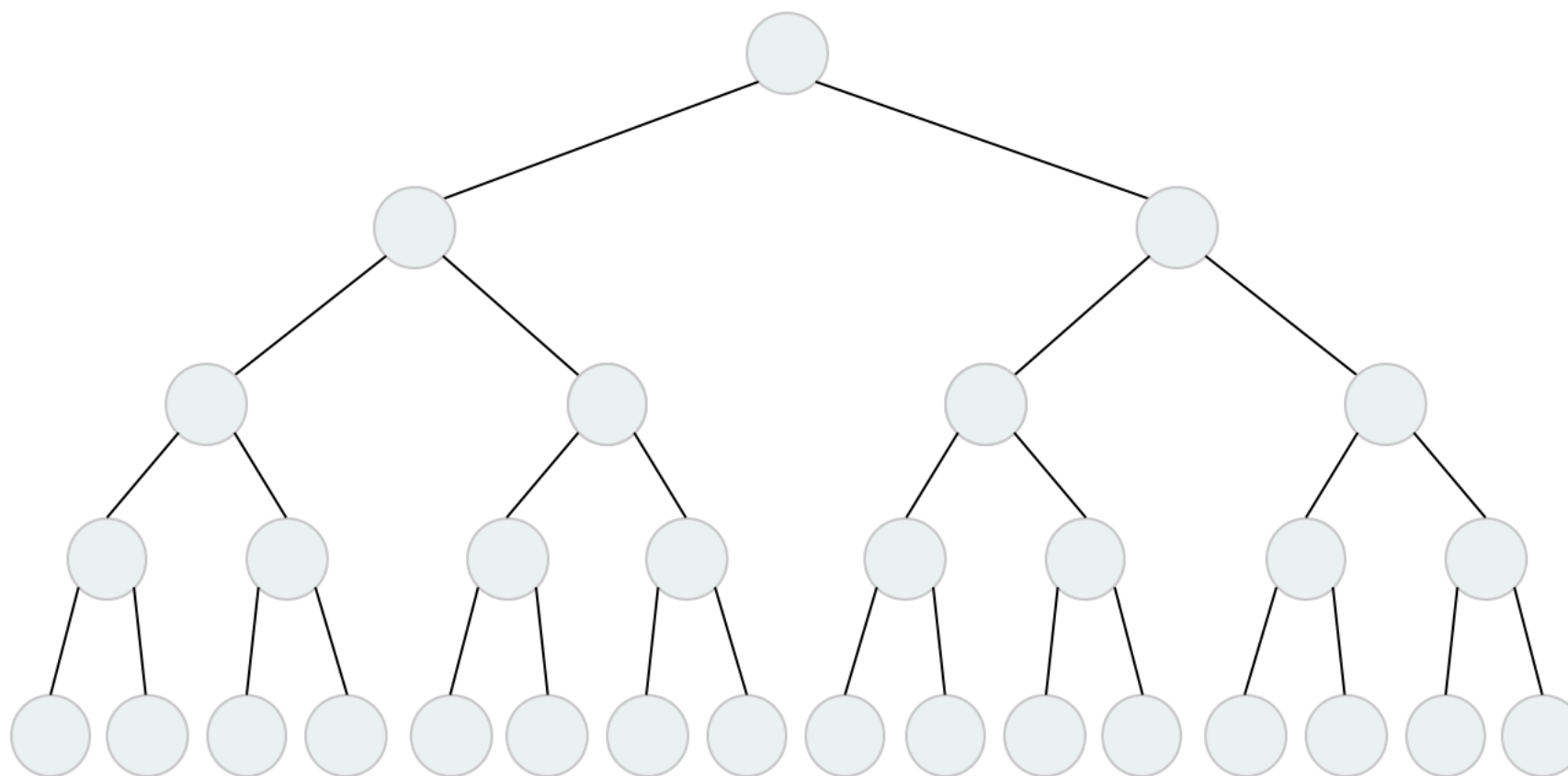
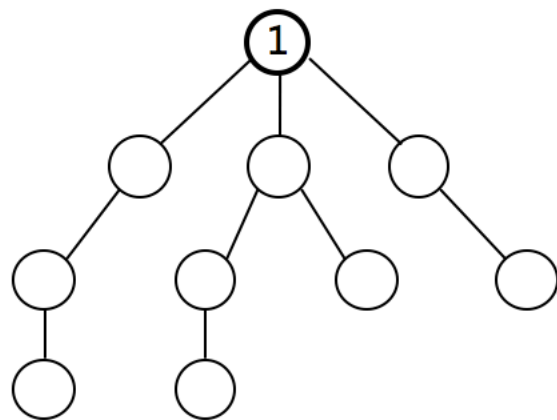


