LAO CHON LAM

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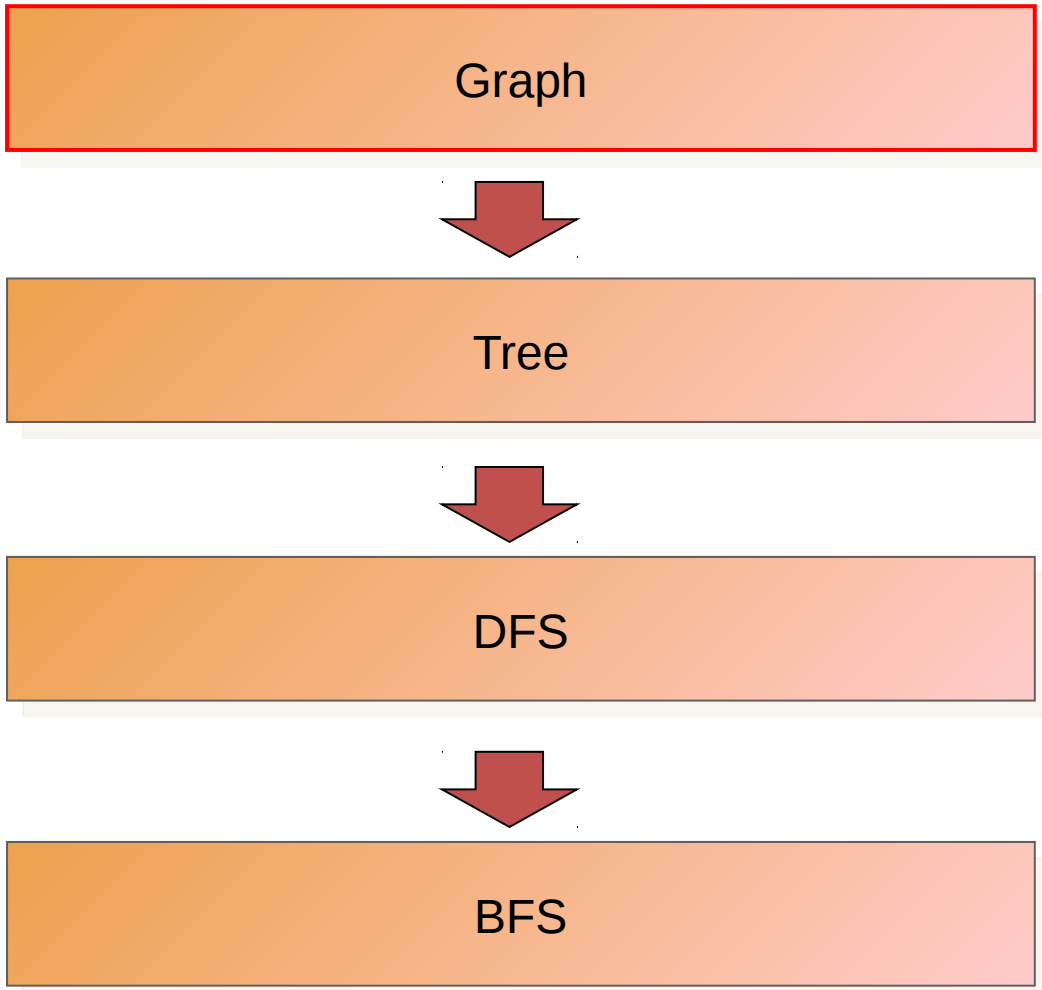
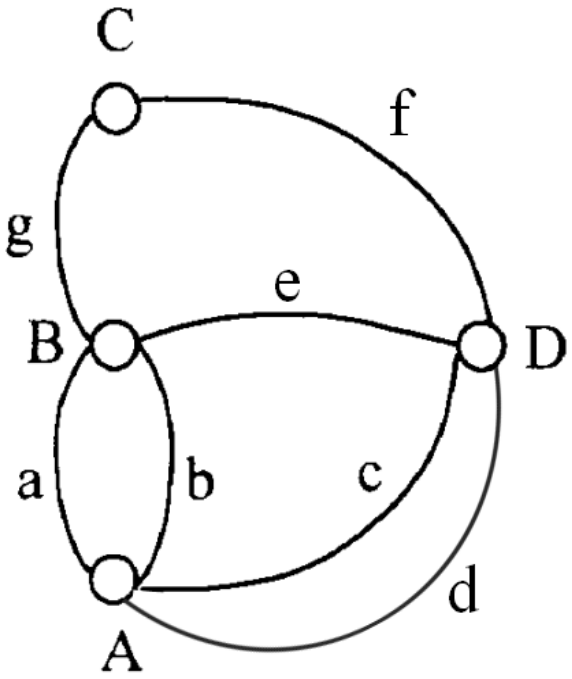
Made By louis7340 & Edit by

Outline



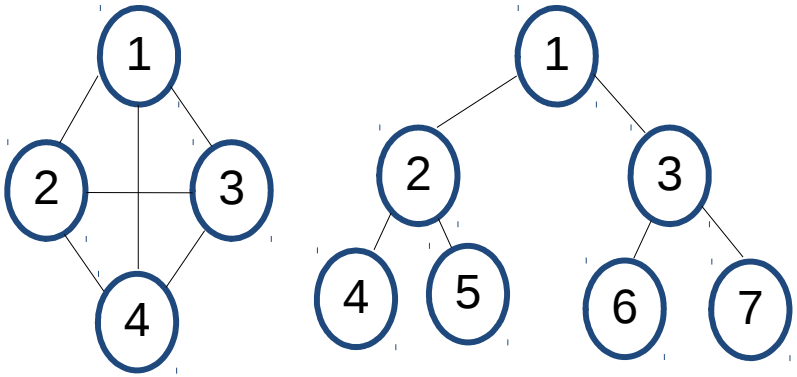
Graph

- Vertex (V)
  - A, D, B, D
- Edge (E)
  - BC, CD,…
- degree (deg)
  - The Branch of a Vertex
- Path (P)
  - Non-duplicate Vertex Connected Seque
    - ADCB
- Cycle (C)
  - A Cycle whose Two Ending Points are th

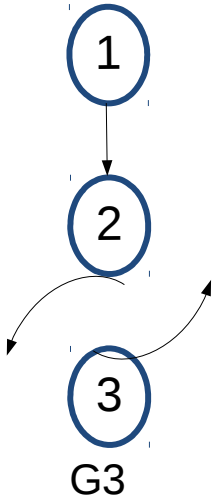


Graph

- Undirected Graph – G1, G2

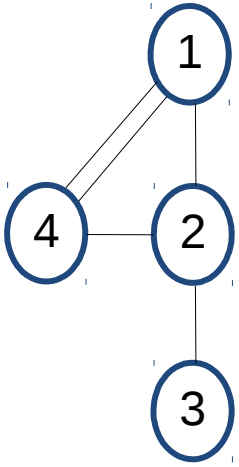


- Directed Graph – G3
  - deg: in-degree and out-degree



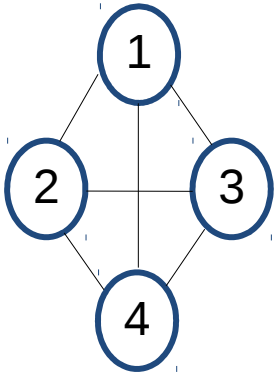
Graph

- Multiple Edge



G4

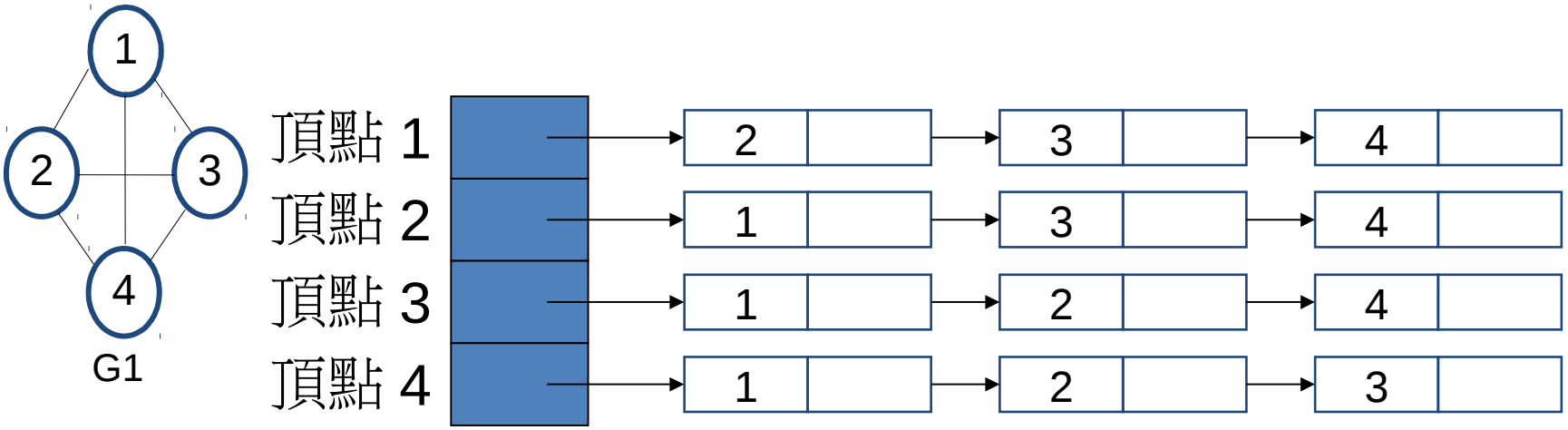
- Complete Graph



G1

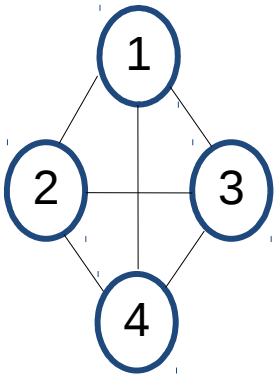
Graph

- Representation
  - adjacent list



Graph

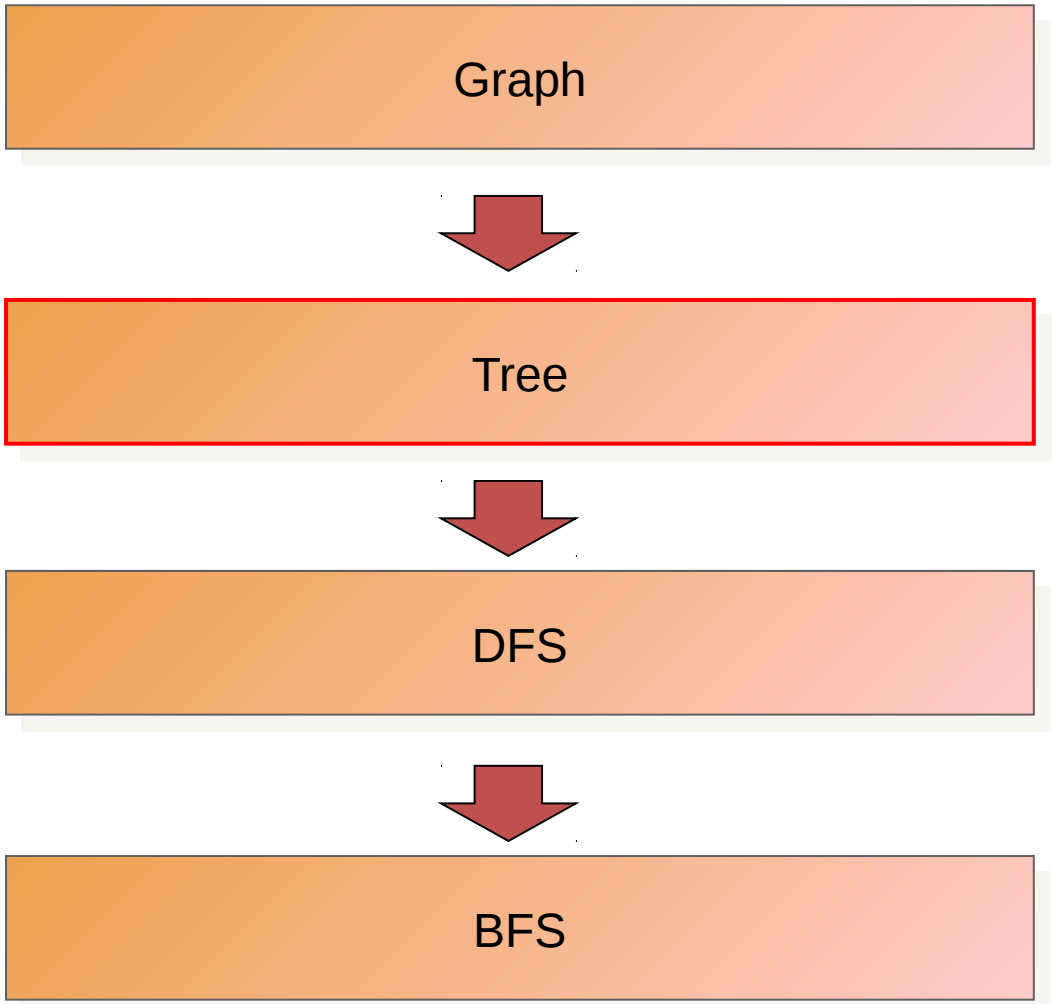
- Representation
  - adjacent matrix

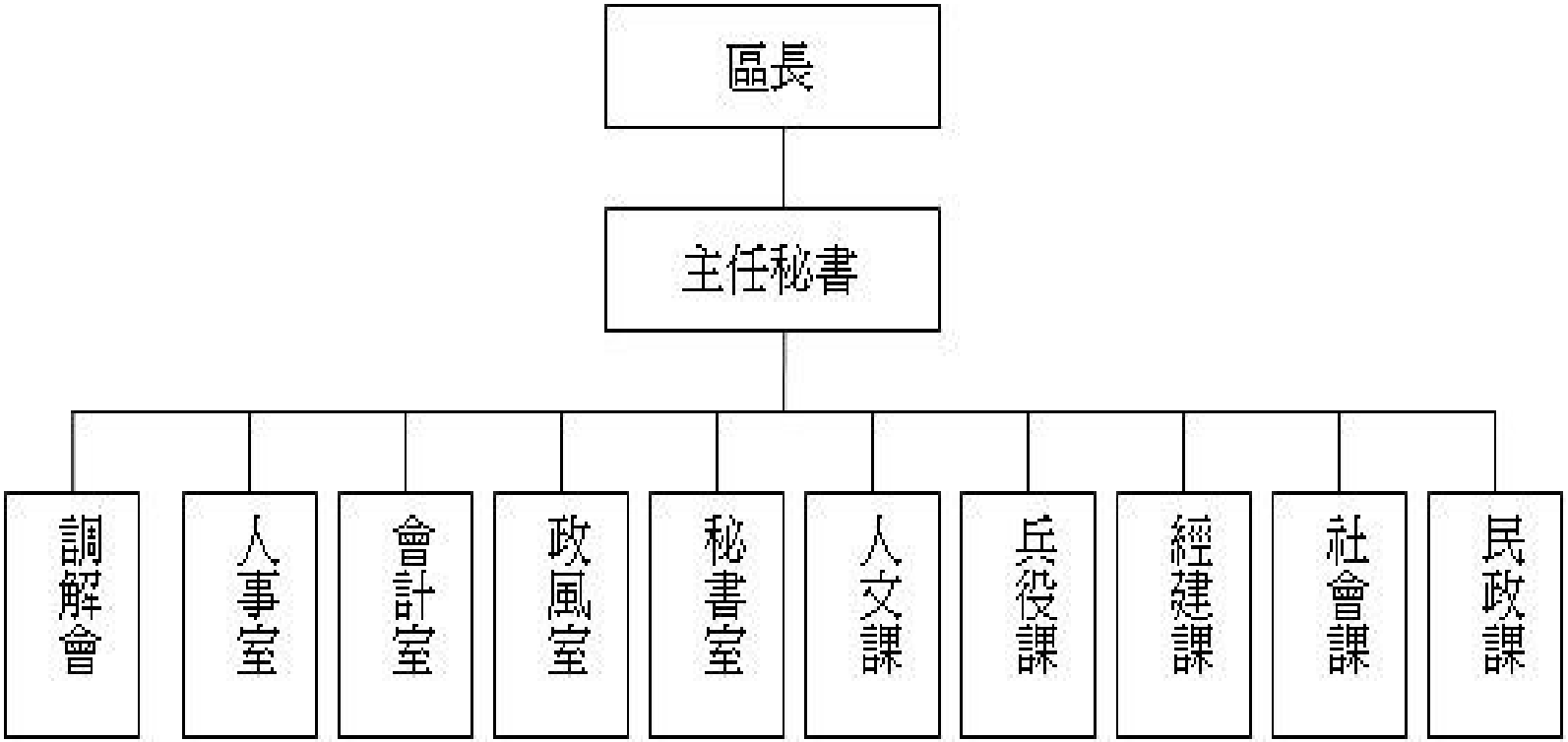


G1

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

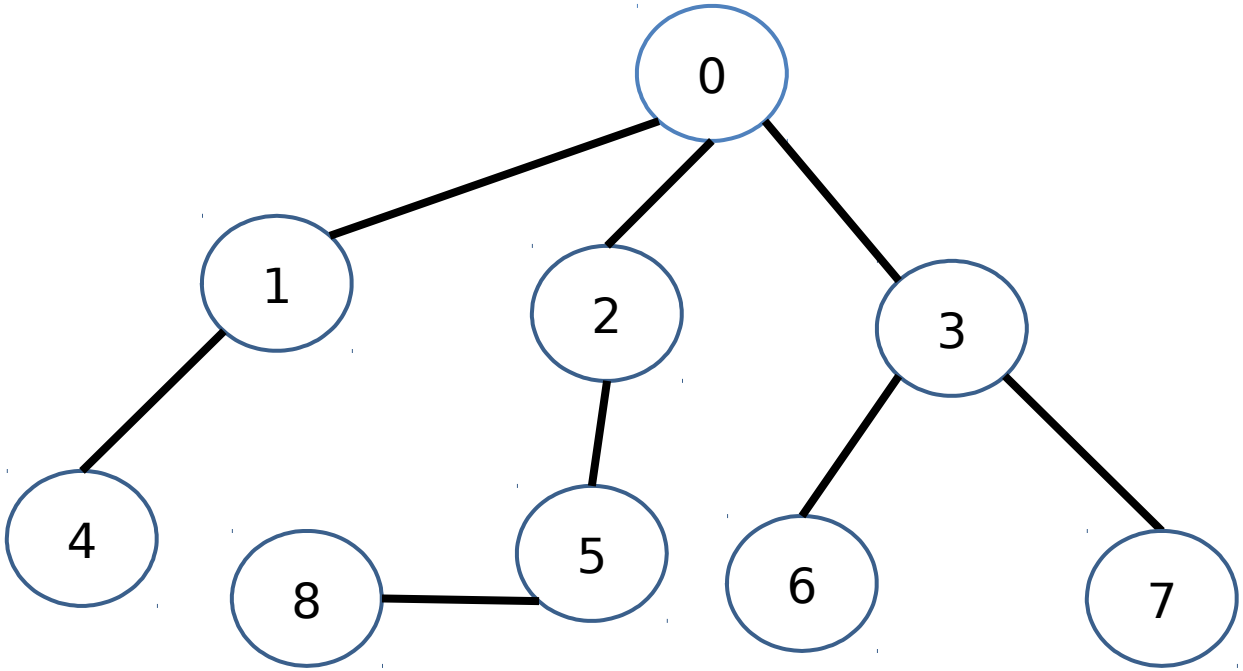
Outline




區長
主任秘書
調解會
人事室
會計室
政風室
秘書室
人文課
兵役課
經建課
社會課
民政課

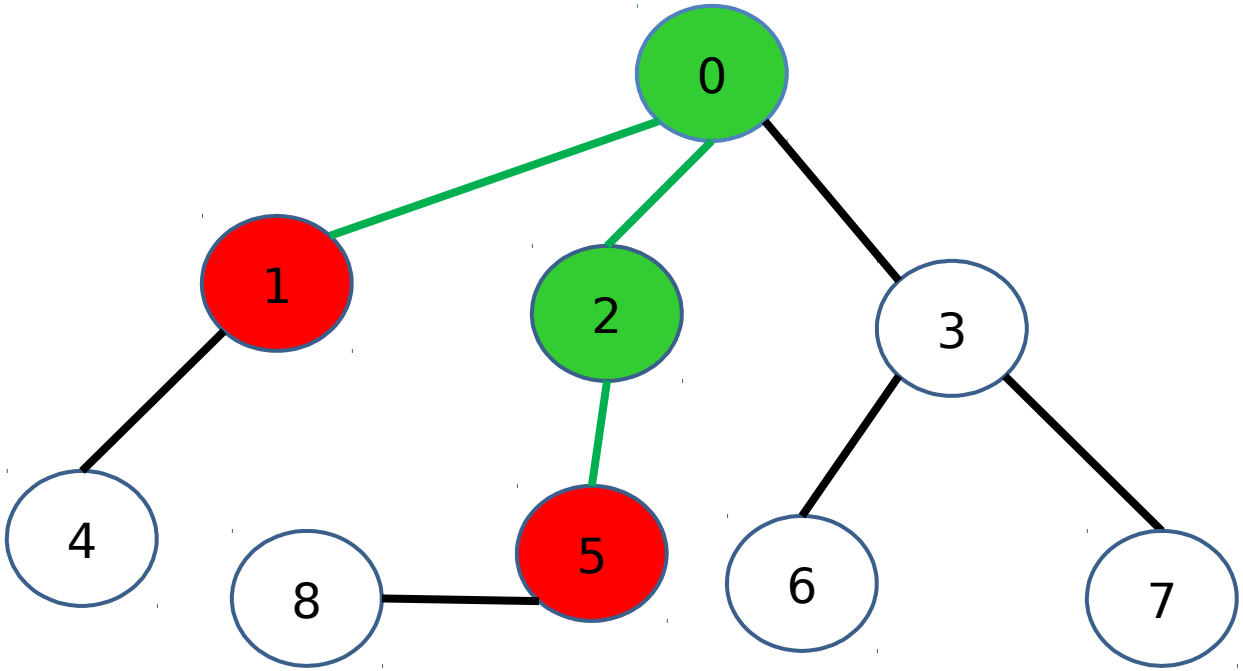
Tree

- A data structure consists of nodes. (at least two)



