Doubt Class With Lakshay Bhaiya [Graph]

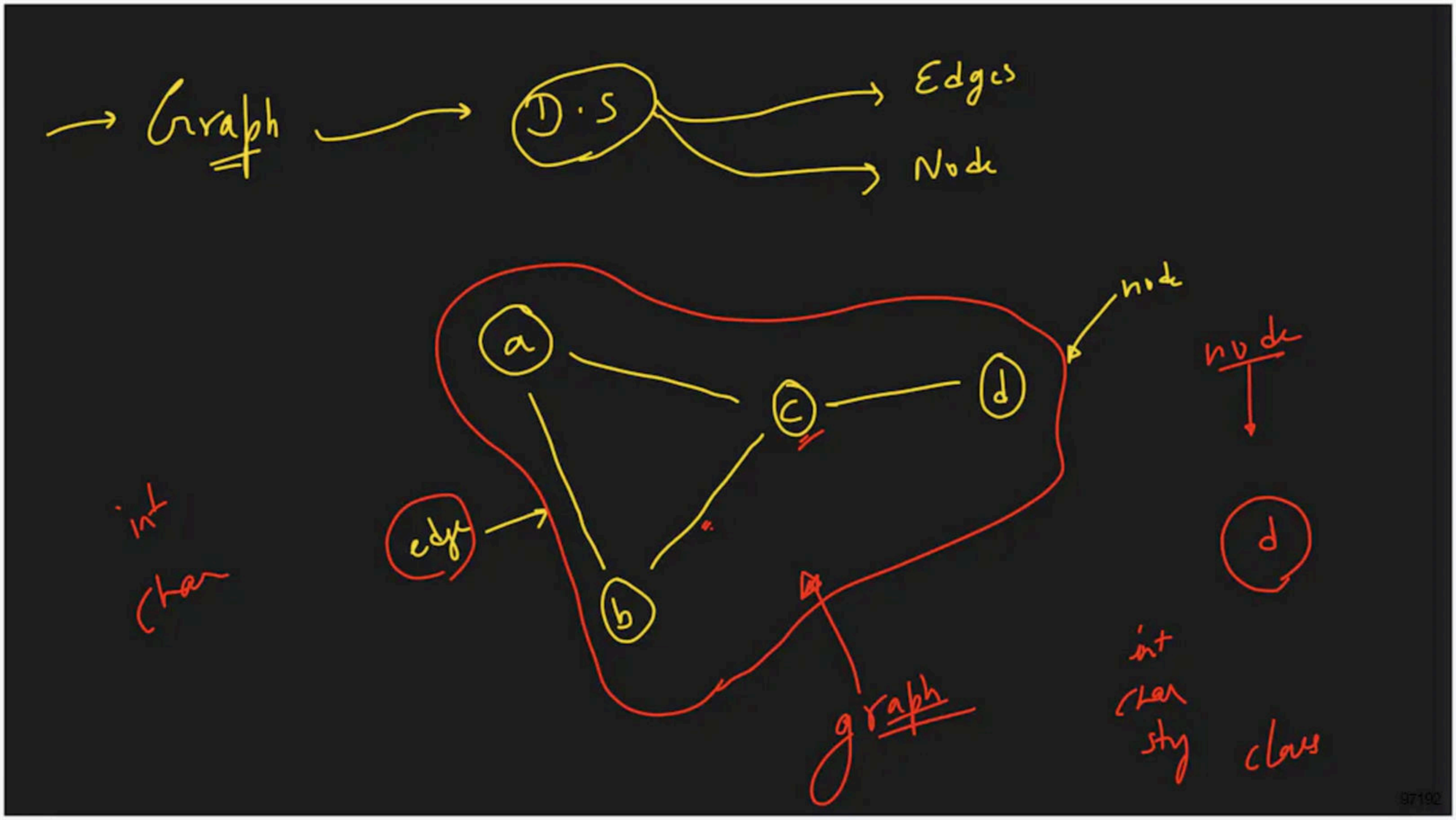
Special class

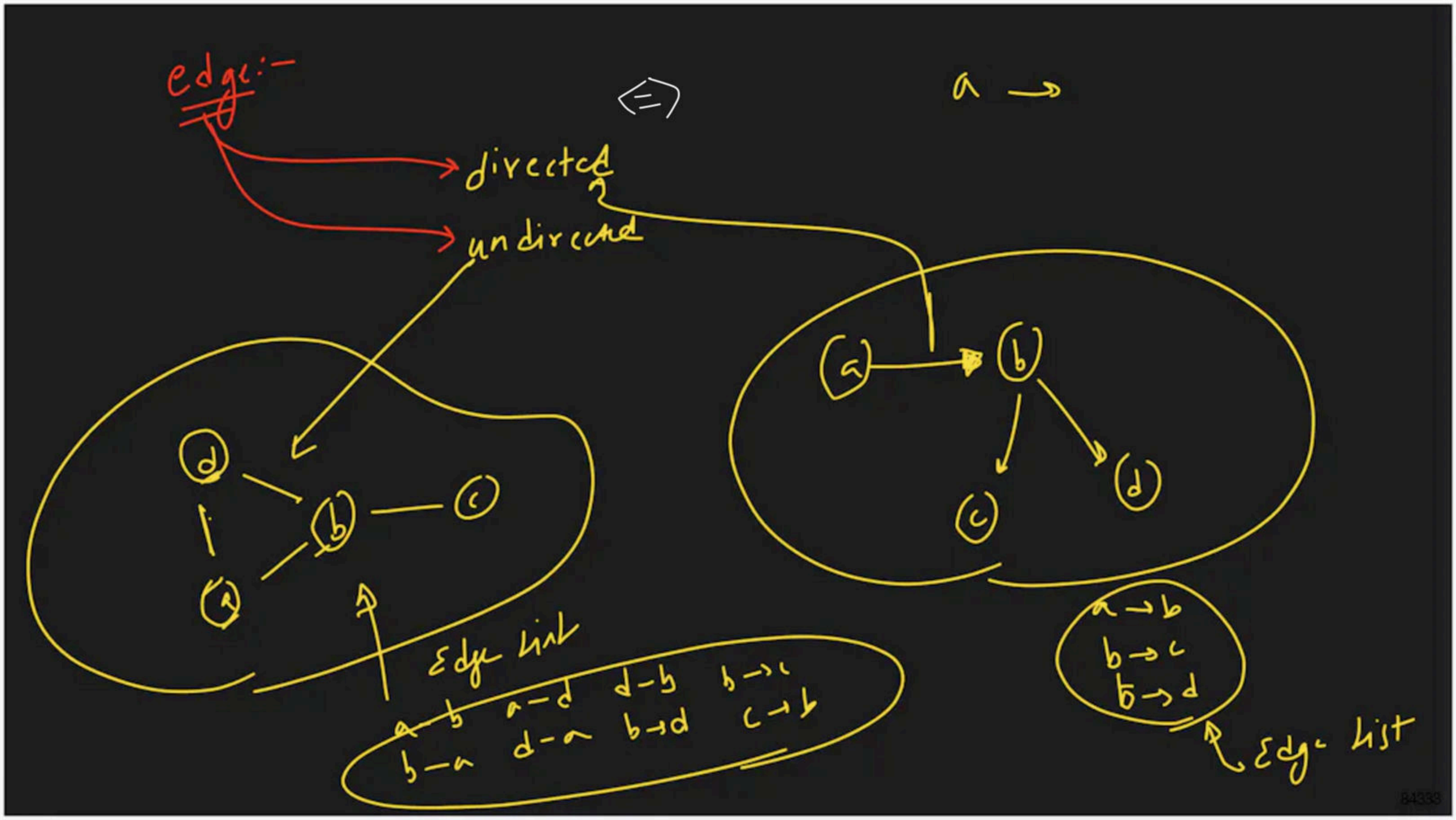
Love Babbar • Feb 11, 2024

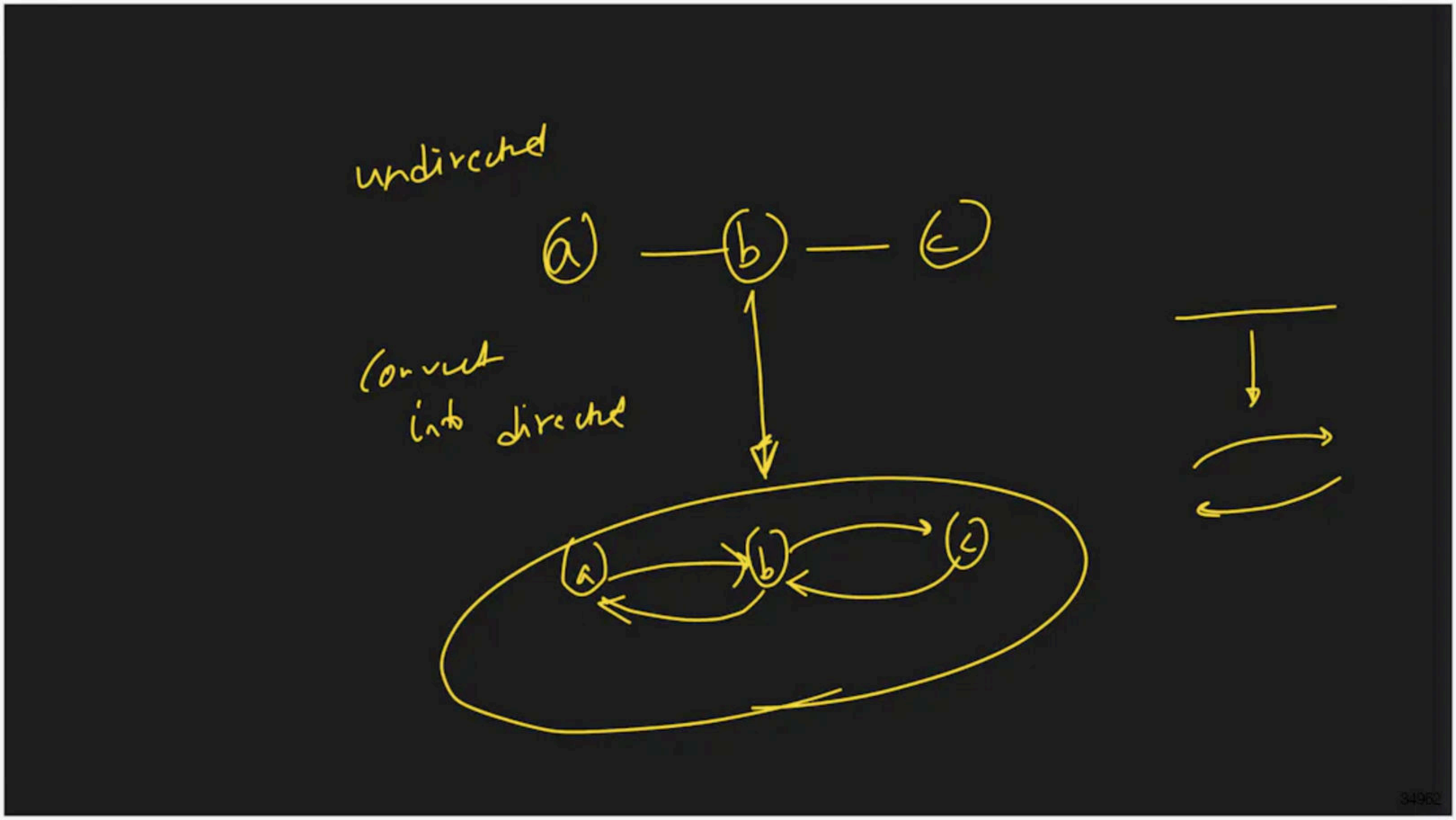