# 广度优先搜索(Breadth-First-Search)

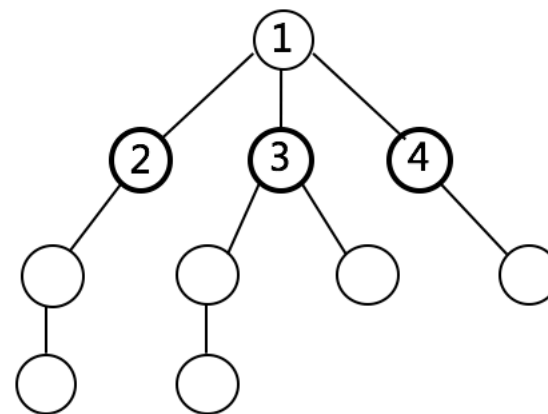
# 在树（图/状态集）中寻找特定节点



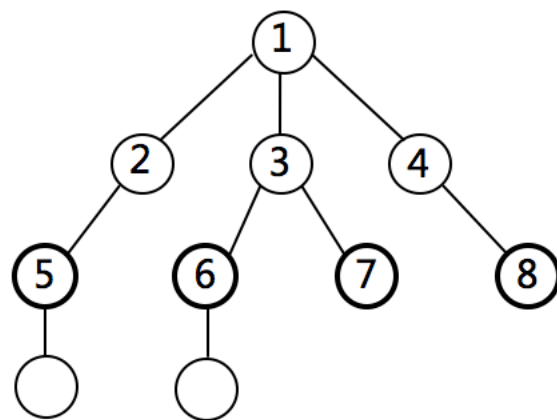
# How the BFS would work



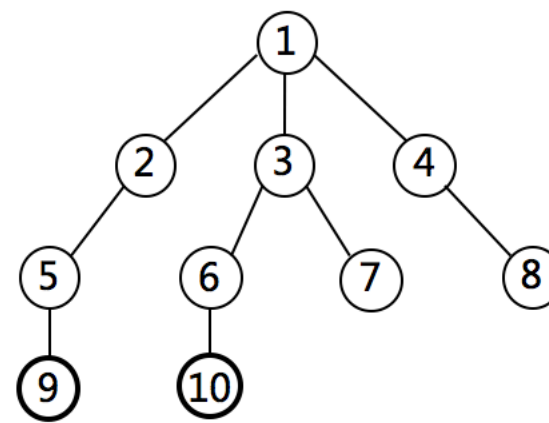
1



2



3



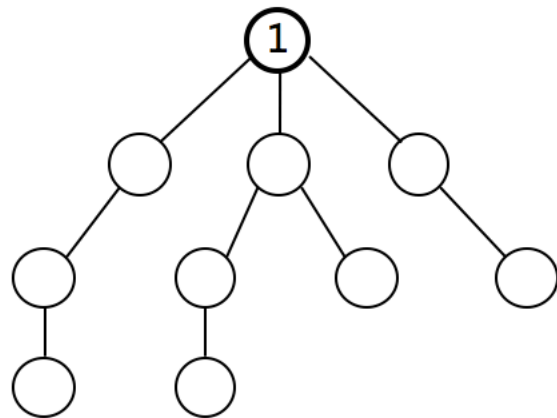
4

# BFS代码

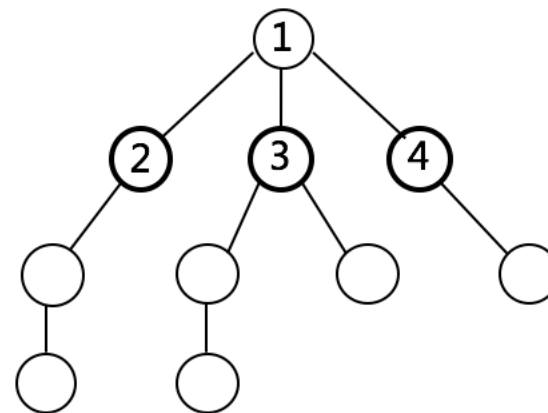
```
def BFS(graph, start, end):  
  
    queue = []  
    queue.append([start])  
    visited.add(start)  
  
    while queue:  
        node = queue.pop()  
        visited.add(node)  
  
        process(node)  
        nodes = generate_related_nodes(node)  
        queue.push(nodes)  
  
    # other processing work  
    ...
```