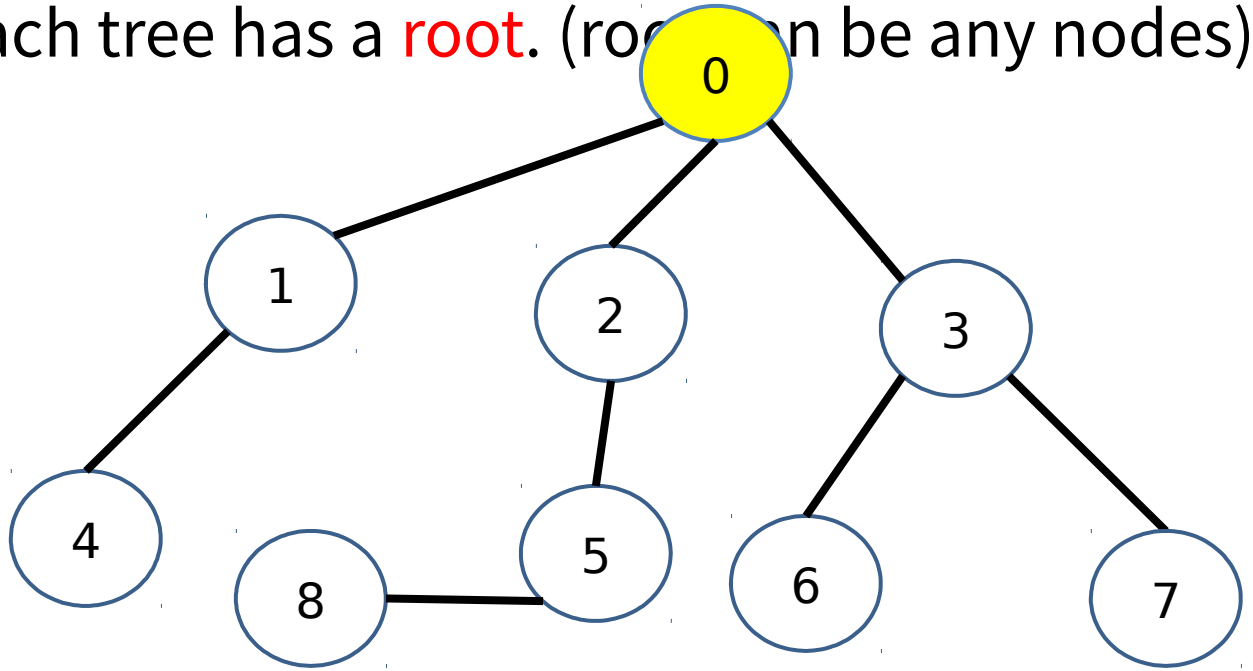
Tree

- A data structure consists of nodes. (at least two)
- Every pair of nodes must have one and only one path.(connected)



Tree

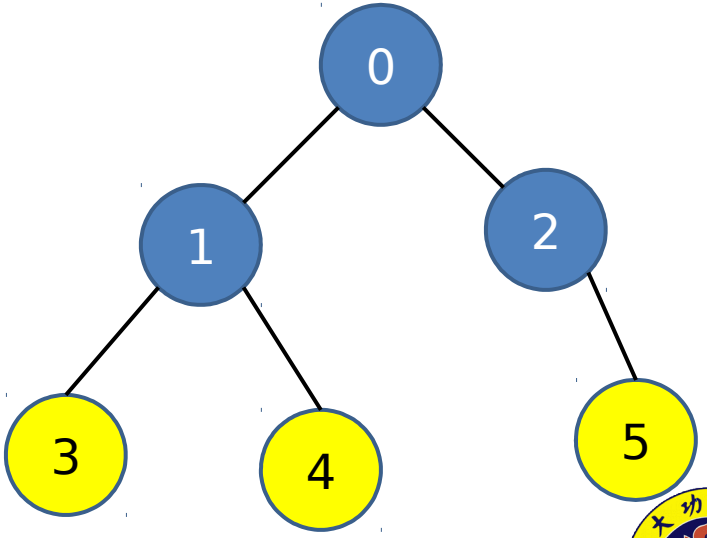
- A data structure consists of nodes. (at least two)
- Every pair of nodes must have one and only one path.(connected)
- Each tree has a root. (root can be any nodes)



Tree

Relations: (using node 0 as root)

-**Leaf :** nodes with no branch. (3,4,5)



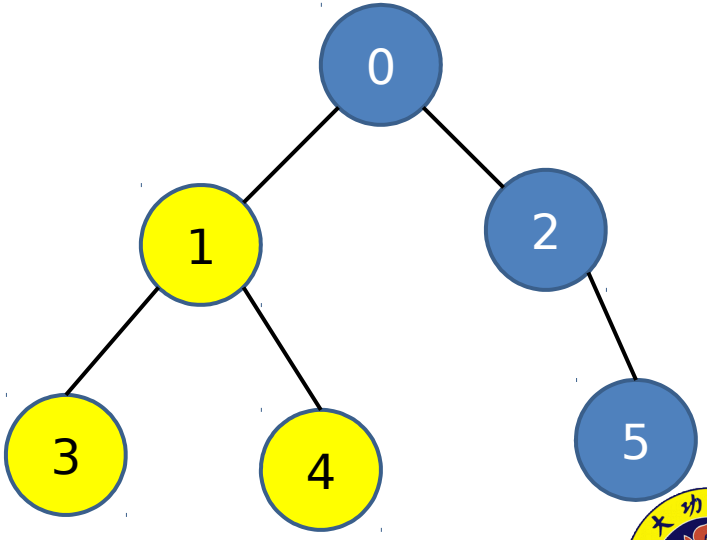
Tree

Relations: (using node 0 as root)

-**Leaf :** nodes with no branch.

-**Parent/Children :** has succesor nodes –Parent (1)

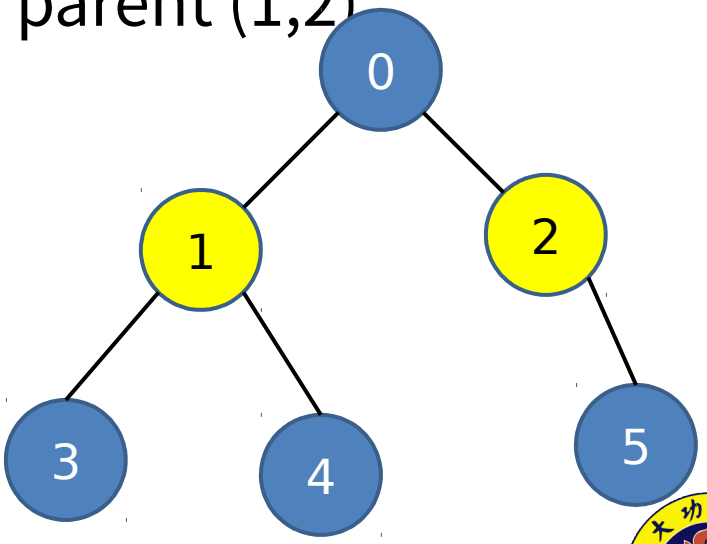
has predecessor node-children (3,4)



Tree

Relations: (using node 0 as root)

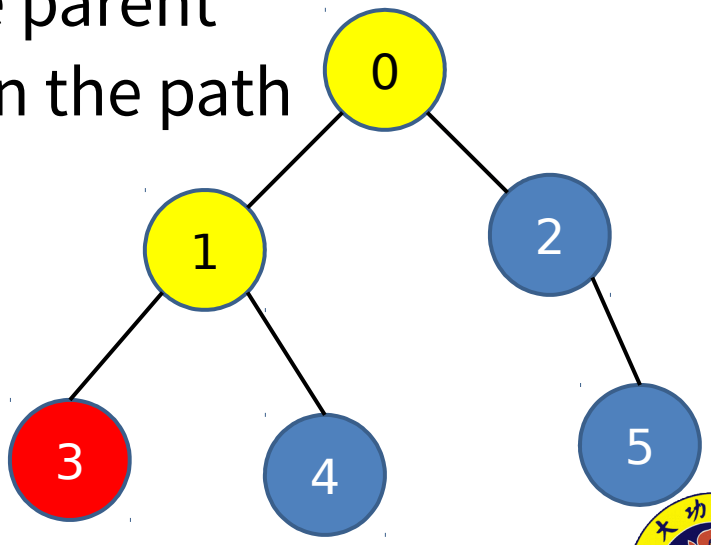
- **Leaf :** nodes with no branch.
- **Parent/Children :** has succesor nodes -Parent has predecessor node-children
- **Sibling:** children with same parent (1,2)



Tree

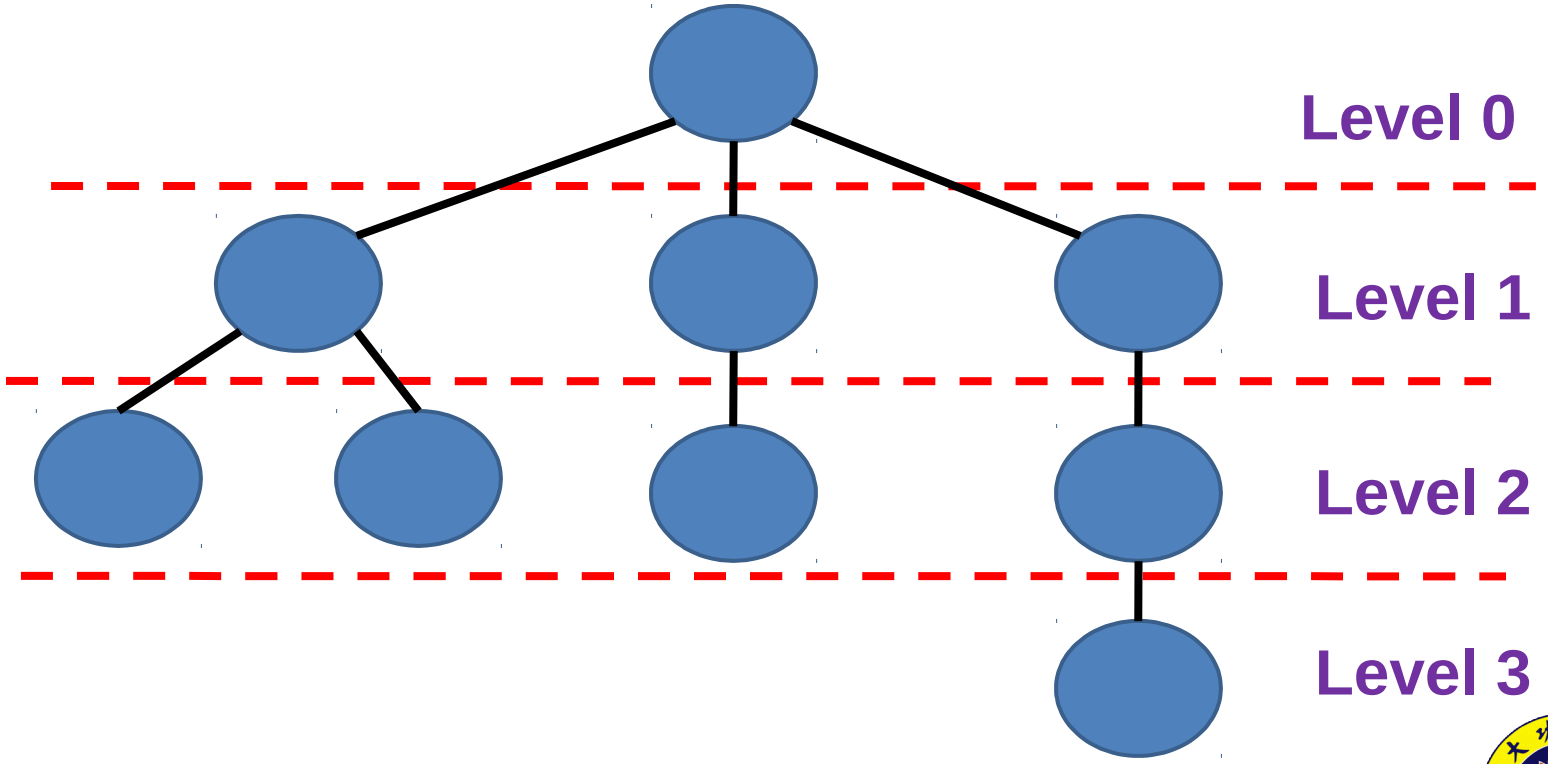
Relations: (using node 0 as root)

- **Leaf :** nodes with no branch.
- **Parent/Children :** has succesor nodes -Parent has predecessor node-children
- **Sibling:** children with same parent
- **Ancestor:** nodes that are on the path from root to itself. (3’ s ancestor: 0,1)



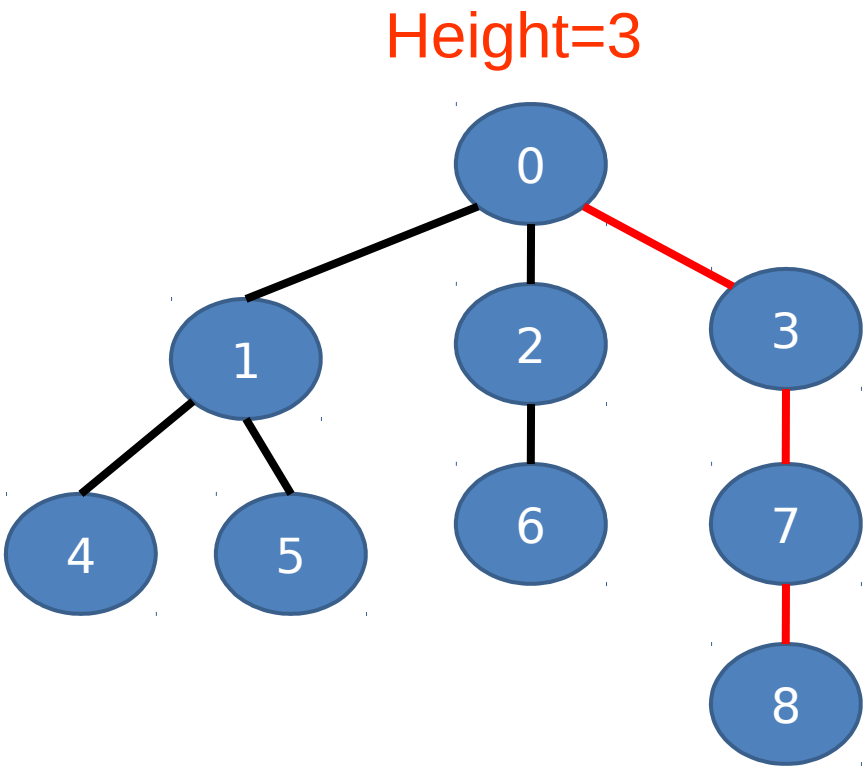
Tree

- **Tree Level:** according to the distance to the root.



