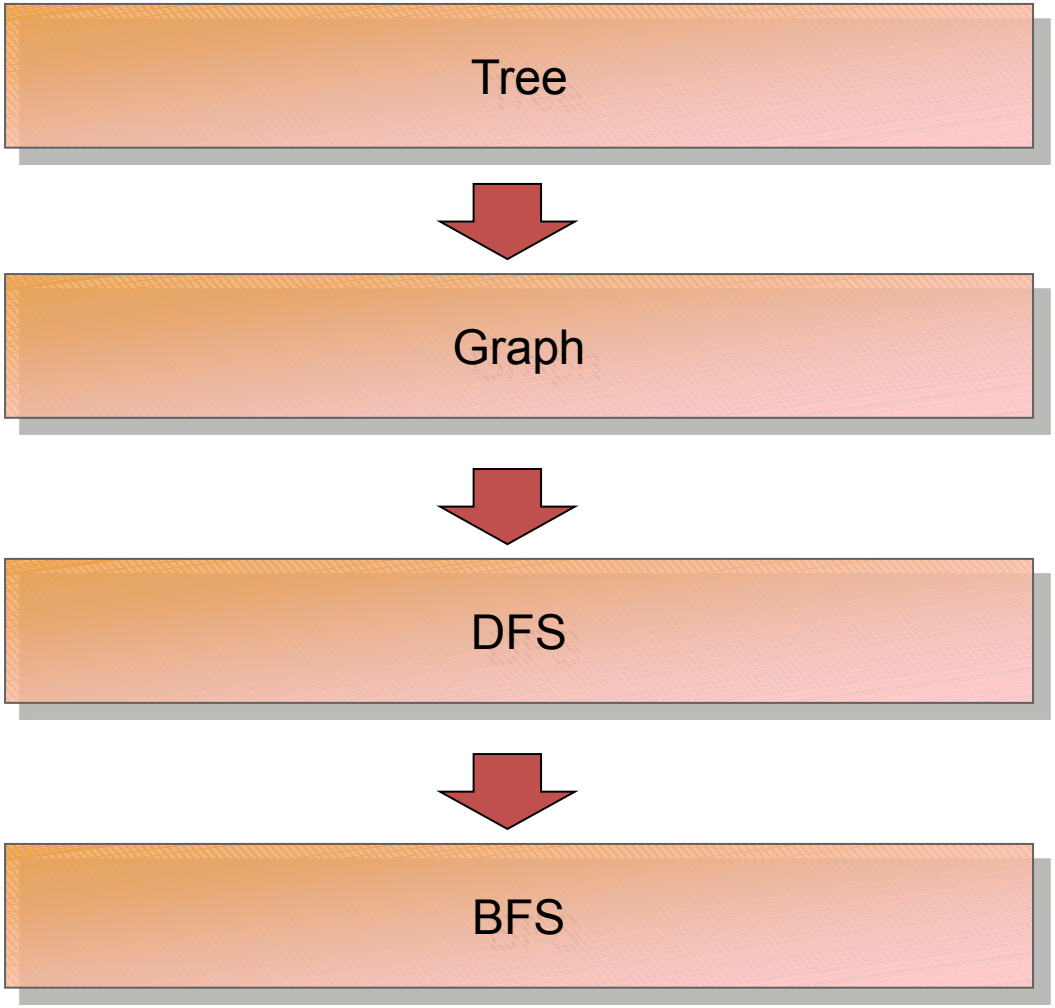
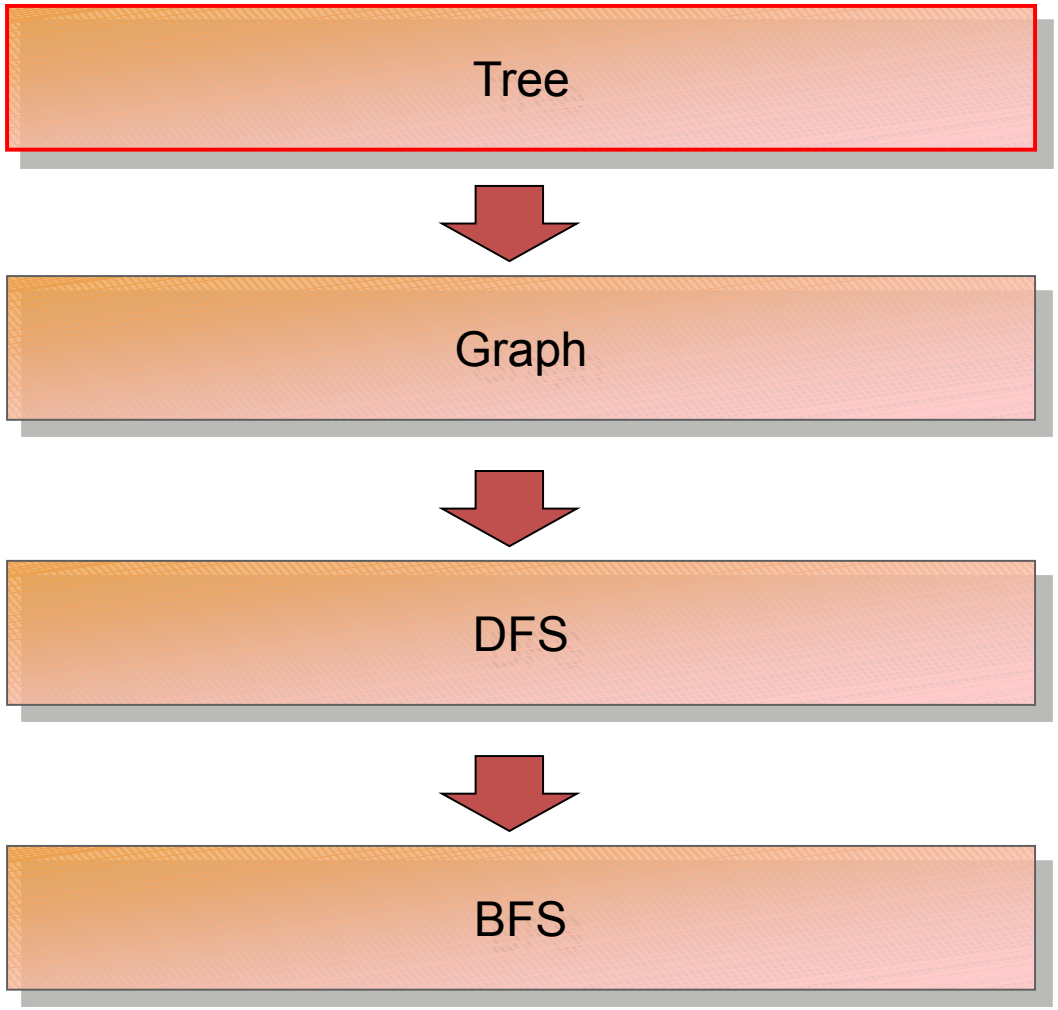
Made By louis7340,Rongz

Outline



Outline



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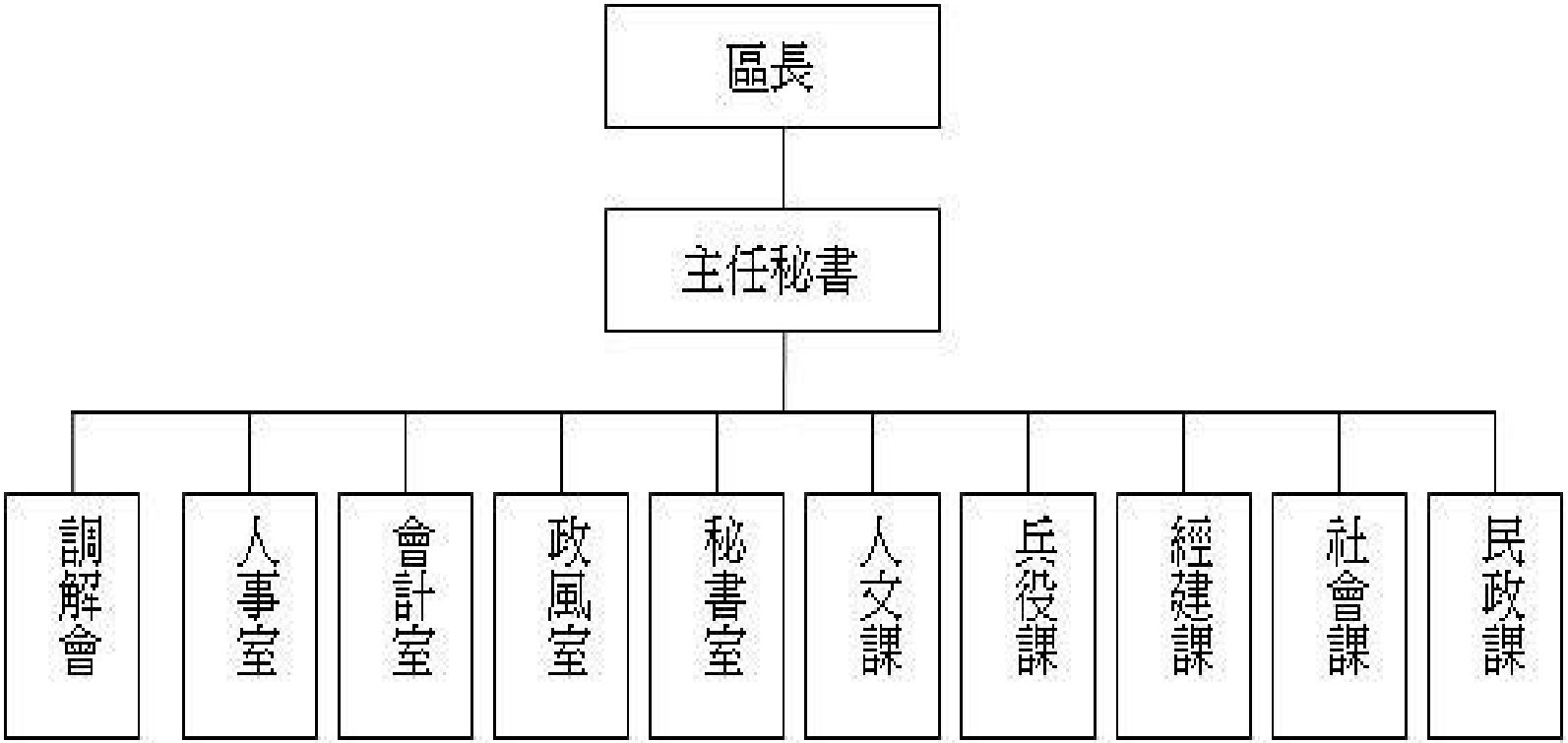
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調解會
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秘書室
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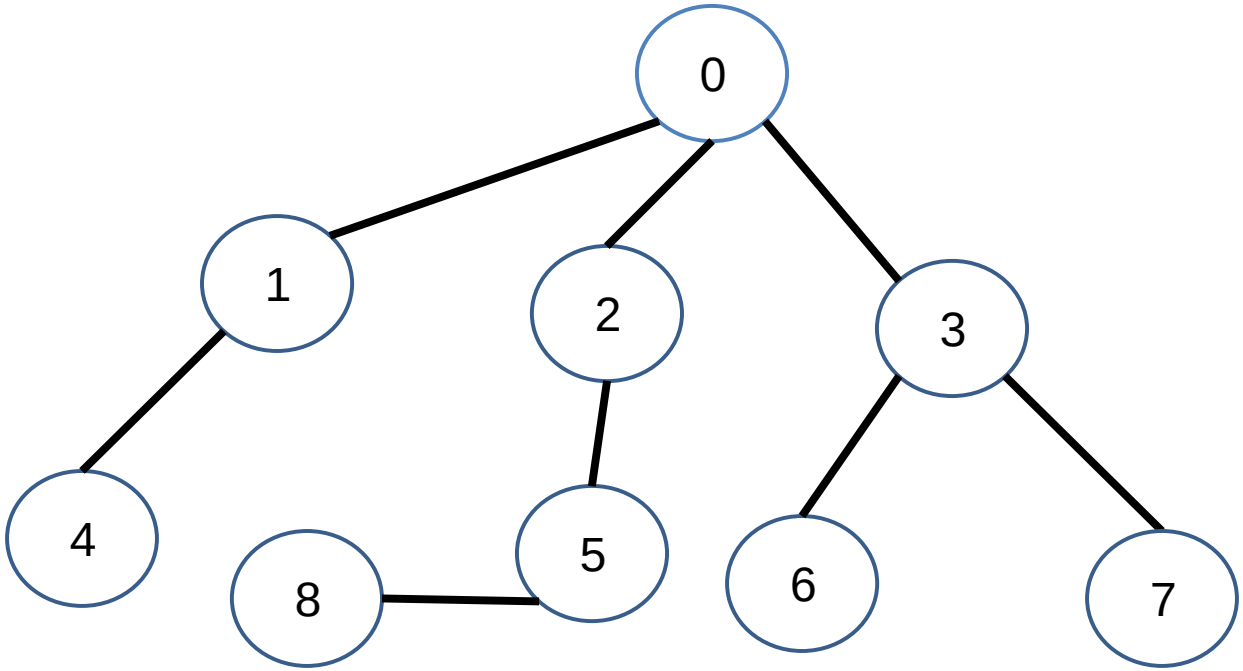
兵役課
經建課
社會課
民政課

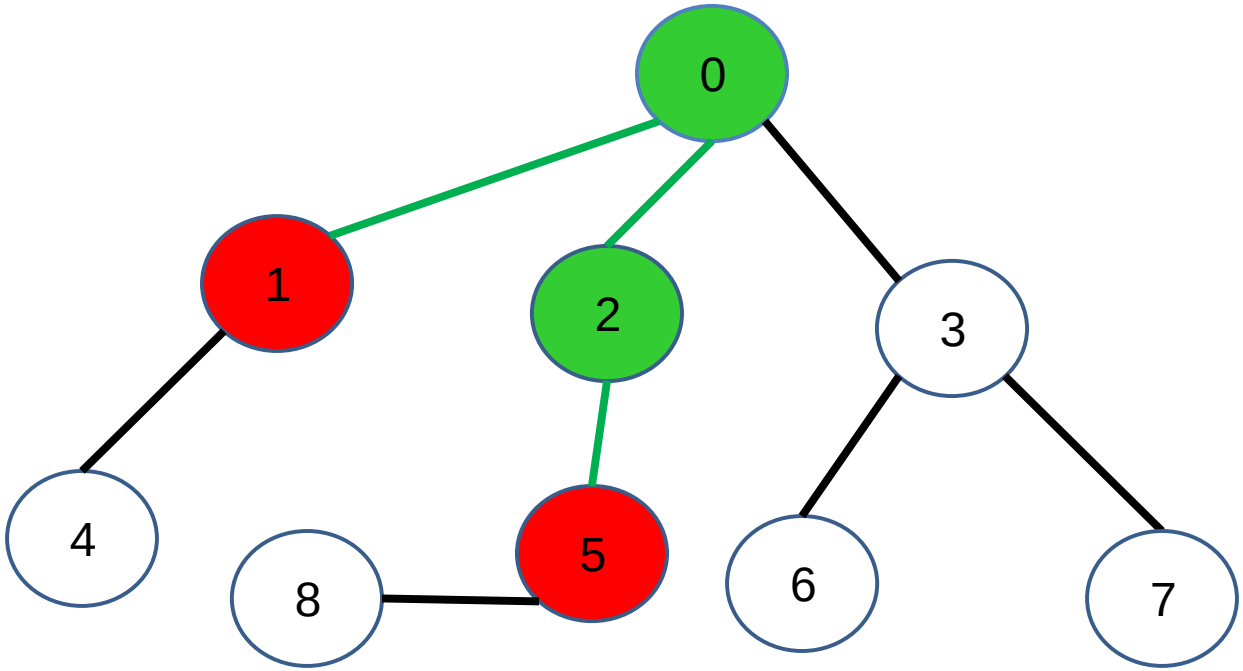
Tree

- 由 node 組成的資料結構



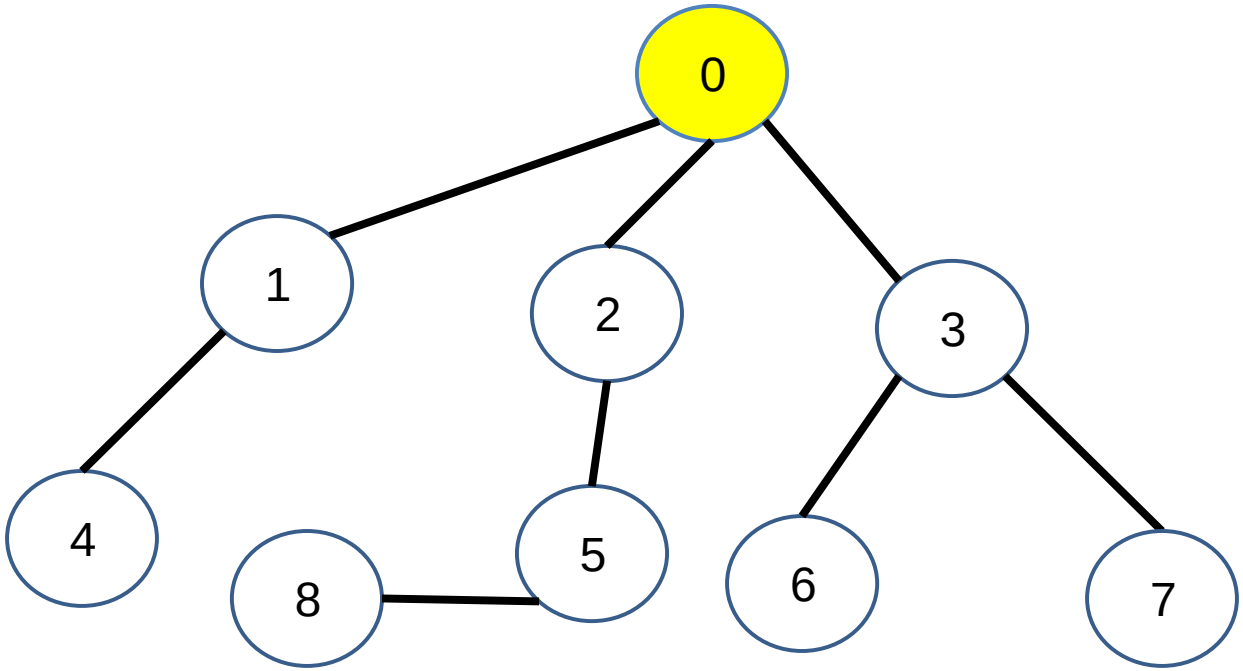
Tree

- 由 node 組成的資料結構
- 每兩個點之間必有一個路徑，且必只有一個路徑



Tree

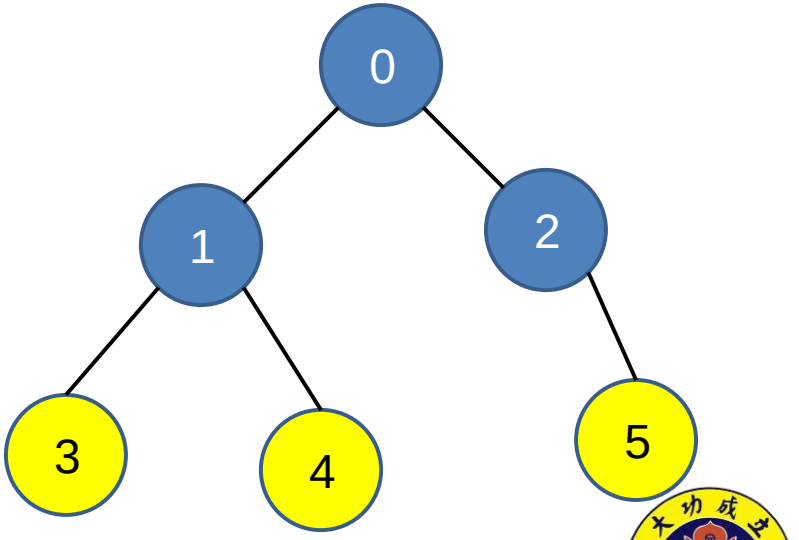
- 由 node 組成的資料結構
- 每兩個點之間必有一個路徑，且必只有一個路徑
- 每個樹都有一個 root



Tree

Relations: (using node 0 as root)

- **Leaf :** 沒有孩子的 **node**

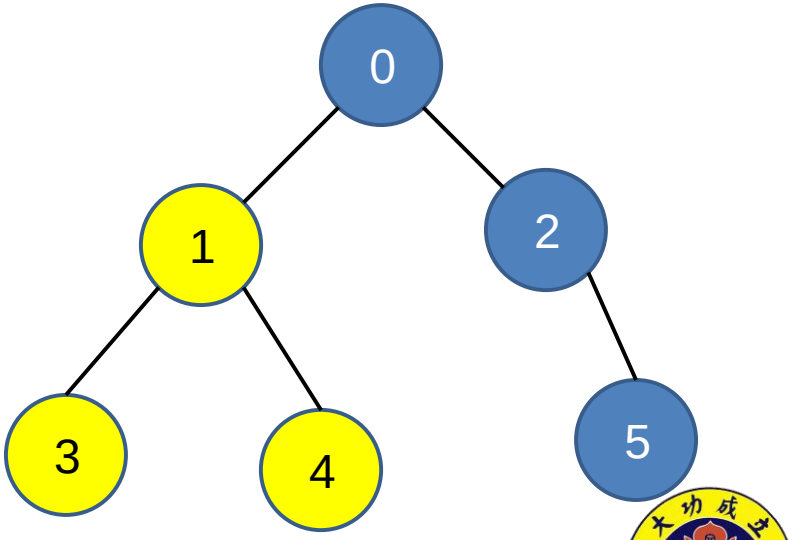


Tree

Relations: (using node 0 as root)