Graphs Class - 1

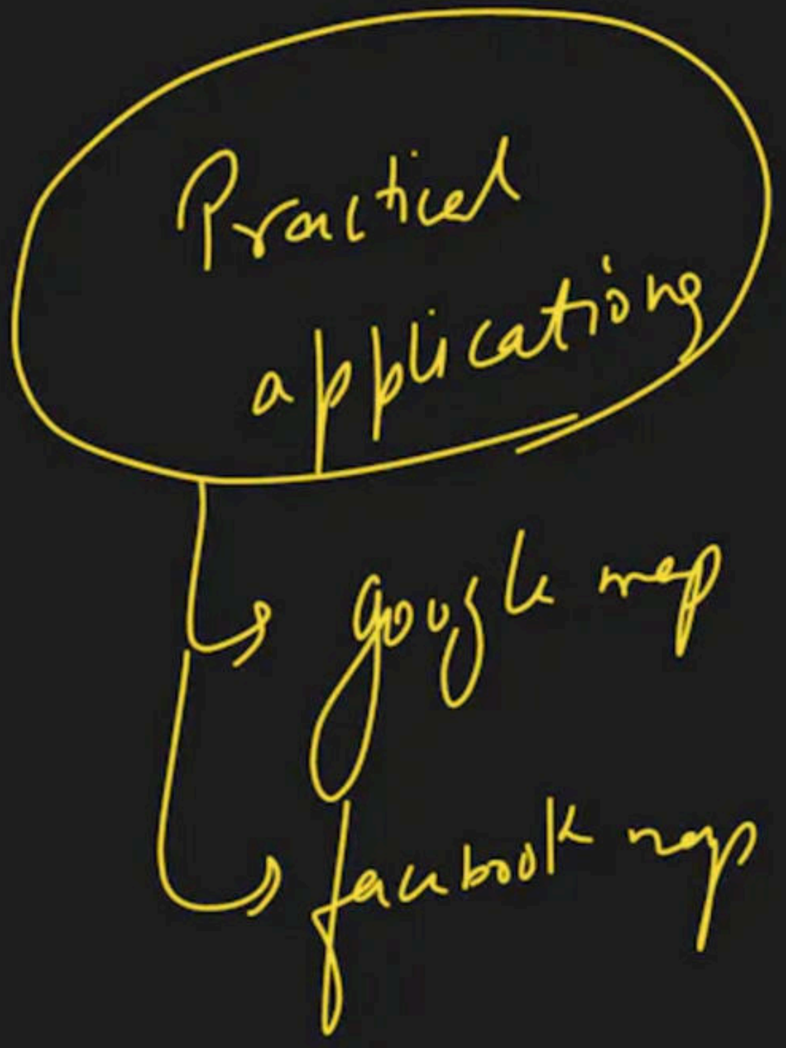
Special class

Love Babbar • Jan 24, 2024


Graph
D.S
Edges
Node
node
a
c
d
b
edge
int
char
node
d
graph
int
char
string
class