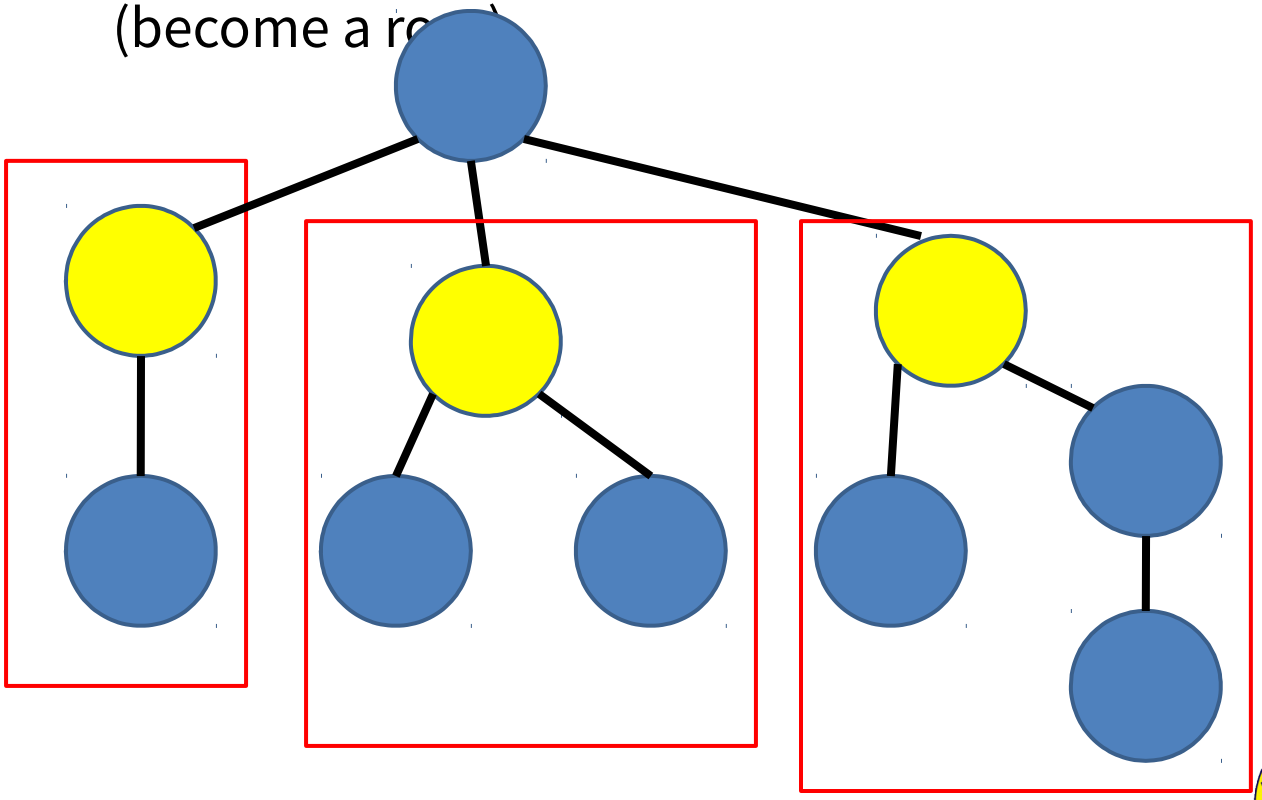
Tree

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



Tree

- **SubTree:** nodes that are not the root can form a subt ree



Tree

- **Feature:**

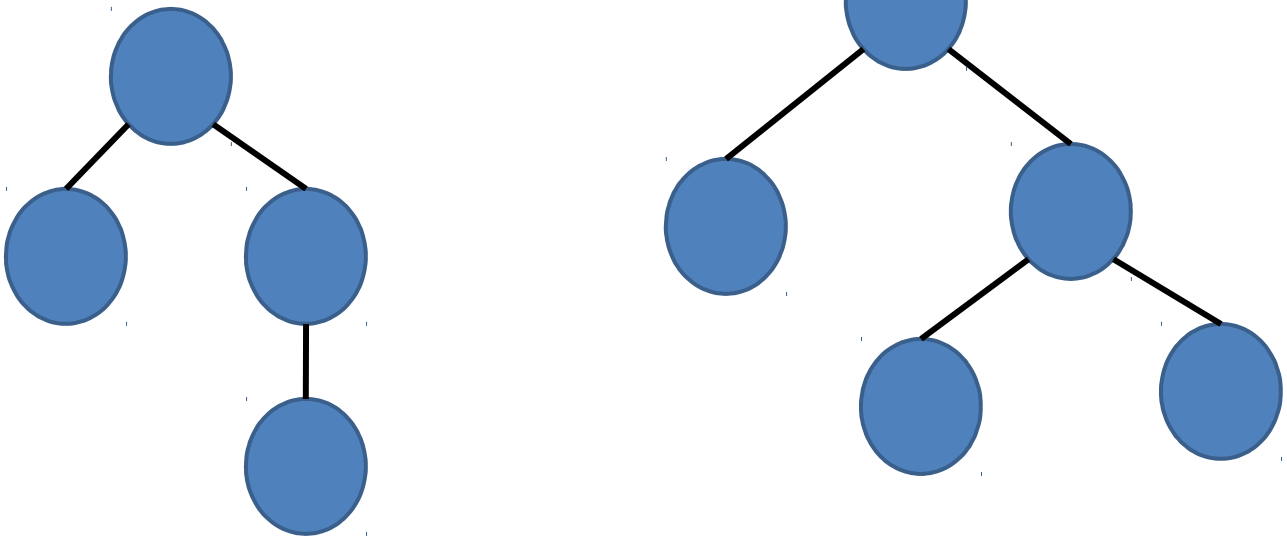
  -no cycle

  -every pair of nodes are connected

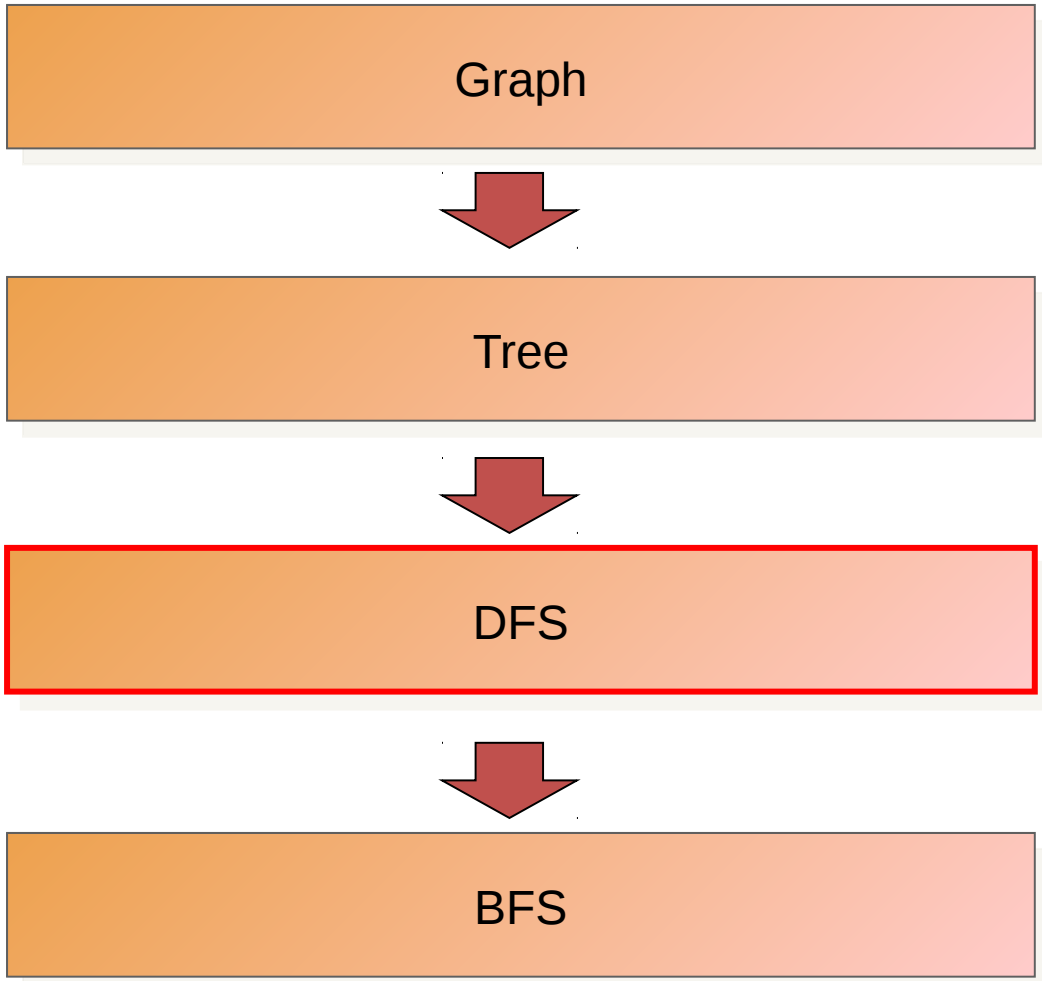
  -every pair of nodes has only one path

Tree

- **Forest:** n trees are disjoint (n ≧ 0)
  - ☒can be empty



Outline



DFS

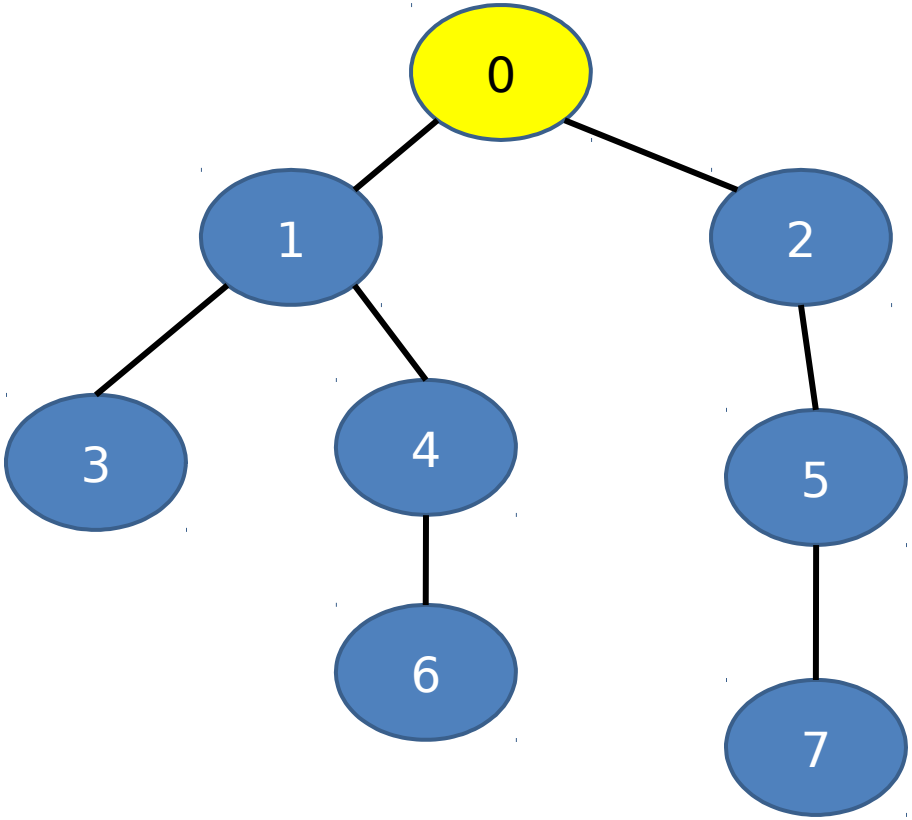
(D)epth-(F)irst-(S)earch

DFS

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

Stack

DFS



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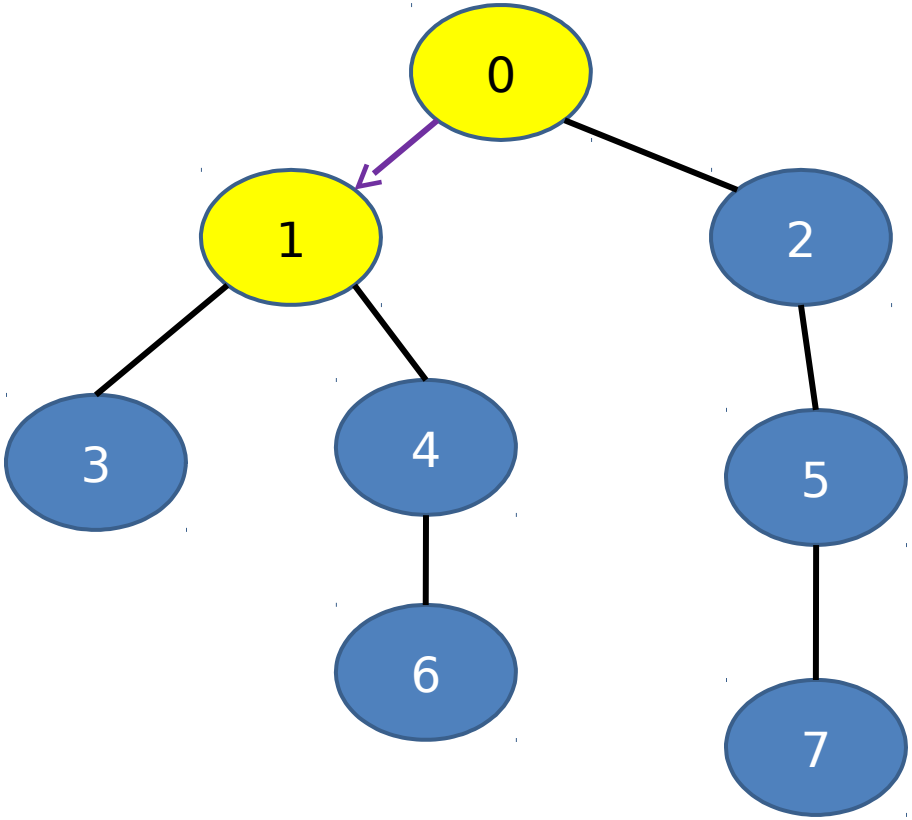

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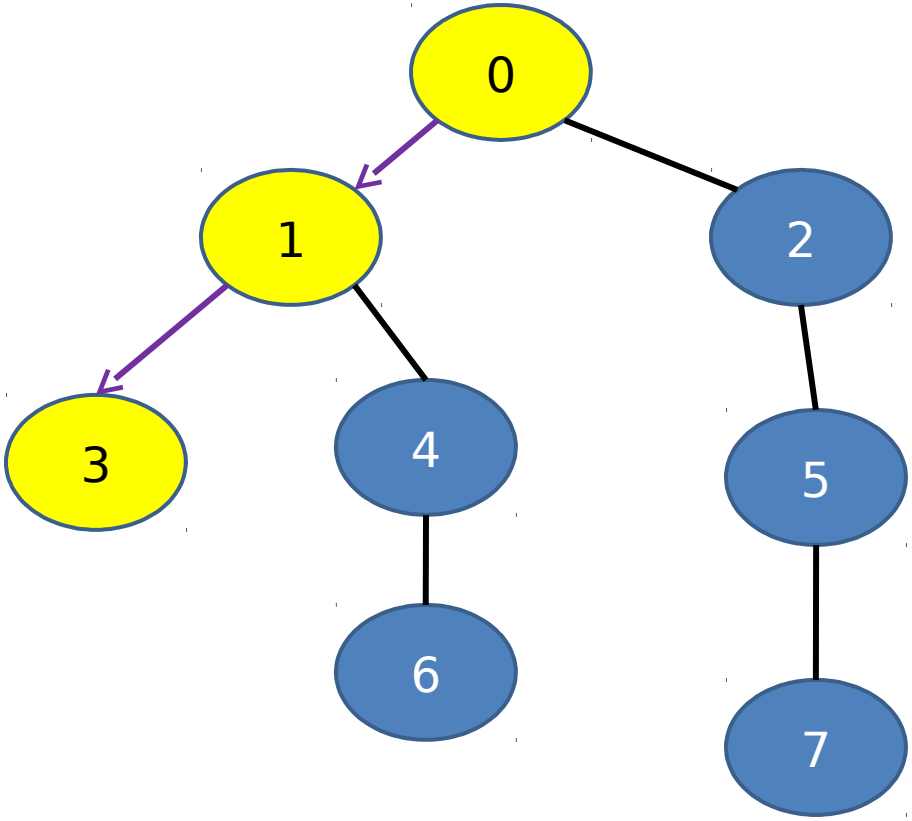

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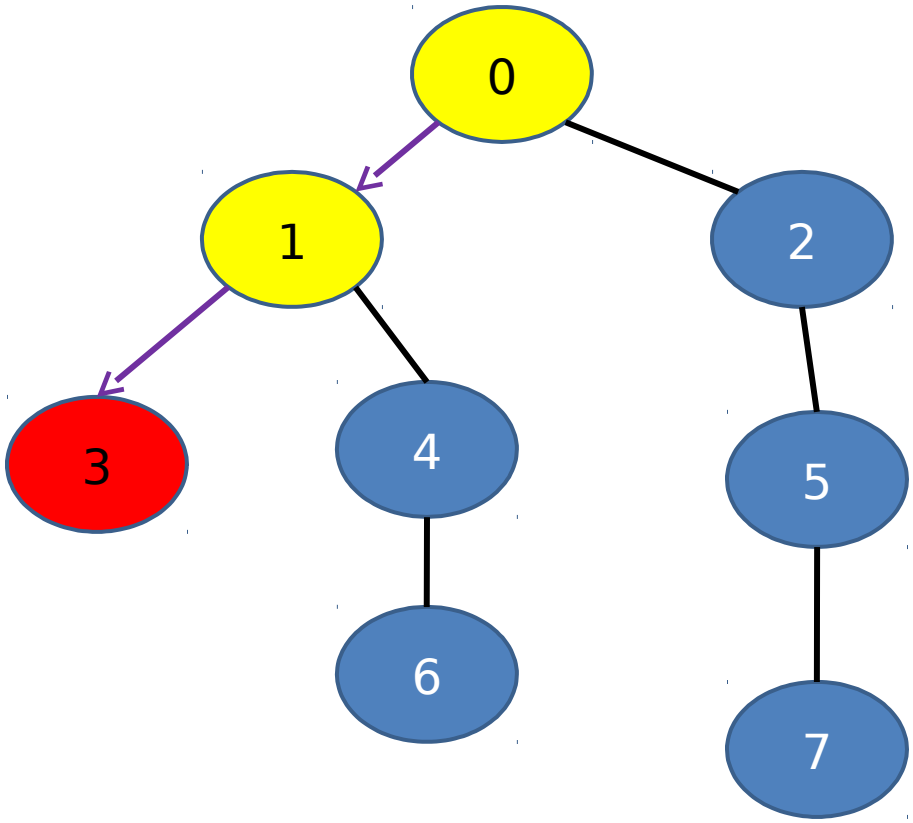

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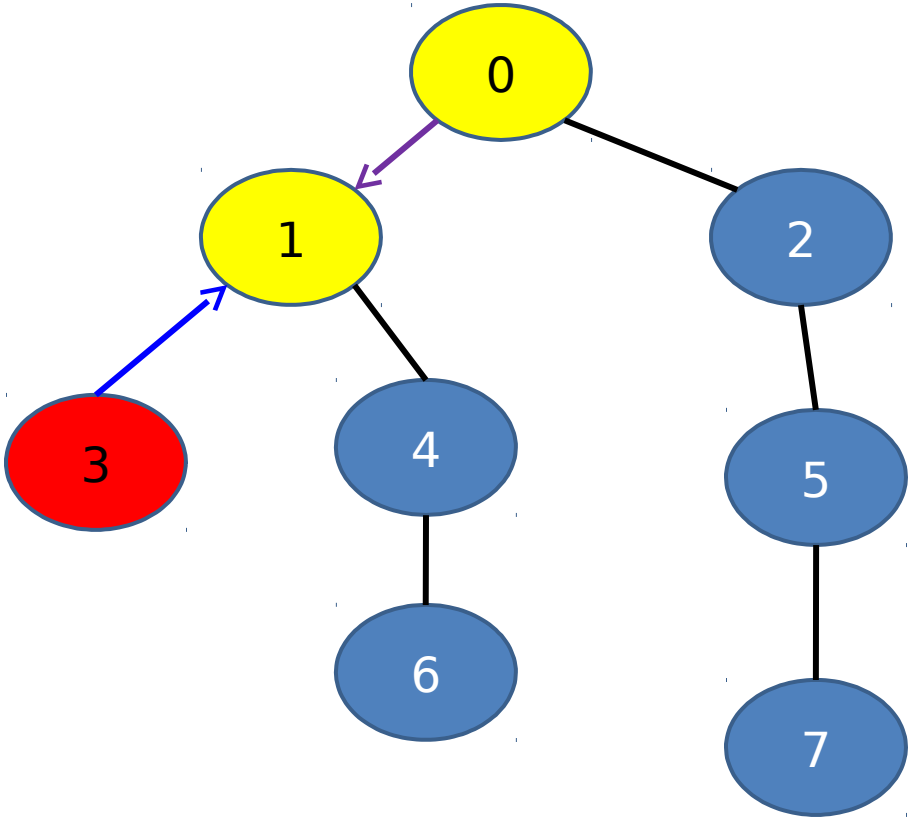

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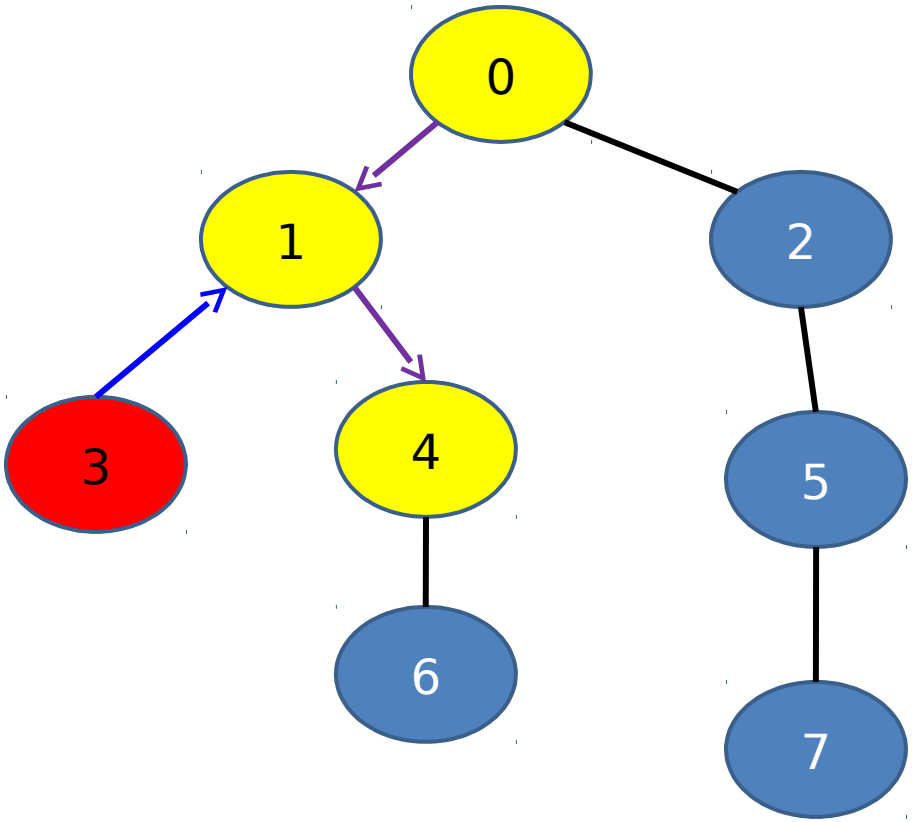

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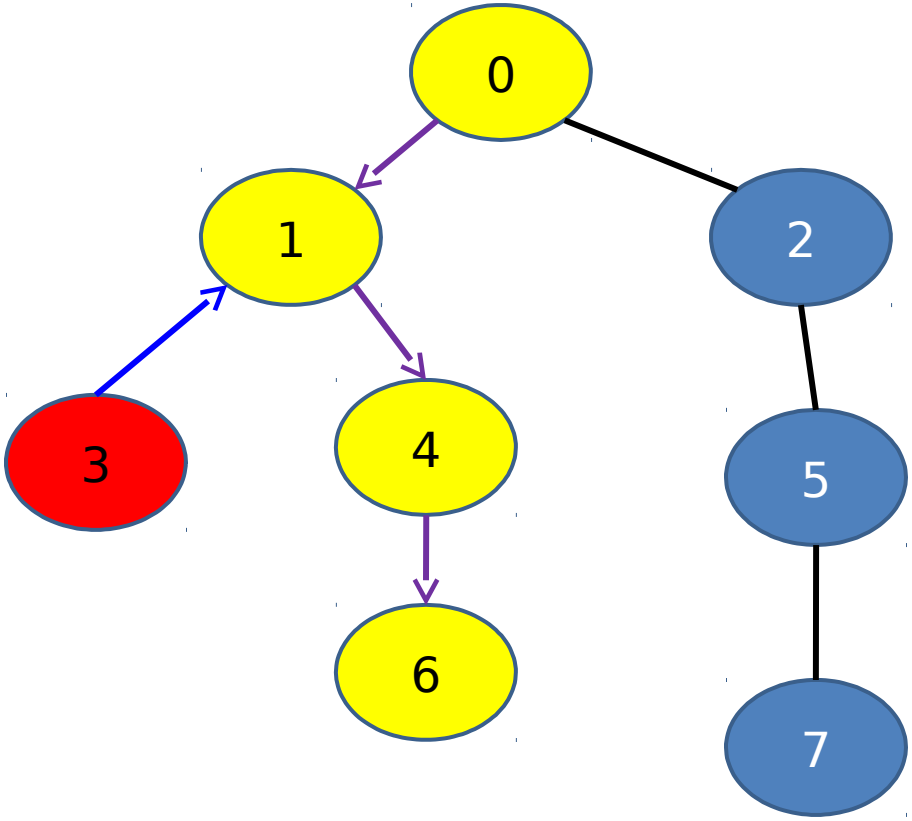