- **Leaf :** 沒有孩子的 **node**
- **Parent/Children :** 上面的 node –Parent (1)

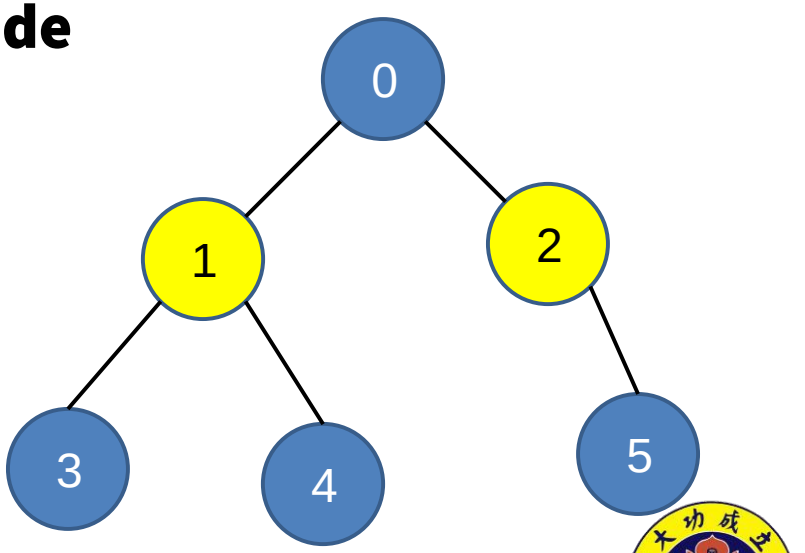
  下面的 node (3,4)



Tree

Relations: (using node 0 as root)

- **Leaf :** 沒有孩子的 **node**
- **Parent/Children :** 上面的 node –Parent
  下面的 node
- **Sibling:** 有一樣 **parent** 的 **node**



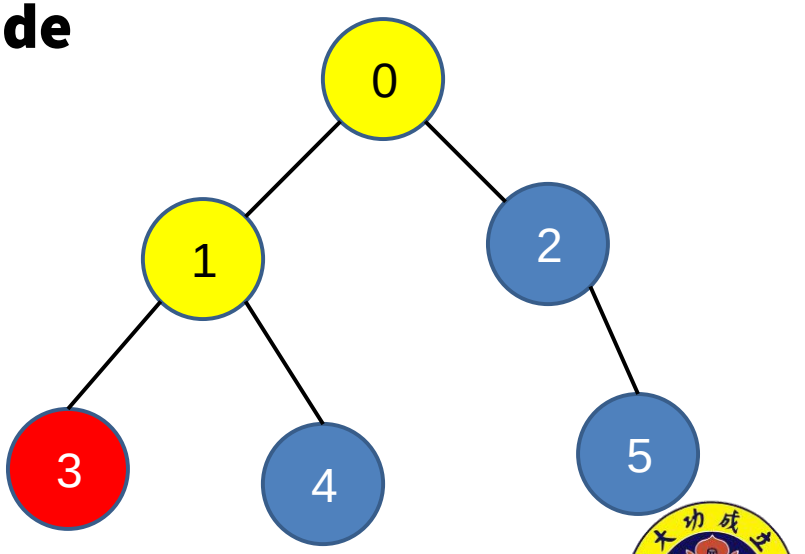
Tree

Relations: (using node 0 as root)

- **Leaf :** 沒有孩子的 **node**
- **Parent/Children :** 上面的 node –Parent

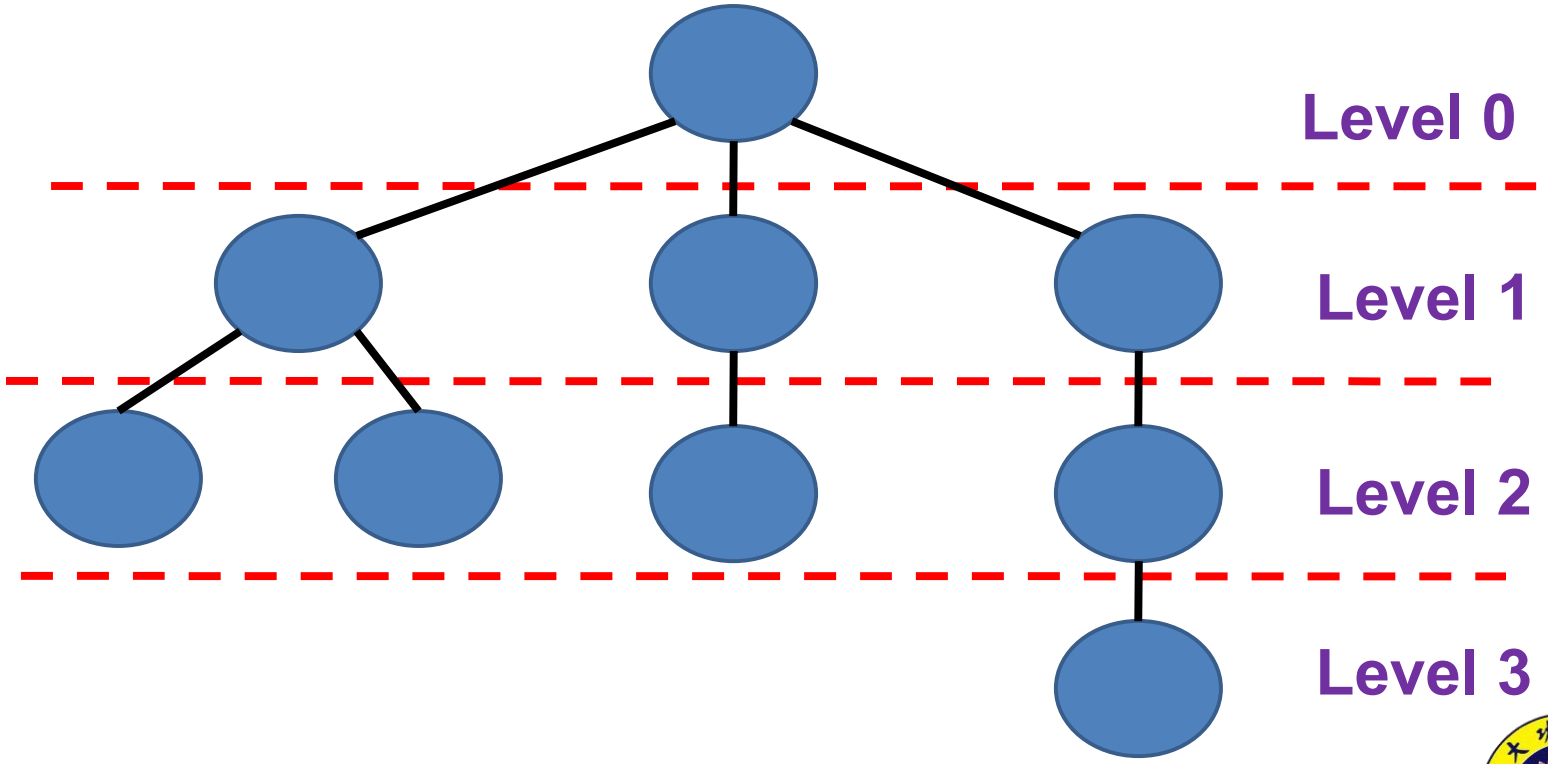
  下面的 node
- **Sibling:** 有一樣 **parent** 的 **node**
- **Ancestor:** 到 **root** 上的 **node**

  (3's ancestor: 0,1)



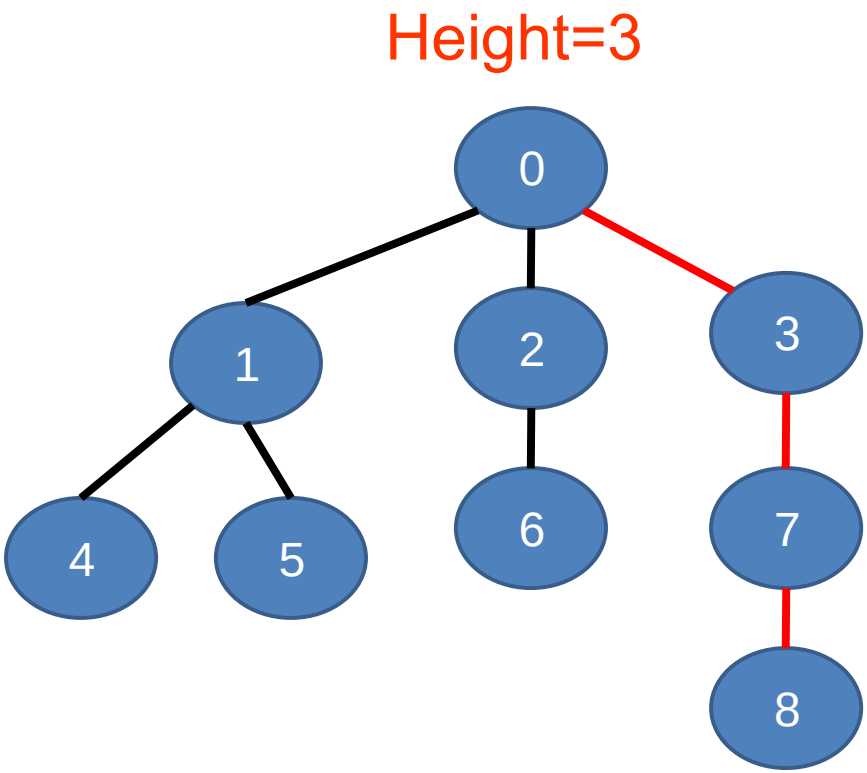
Tree

- **Tree Level:** 從根到 **root** 的距離



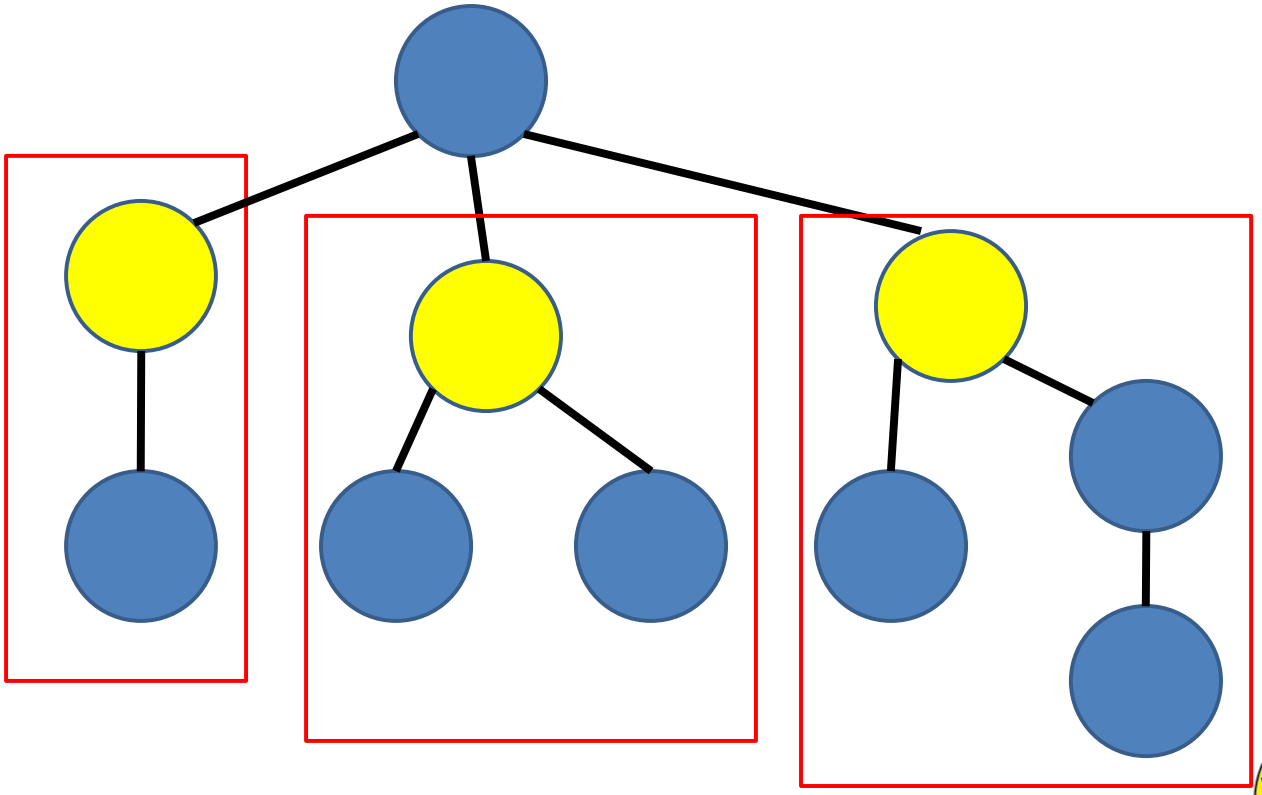
Tree

- **Tree Height(Depth):** the maximum distance from the root.



Tree

- **SubTree:** nodes that are not the root can form a subtree (become a root)



Tree

- **Feature:**

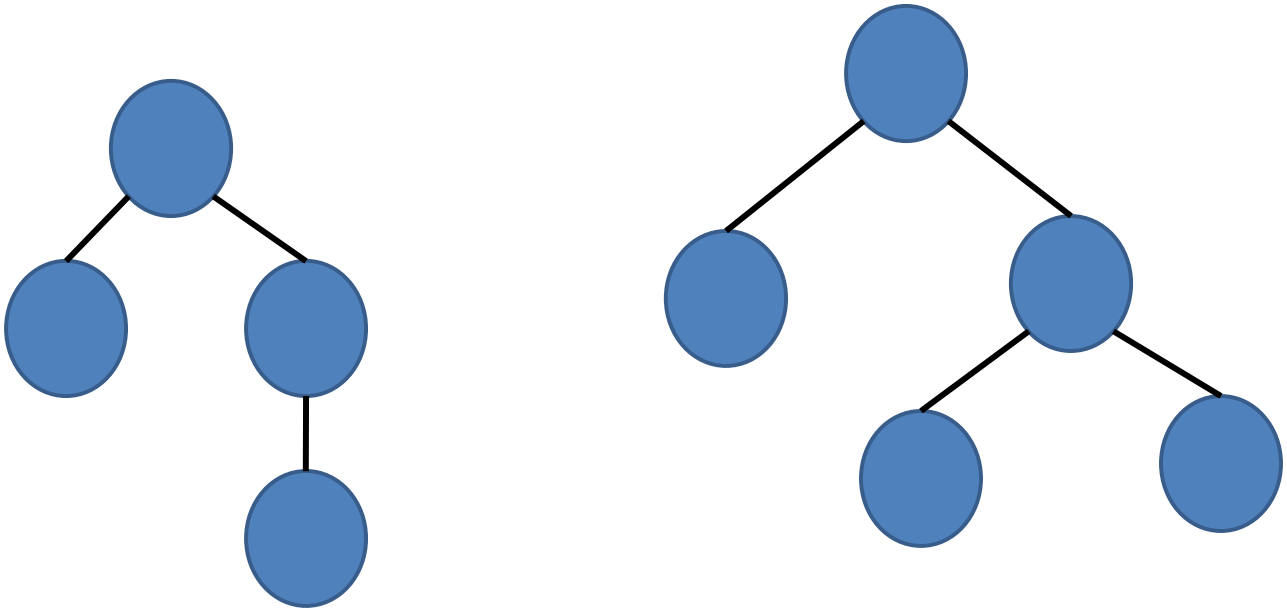
  -no cycle

  -every pair of nodes are connected

  -every pair of nodes has only one path

Tree

- **Forest:** n trees are disjoint ($n \geq 0$)



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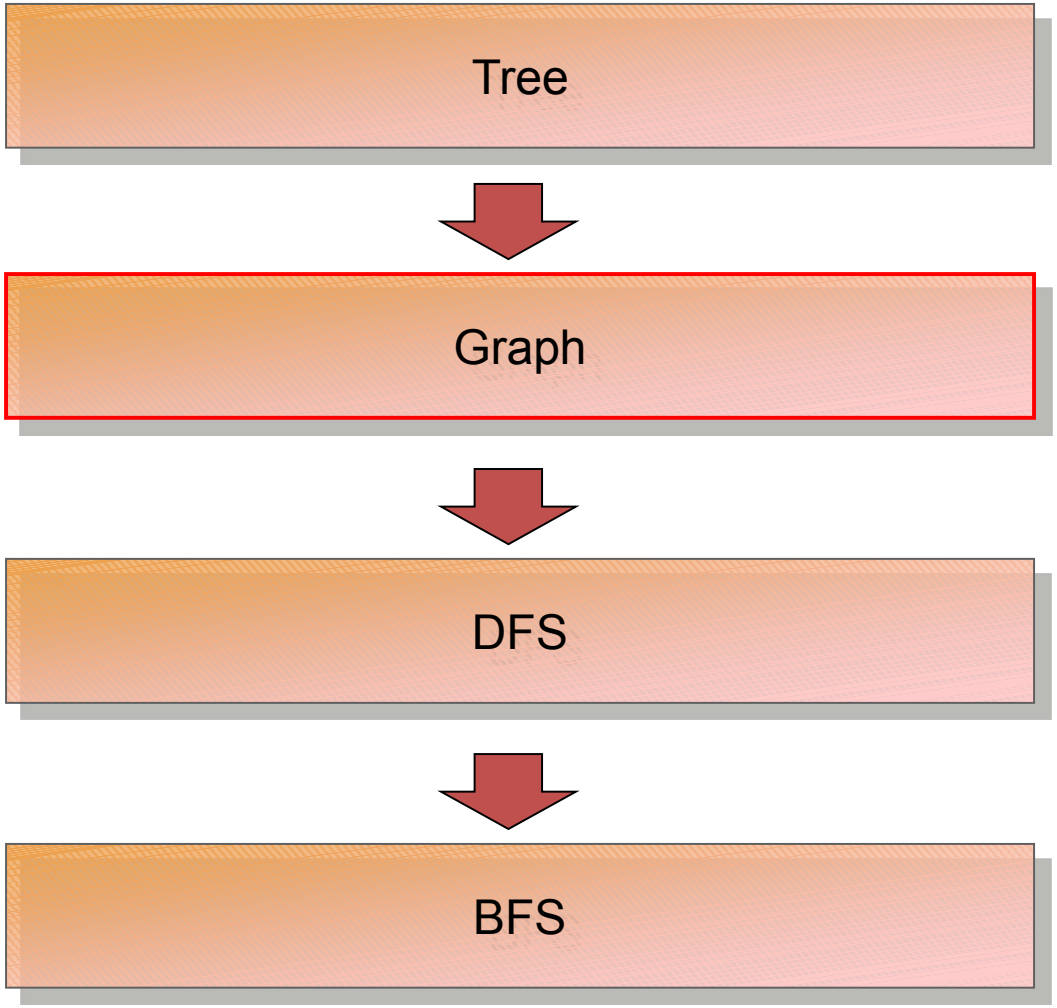
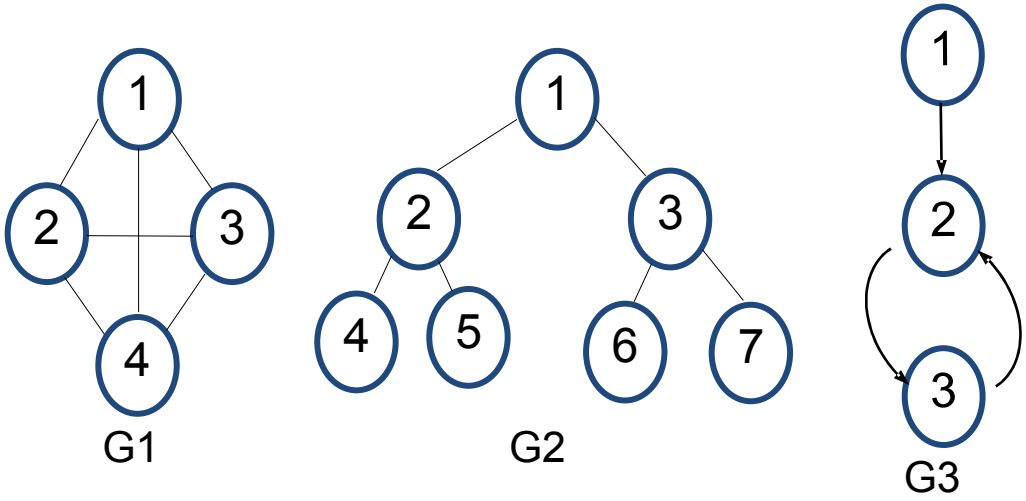