edge:-
directed
undirected
a → b
b → c
b → d
edge list
edge list


undirected
a
b
c
convert
into directed
a
b
c


Practical
applications
google map
facebook map

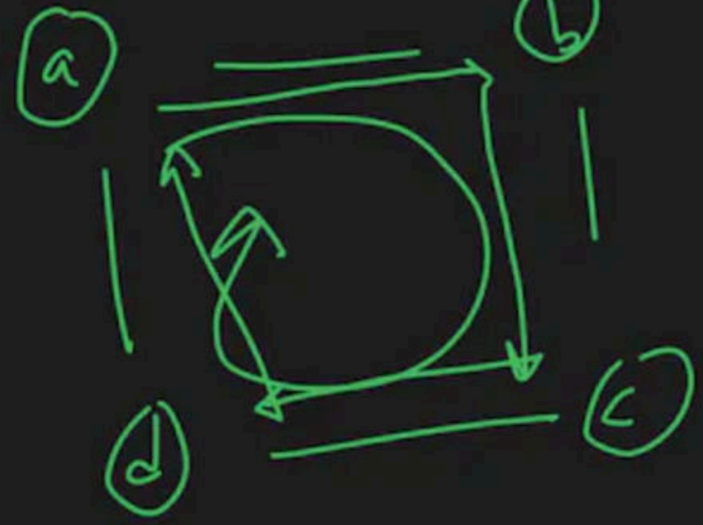
edge with no weight

unweighted edge

weight

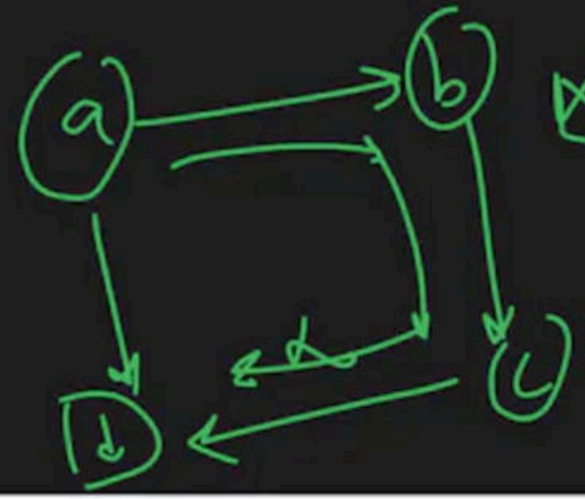
weighted graph

Cyclic

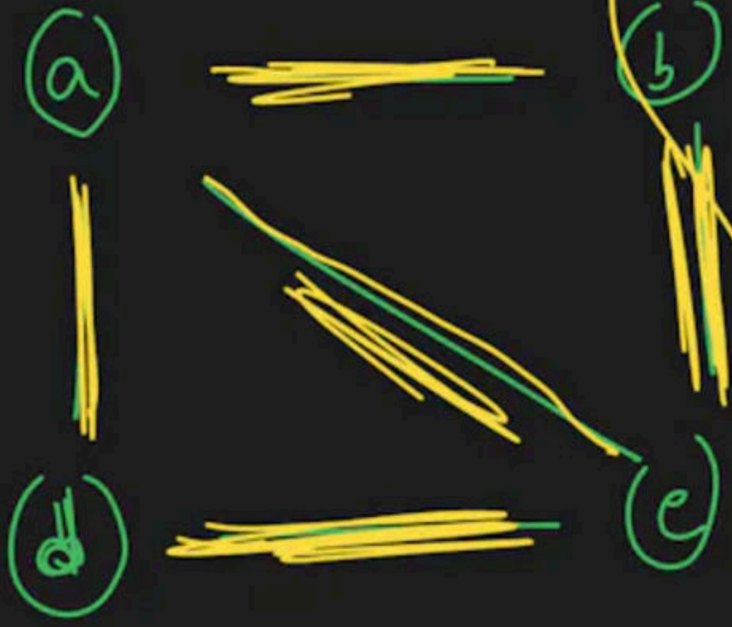


Cyclic graph

Acyclic



degree



degree(a) = 3

degree(b) = 2

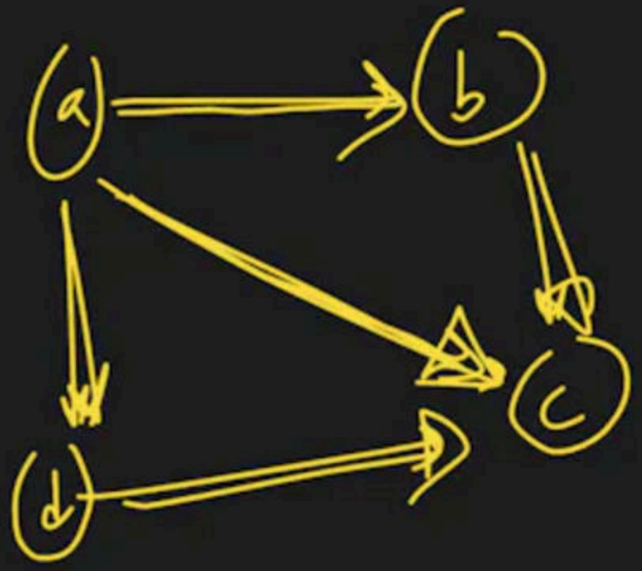
degree(d) = 2

degree(e) = 3

Directed graph

Indegree

Outdegree