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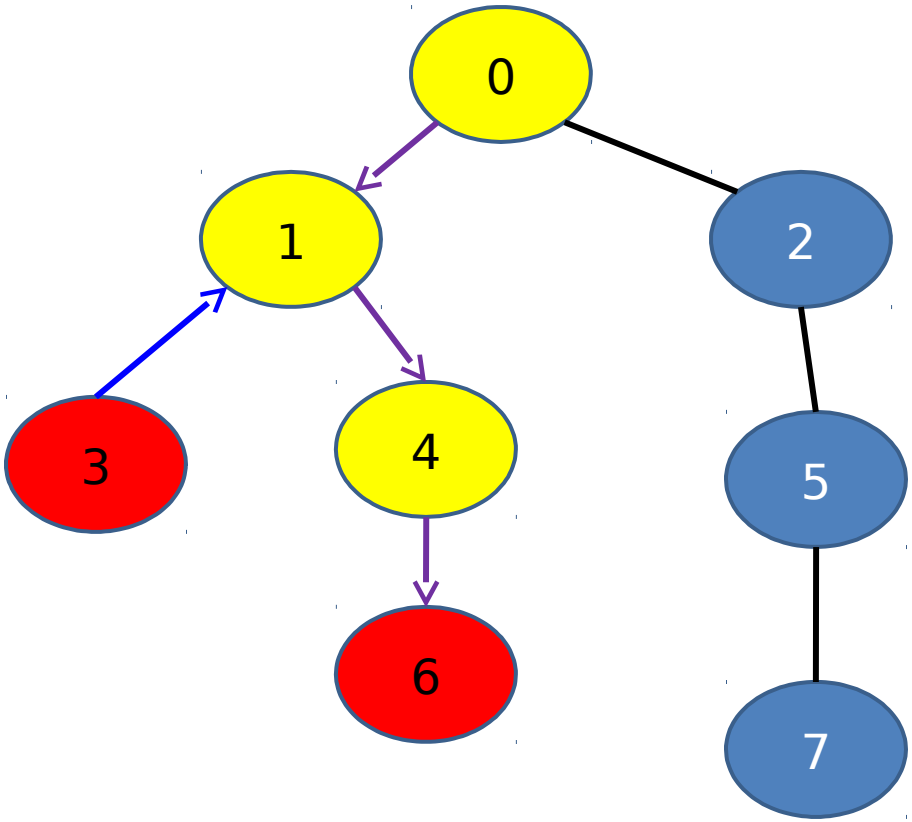

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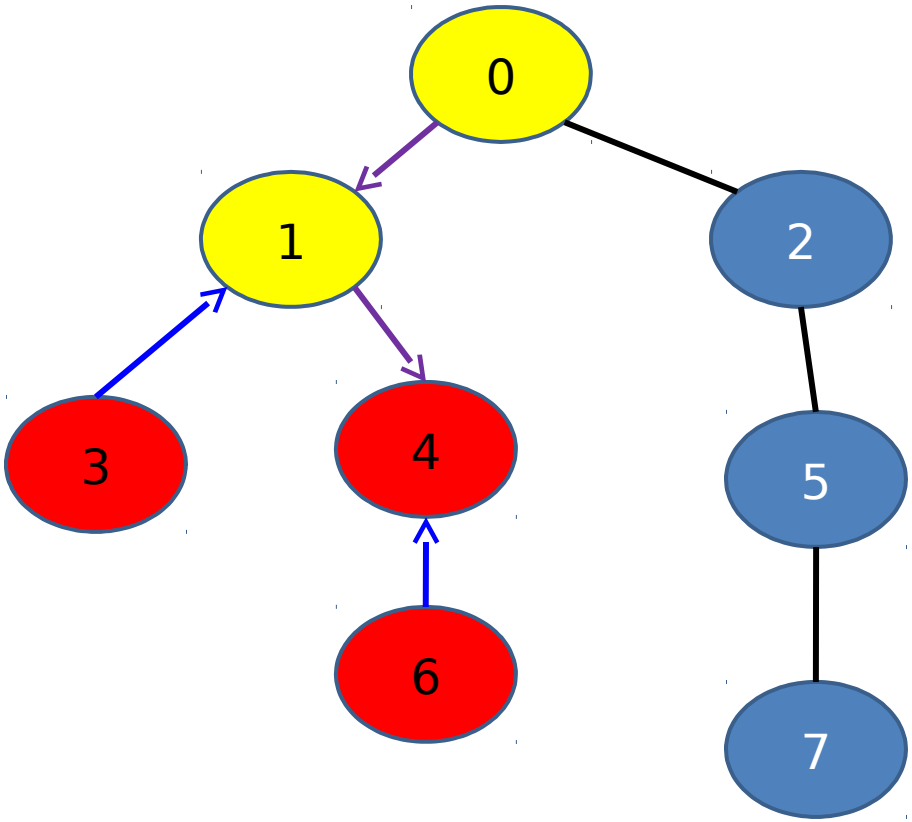

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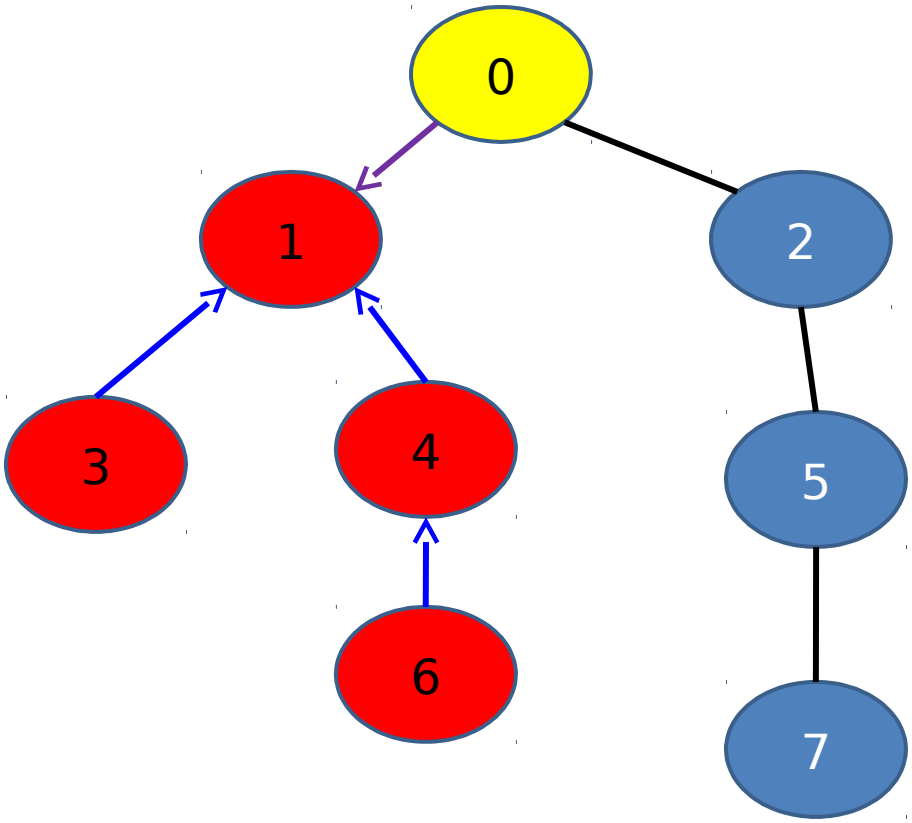

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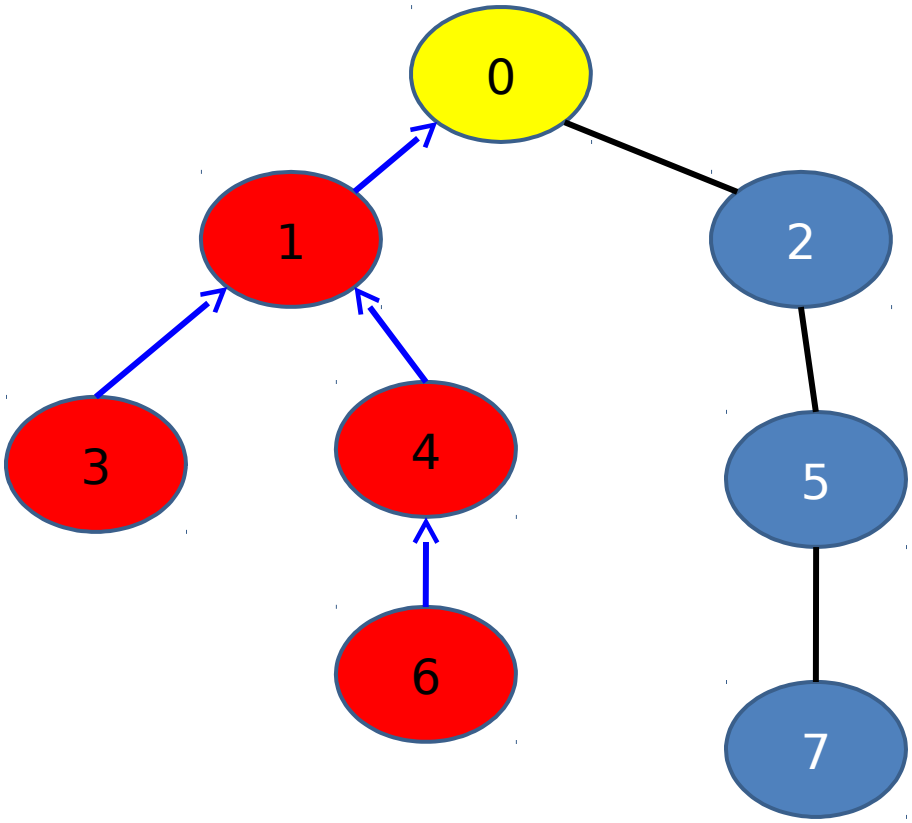

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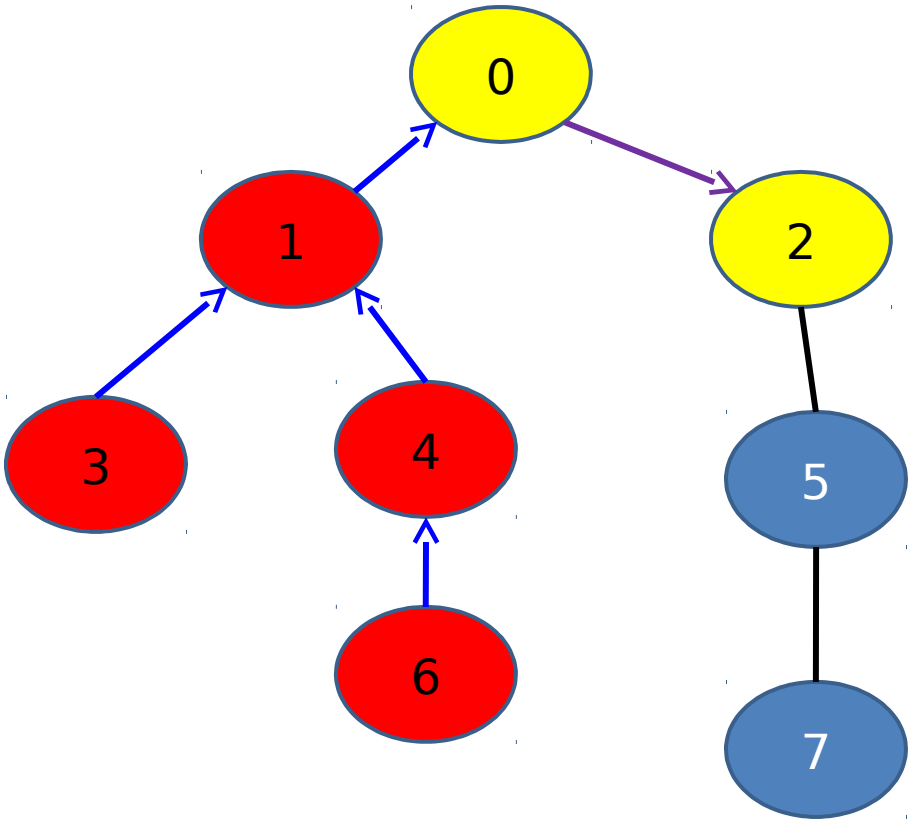

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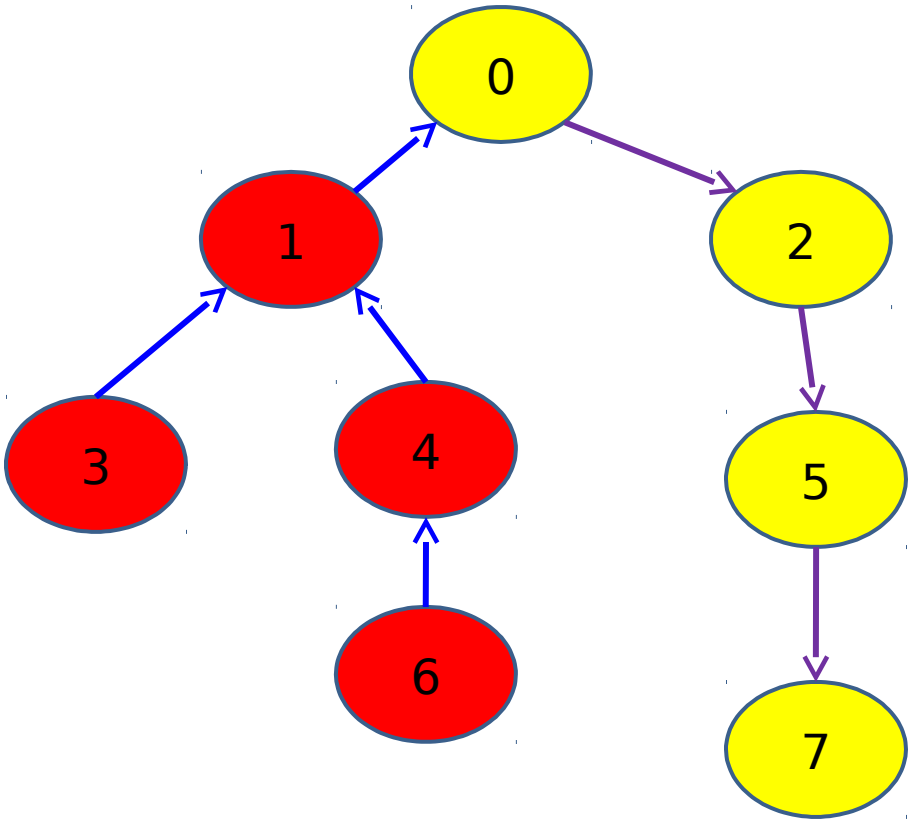

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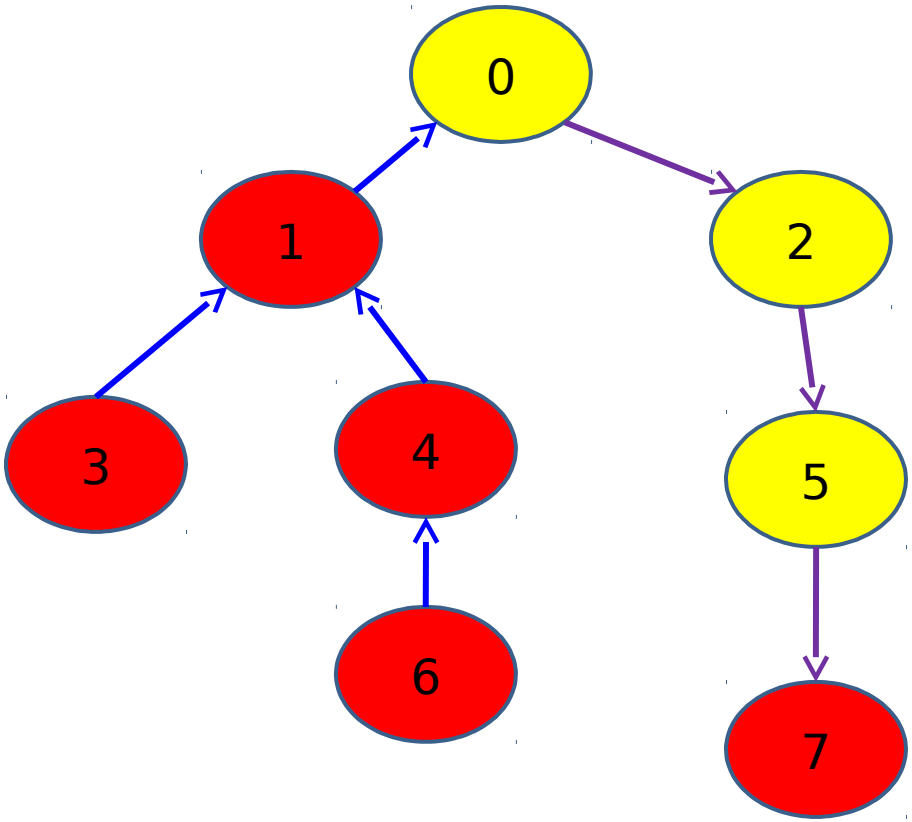

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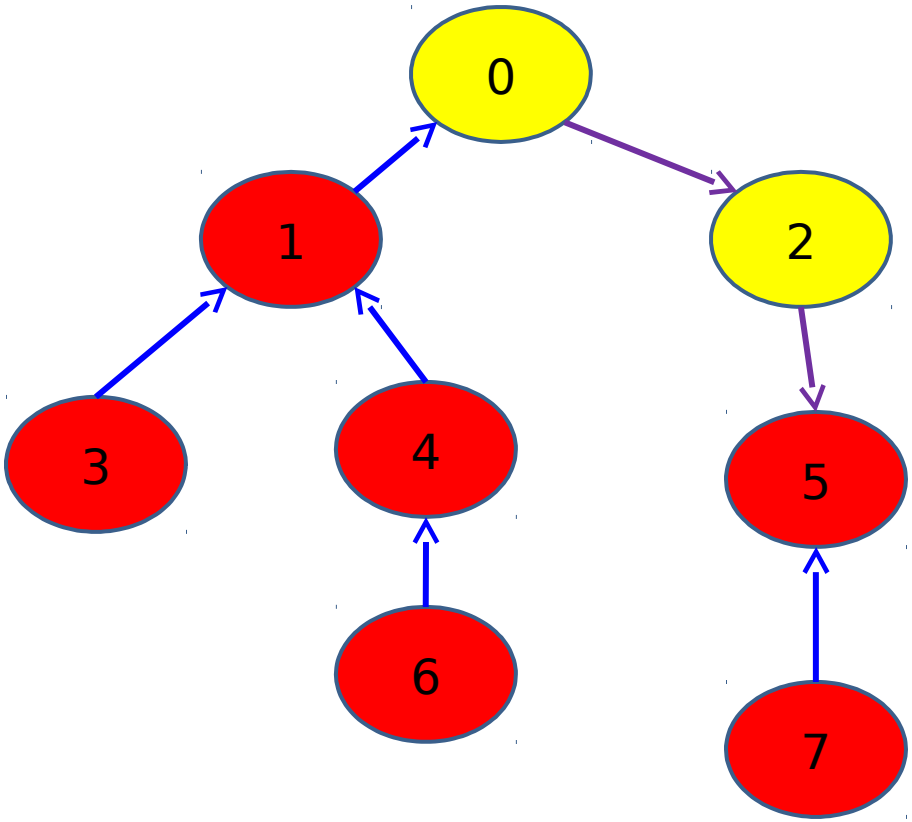

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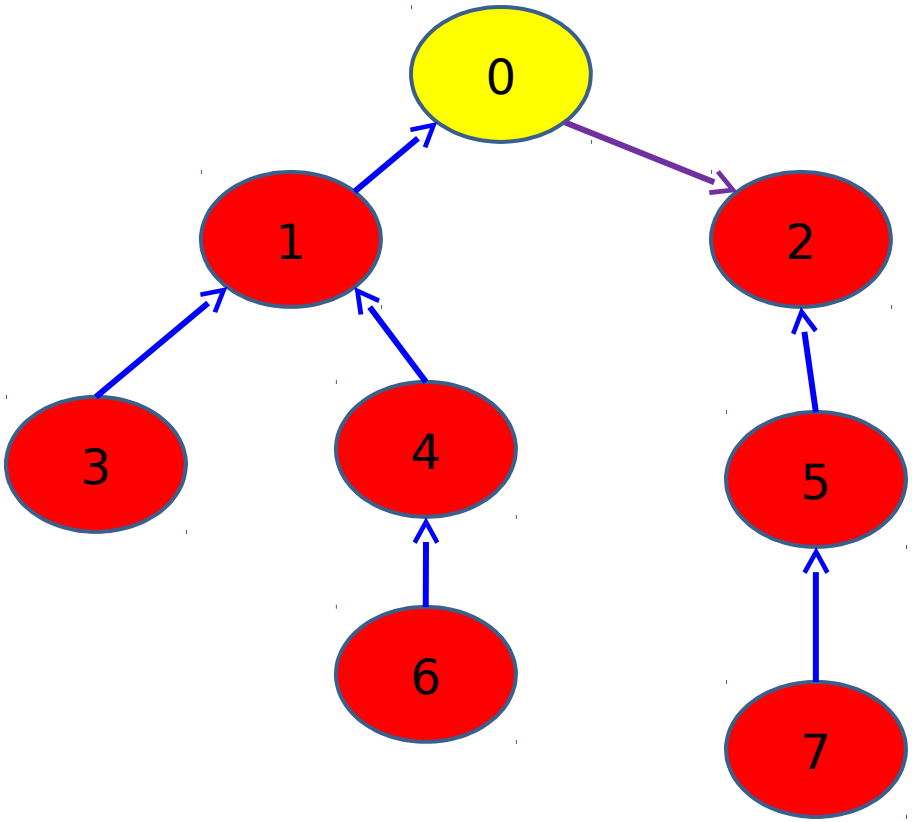