# 深度优先搜索(Depth-First-Search)

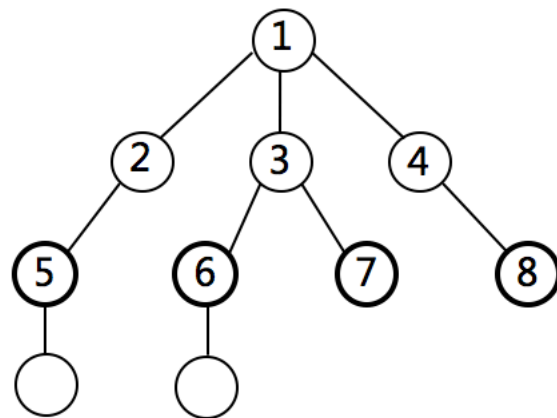
# How a BFS Would Traverse This Tree



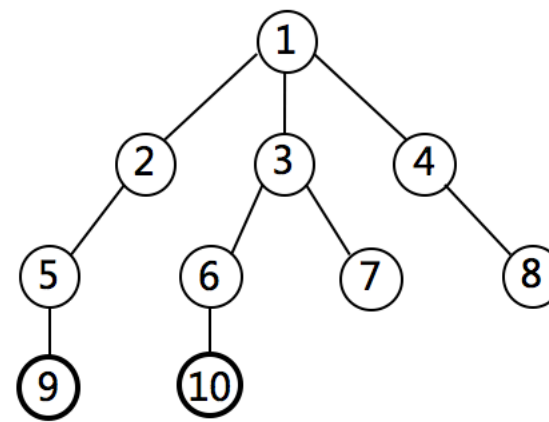
1



2

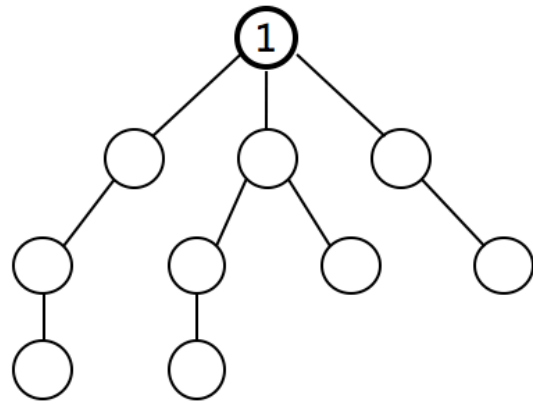


3

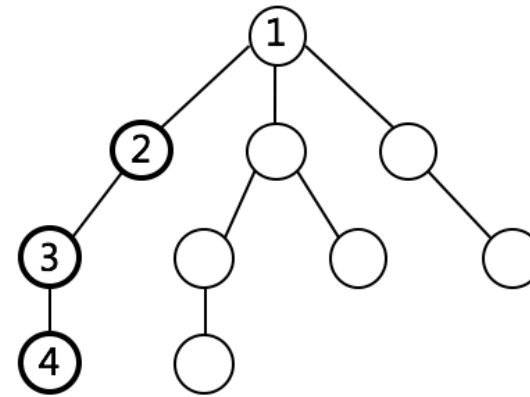


4

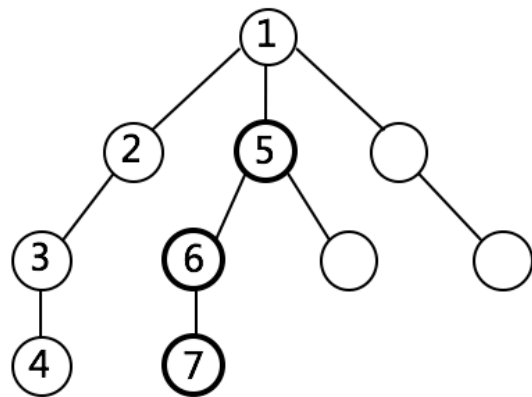
# How a DFS Would Traverse This Tree



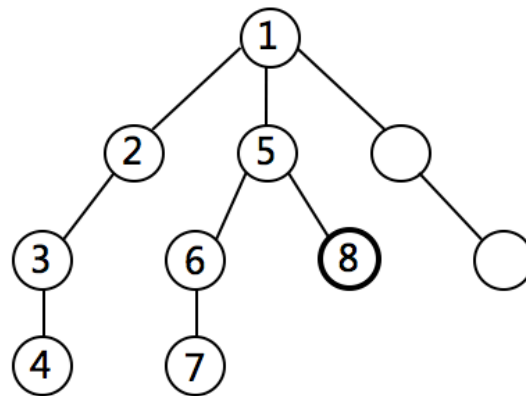
1



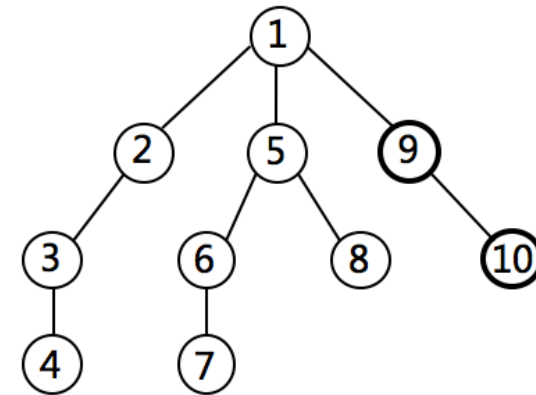
2



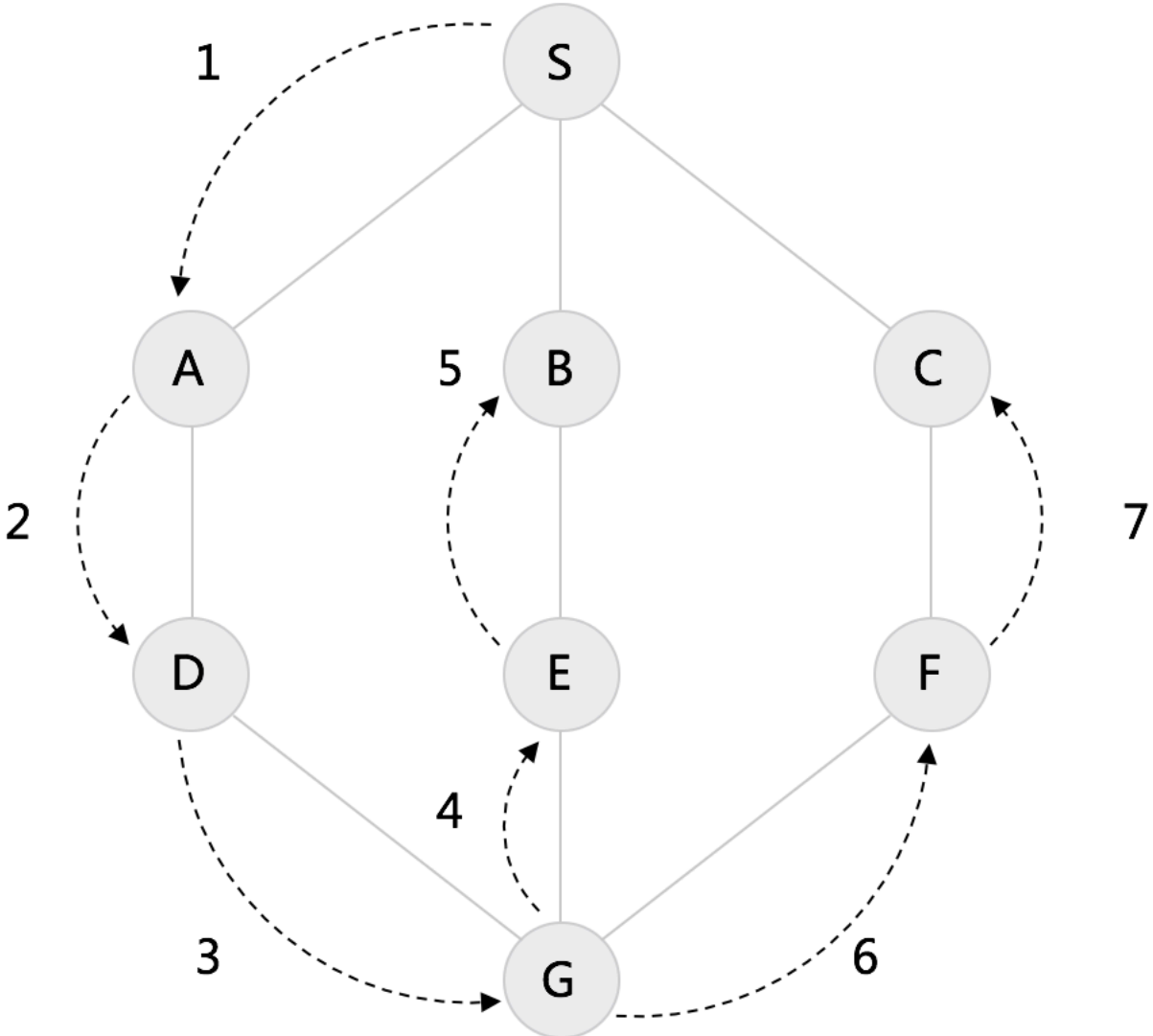
3



4

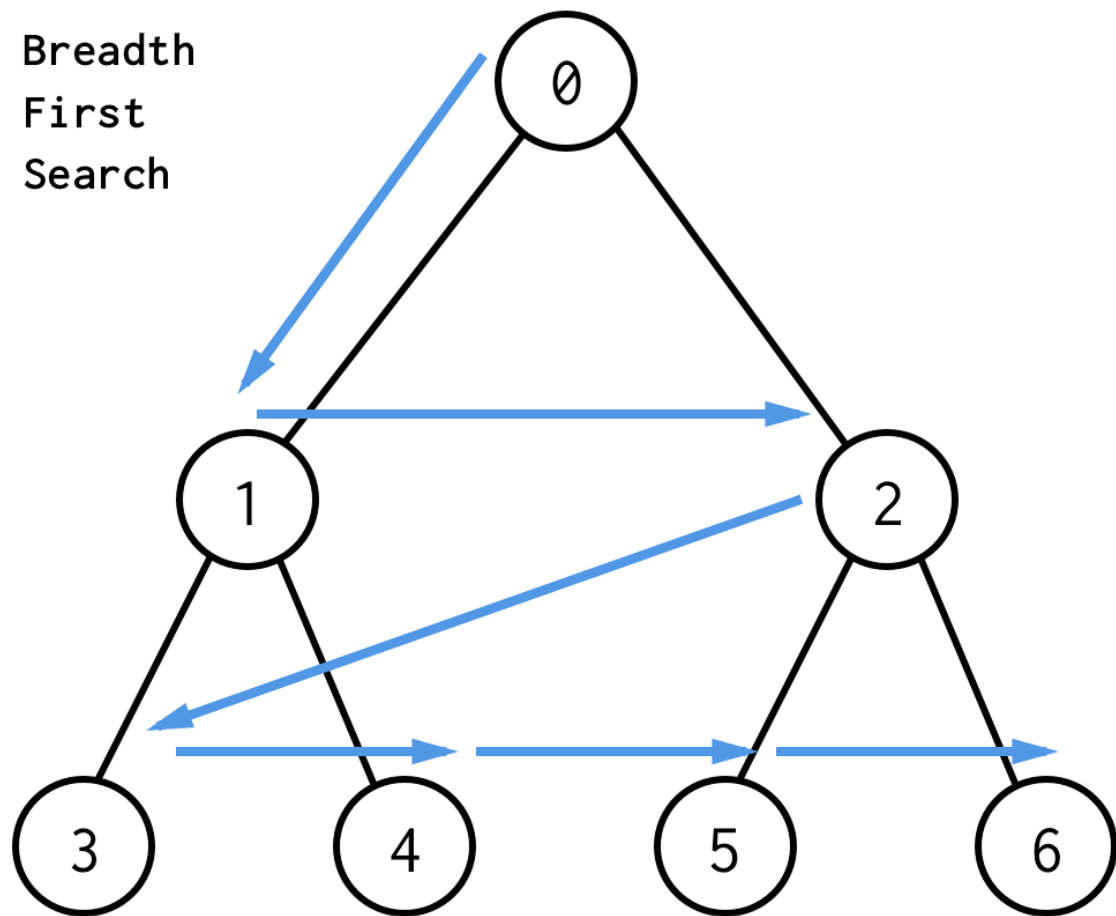


5