Indegree(a) = 0

Outdegree(c) = 3

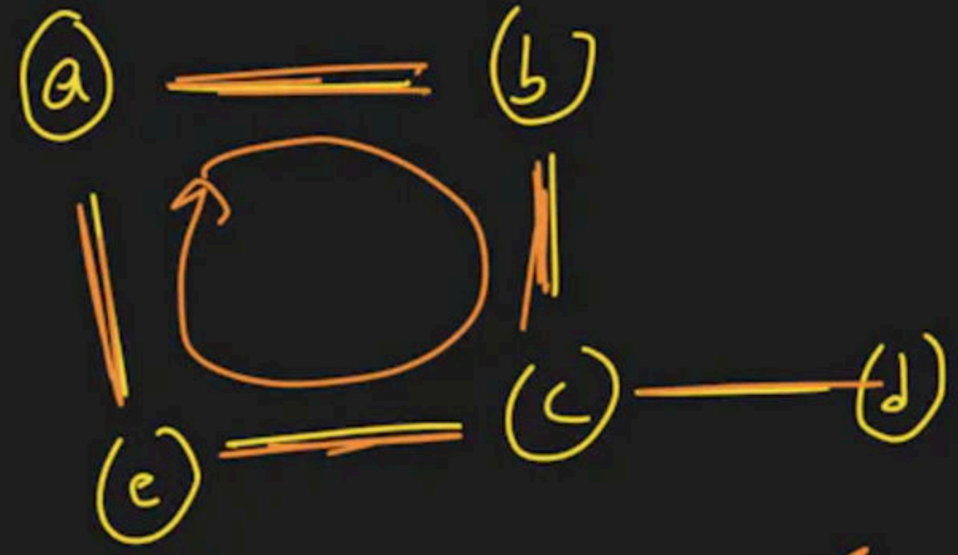
Indegree(c) = 2

Outdegree(c) = 0

61036

Path :-

a - b - c - c - c



a - b - c - d

a - b - c - e

graph

→ path

→ edge

→ node

→ undirected

→ directed

→ weighted

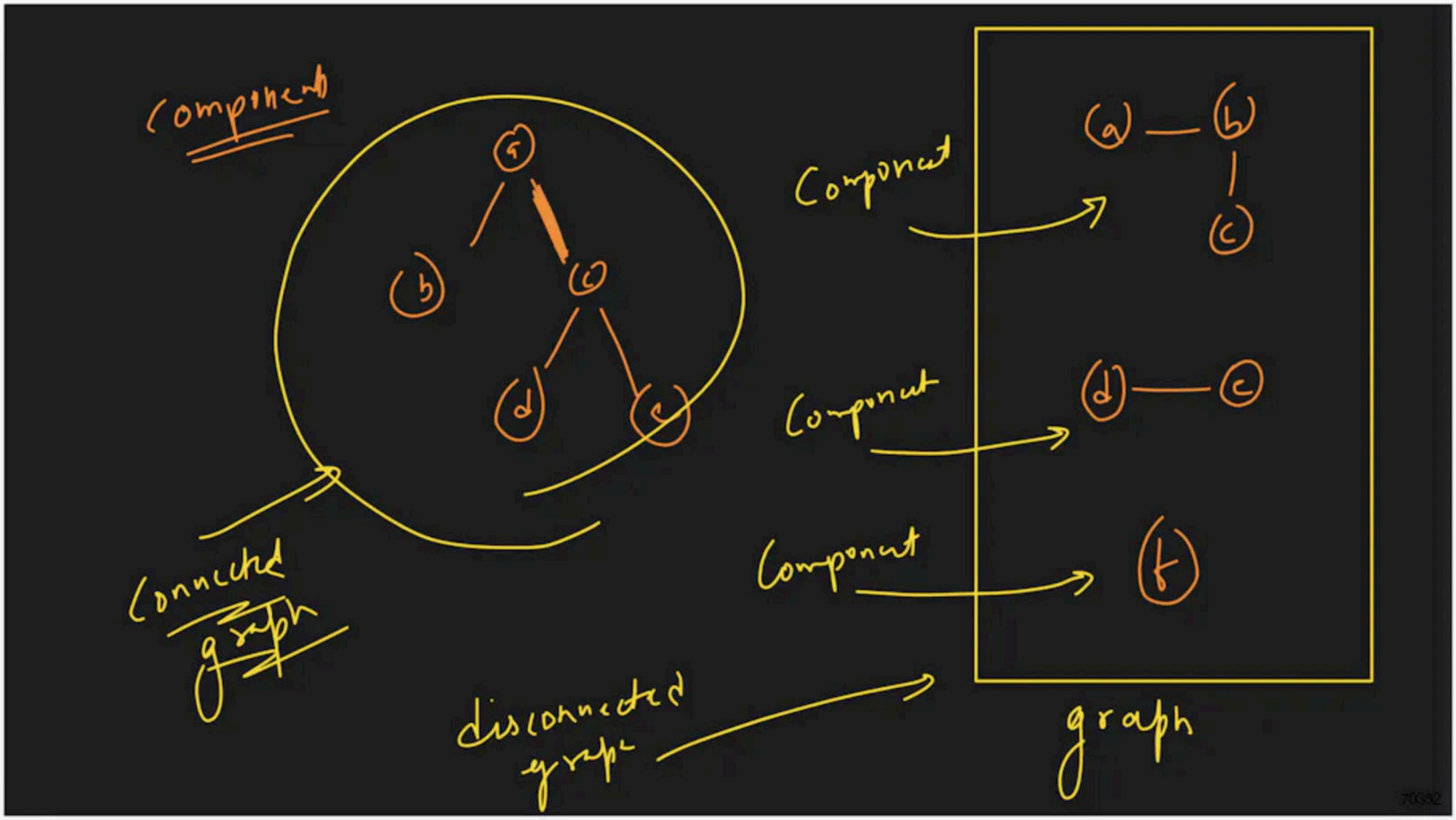
→ unweighted

→ degree

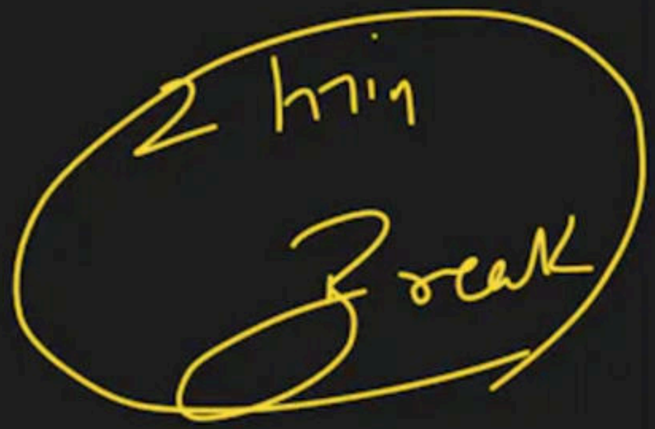
→ indegree

→ outdegree

→ cyclic / Acyclic

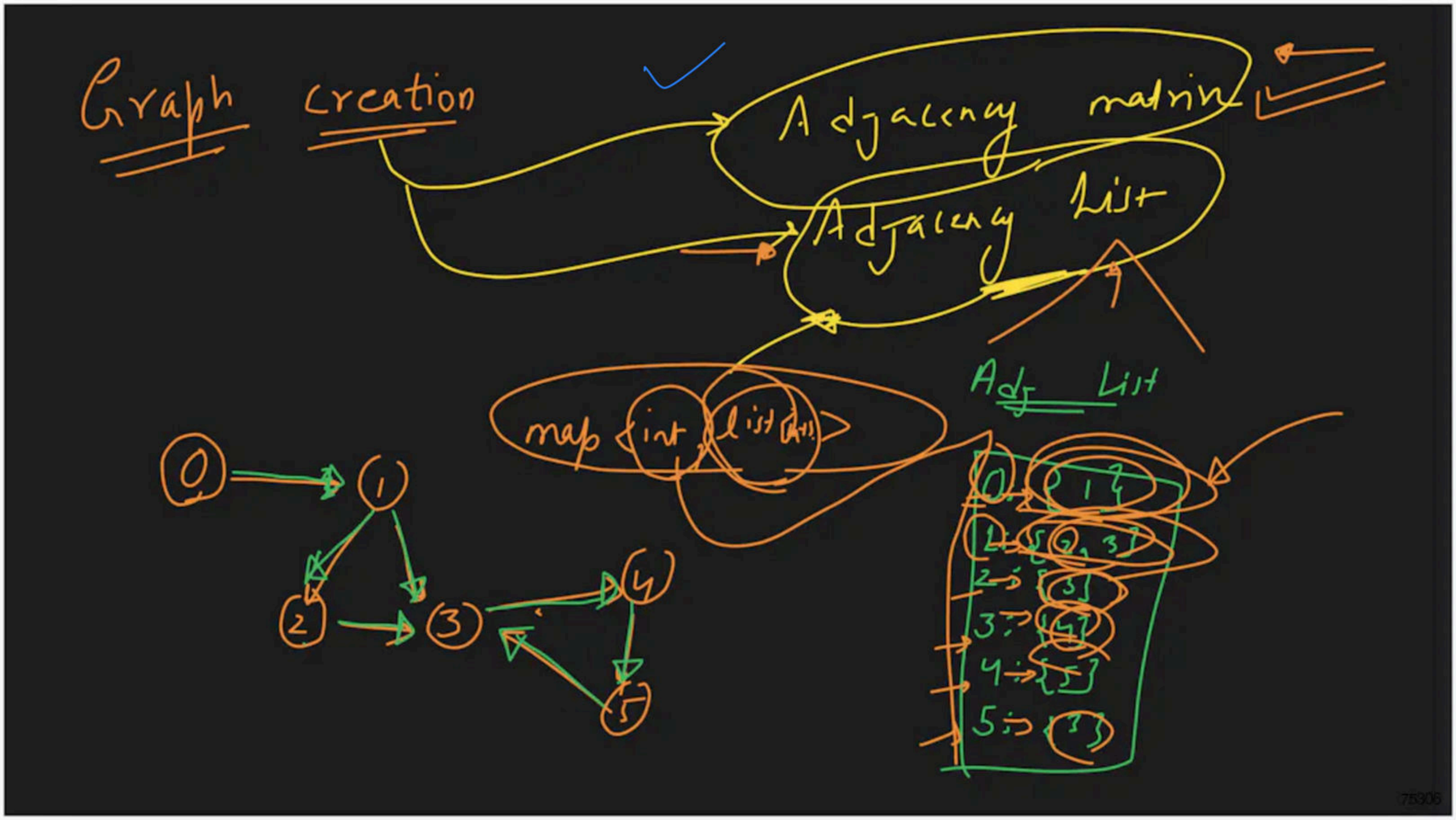

Components
a
b
c
d
e
Connected graph
disconnected graph
Component
Component
Component
graph