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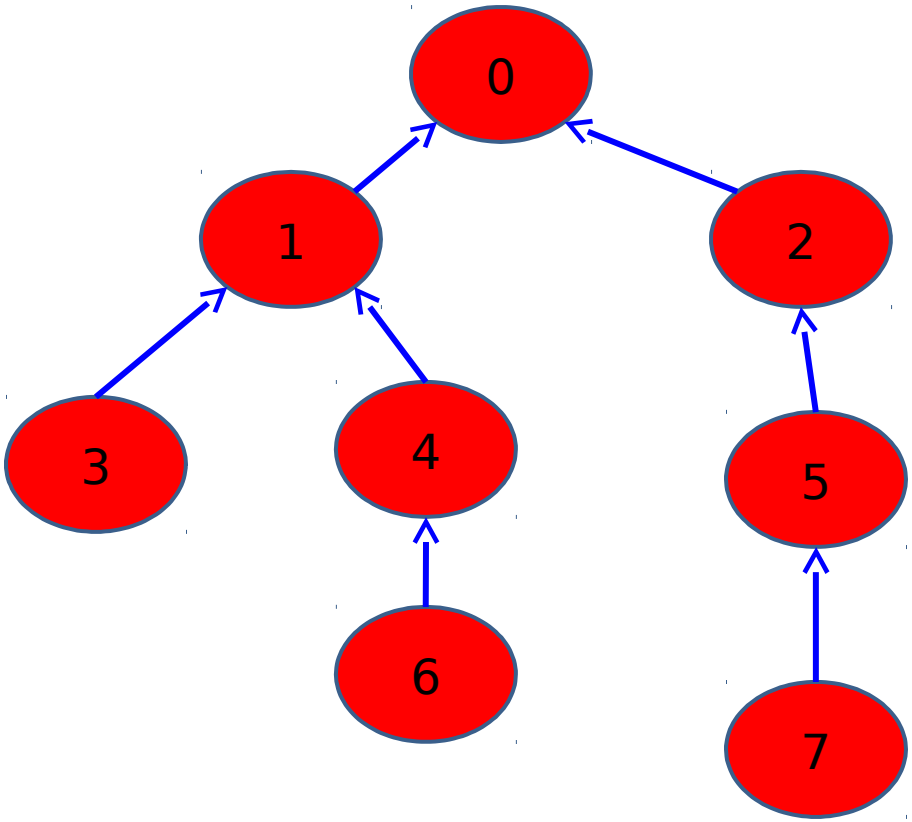

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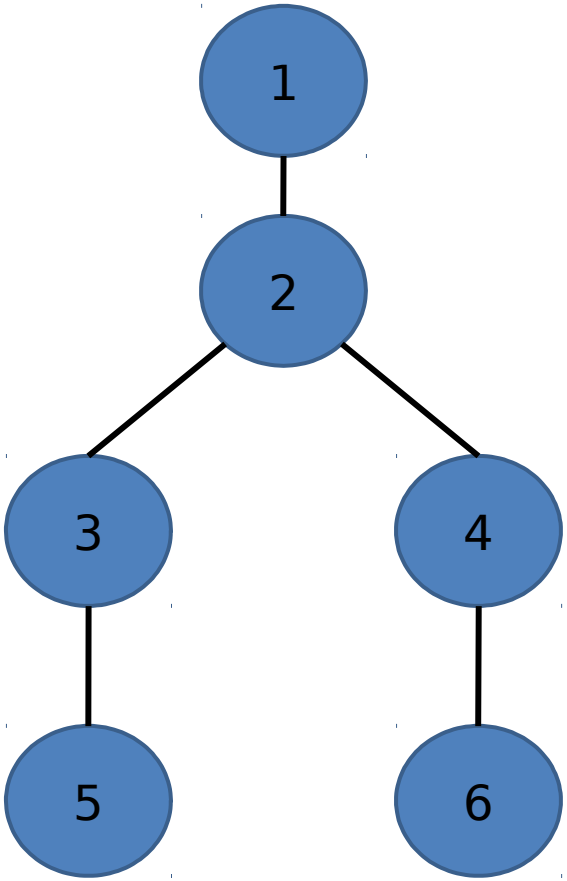
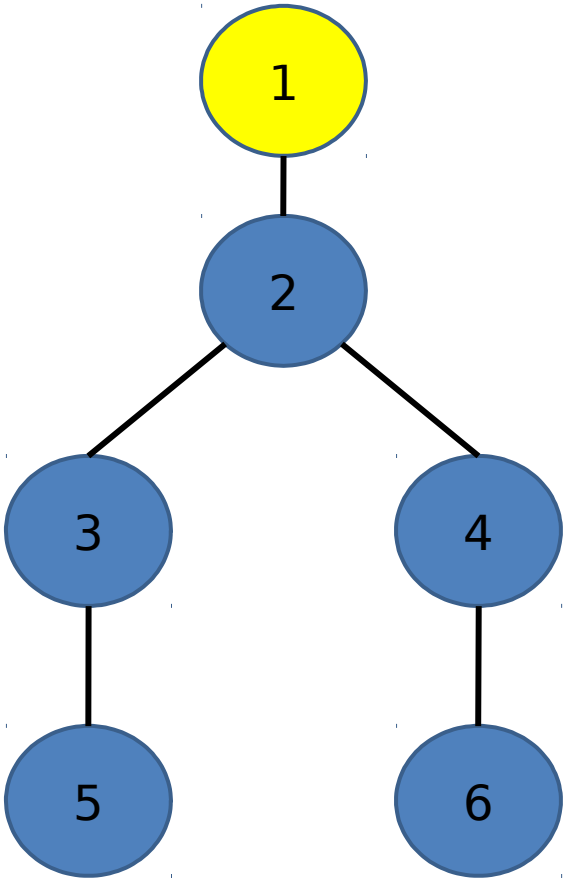
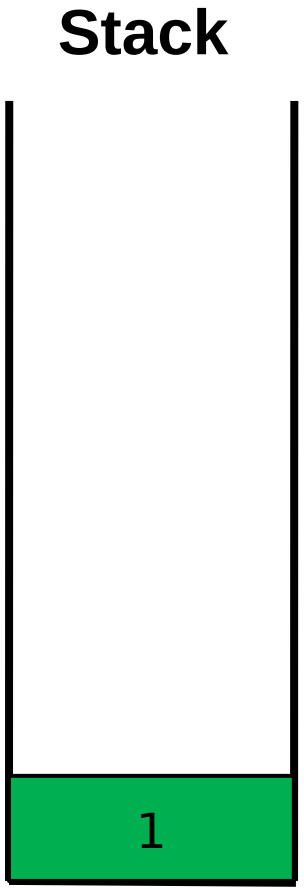


Stack

DFS





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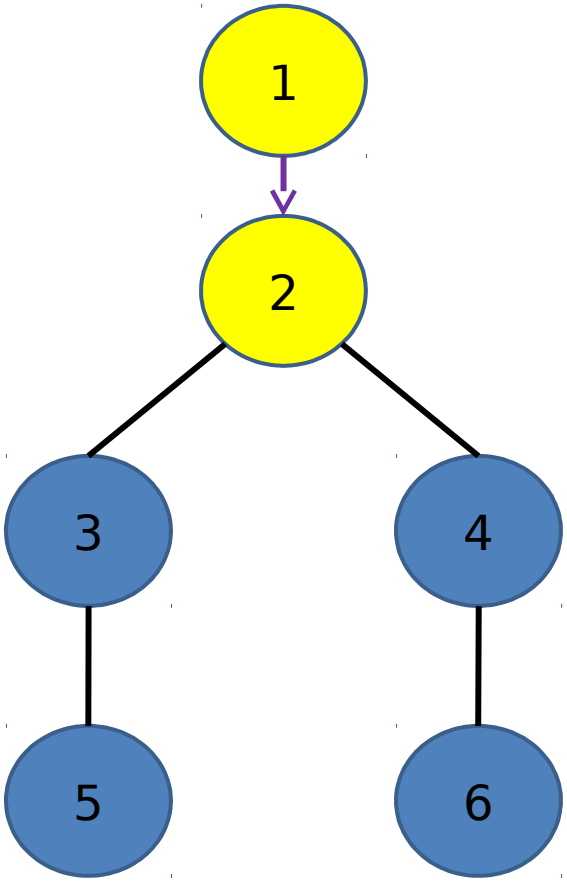

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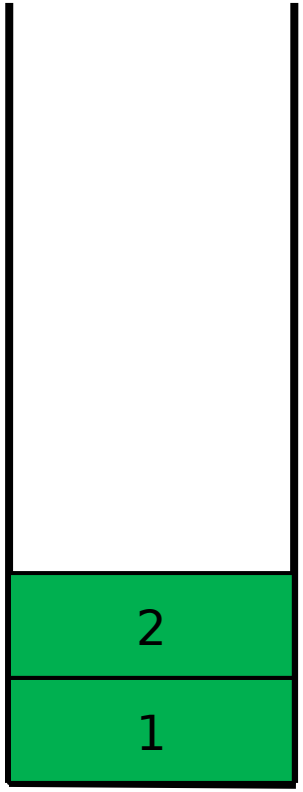

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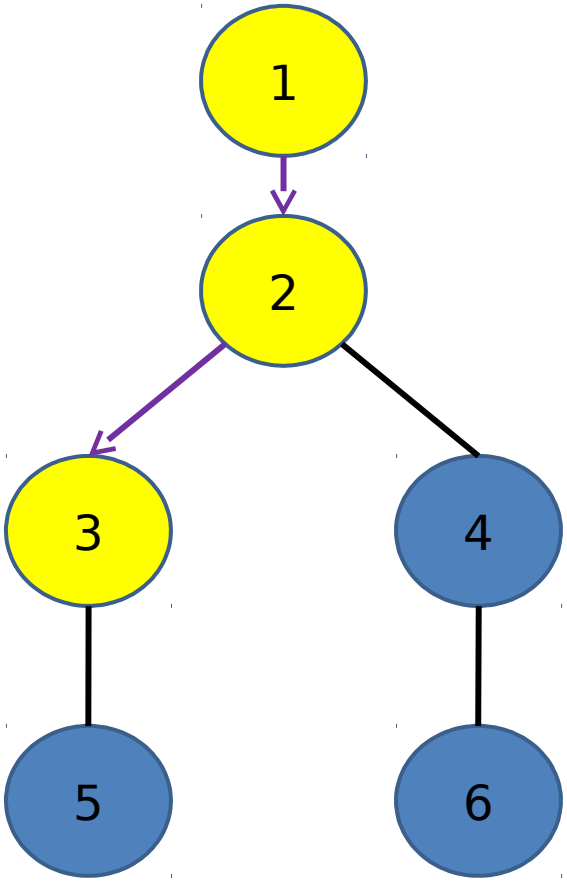

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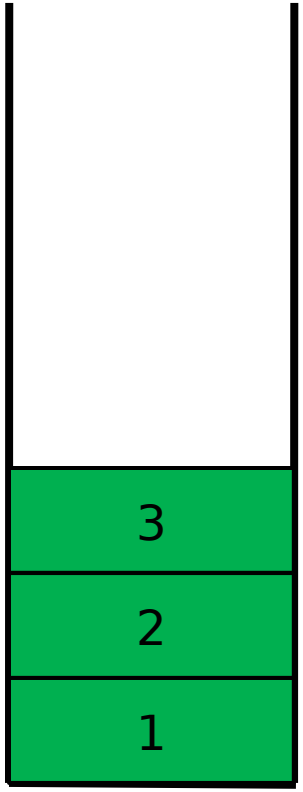

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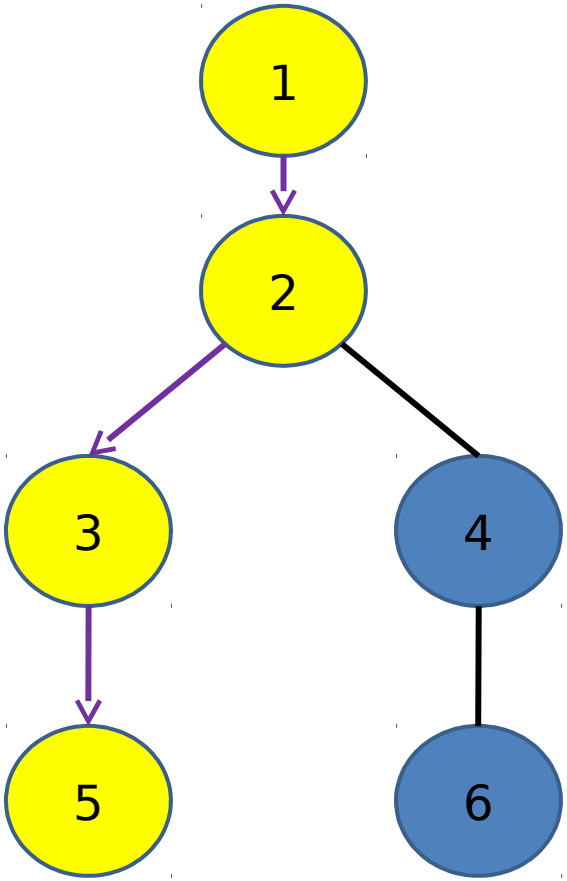

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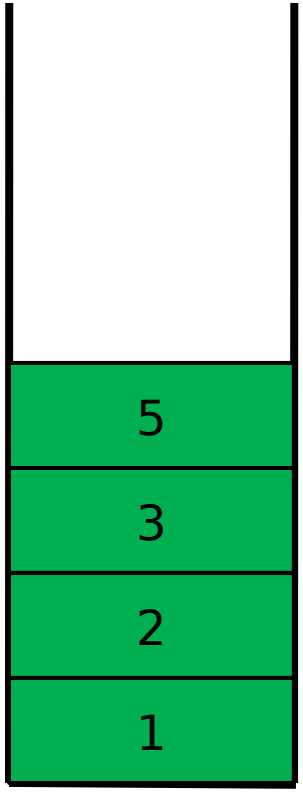

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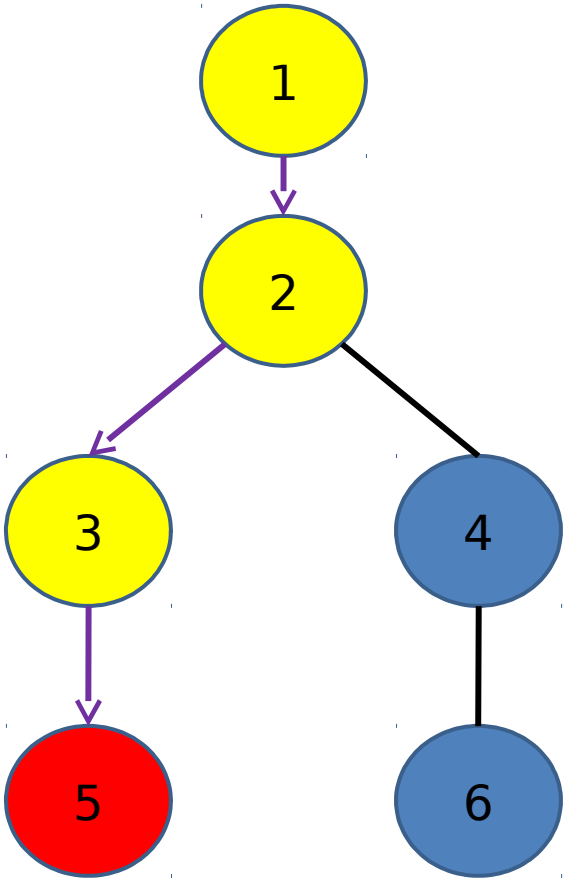

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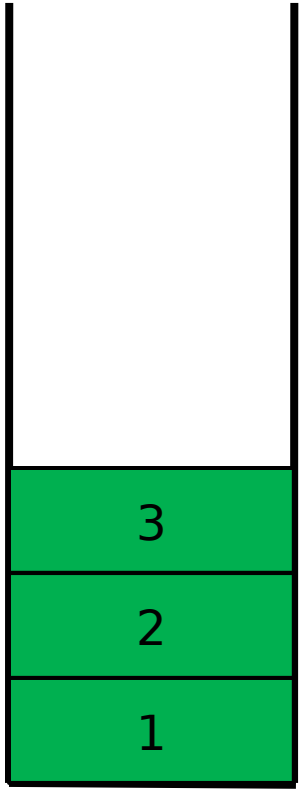

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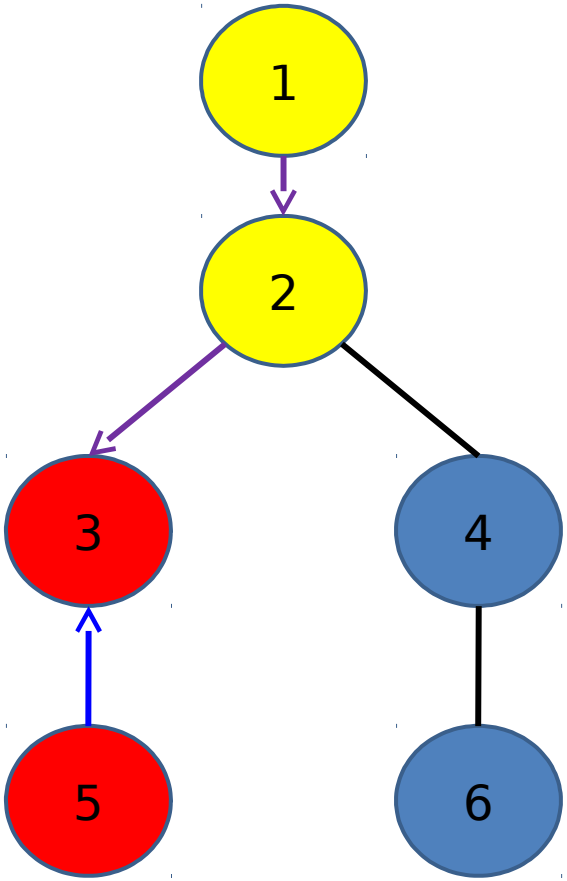

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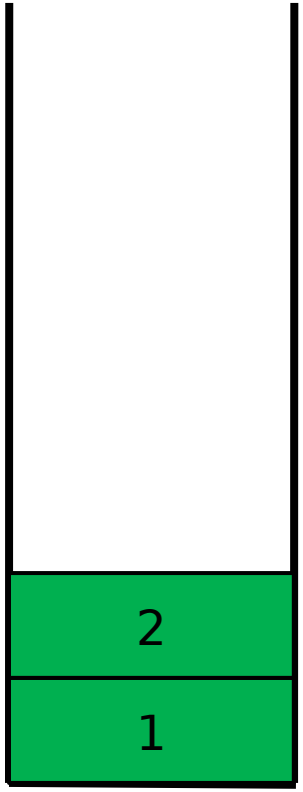

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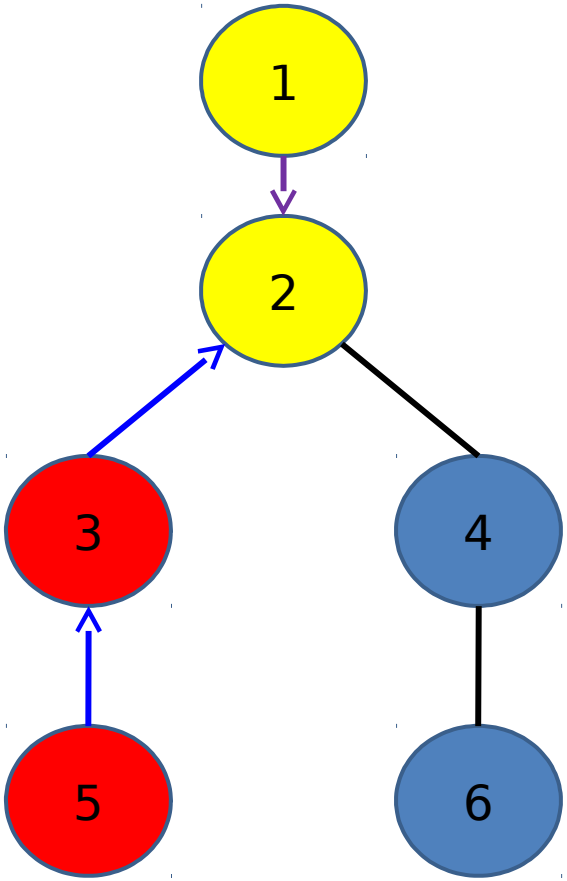