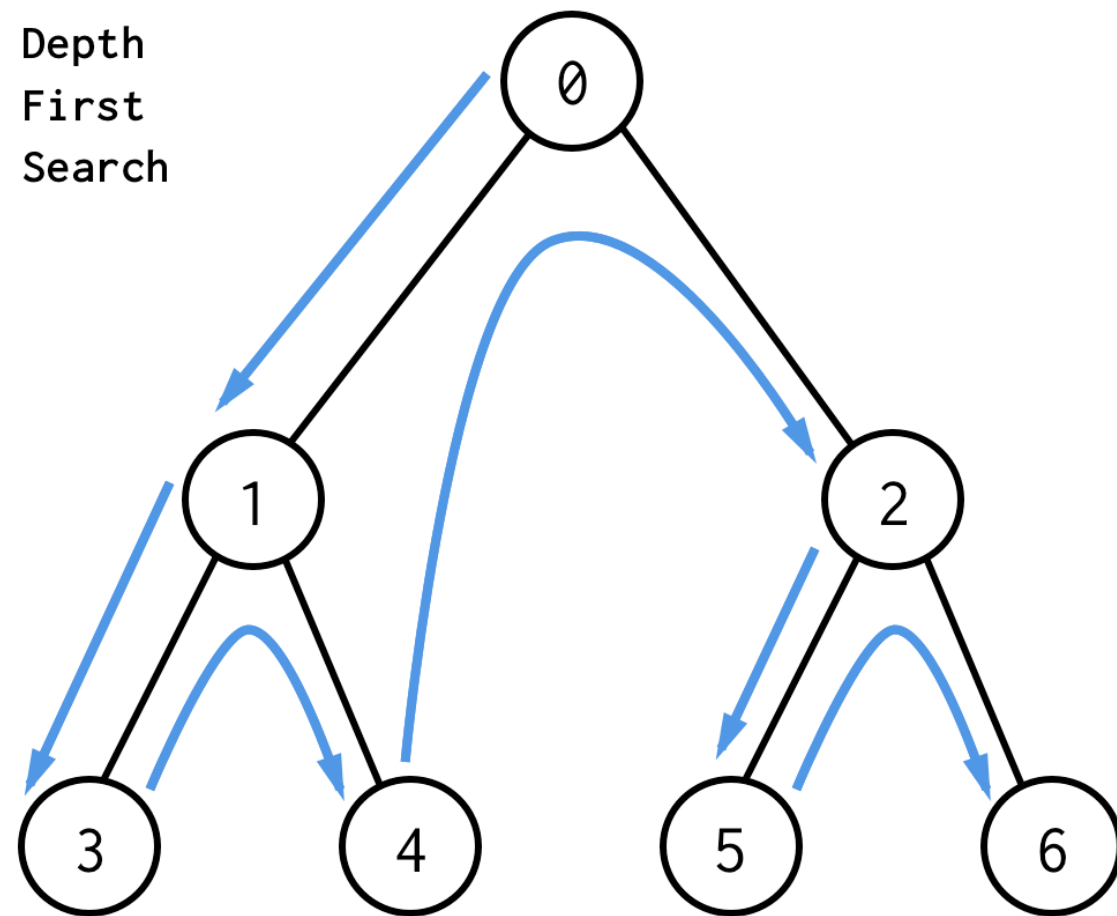




Breadth  
First  
Search



Depth  
First  
Search



# DFS代码 - 递归写法

```
visited = set()
def dfs(node, visited):
    visited.add(node)
    # process current node here.
    ...
    for next_node in node.children():
        if not next_node in visited:
            dfs(next_node, visited)
```

# DFS代码 - 非递归写法

```
def DFS(self, tree):  
  
    if tree.root is None:  
        return []  
  
    visited, stack = [], [tree.root]  
  
    while stack:  
        node = stack.pop()  
        visited.add(node)  
  
        process(node)  
        nodes = generate_related_nodes(node)  
        stack.push(nodes)  
  
    # other processing work  
    ...
```

# DFS代码 - 递归写法

```
visited = set()
def dfs(node, visited):
    visited.add(node)
    # process current node here.
    ...
    for next_node in node.children():
        if not next_node in visited:
            dfs(next_node, visited)
```

# BFS代码

```
def BFS(graph, start, end):  
  
    queue = []  
    queue.append([start])  
    visited.add(start)  
  
    while queue:  
        node = queue.pop()  
        visited.add(node)  
  
        process(node)  
        nodes = generate_related_nodes(node)  
        queue.push(nodes)  
  
    # other processing work  
    ...
```

# 实战题目

1. <https://leetcode.com/problems/binary-tree-level-order-traversal/>
2. <https://leetcode.com/problems/maximum-depth-of-binary-tree/>
3. <https://leetcode.com/problems/minimum-depth-of-binary-tree/description/>
4. <https://leetcode.com/problems/generate-parentheses/>