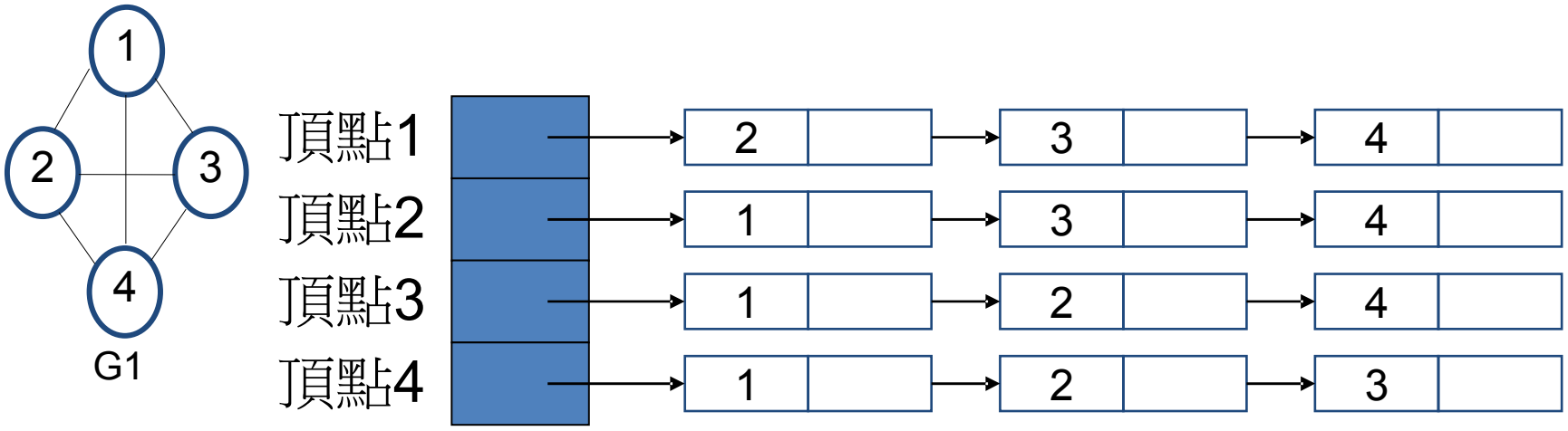
Graph

- Undirected Graph – G1, G2
- Directed Graph – G3
  - deg: in-degree and out-degree



Graph

- Representation
  - adjacent list



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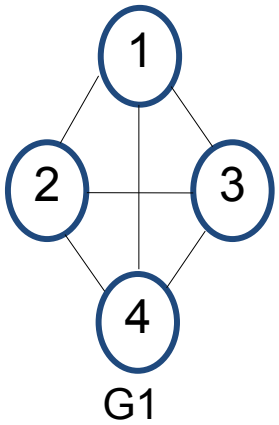
Graph

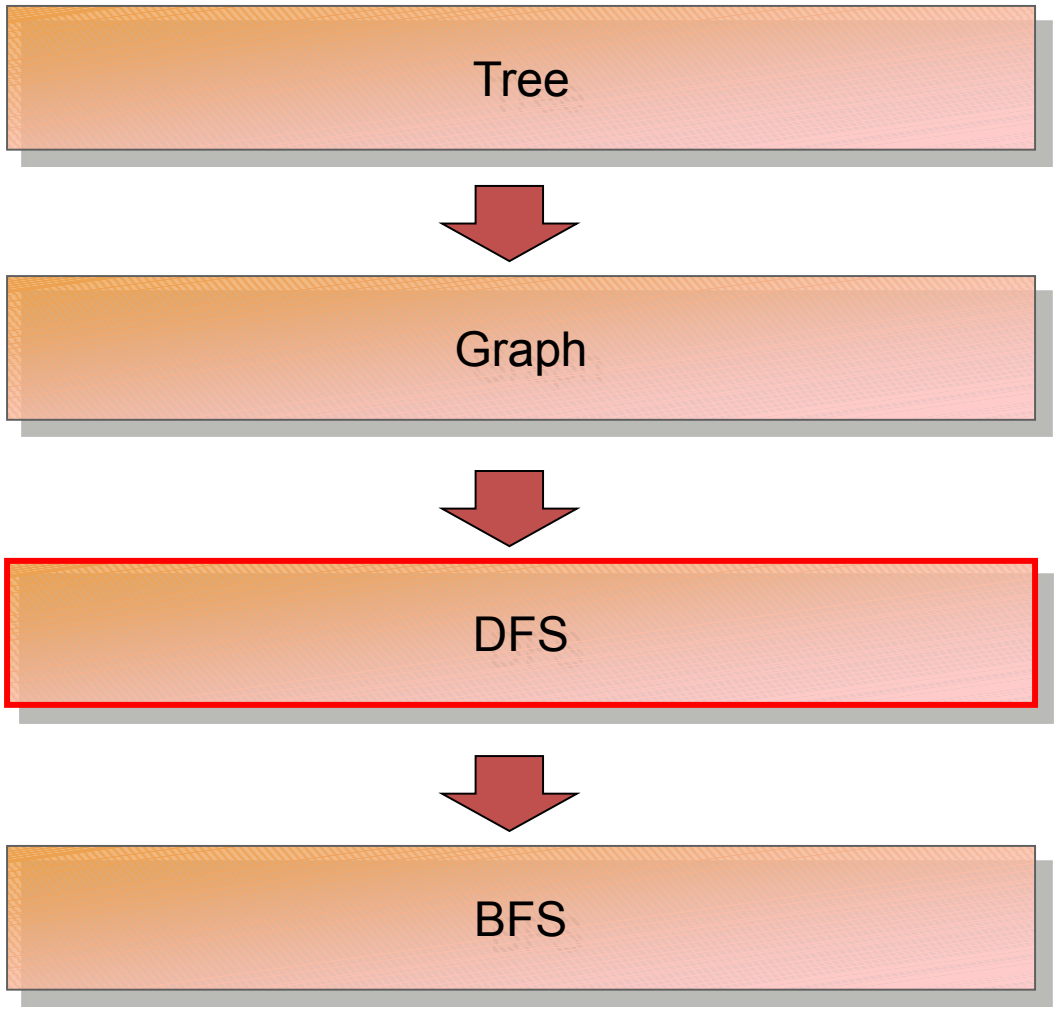
- Representation
  - adjacent matrix



G1

	1	2	3	4
1	0	1	1	1
2	1	0	1	1
3	1	1	0	1
4	1	1	1	0

Outline



DFS

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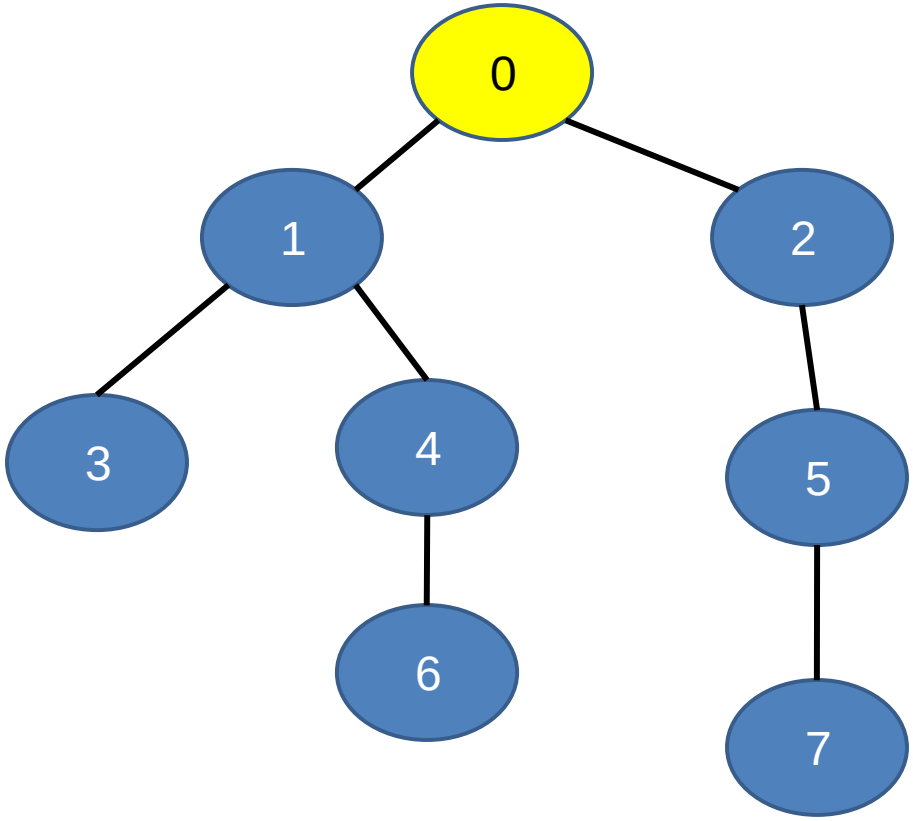
DFS

(D)epth (F)irst (S)earch

Stack

DFS



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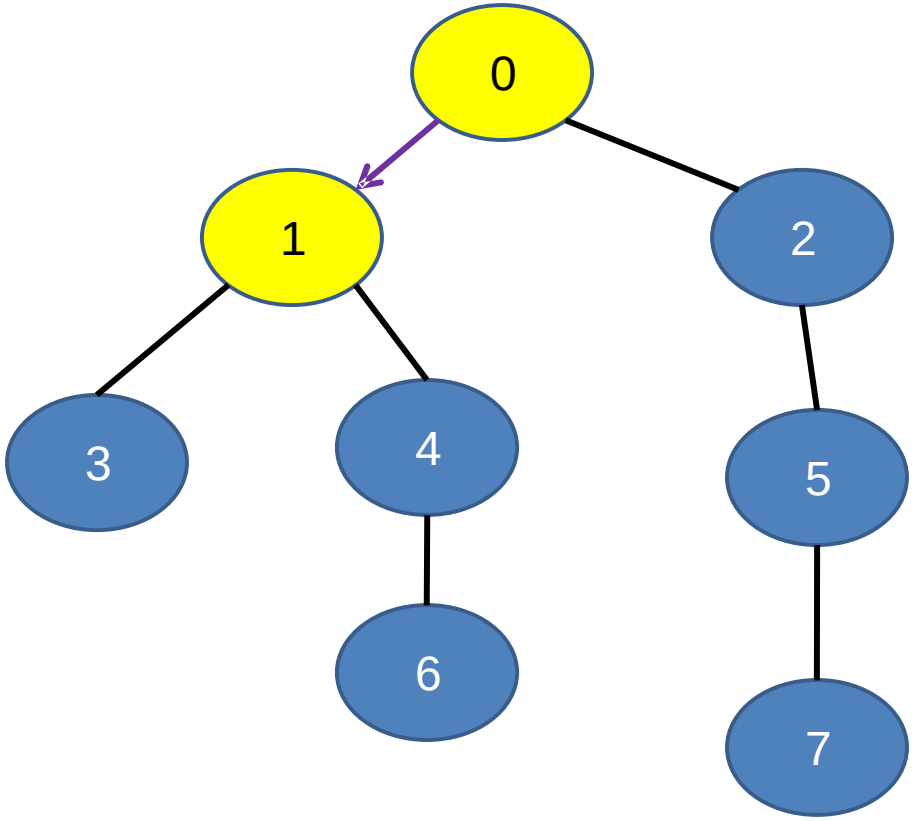

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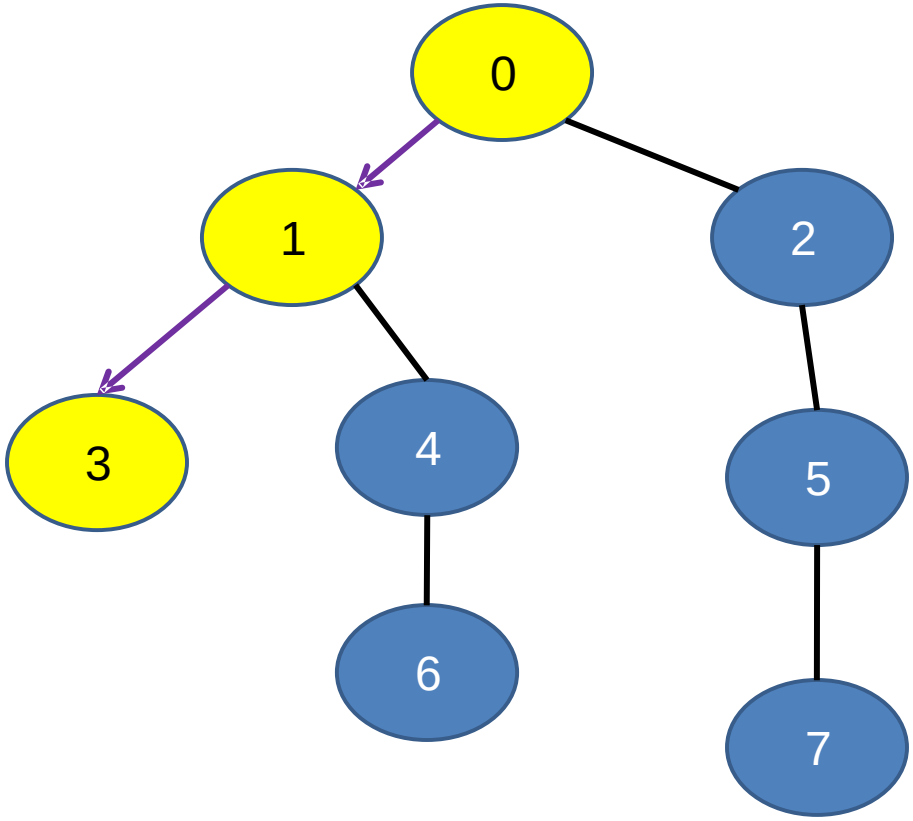

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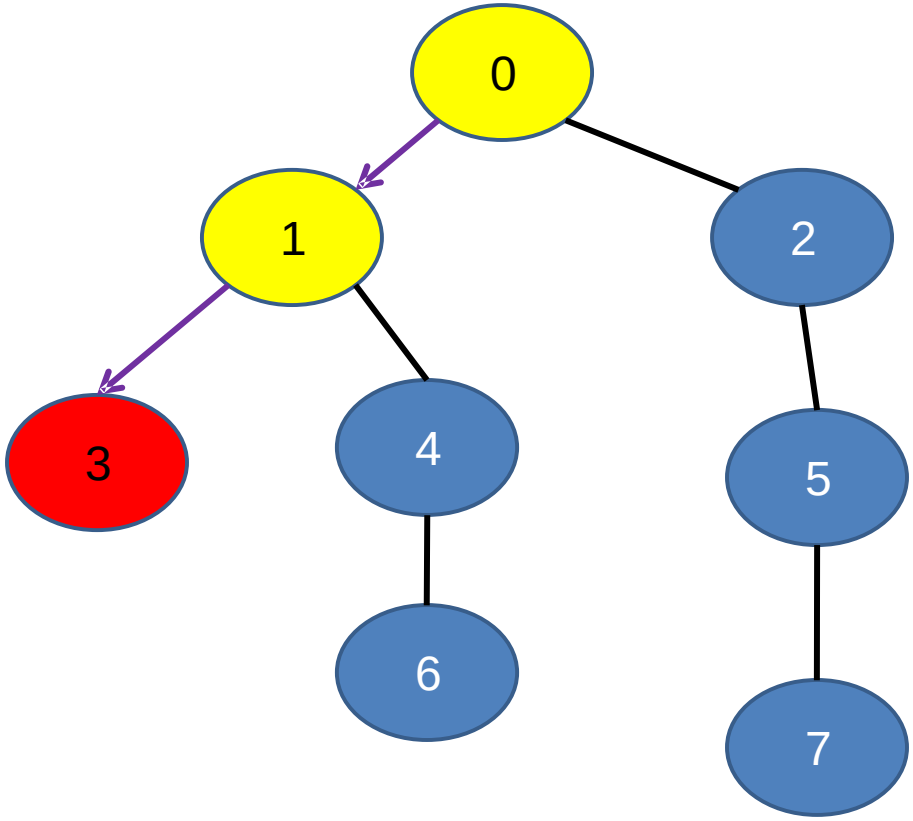

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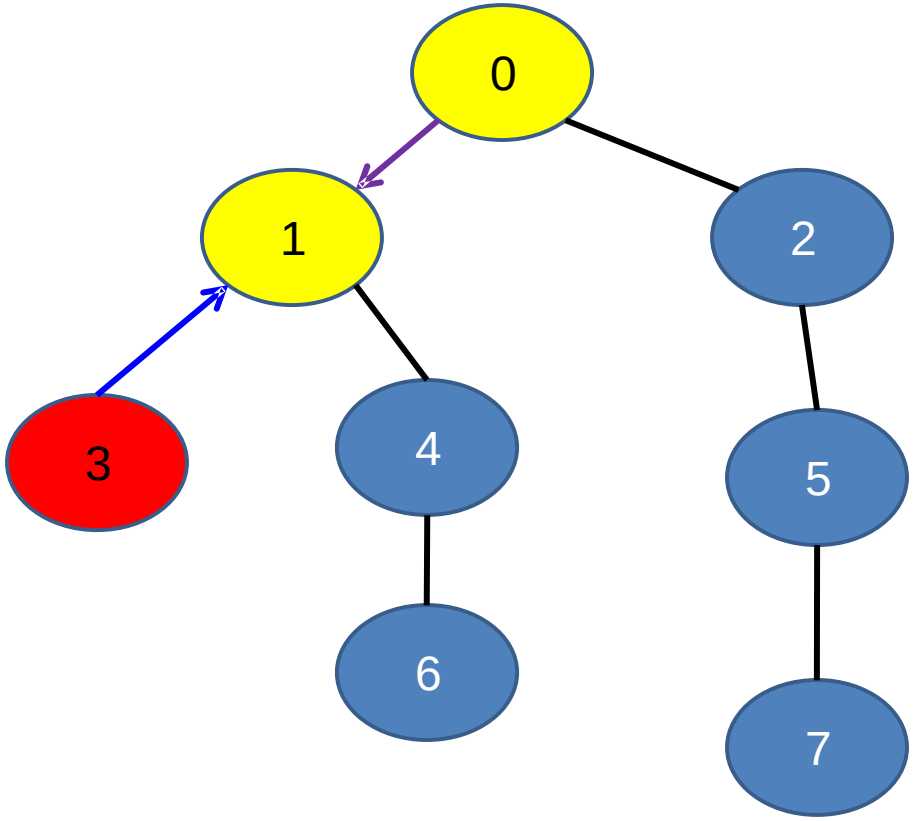

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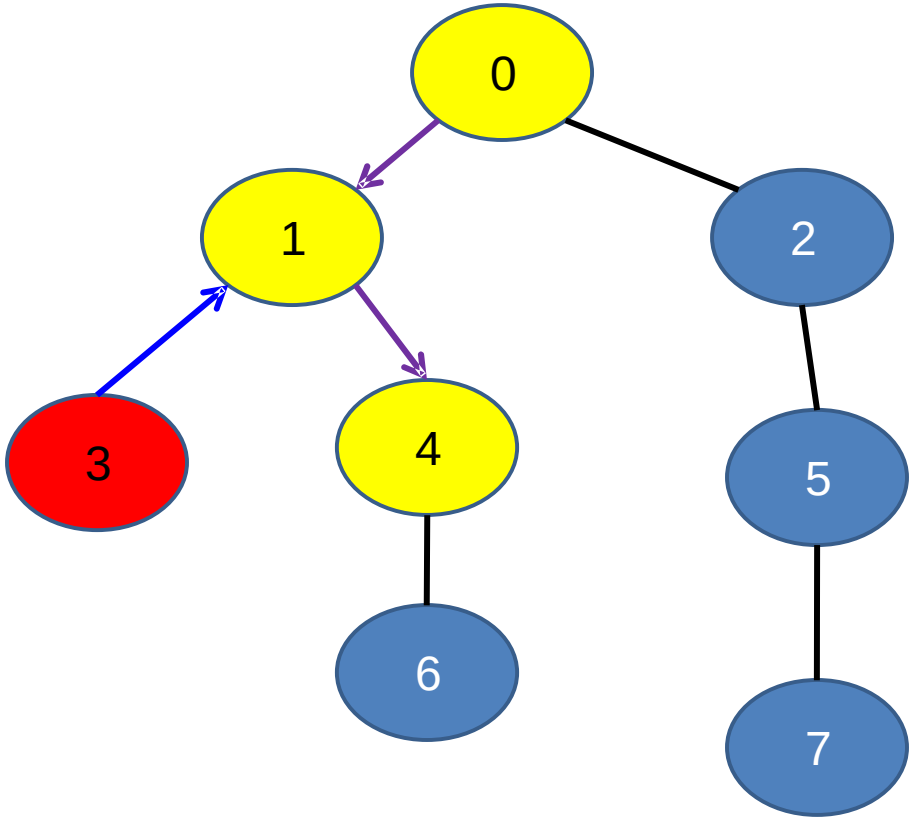

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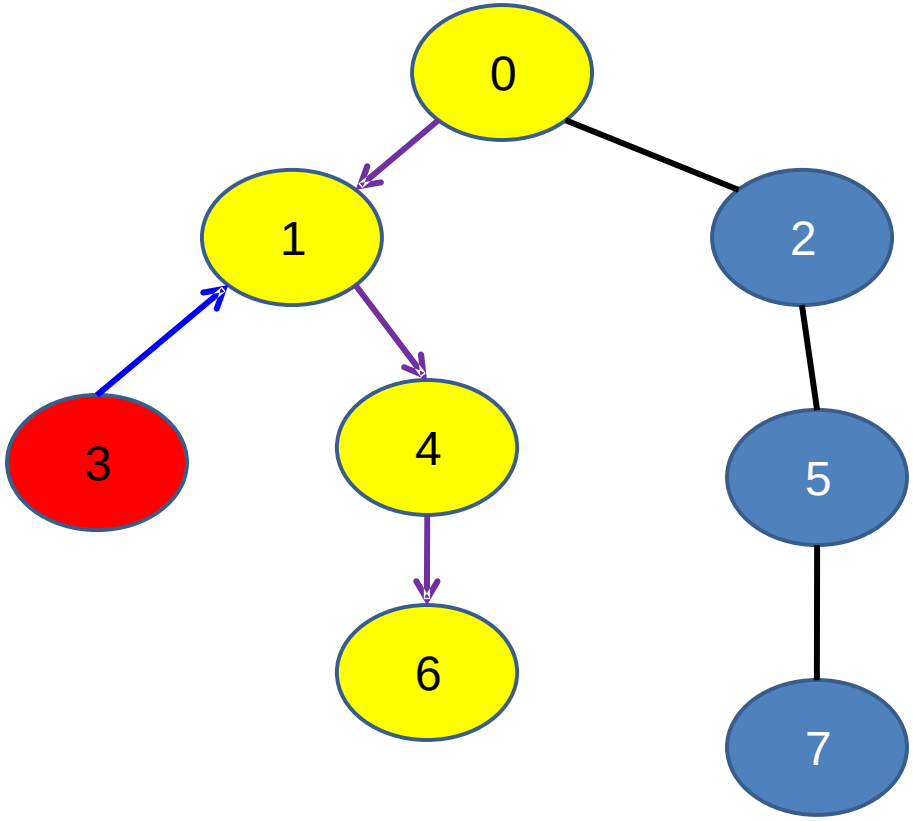