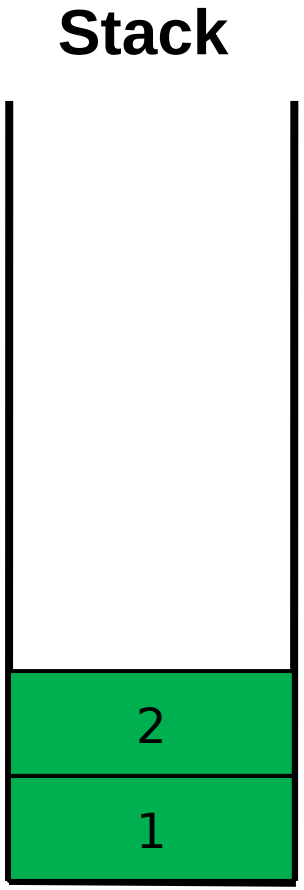

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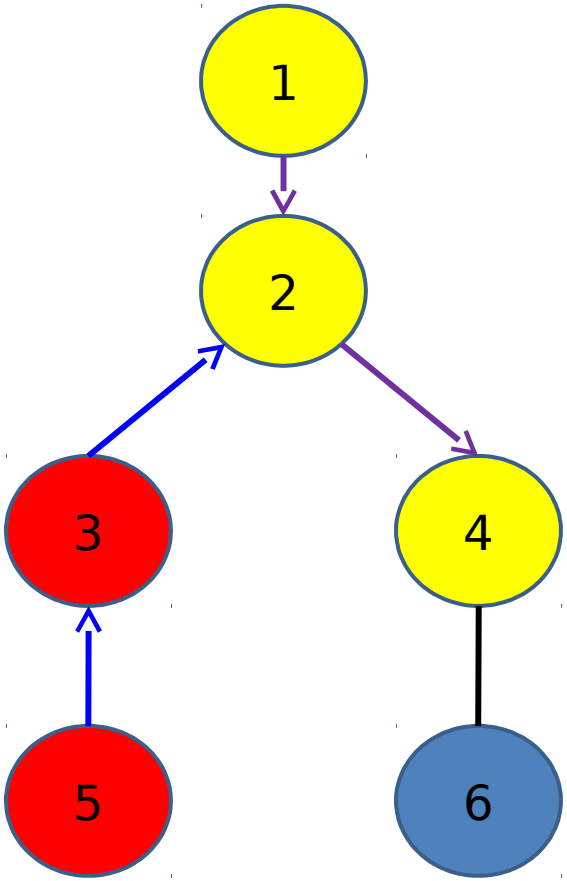
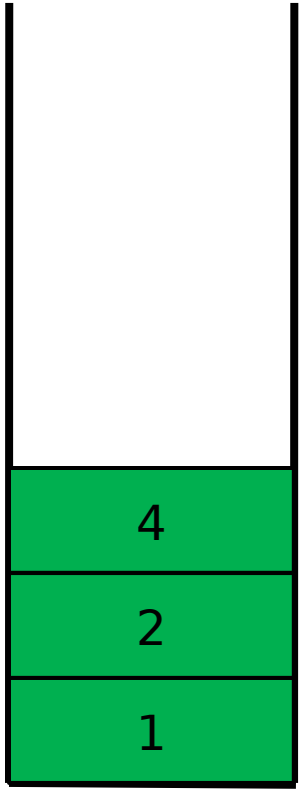
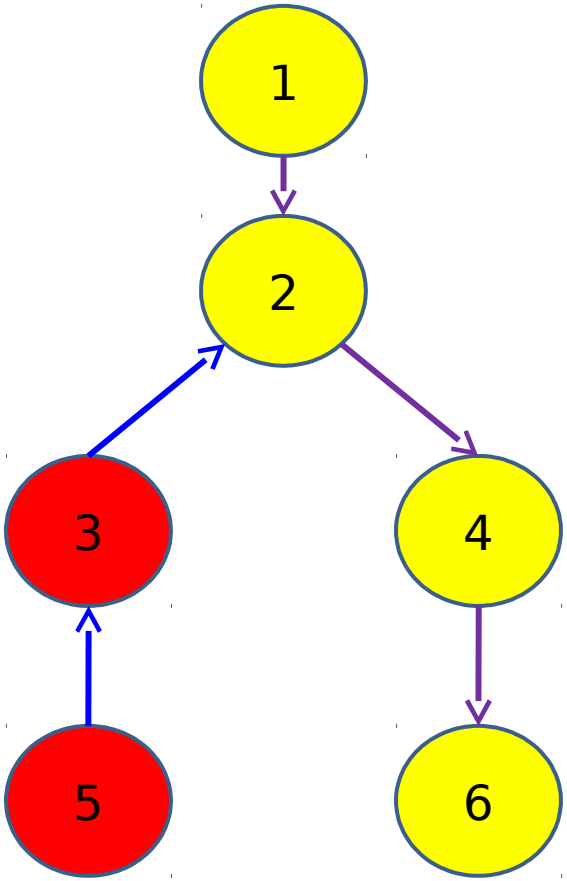


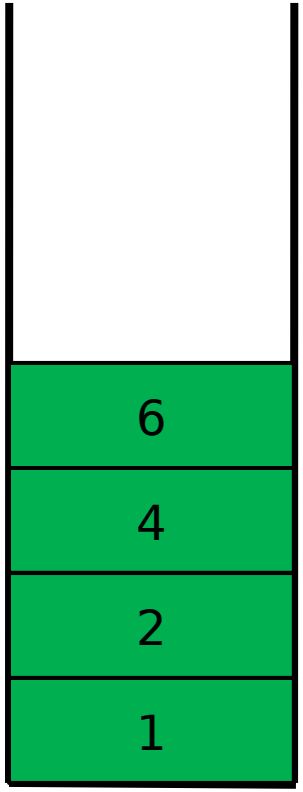
Stack



DFS



Stack



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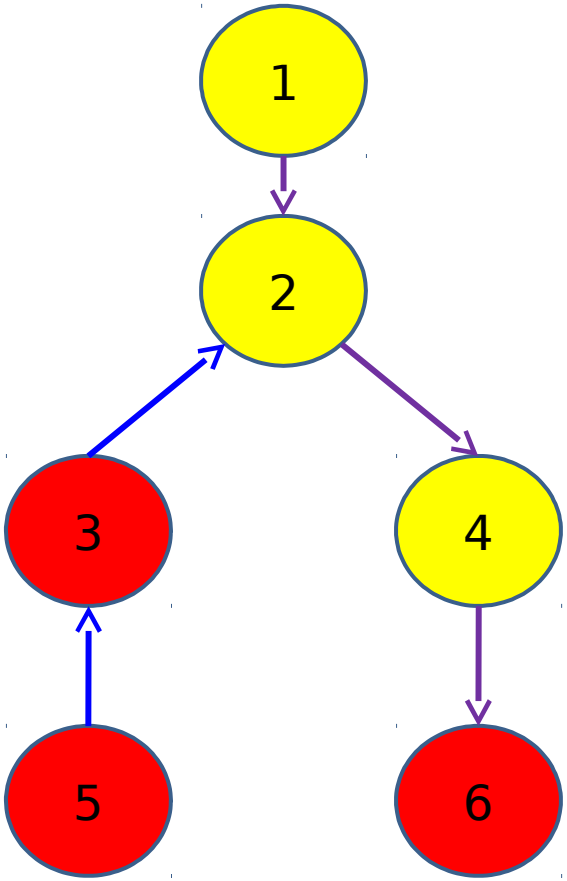
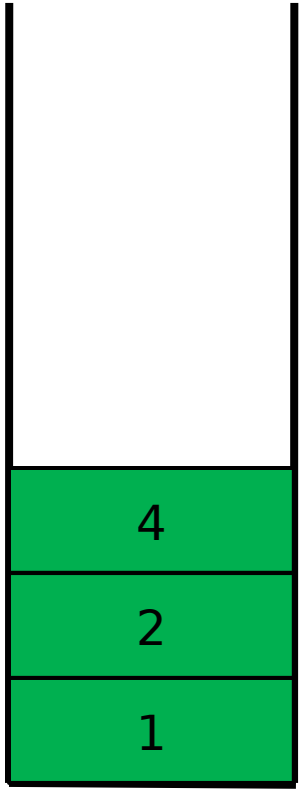


Stack



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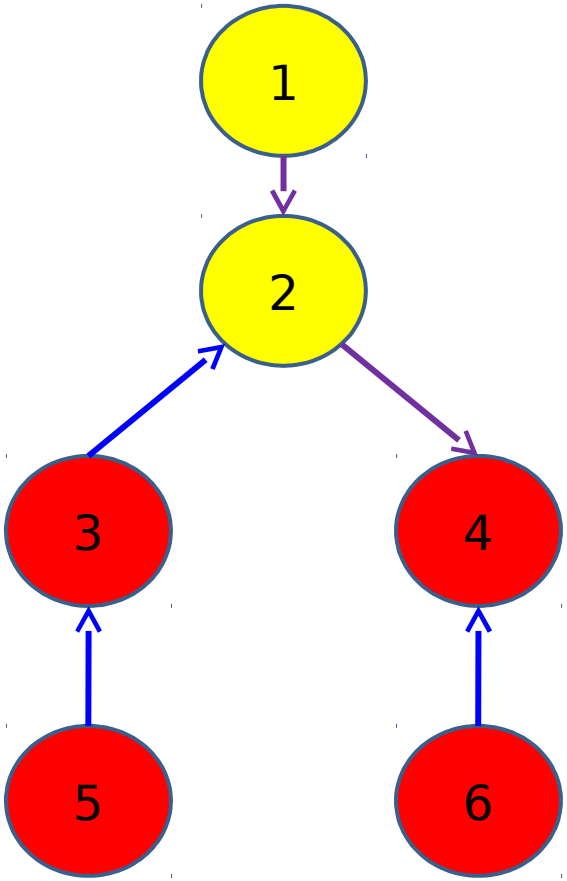

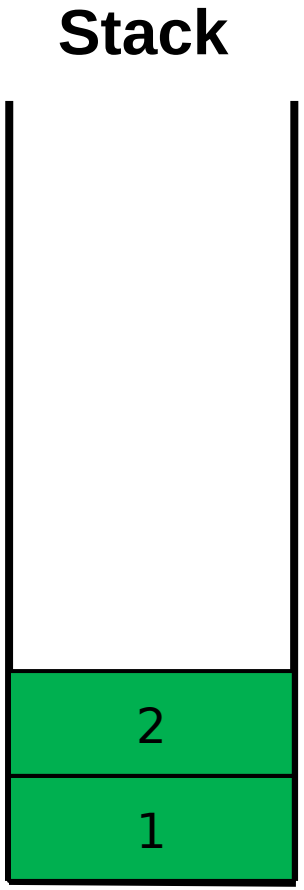

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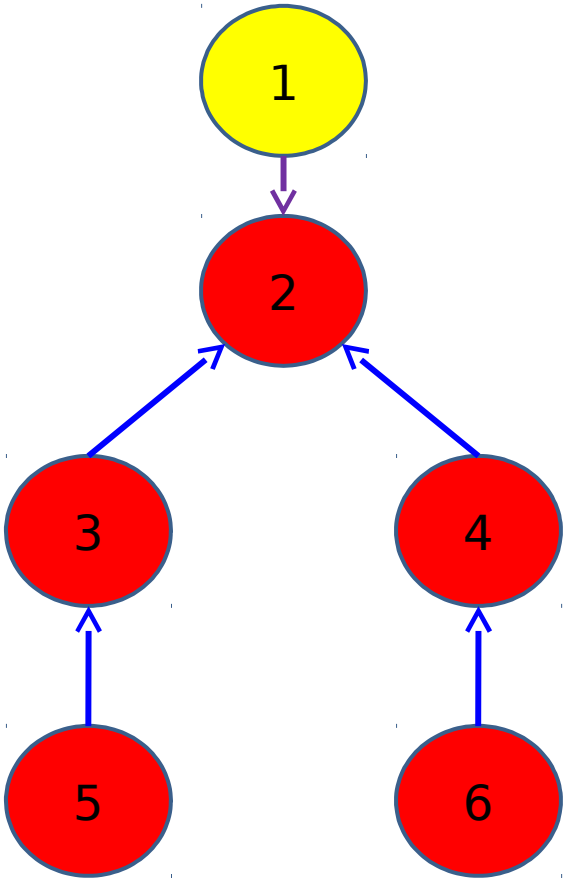

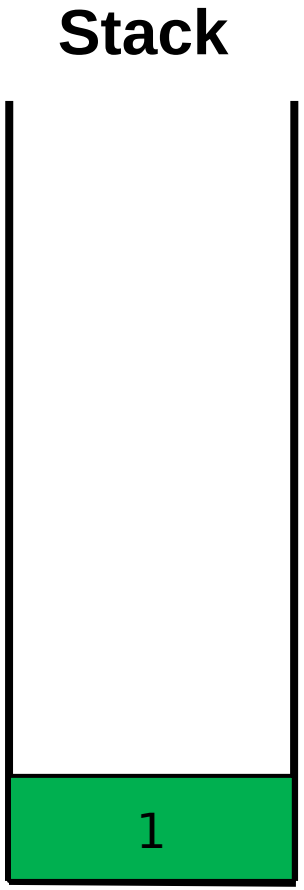

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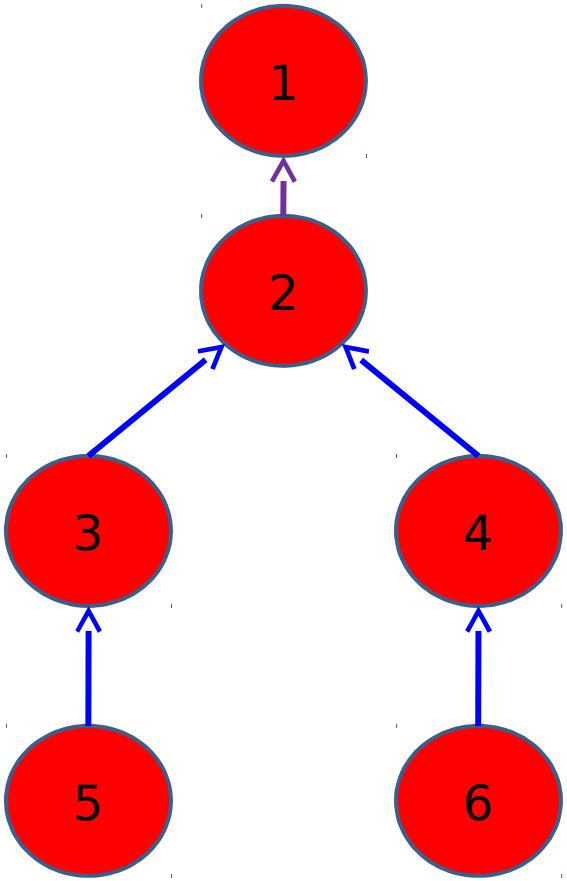

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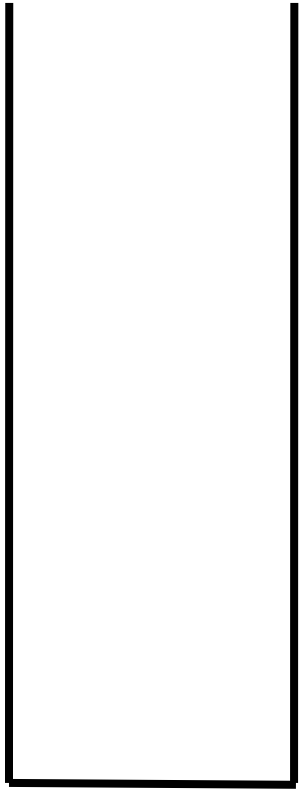


DFS

- Source Code(adjacency list)