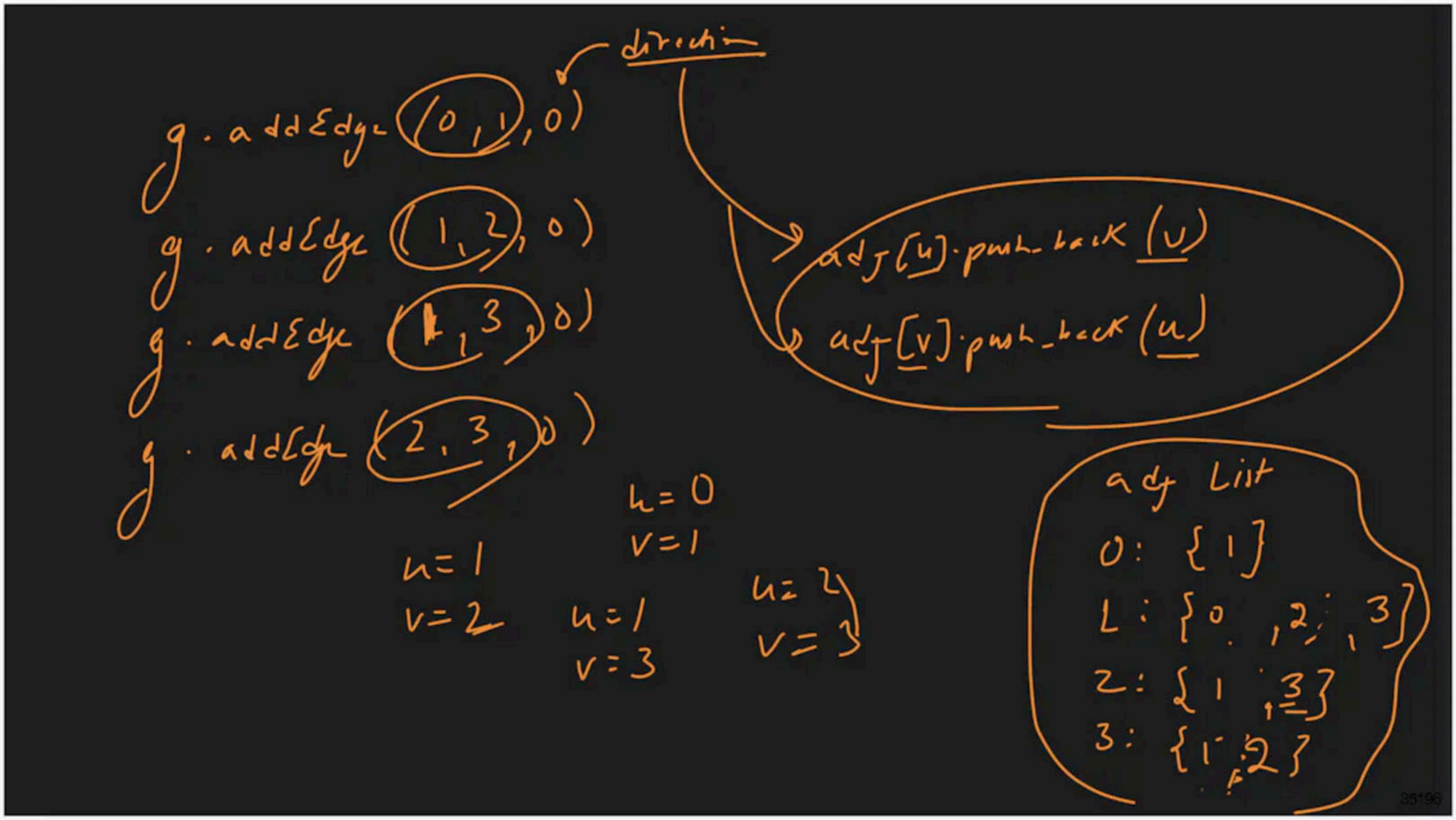

1
2
3

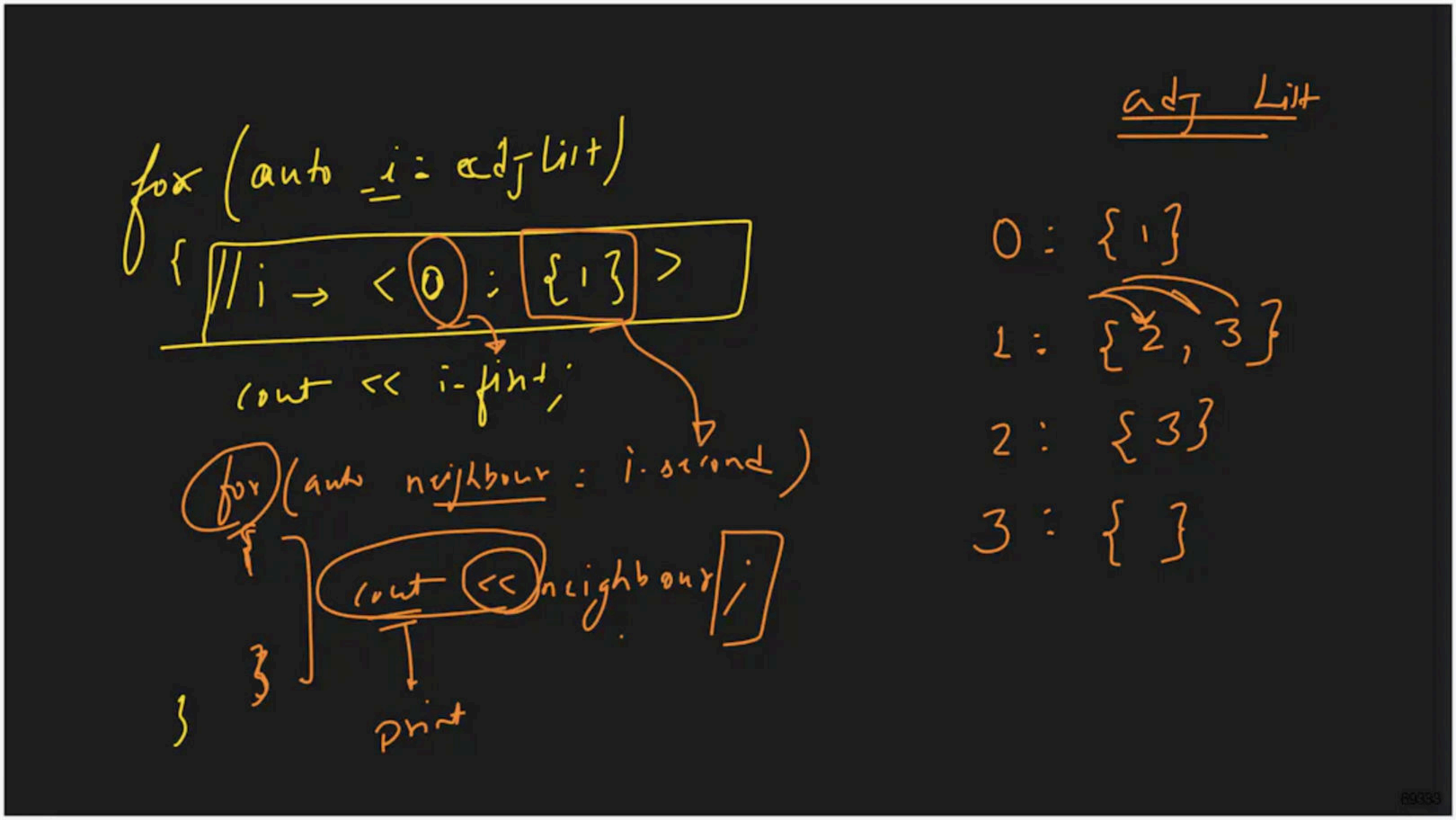

2 min
break


① clone a graph
②

Graph Creation

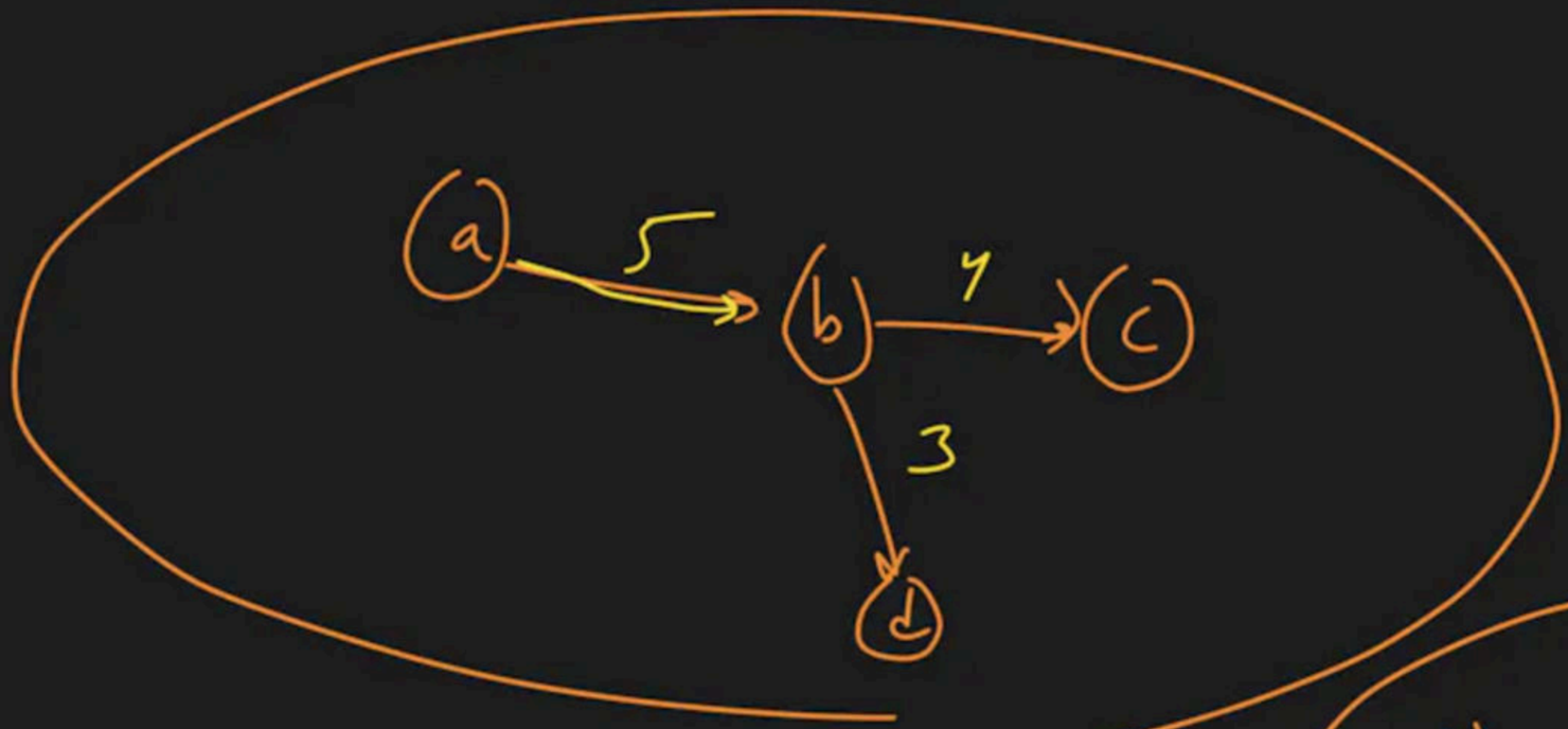



directed
g.addEdge(0, 1, 0)
g.addEdge(1, 2, 0)
g.addEdge(1, 3, 0)
g.addEdge(2, 3, 0)
adj[u].push_back(v)
adj[v].push_back(u)
u = 0
v = 1
u = 1
v = 2
u = 1
v = 3
u = 2
v = 3
adj List
0: {1}
1: {0, 2, 3}
2: {1, 3}
3: {1, 2}


adj List
for (auto _i : adj List)
{
// i → < 0 : { 1 } >
cout << i.first;
for (auto neighbour : i.second)
{
cout << neighbour;
}
}
print
0 : { 1 }
1 : { 2, 3 }
2 : { 3 }
3 : { }