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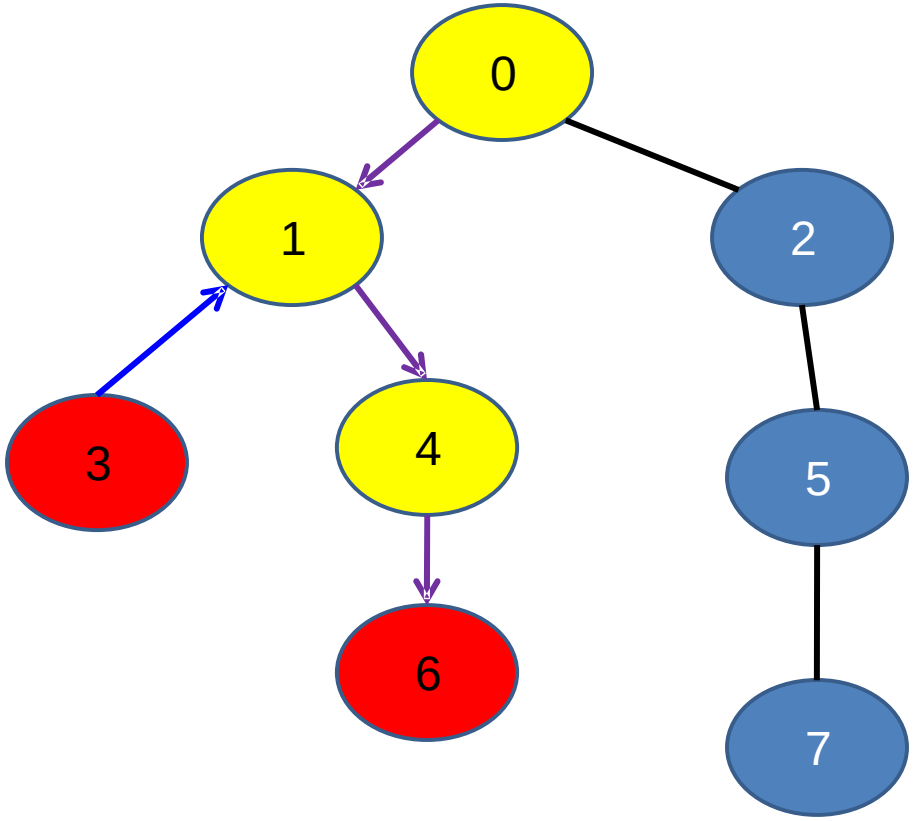

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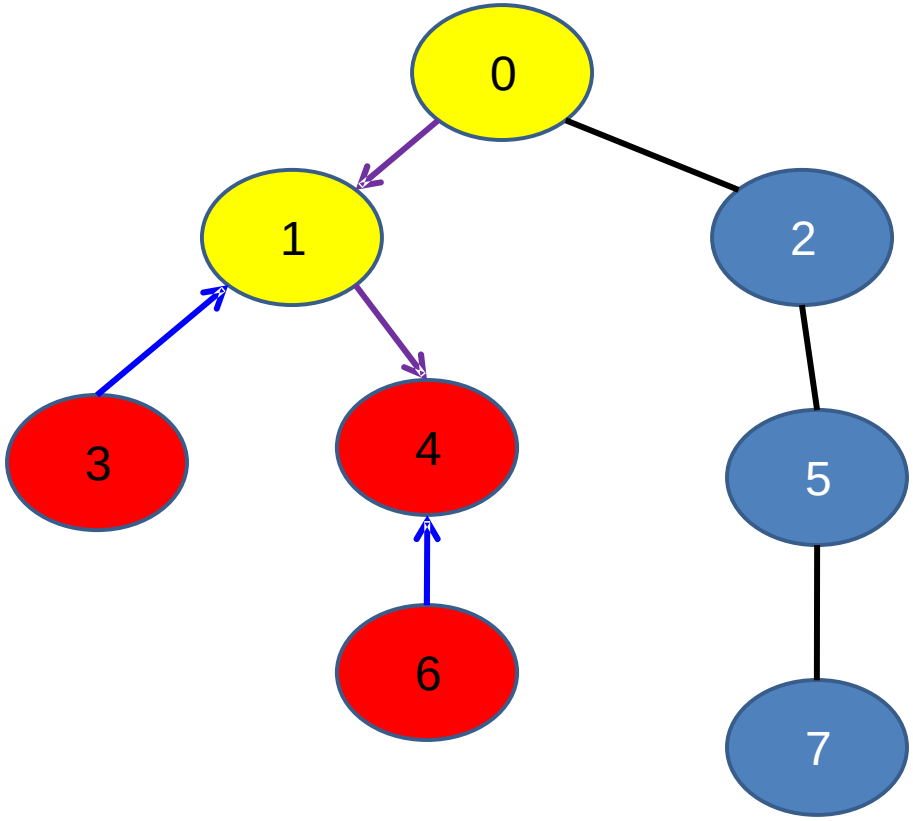

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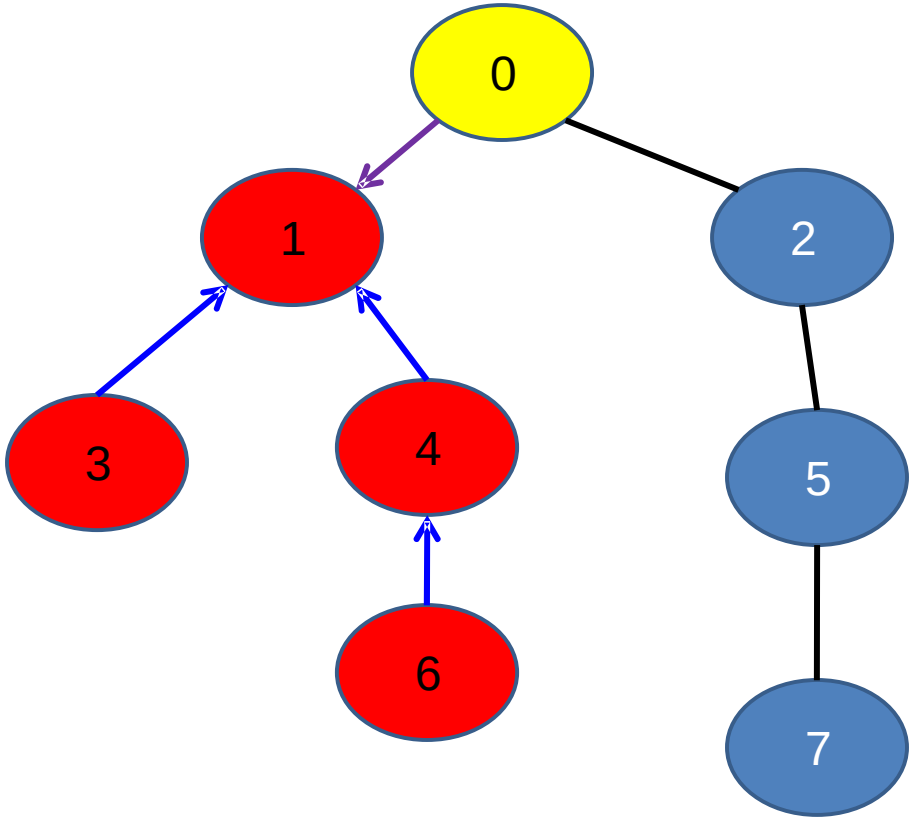

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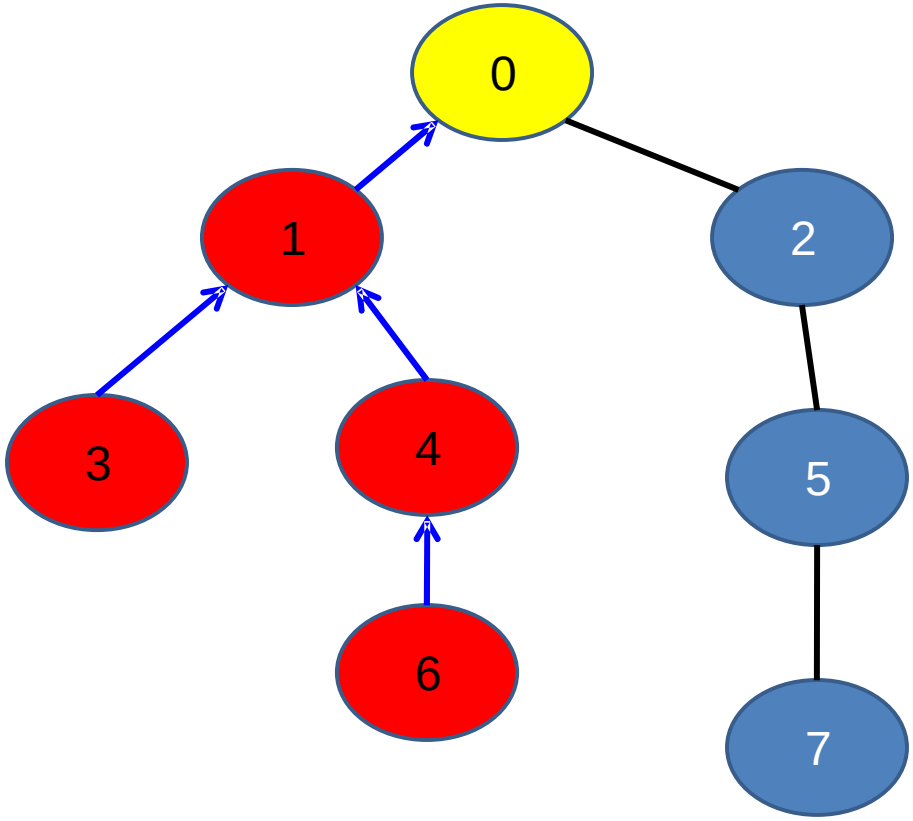

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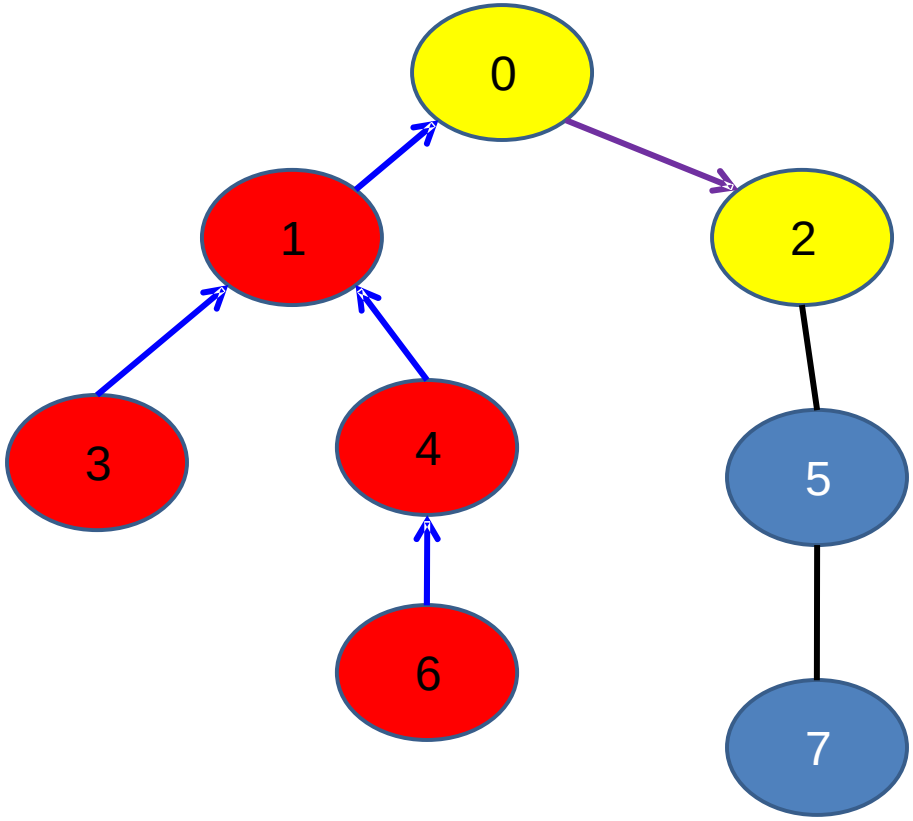

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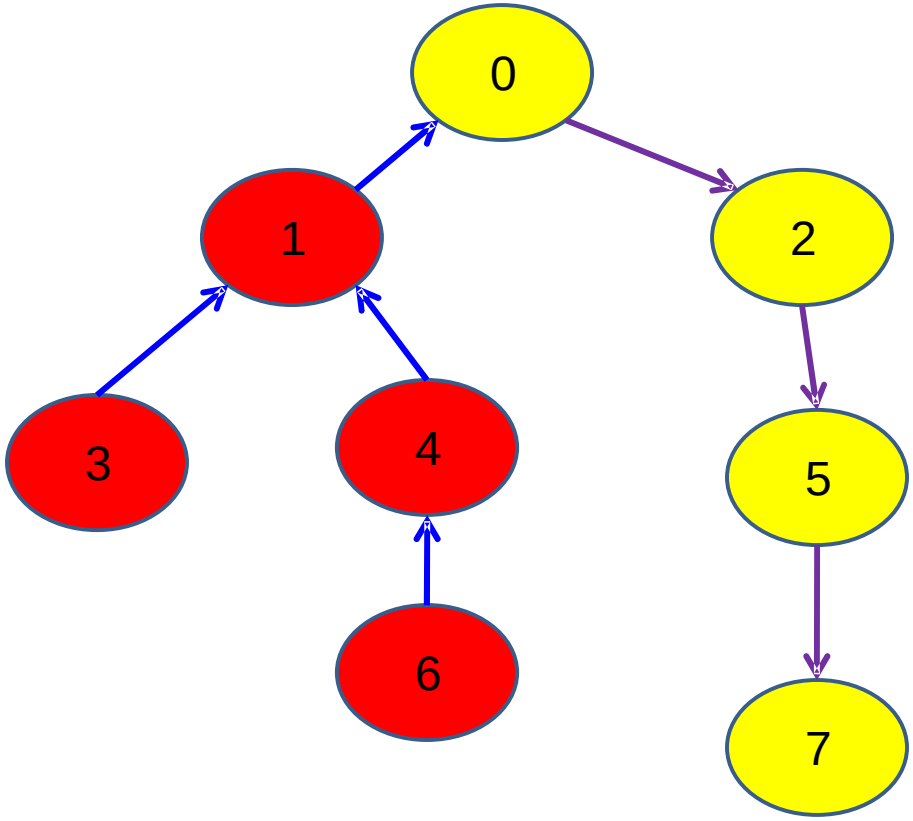

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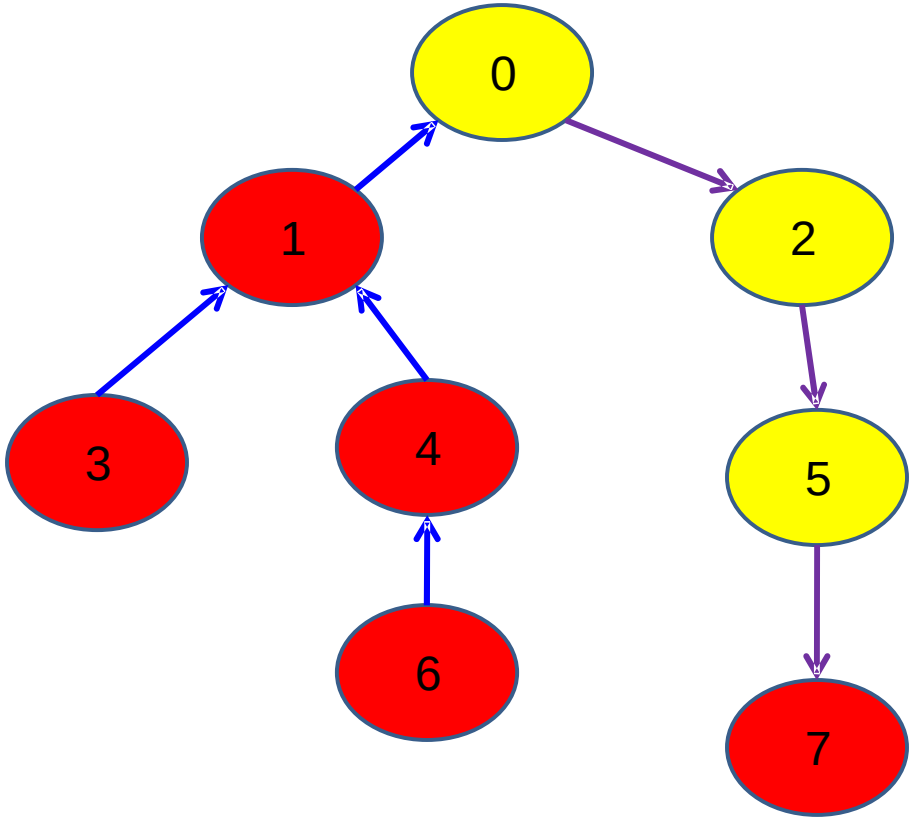

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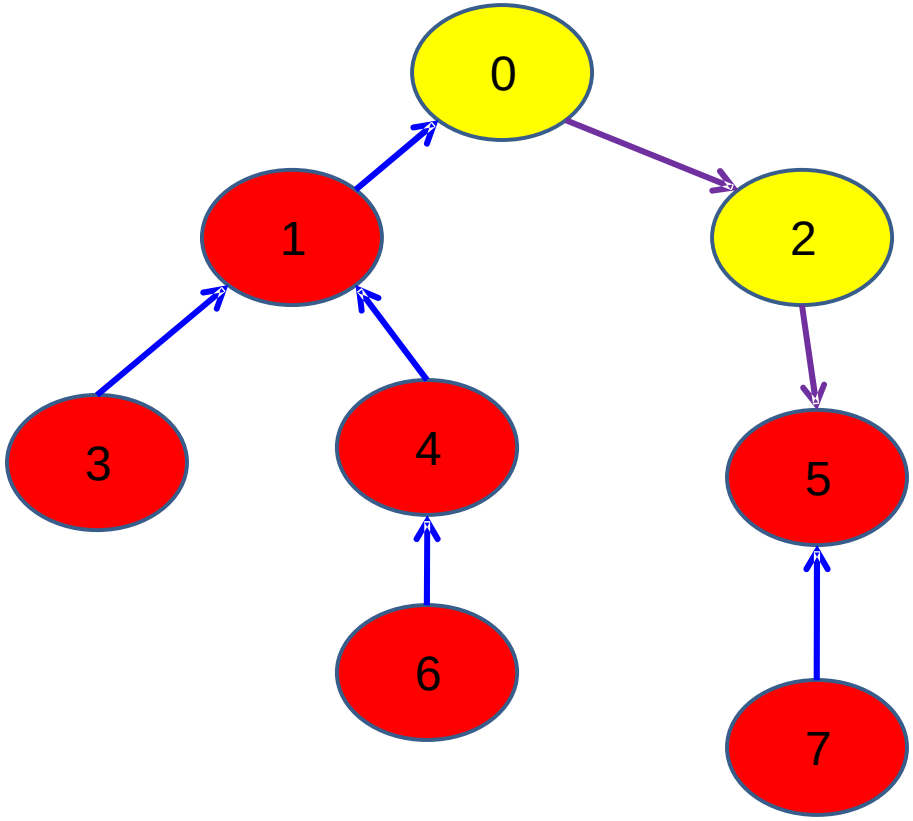