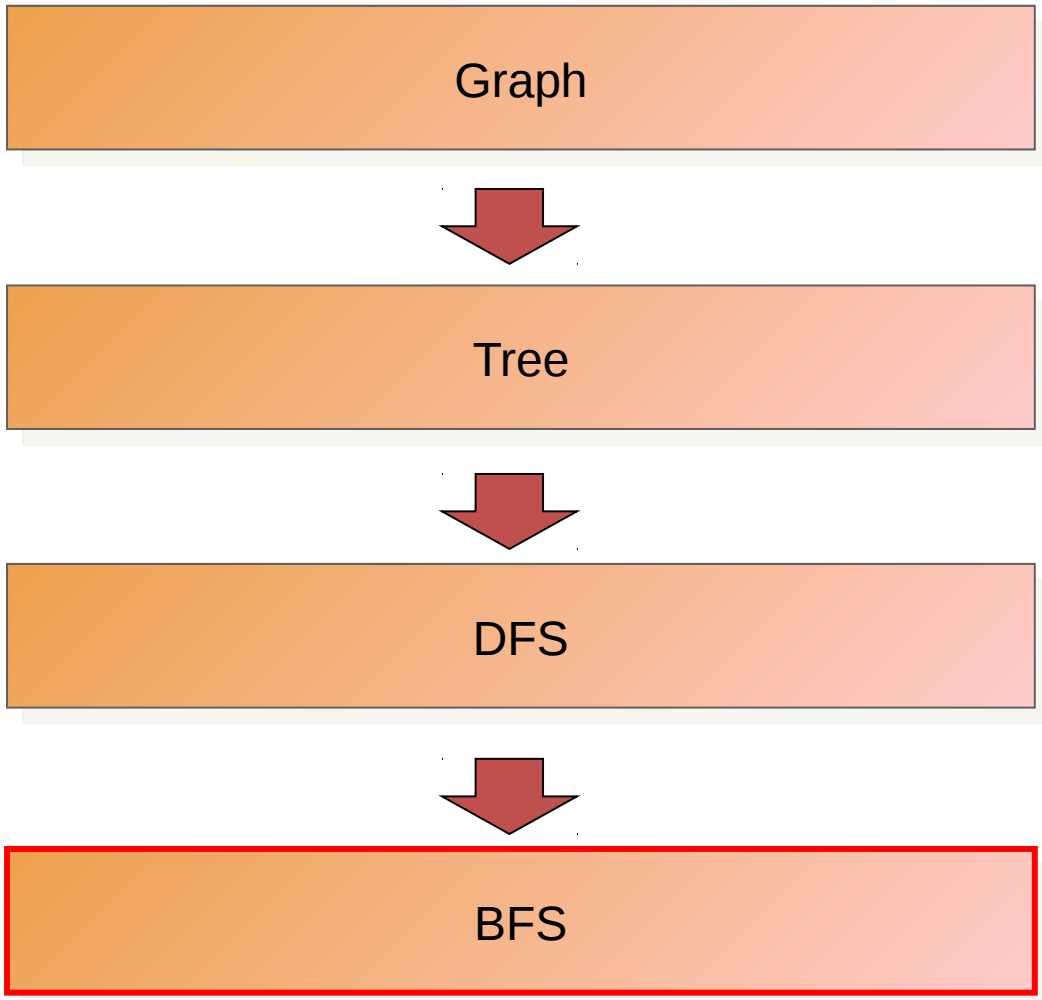
```
void DFS(int cur)
{
    vis[cur]=true;

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

DFS

- Practice

[UVA-572] Oil Deposits

Outline



BFS

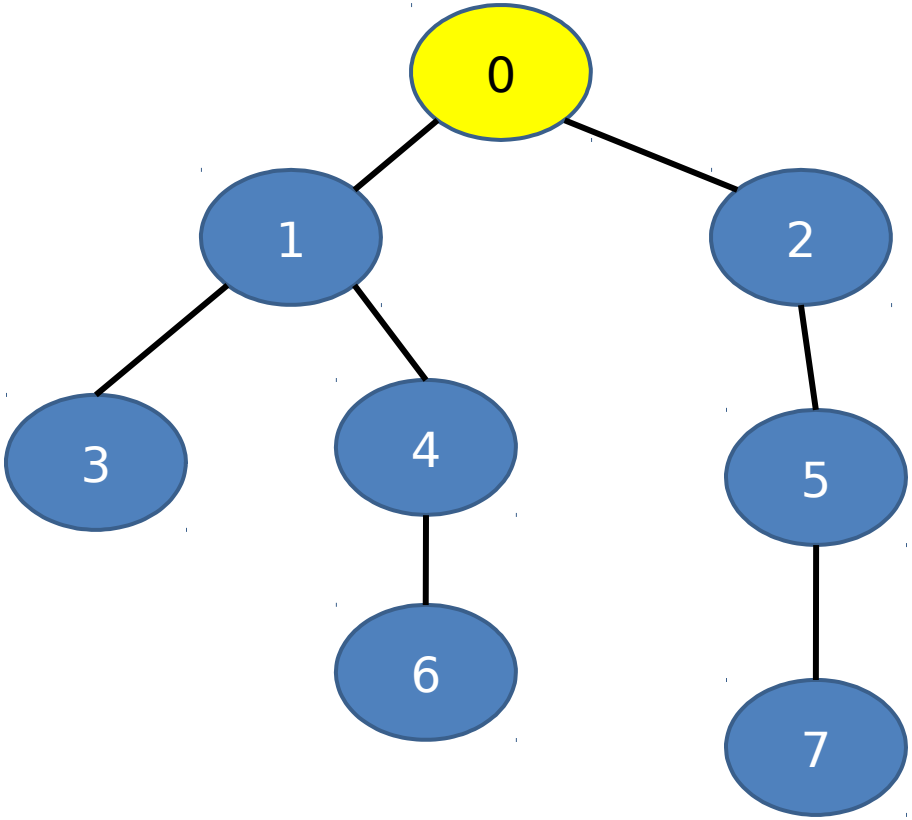
(B)readth-(F)irst-(S)earch

BFS

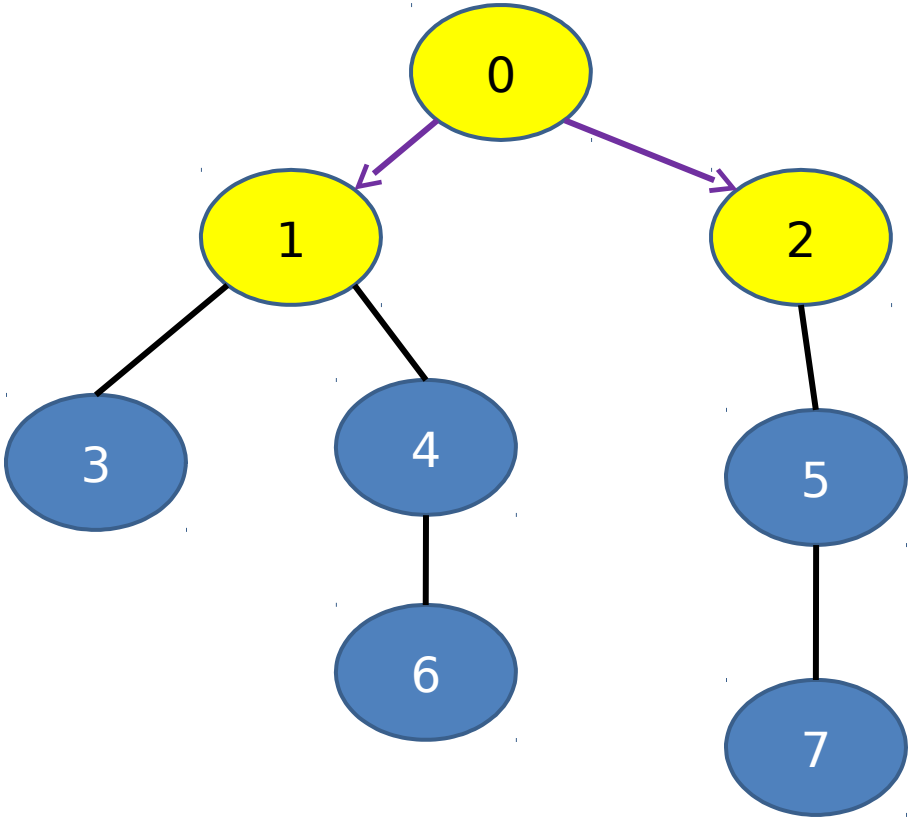
(B)readth-(F)irst-(S)earch

Queue

BFS



BFS



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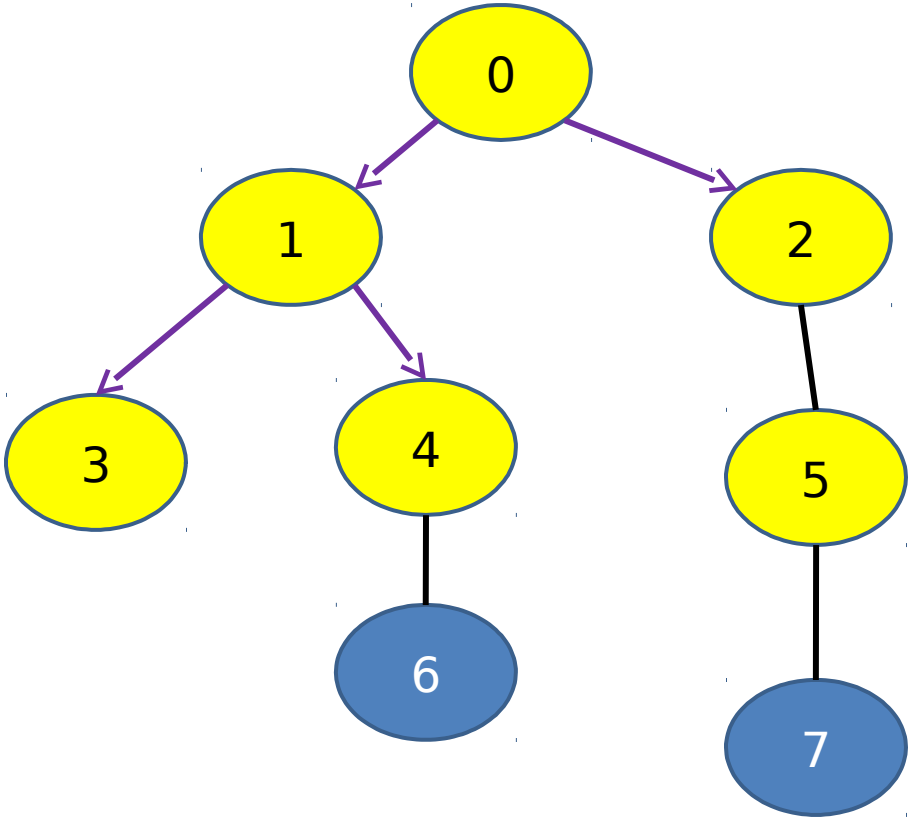
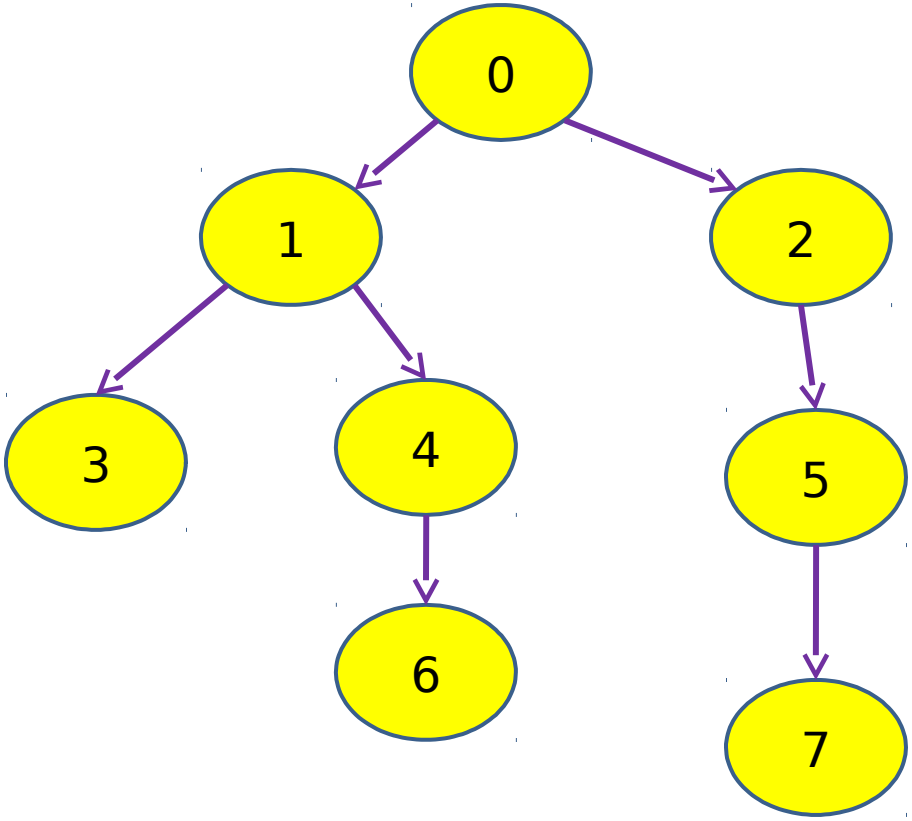
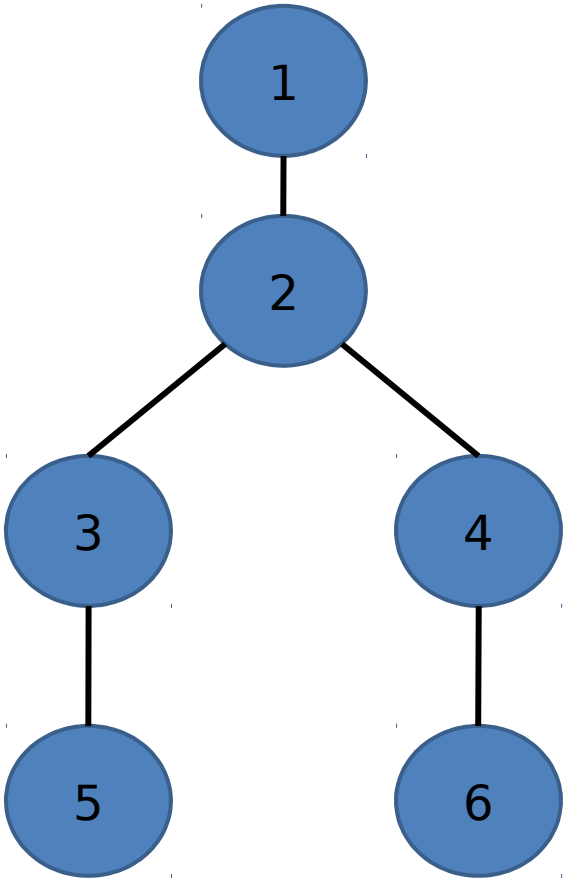


BFS

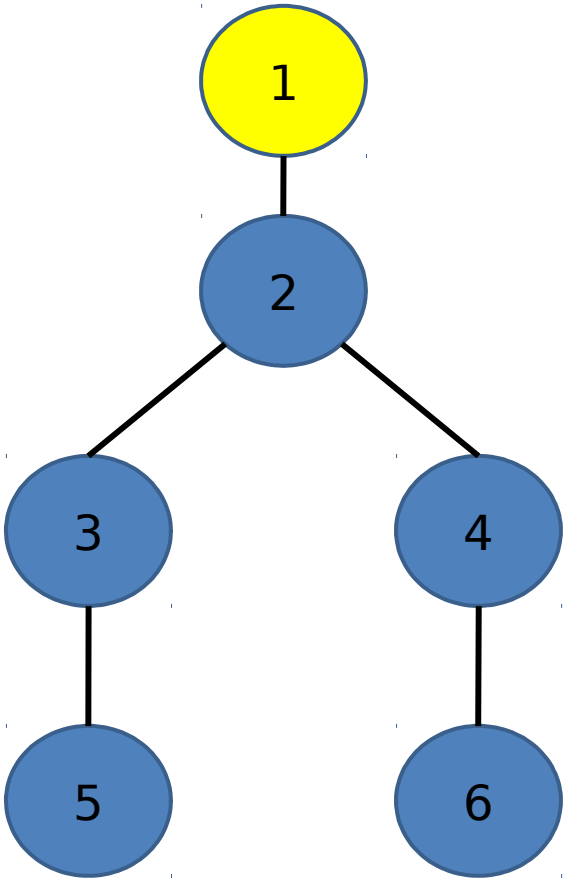


BFS



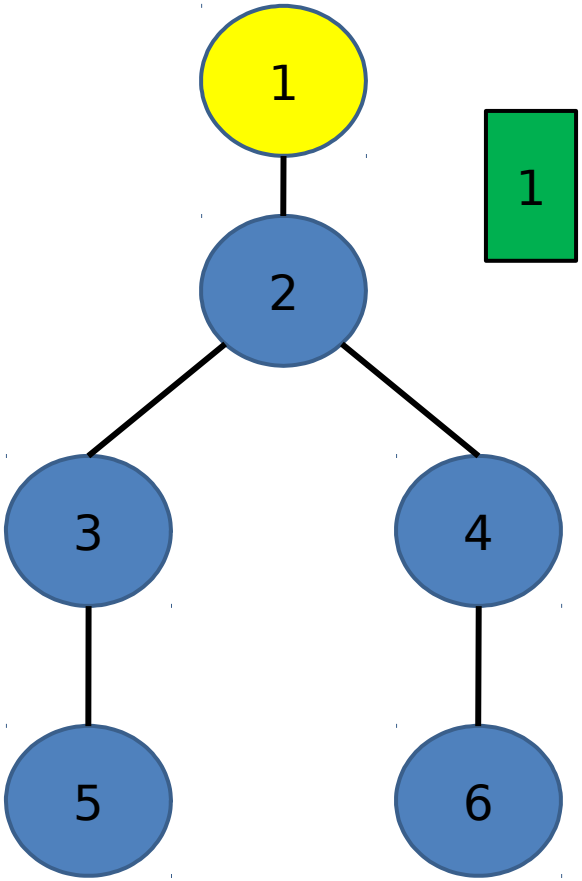
Queue

BFS



Queue

BFS



Queue

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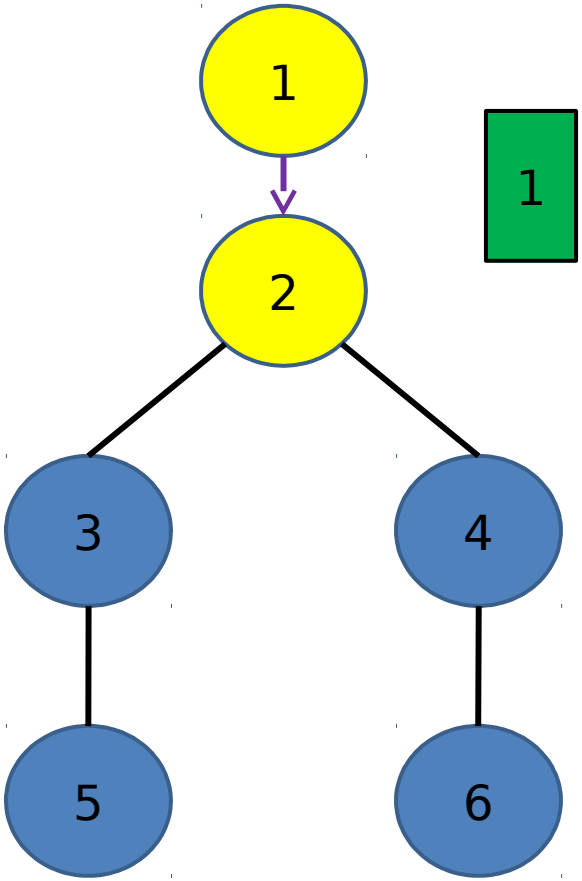

Queue

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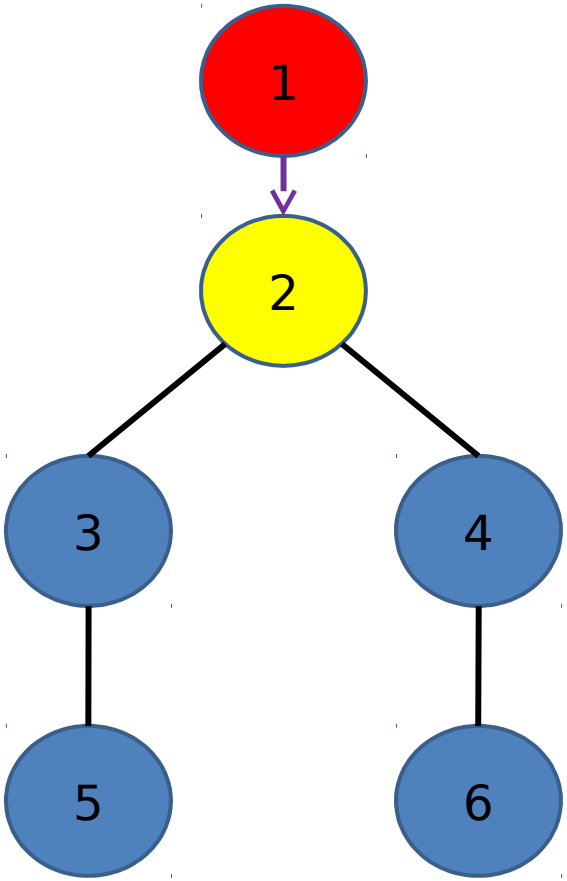
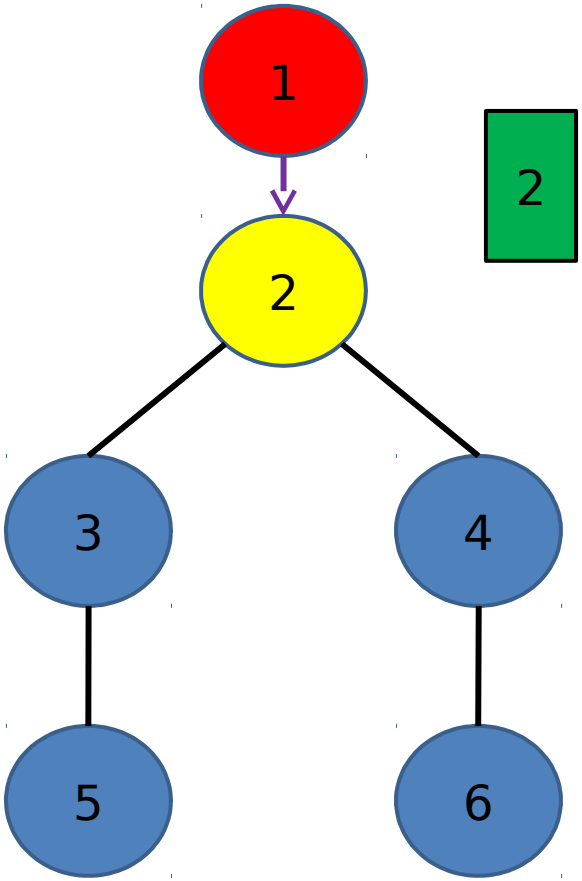


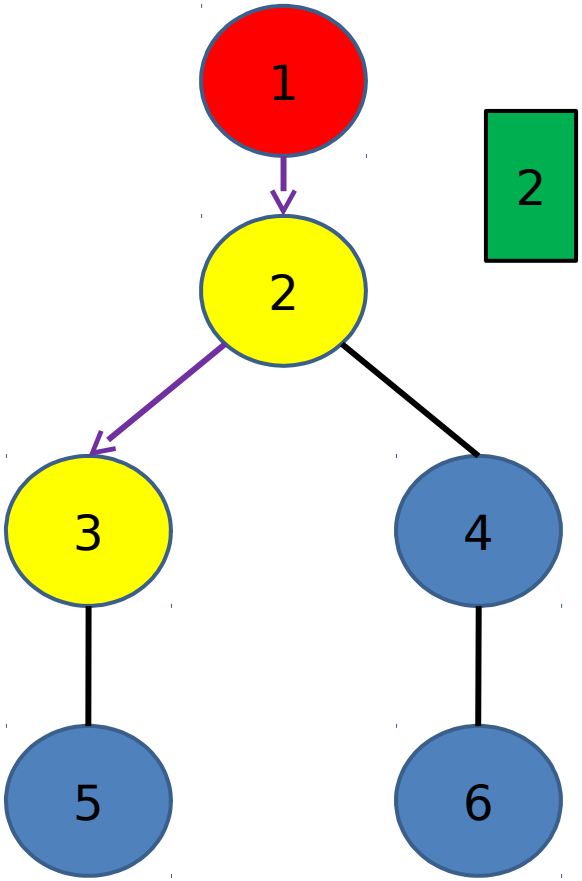
Queue

BFS



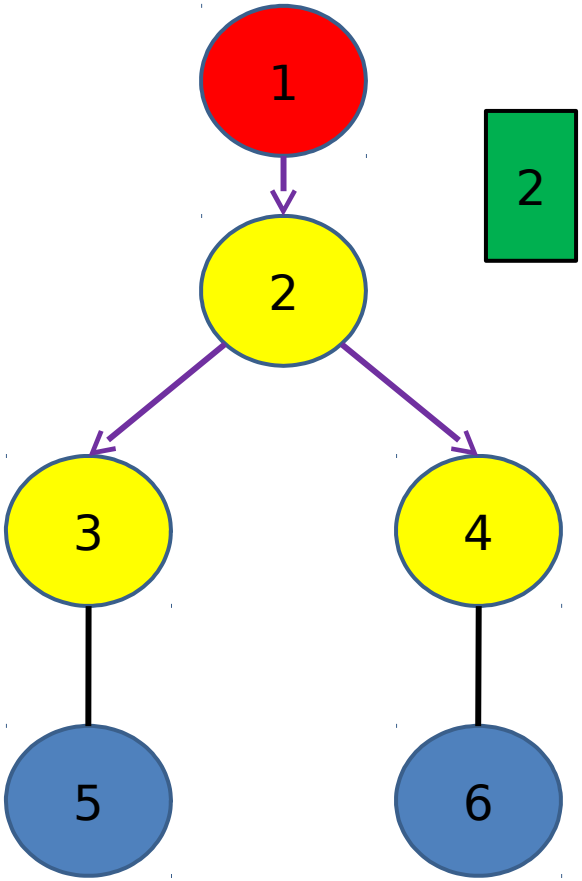
Queue

BFS



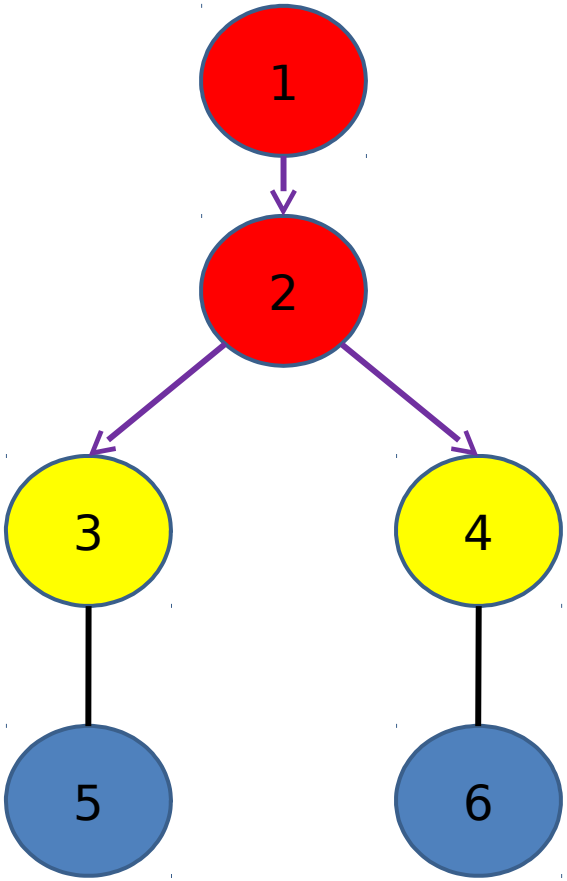
Queue

BFS



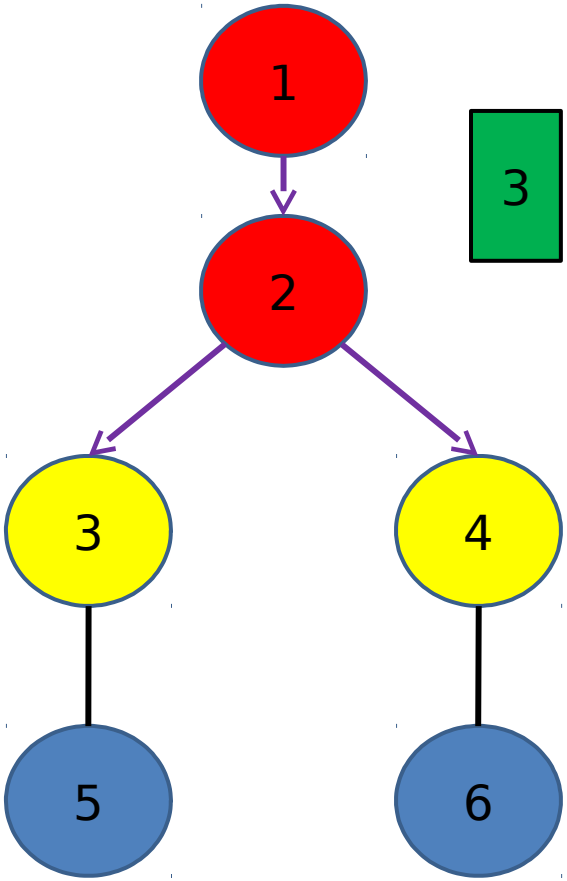
Queue

BFS



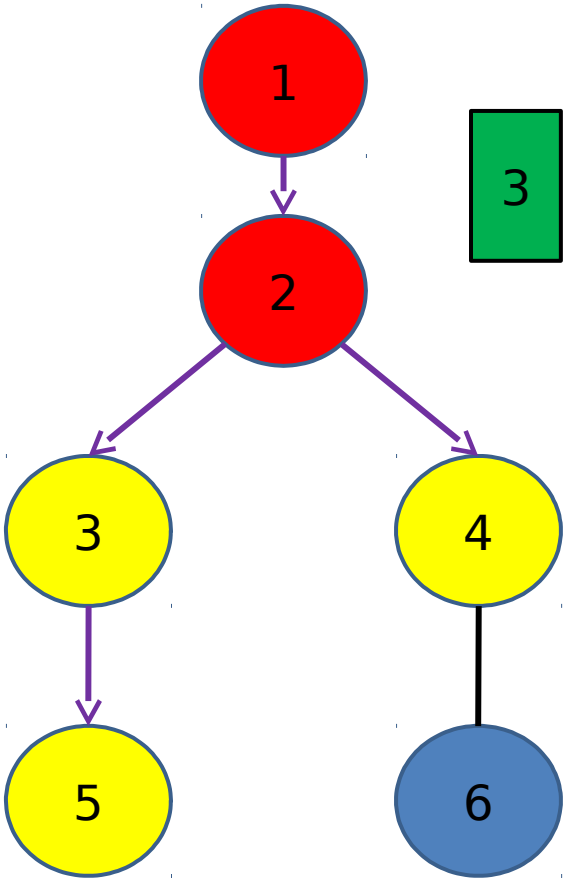
Queue

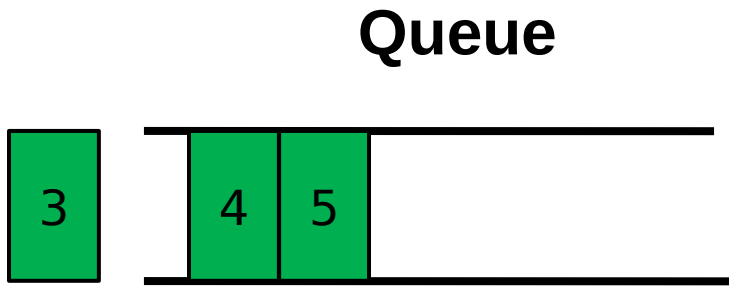
BFS



Queue

BFS





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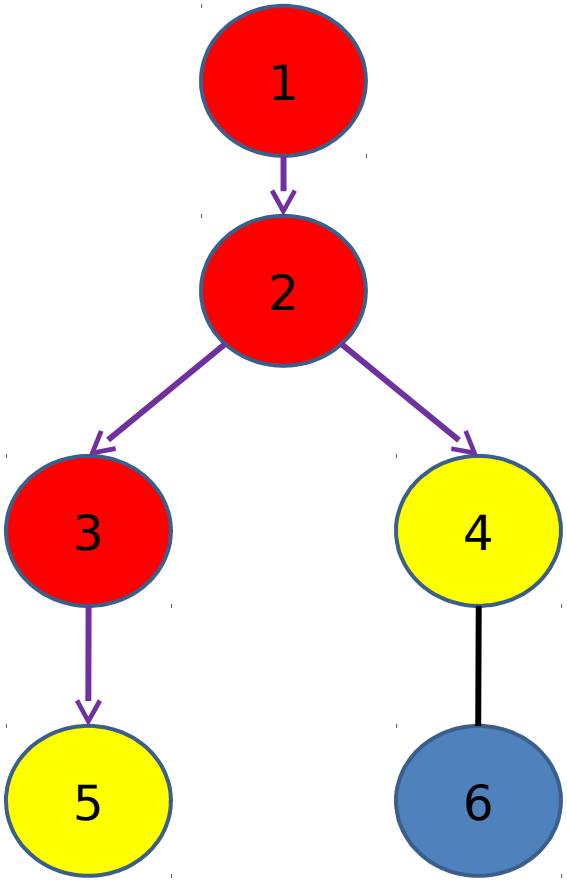
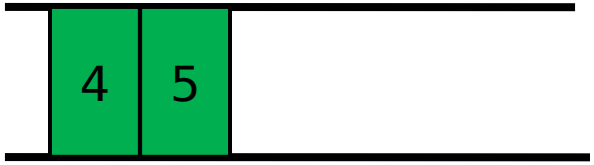