Rawat

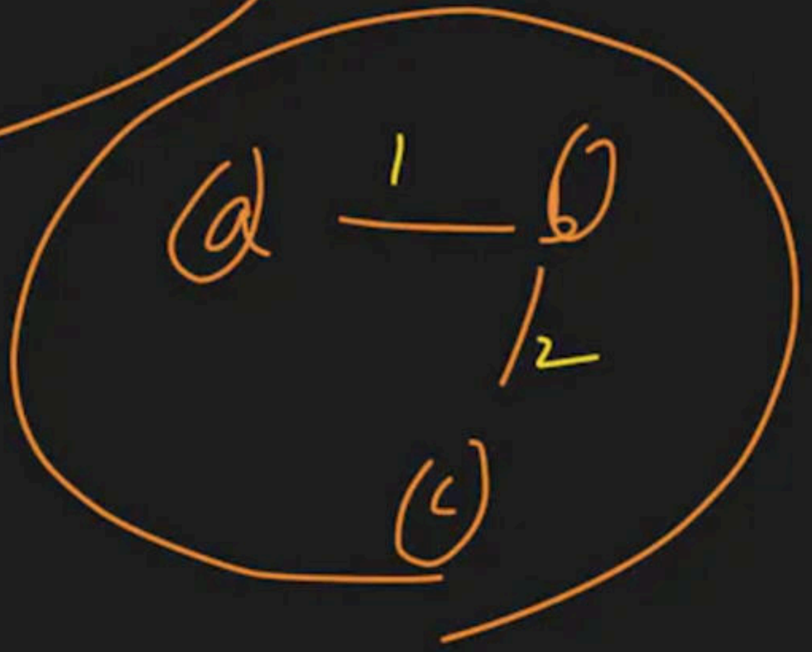
weighted

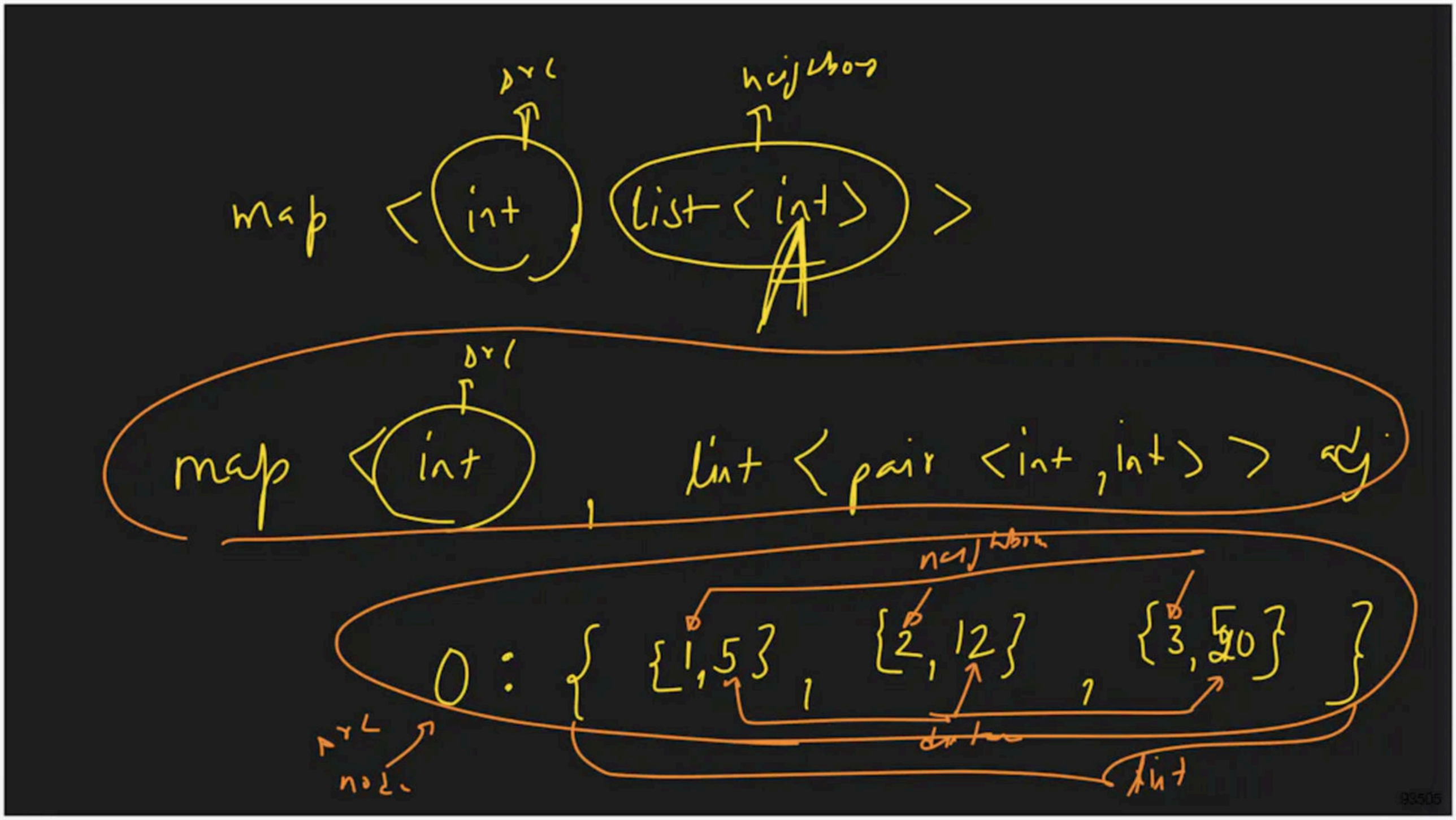


a —5→ b

b —7→ c

b —3→ d




src
neighbors
map < int list<int> >
src
map < int list<pair <int, int> > adj
neighbors
0 : { {1, 5} {2, 12} {3, 20} }
src
node
dist
int

adj list

E = 8

V = 4 ⇒ 12

0 : { 1, 2 } 2
1 : { 0, 3 } 2
2 : { 0 } 2
3 : { 2, 1 } 2

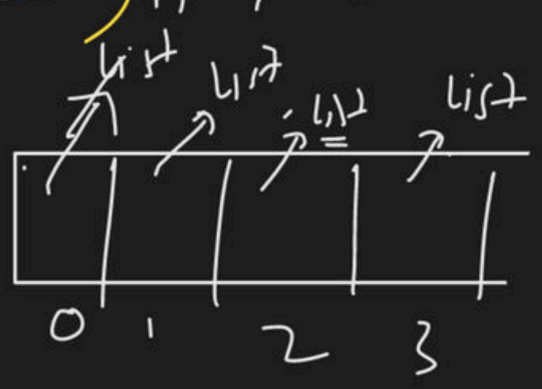
V → no. of vertices

E → edges

S.C: O(V+E)