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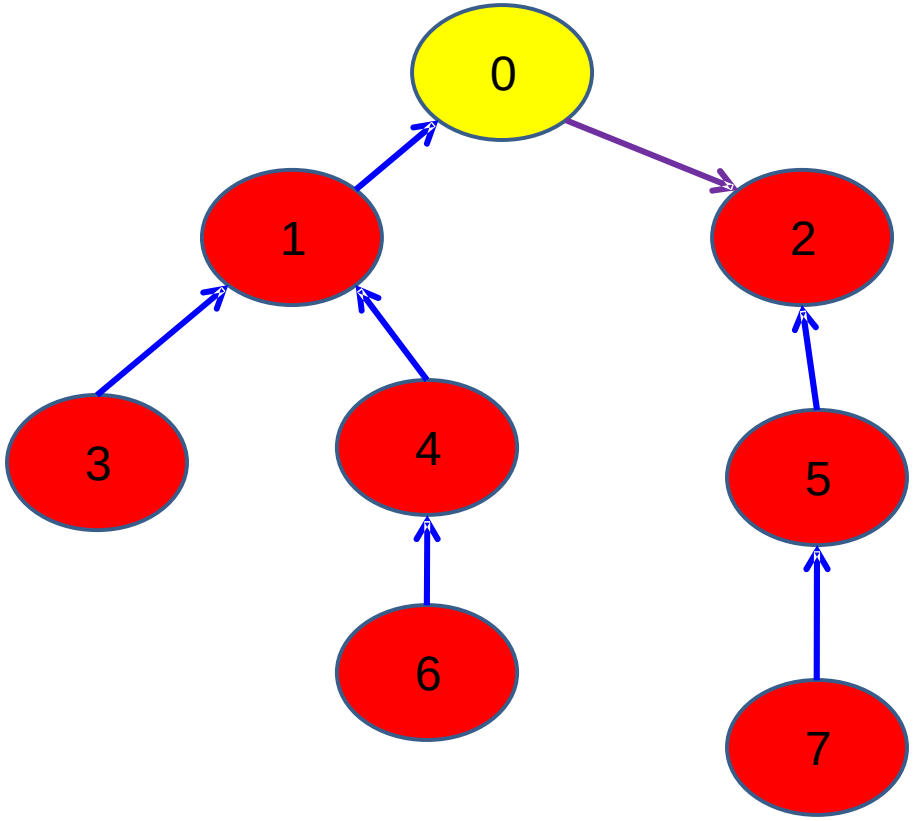

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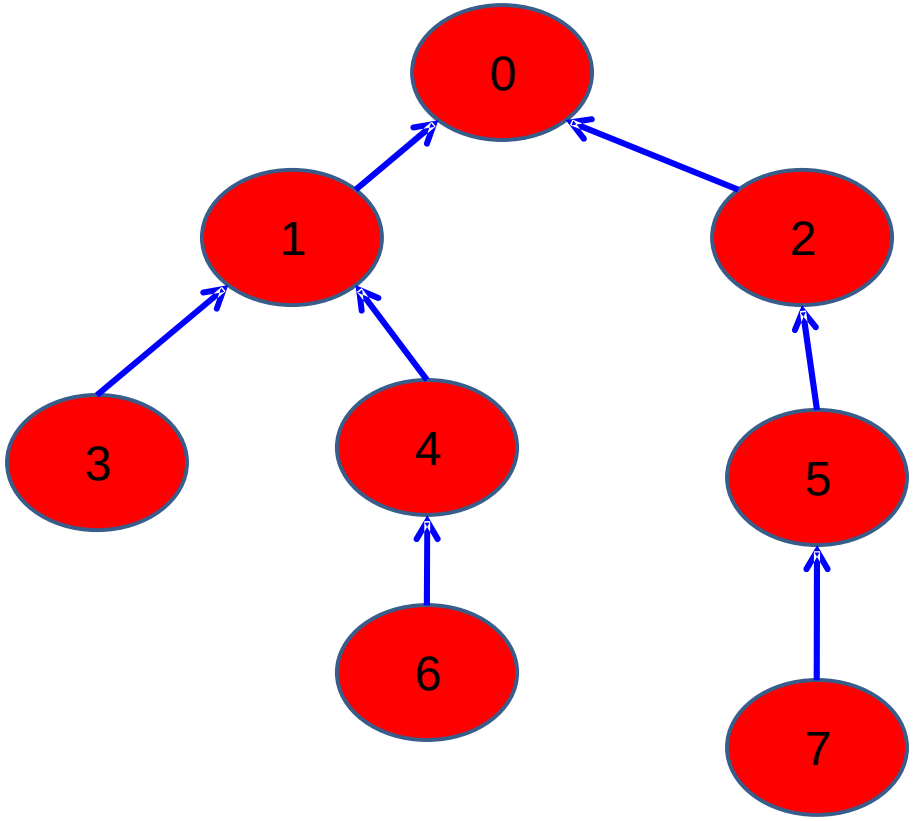

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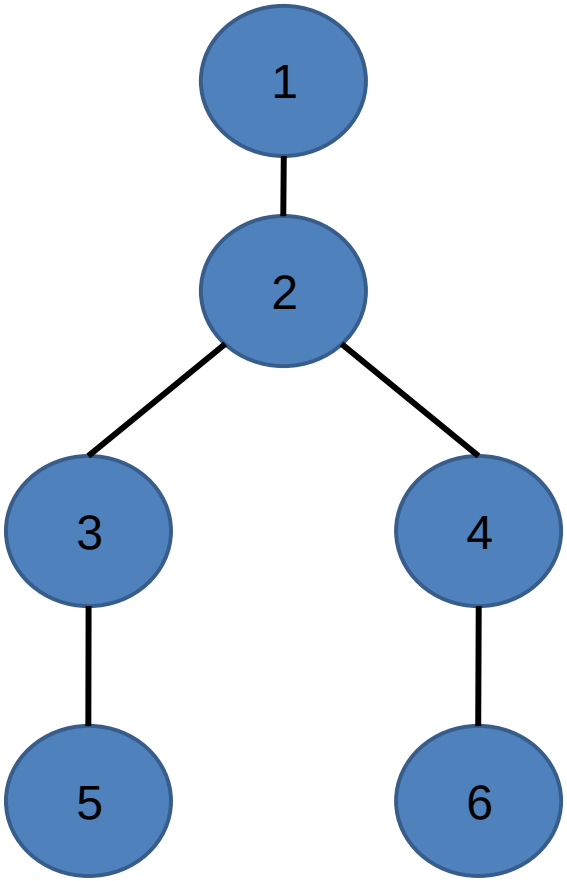

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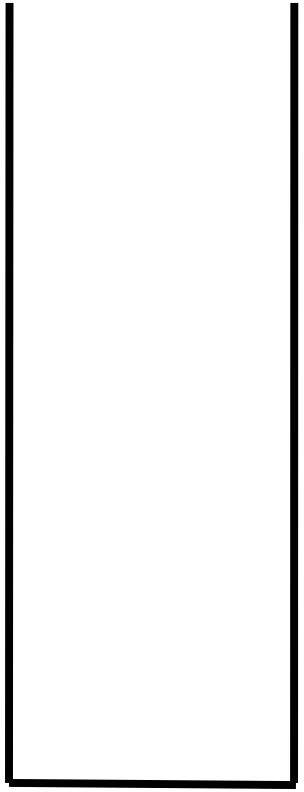

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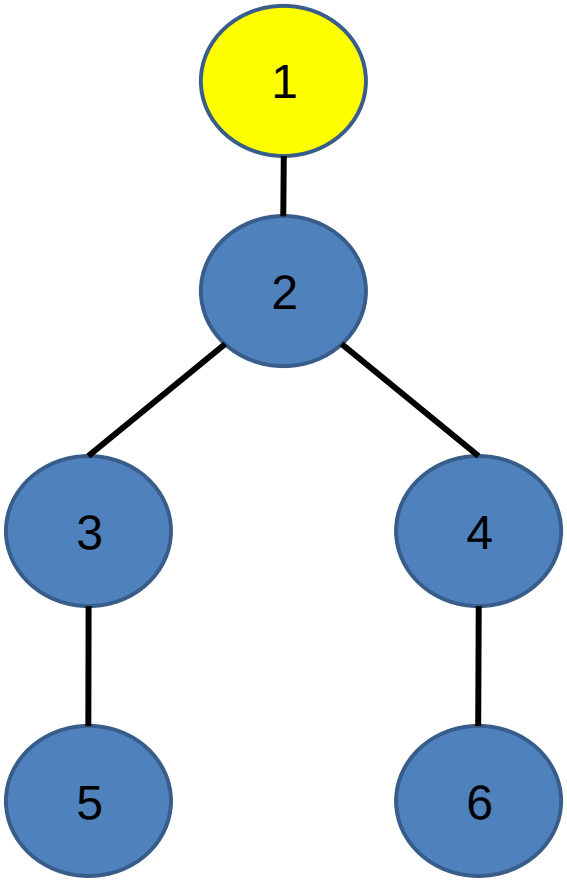

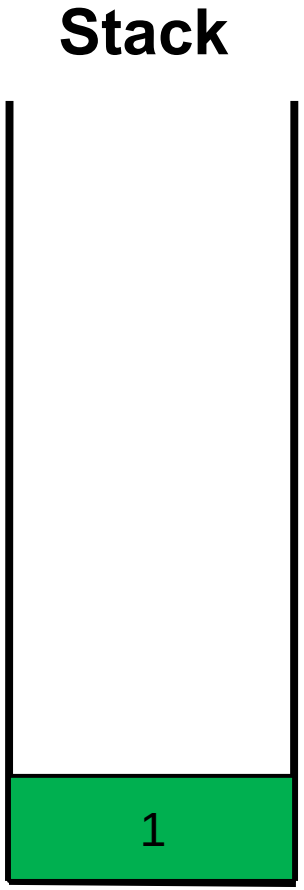

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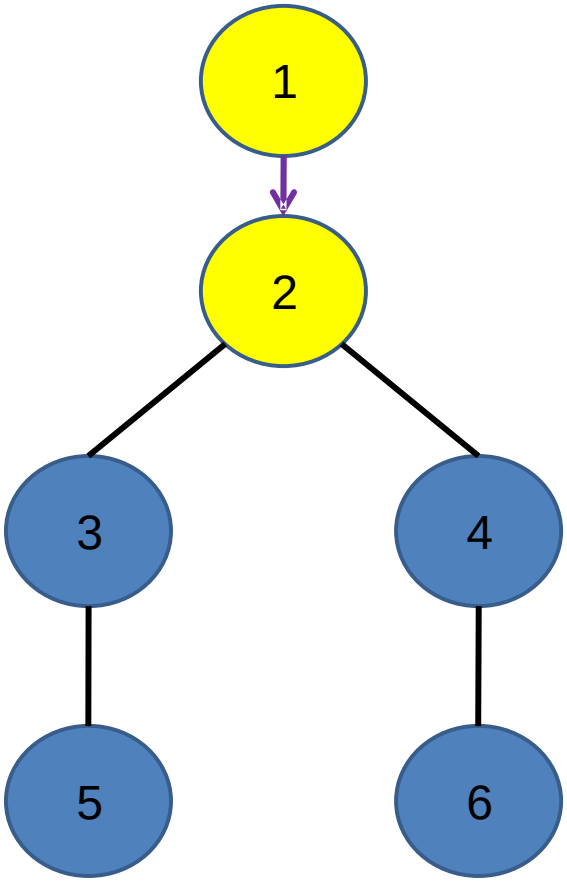

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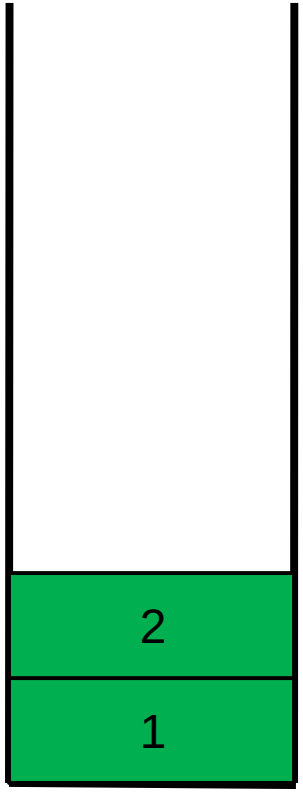

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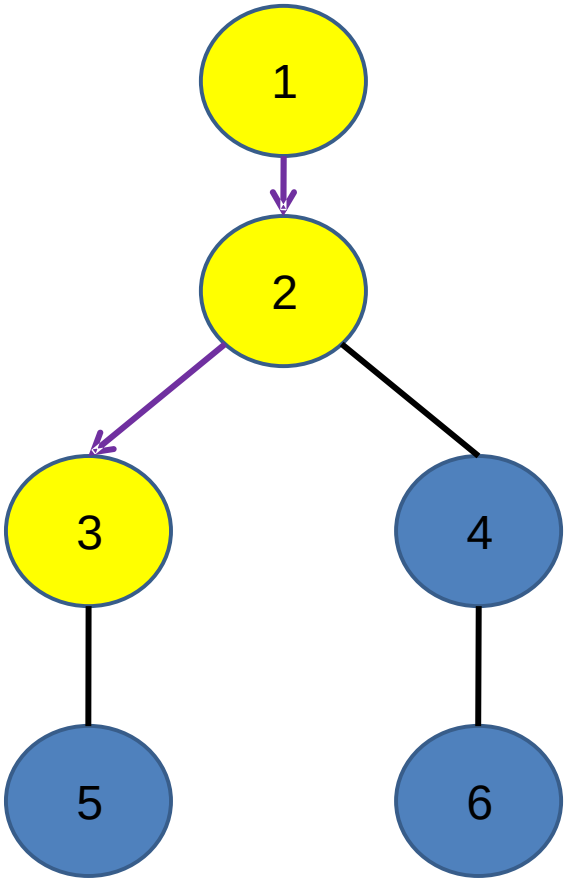

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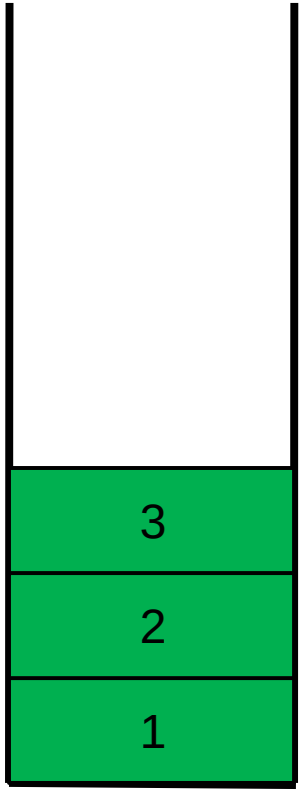

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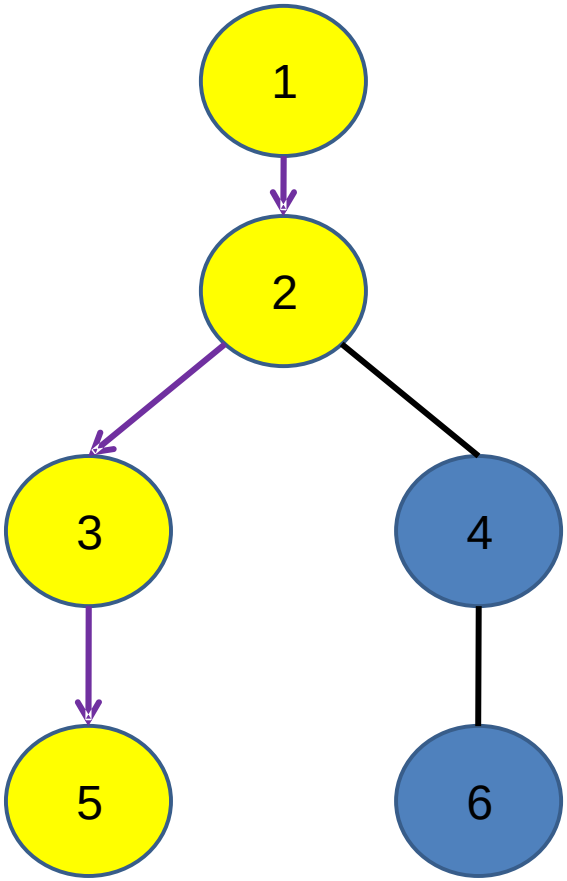

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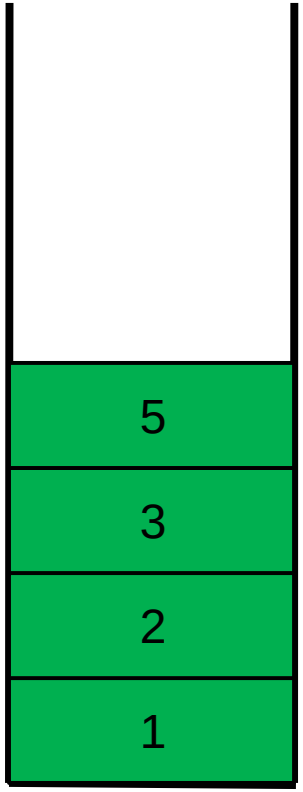

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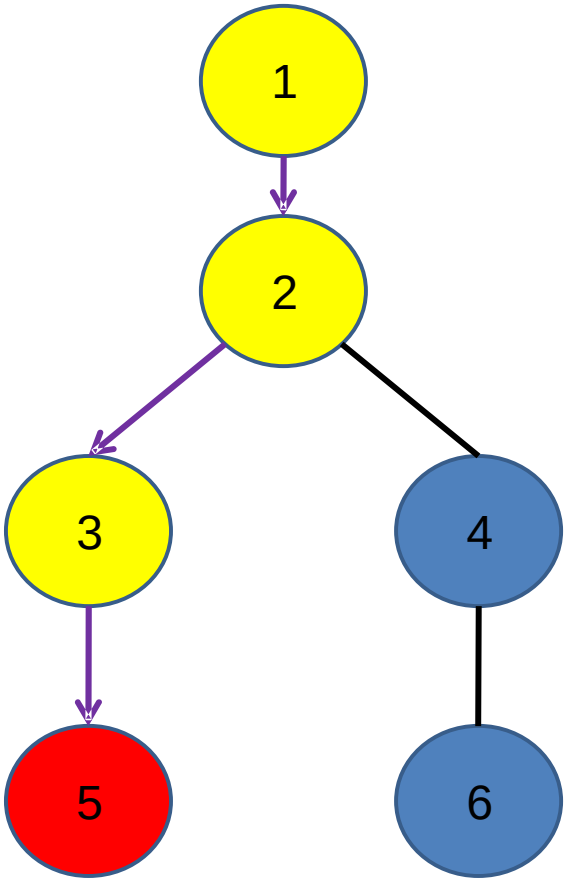

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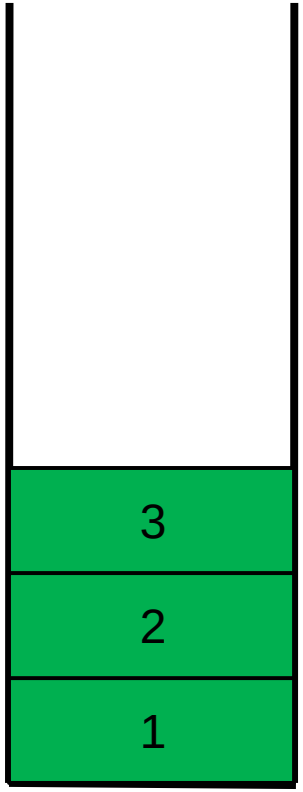

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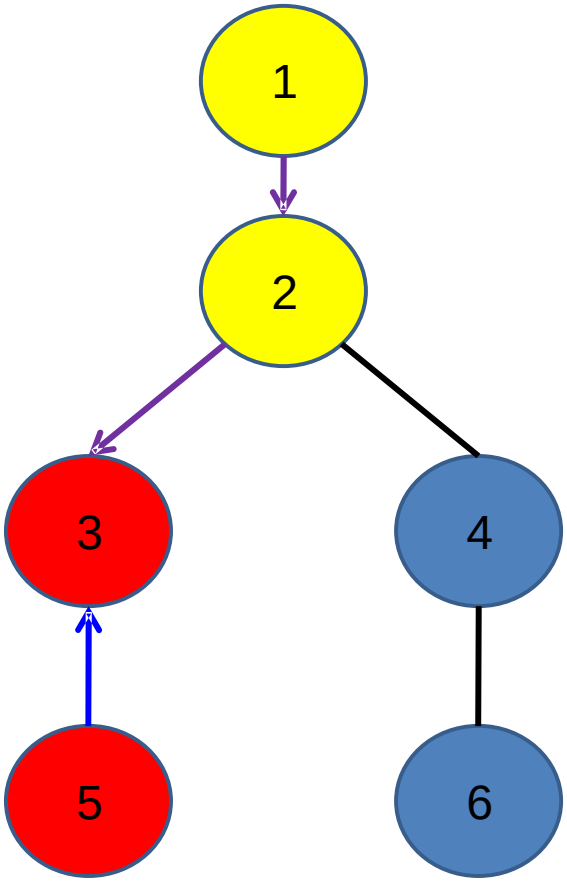

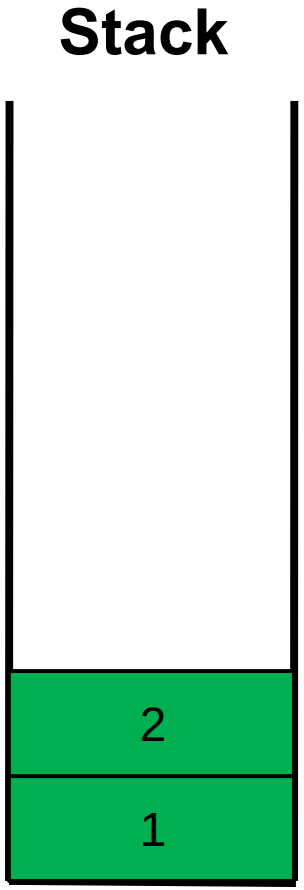

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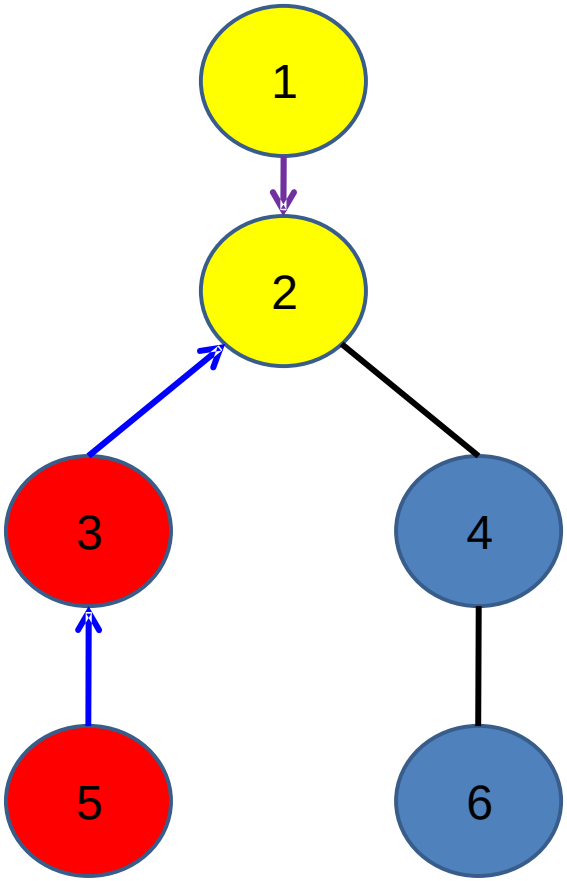