Queue



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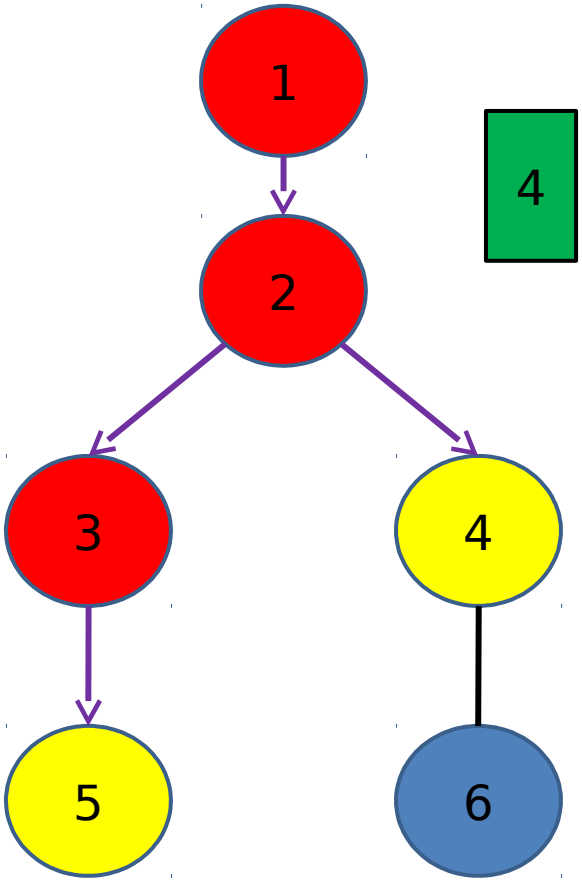

Queue

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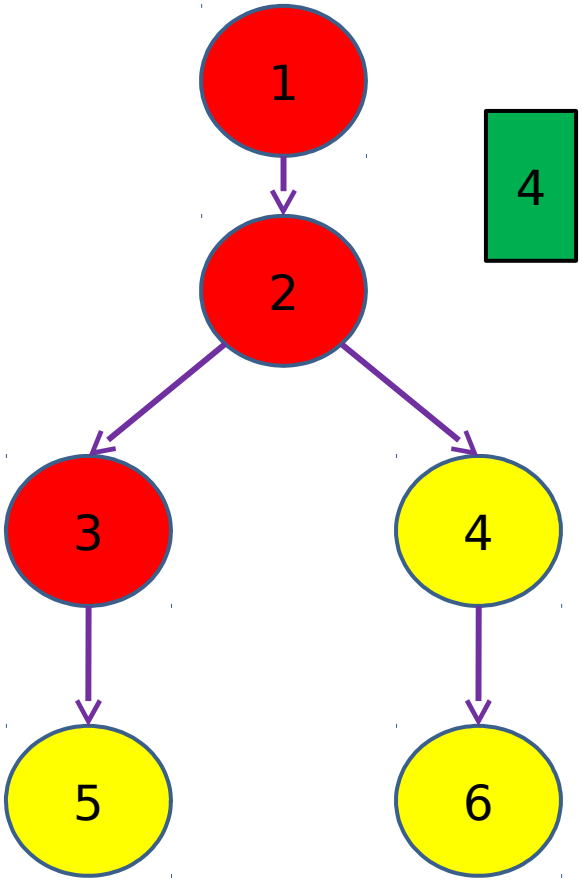

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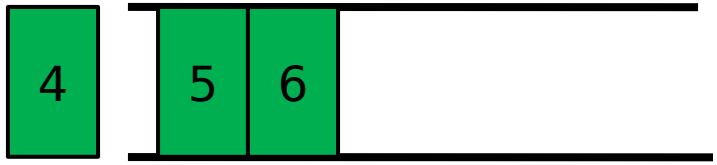

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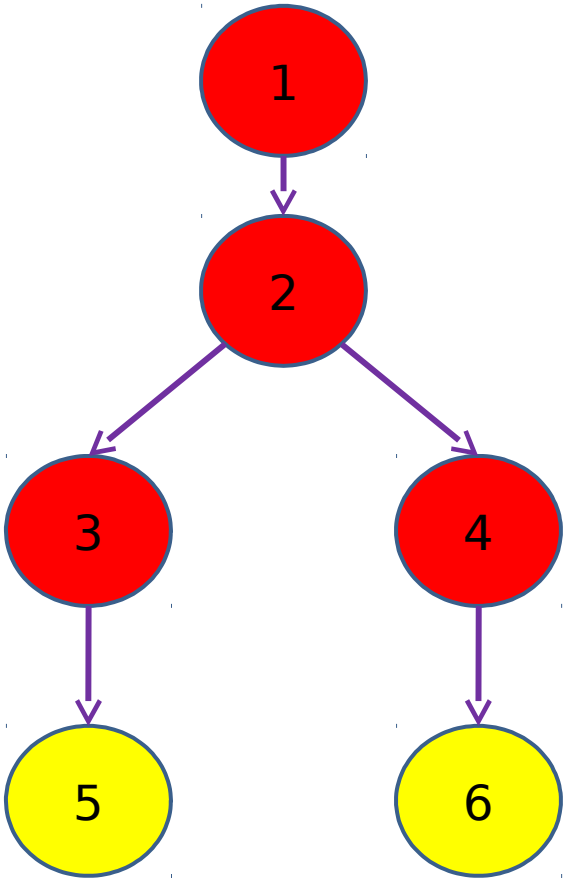

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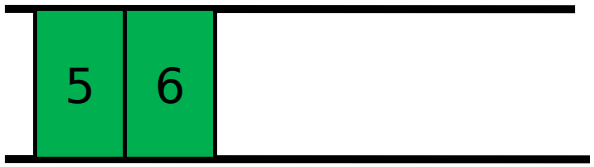

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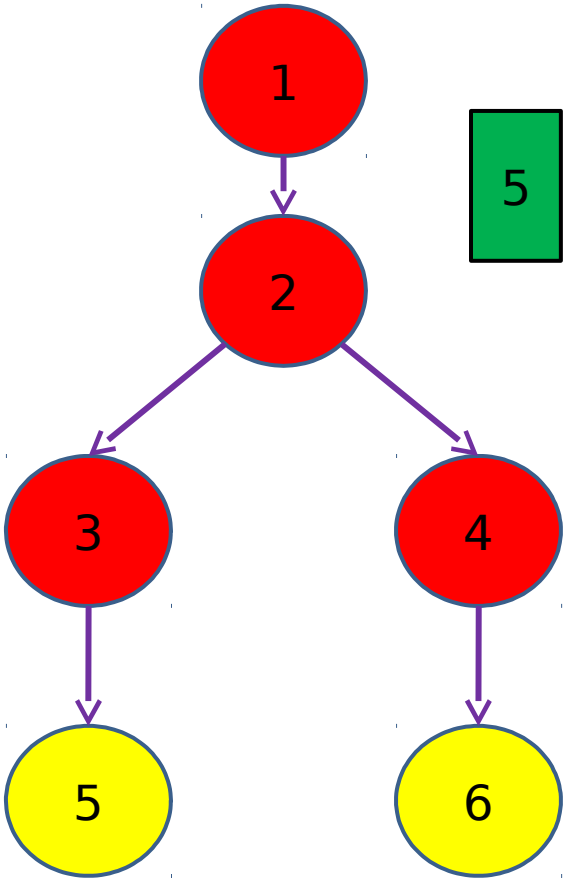

Queue

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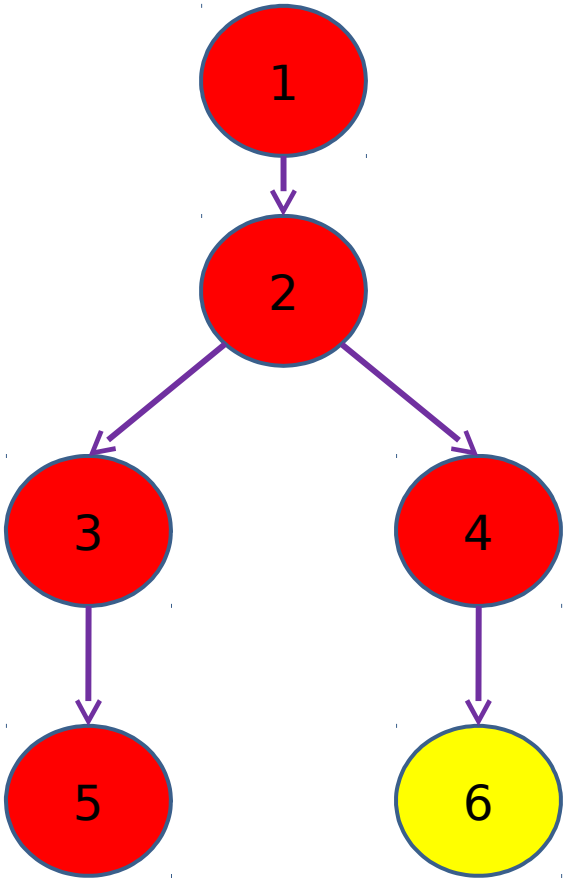

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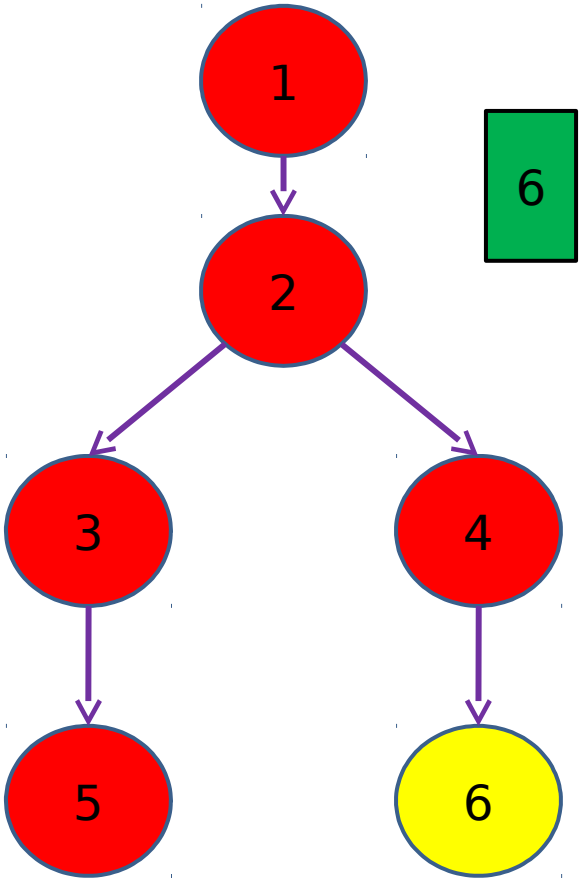

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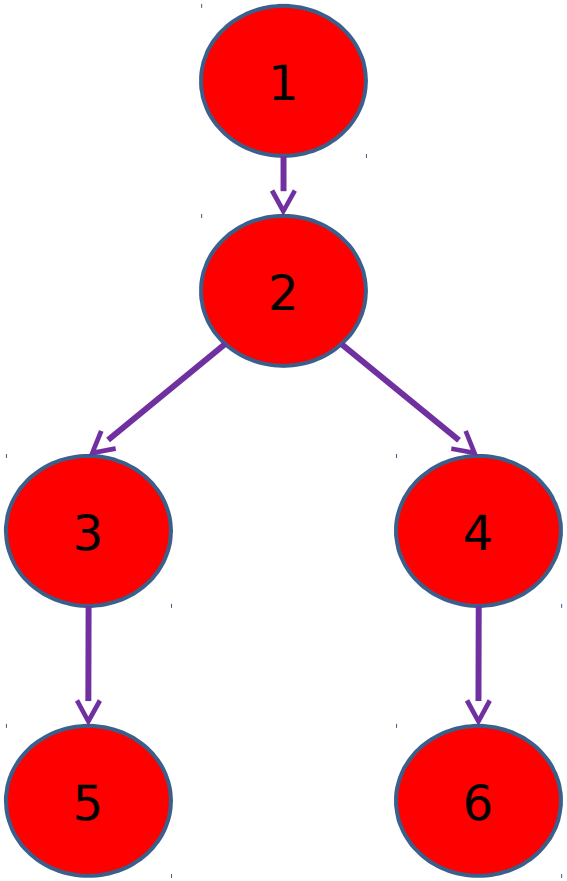

Queue

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)

Time Complexity

DFS O(V^2)

BFS O(V^2)

V: the number of nodes

E: the number of edges

(adjacency matrix)

HW3

Totally 30 problems

UVa:

260,336,352,383,439,532,539,567,571,601,705,

762,10004,10009,10474, 10505,10592,10603, 10946, 11624, 532, 572

POJ:

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

acm International Collegiate Programming Contest

IBM event sponsor

Thank for Your Attention

Made By louis7340 & Edit by