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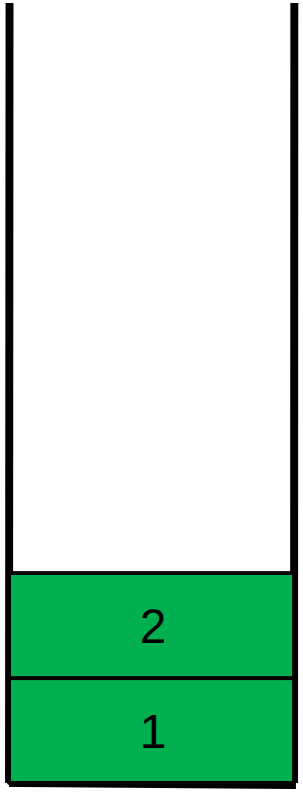

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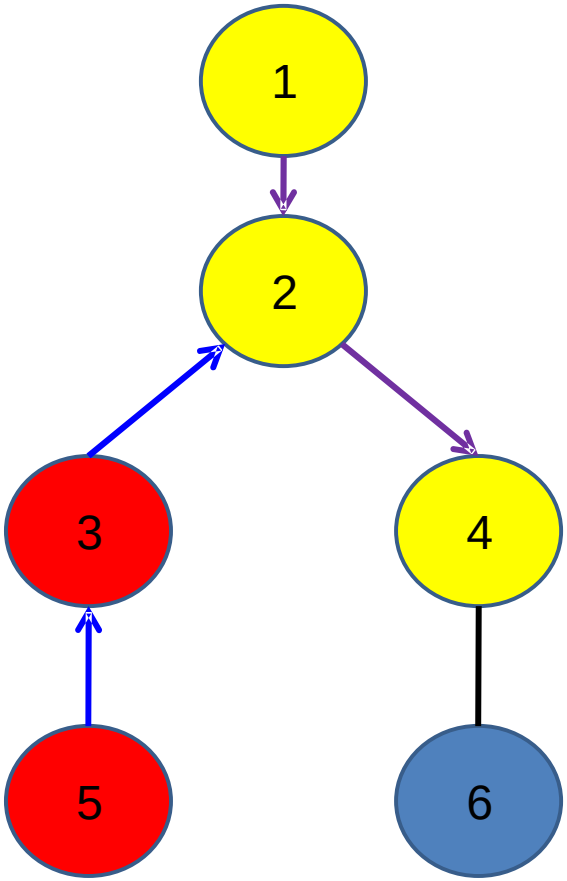

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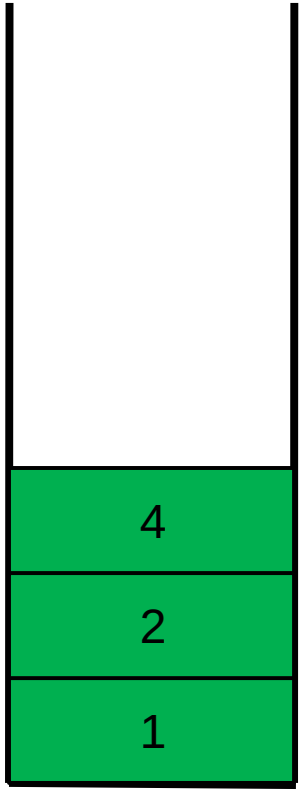
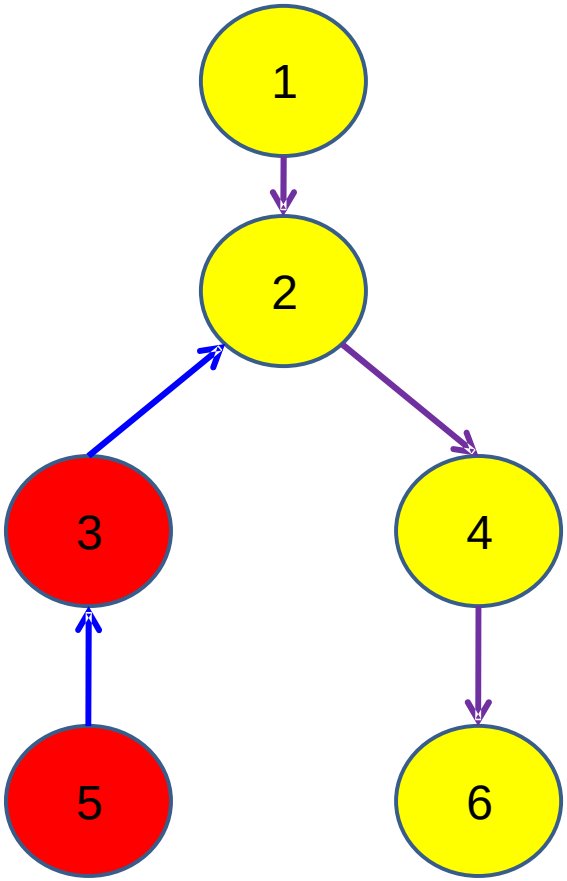
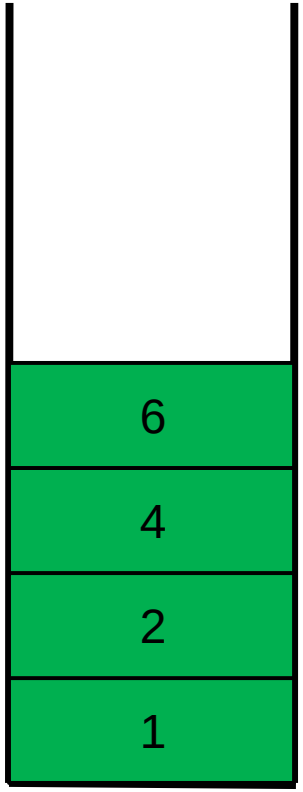


DFS



Stack



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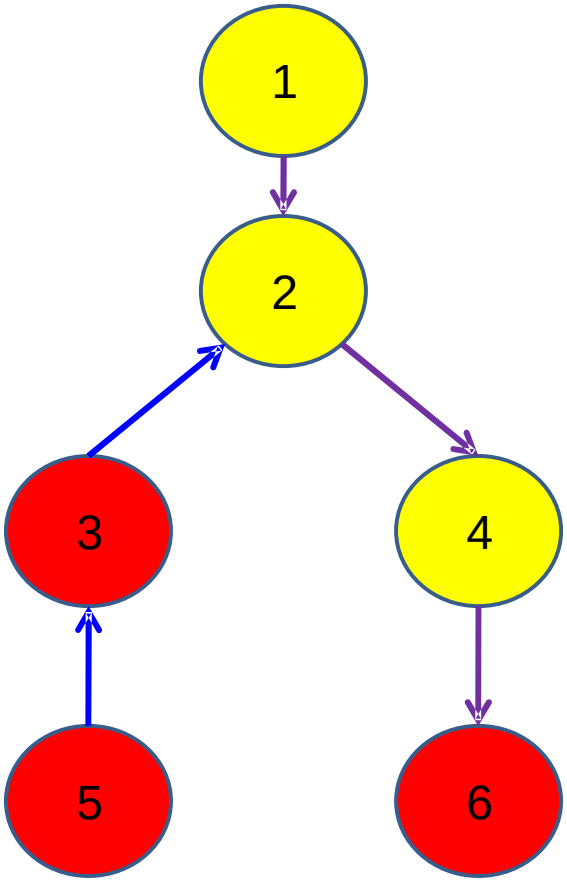
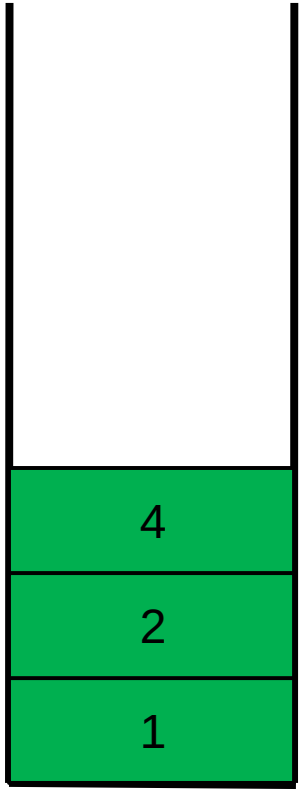
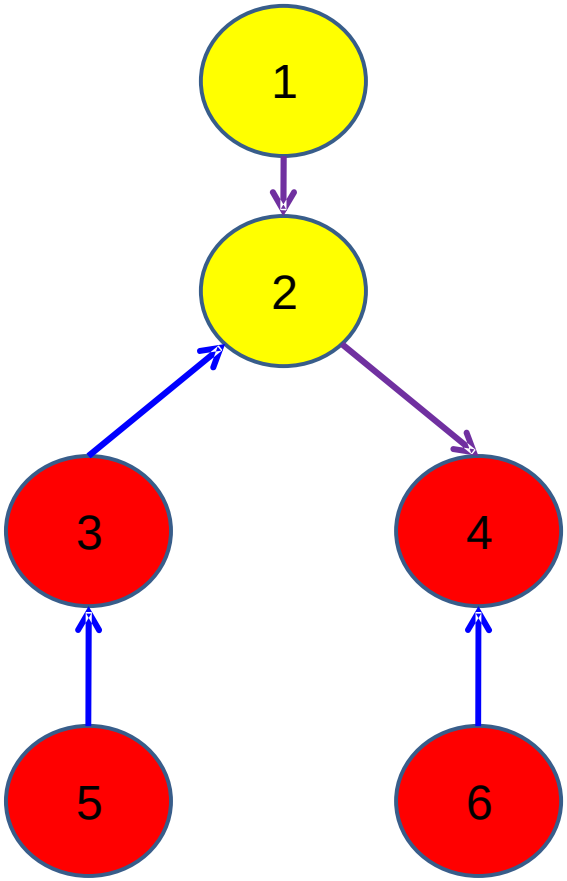
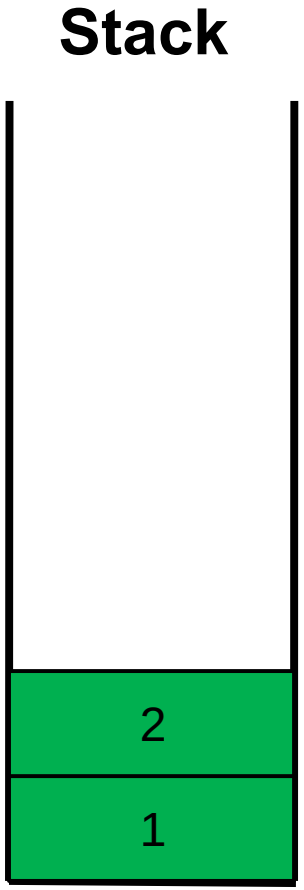


Stack



DFS





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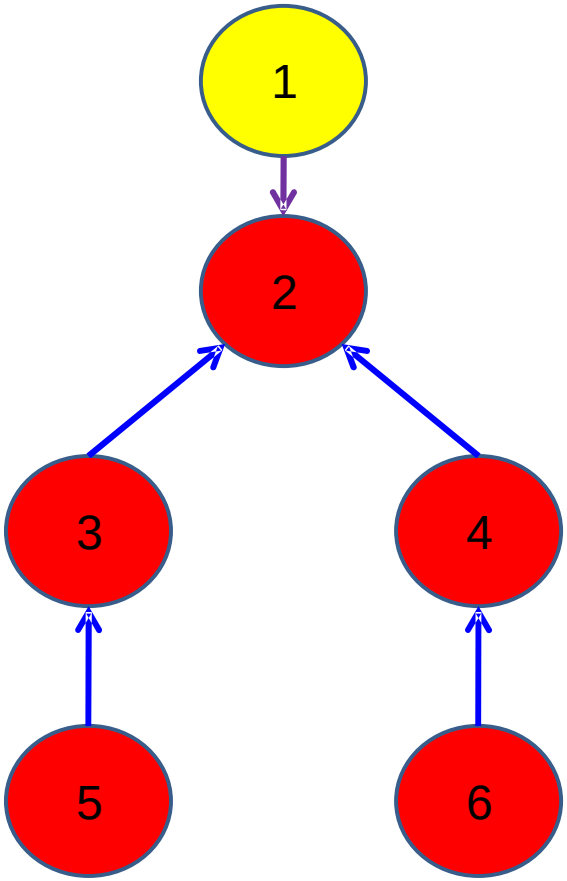

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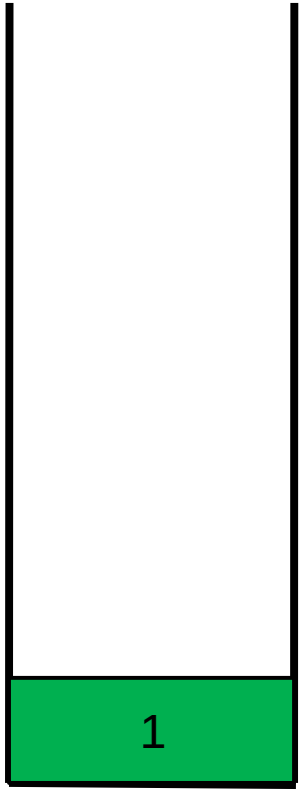

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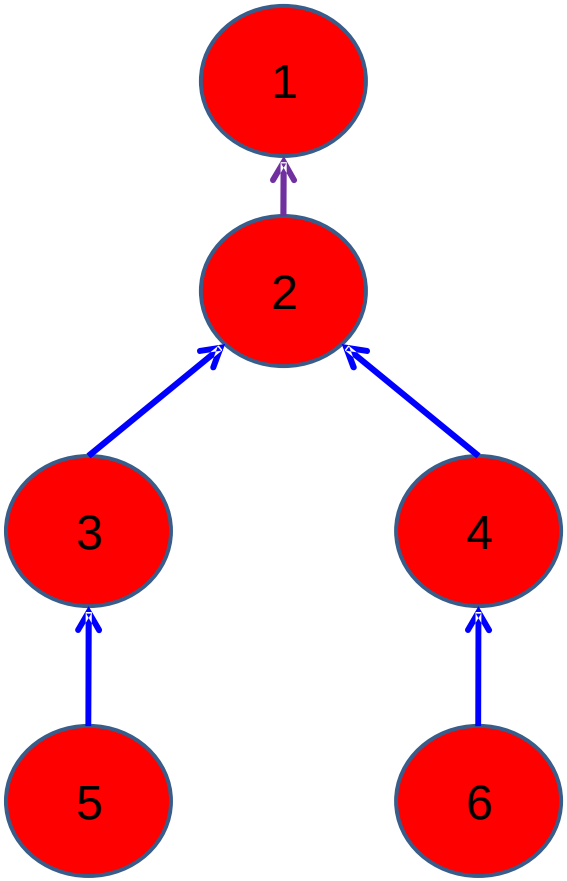


Stack

DFS

- Sourse Code(adjacency list)

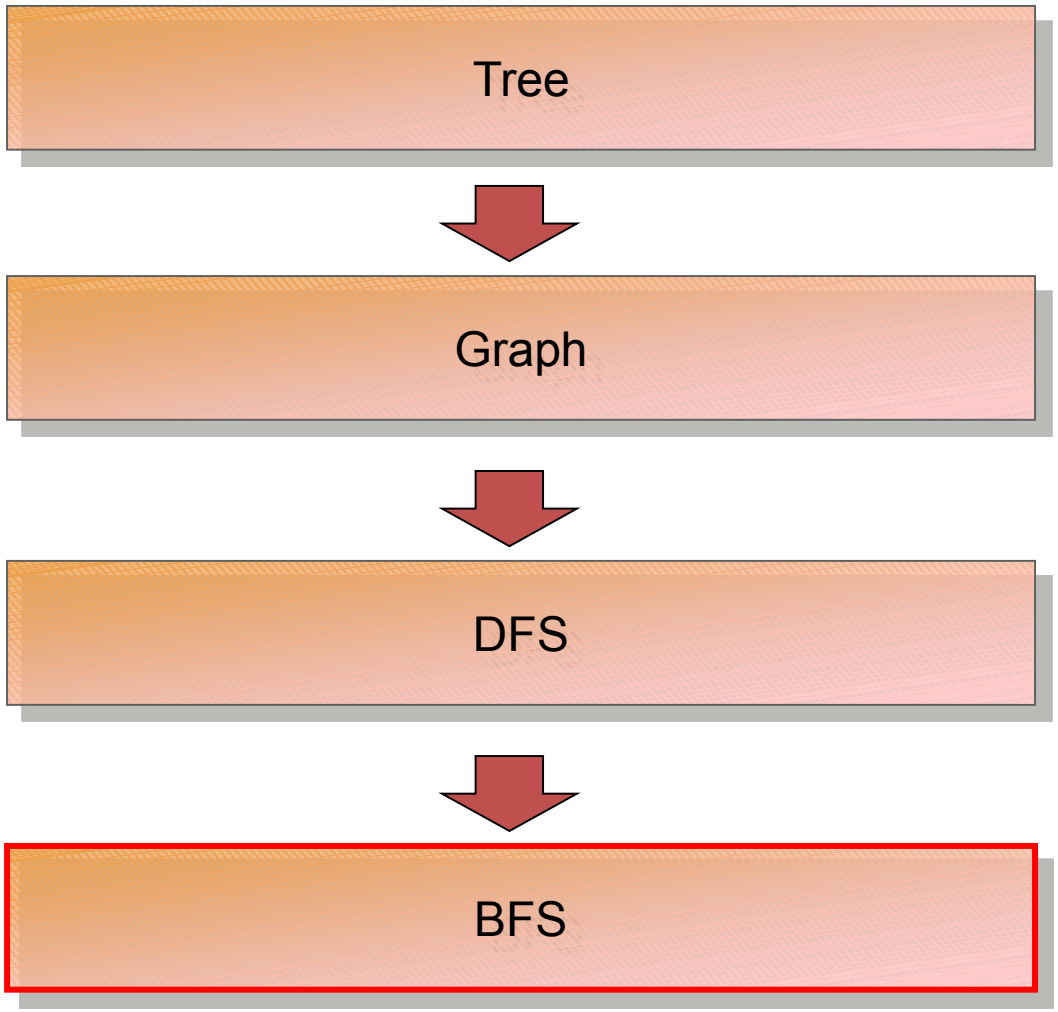
```
void DFS(int cur)
{
    vis[cur]=true;

    for(int i=0;i<adj[cur].size();i++)
    {
        int next=adj[cur][i];
        if(!vis[next])
            DFS(next);
    }
    return;
}
```

DFS

- Practice

[UVA-352] The Seasonal War

Outline



BFS

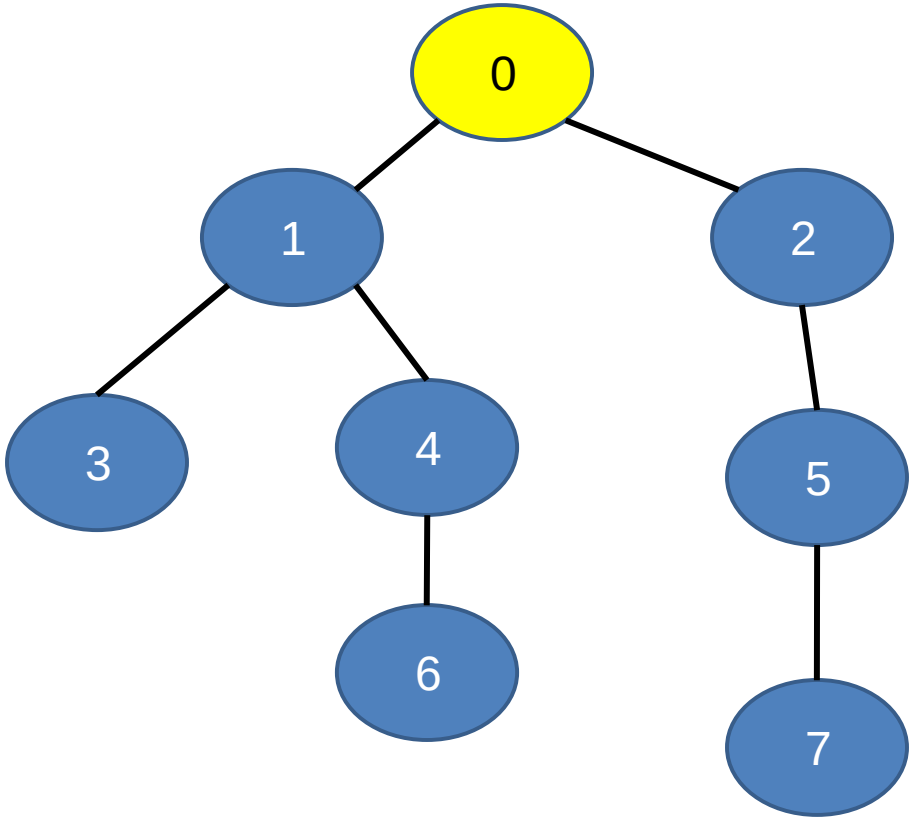
(B)readth-(F)irst-(S)earch

BFS

(B)readth-(F)irst-(S)earch

Queue

BFS



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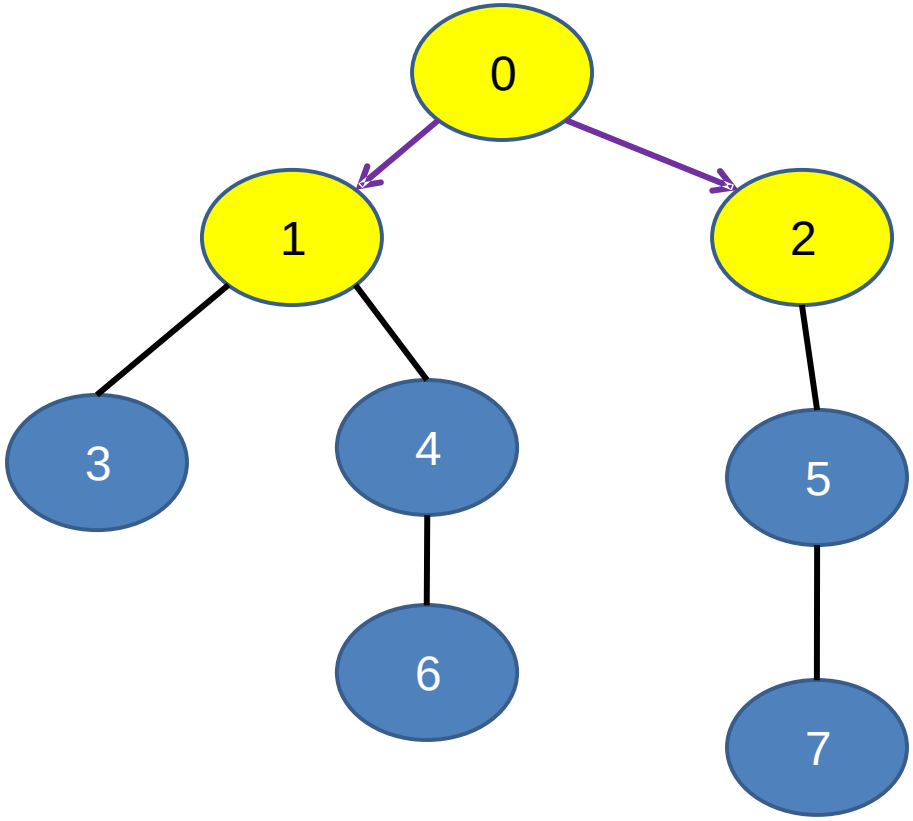

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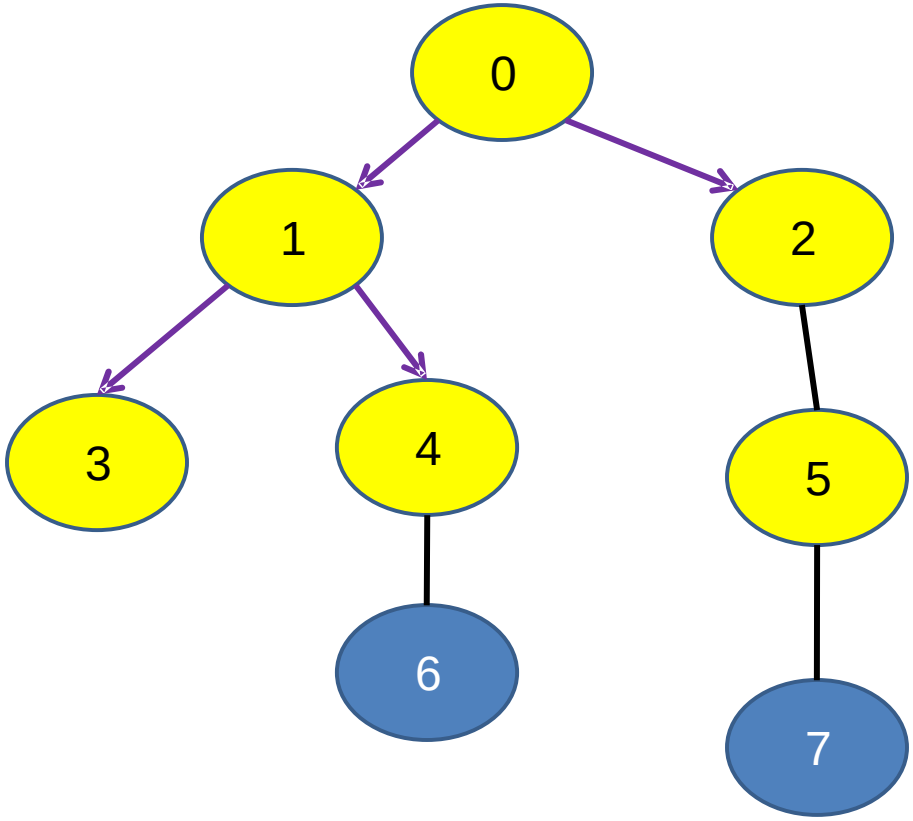

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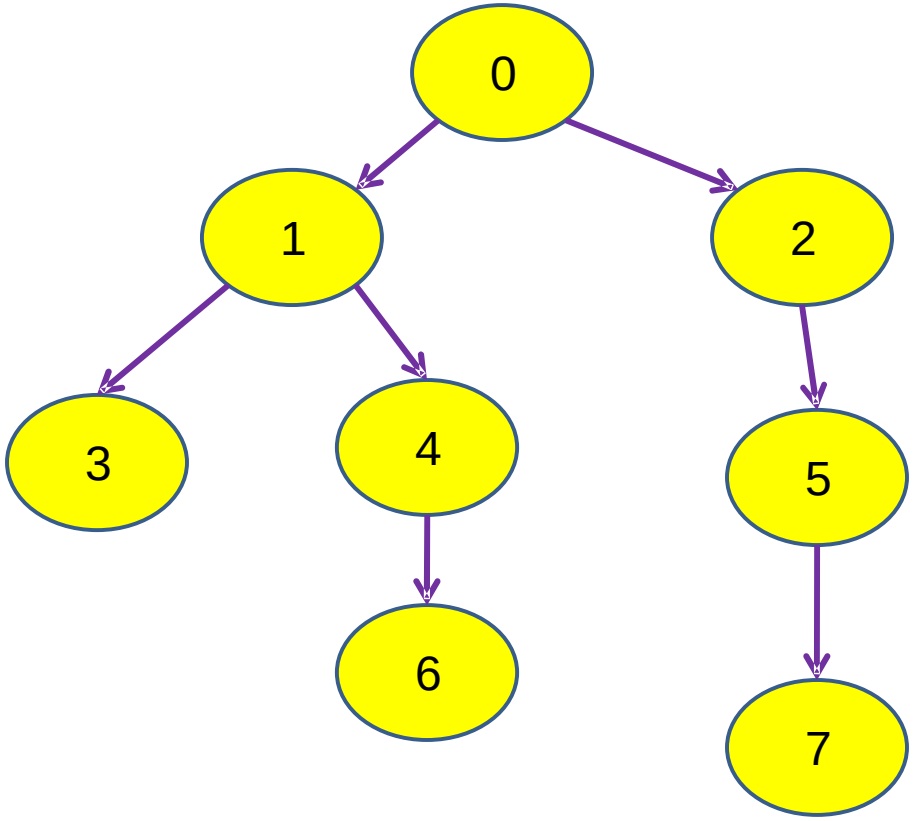

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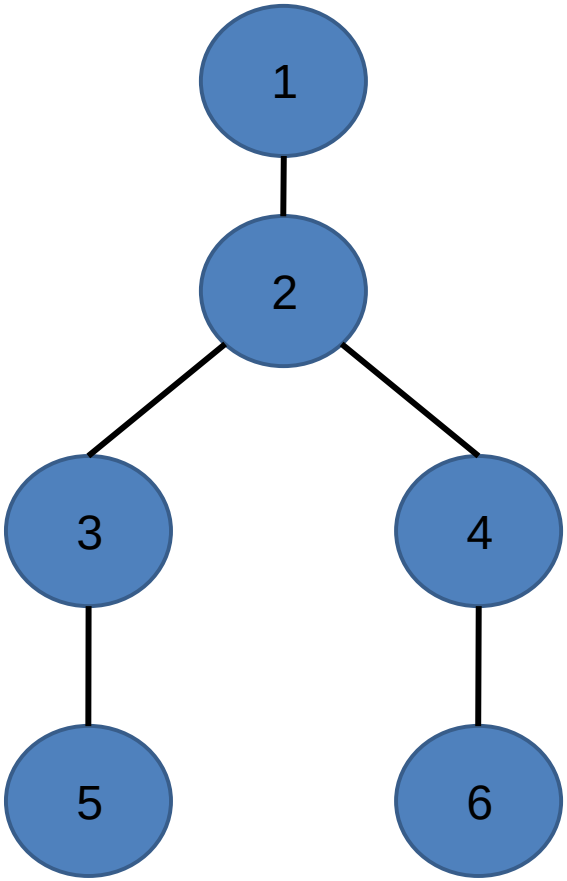
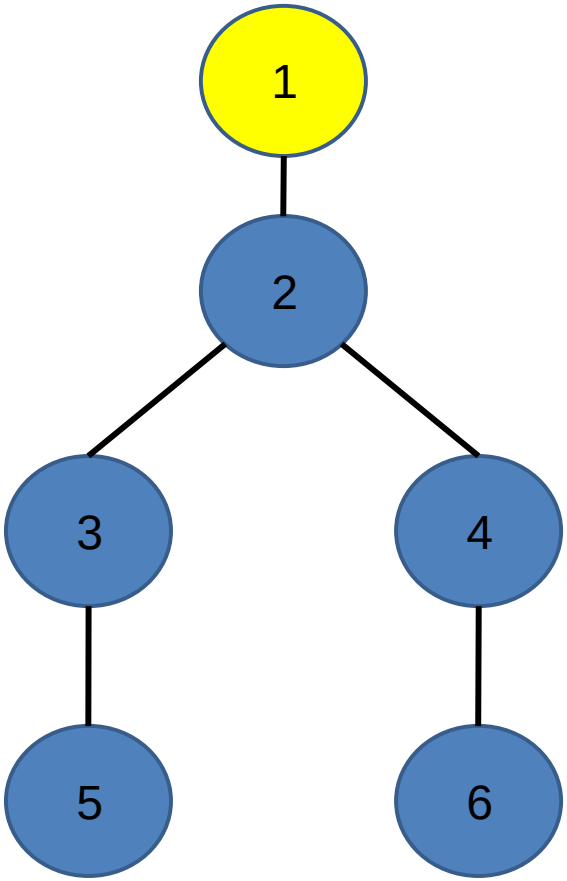


Queue

BFS



Queue

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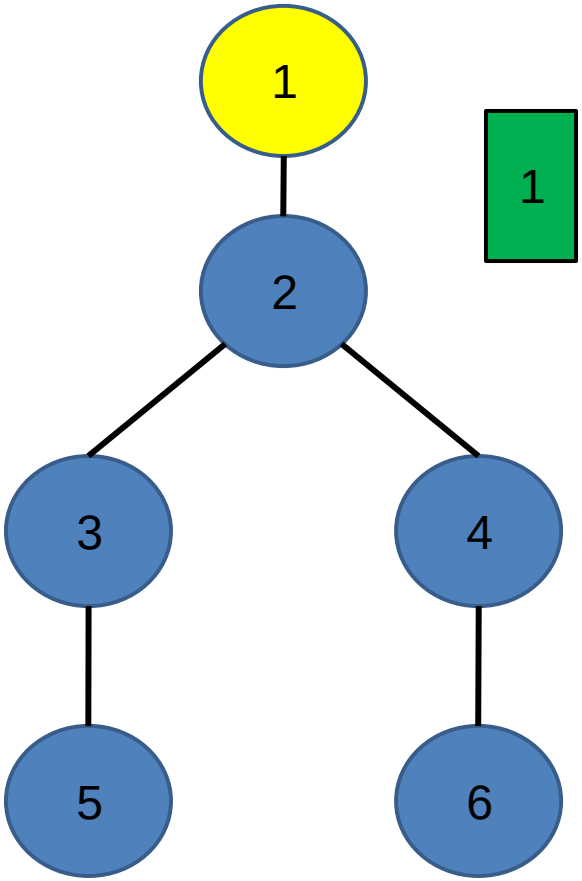

Queue

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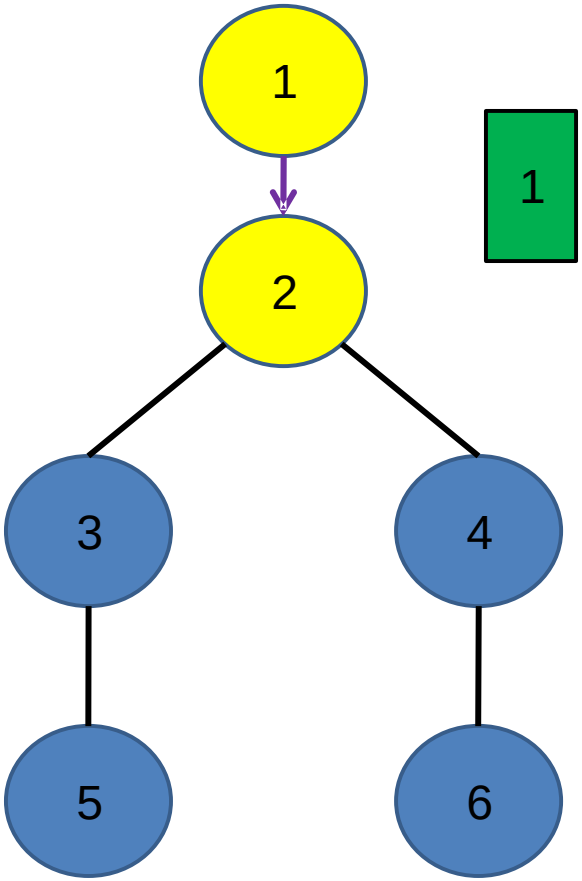

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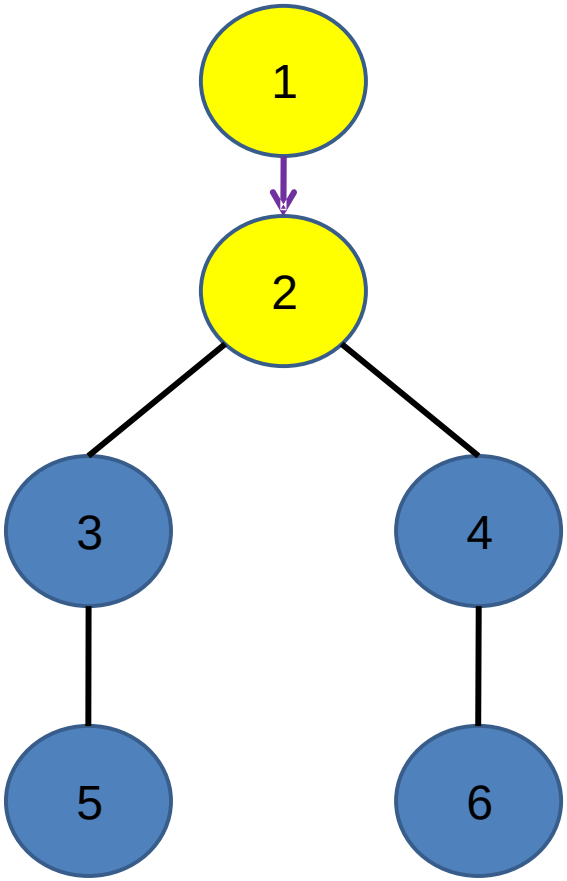
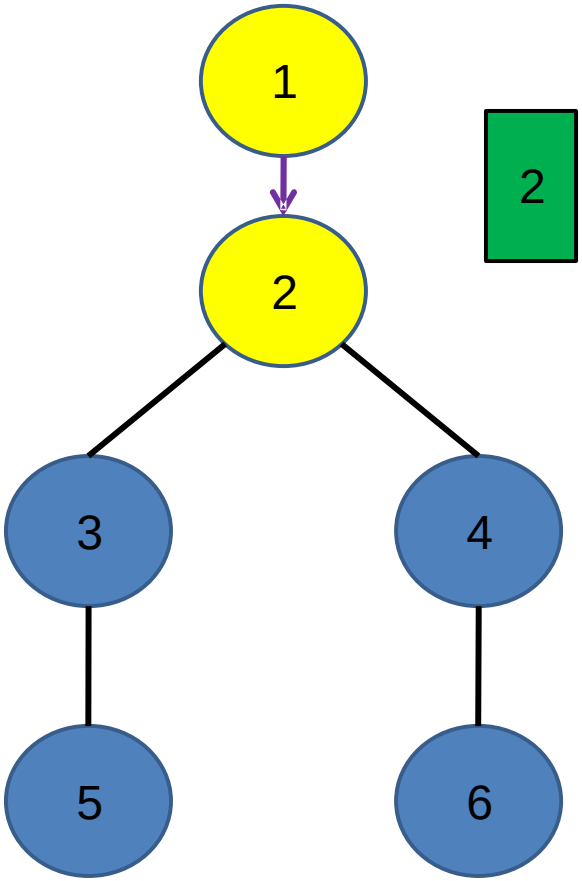


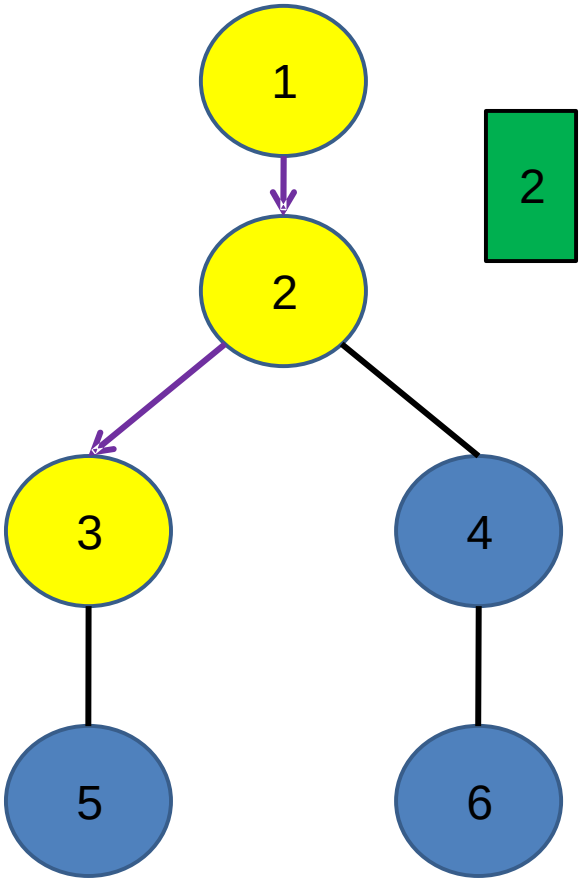
Queue

BFS



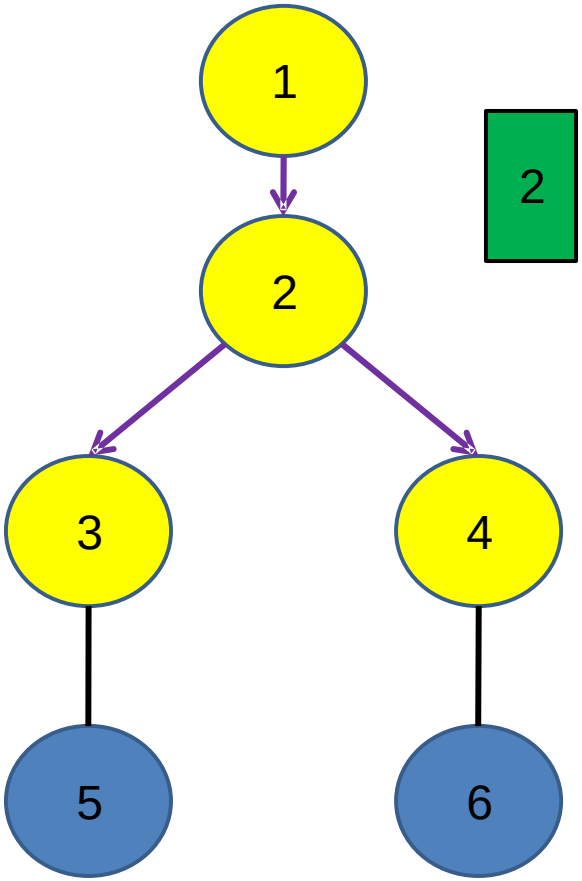
Queue

BFS



Queue

BFS



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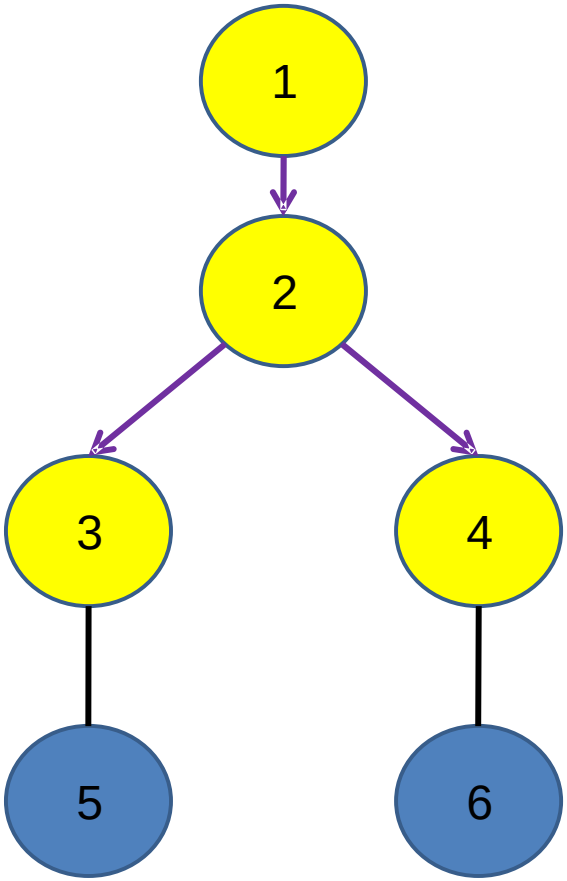
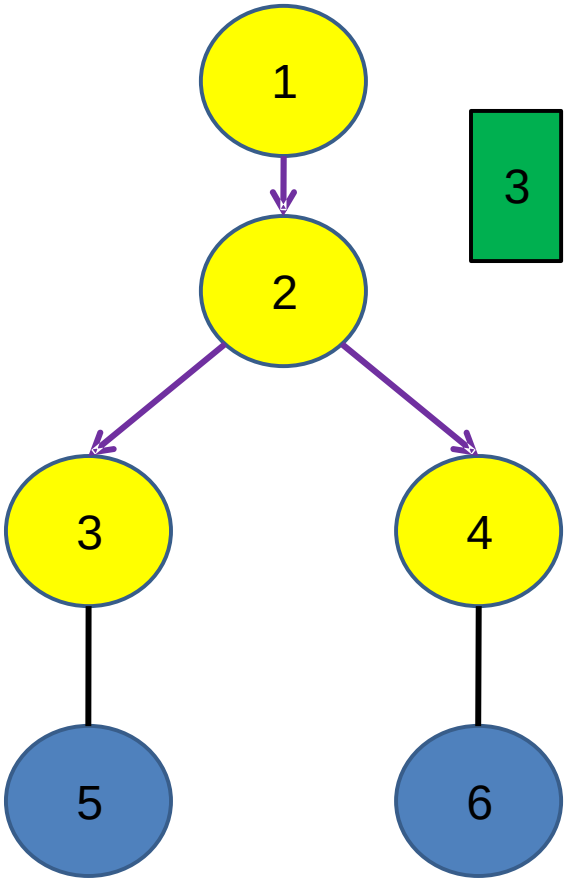
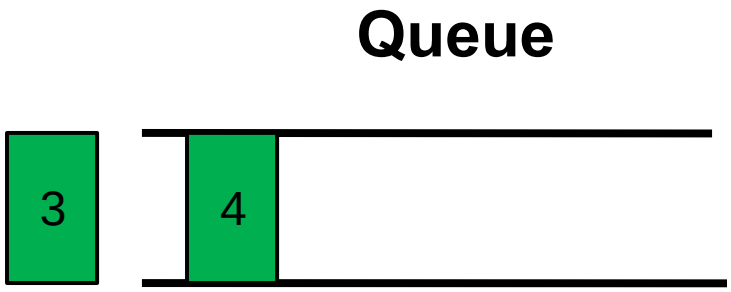


Queue

BFS





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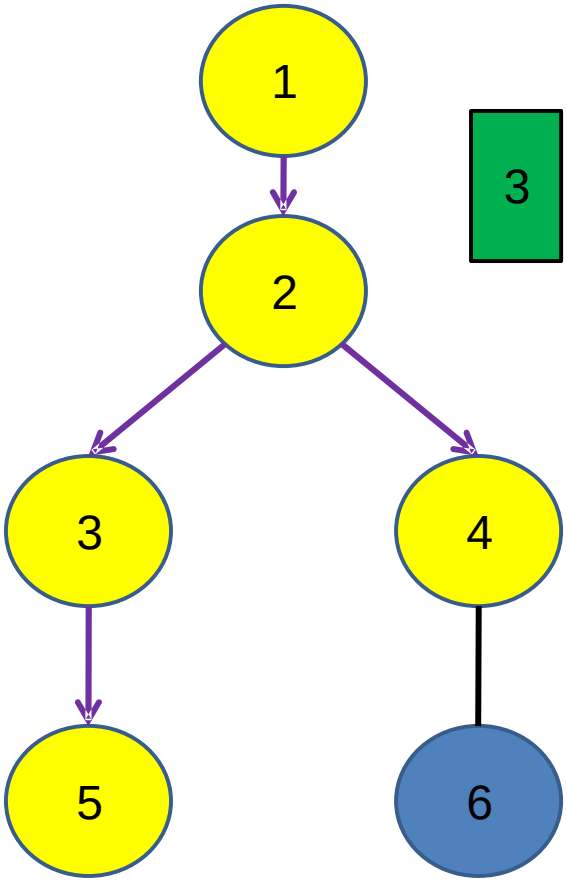

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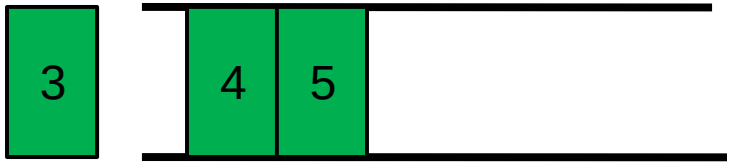

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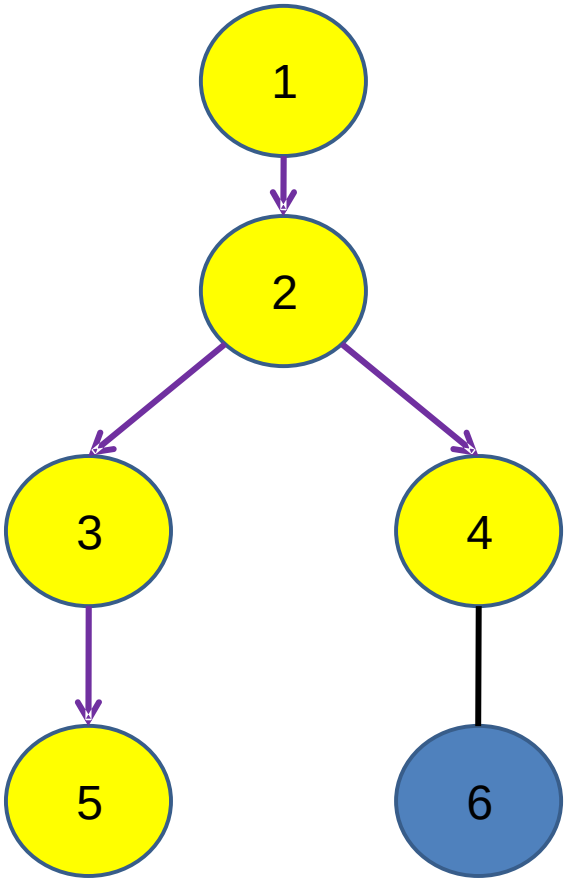

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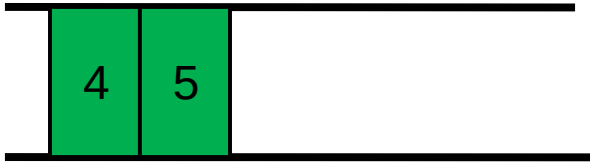
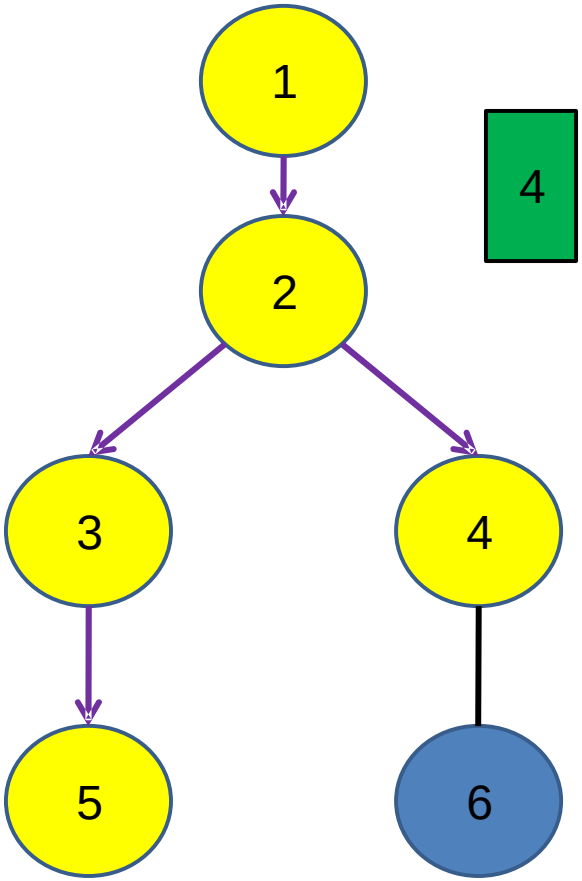


Made By louis7340

BFS



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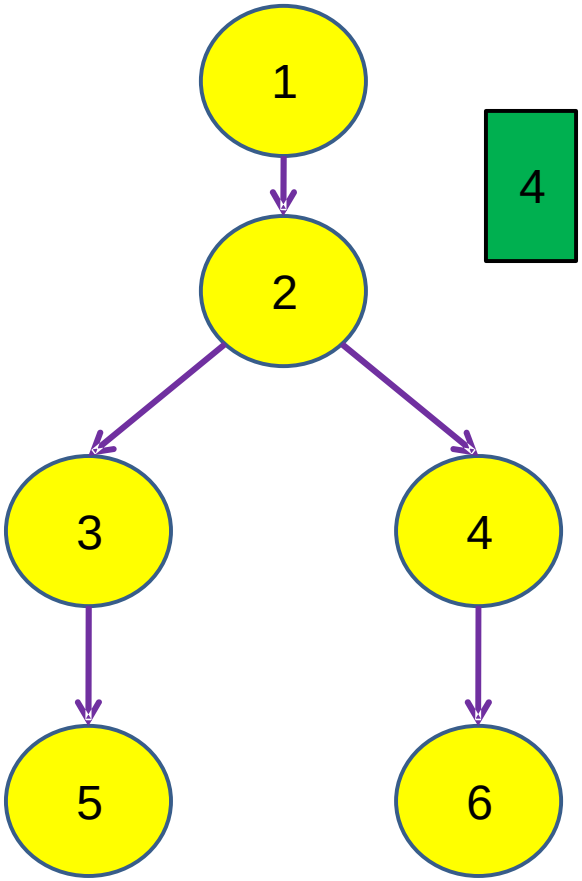

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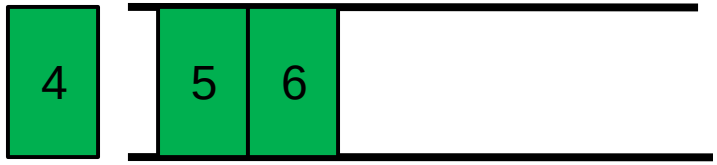

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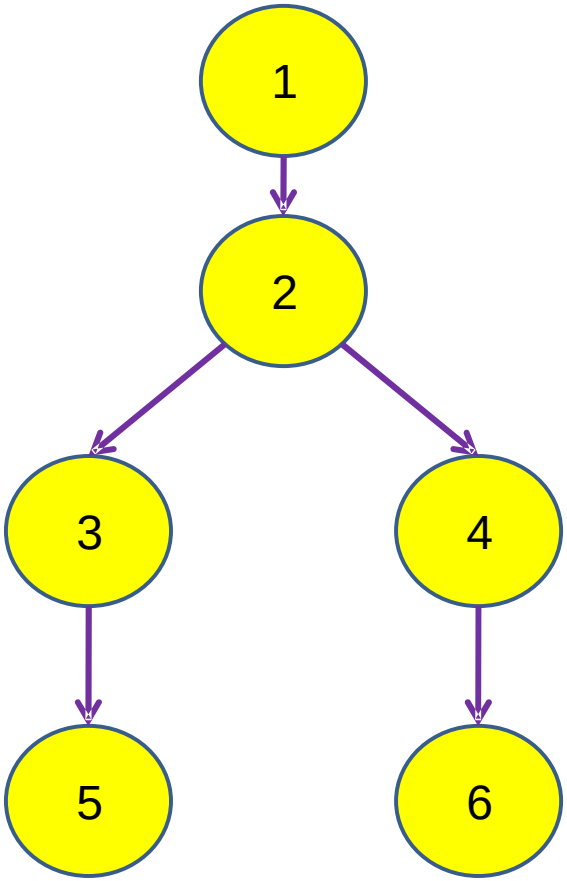

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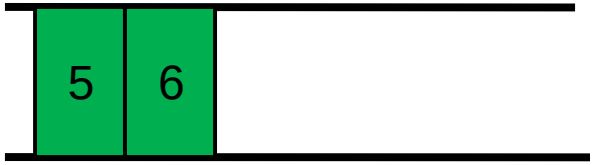

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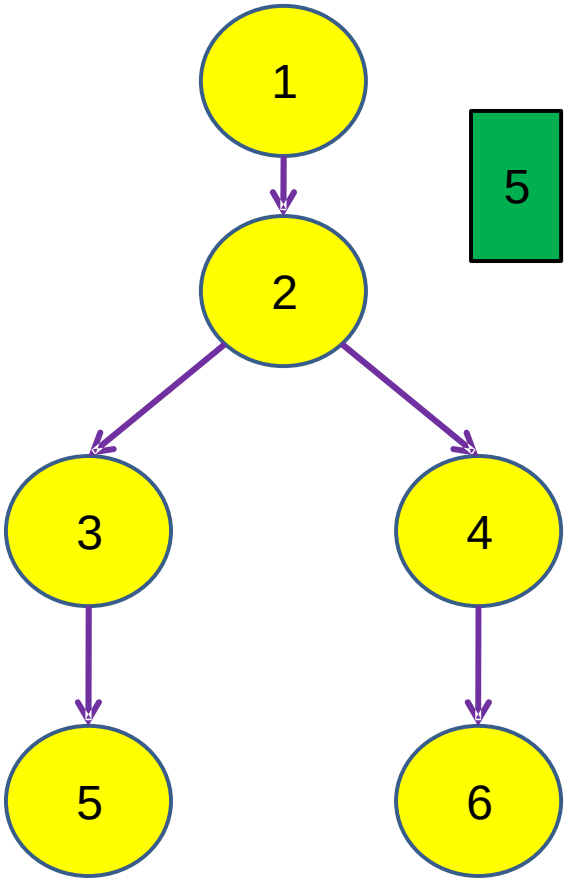

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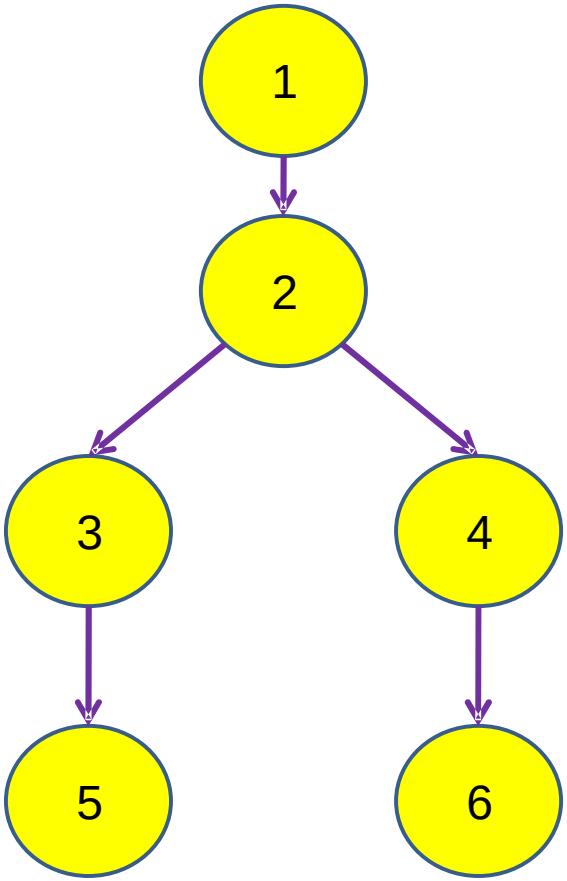

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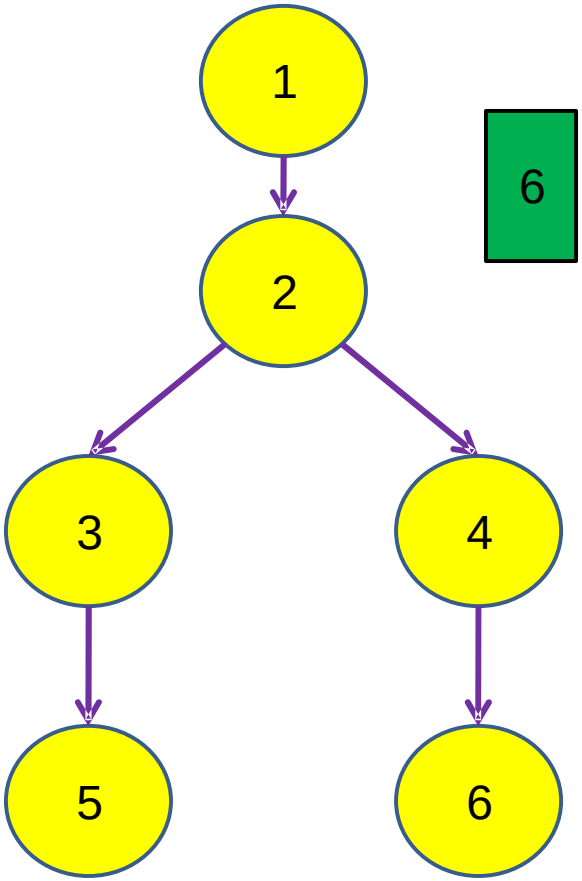

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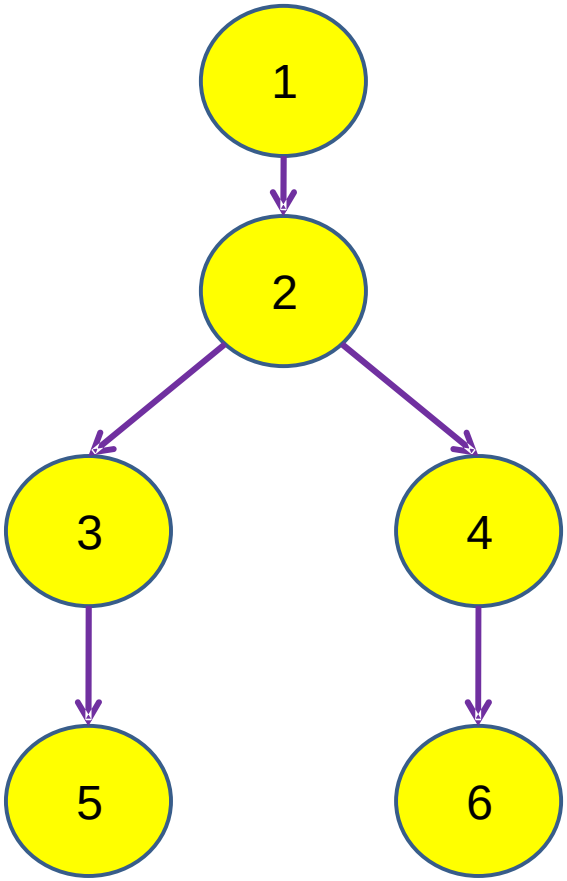

Queue

BFS

- **Source Code** (adjacency list)

```
void BFS(int root)
{
    queue<int> que;
    que.push(root);
    visited[root]=true;

    while(!que.empty())
    {
        int cur=que.front();
        que.pop();

        for(int i=0;i<adj[cur].size();i++)
        {
            int next=adj[cur][i];
            if(!visited[next])
            {
                visited[next]=true;
                que.push(next);
            }
        }
    }
    return;
}
```

BFS

- **Practice**

[UVA-532]　Dungeon Master

- **Skill:**

  int dir[4][2]={ {1,0},{-1,0},{0,1},{0,-1} }

  Ⓟ search four directions

- **Skill:**

```
int dir[4][2]={ {1,0},{-1,0},{0,1},{0,-1} };

void DFS(int cur_x,int cur_y)
{
    vis[cur_x][cur_y]=1;

    for(int i=0;i<4;i++)
    {
        int nx=cur_x+dir[i][0];
        int ny=cur_y+dir[i][1];

        //watch for boundary
        if( !vis[nx][ny])
            DFS(nx,ny);
    }
}
```

Time Complexity

DFS O(V + E)

BFS O(V + E)

V: the number of nodes

E: the number of edges

(adjacency list)

HW5

Toatlly 28 problems

UVa:

336,352,383,532,567,571,601,705,

762,10004,10009,10474, 10505,10592,10603,

10946, 11624

POJ:

1129,1154,1416,1606,1753,1915,1979,2243

Thank for Your Attention

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