T.C: O(V + E)

8

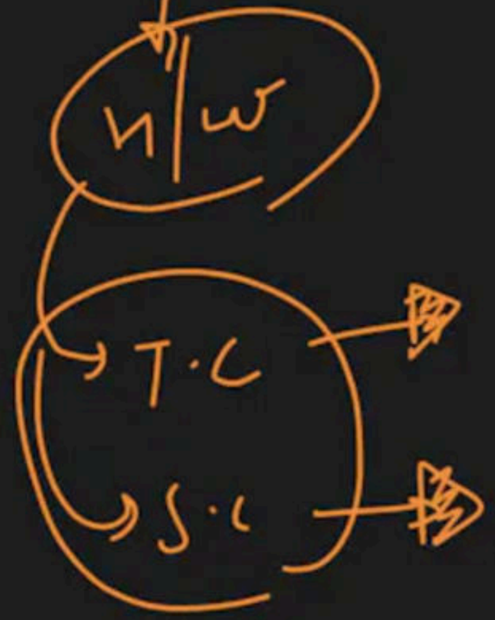


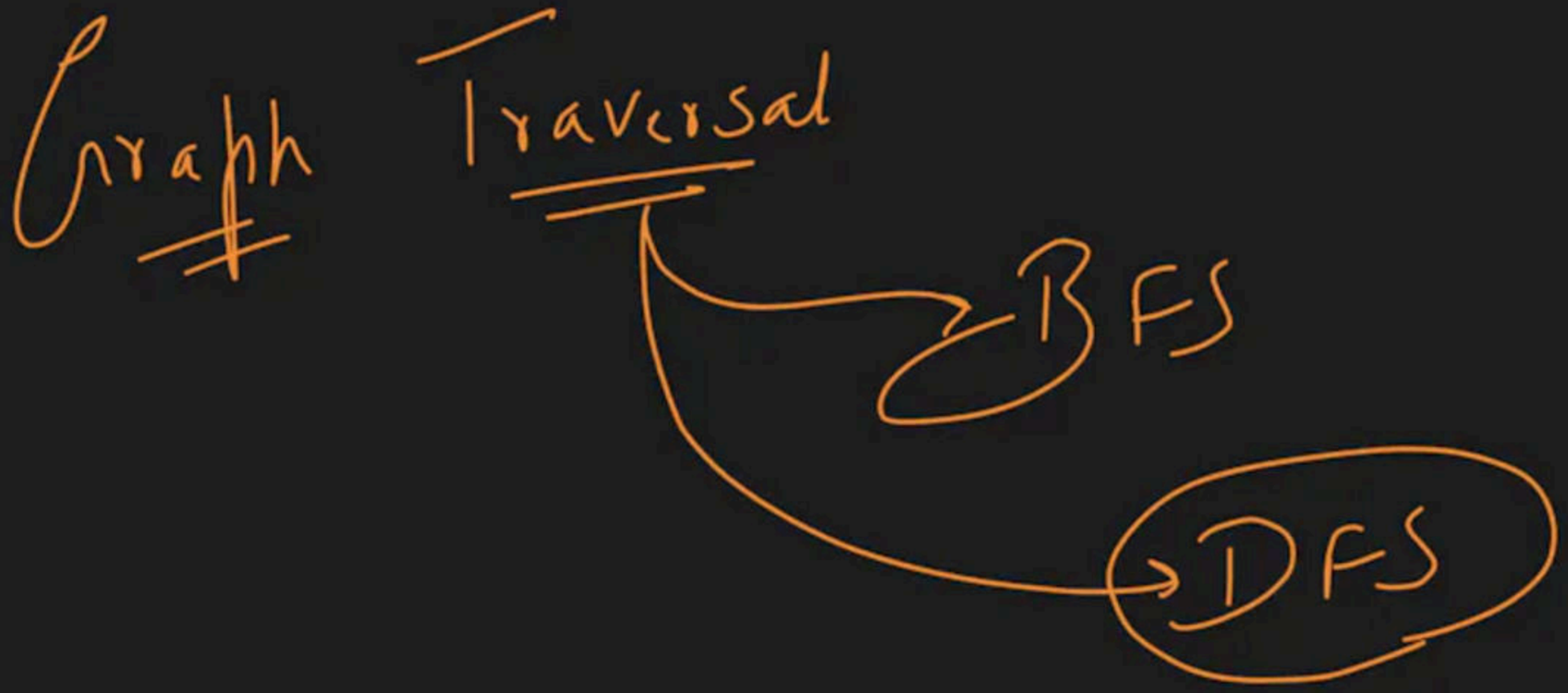
① int V

② Edge

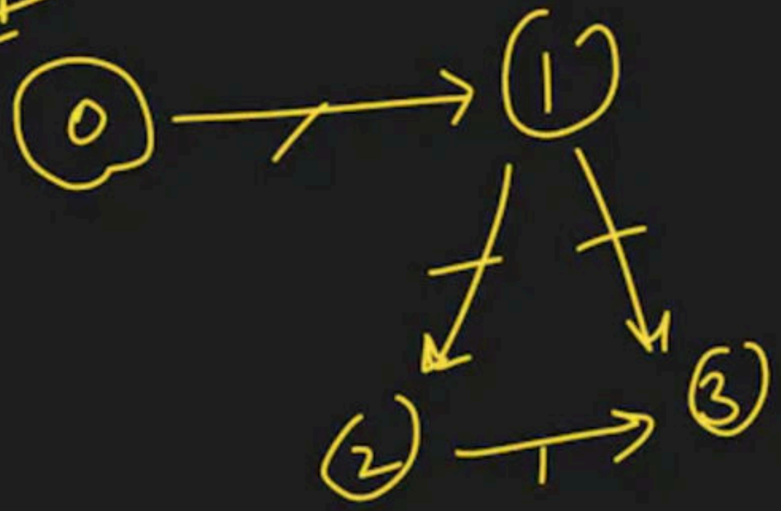
graph

↳ adj List

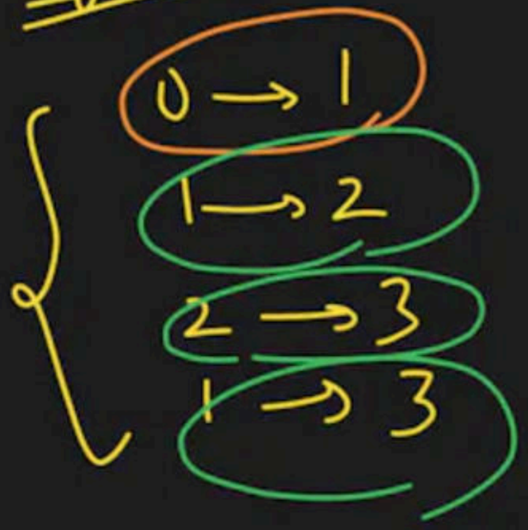



Graph
Traversal
BFS
DFS

graph



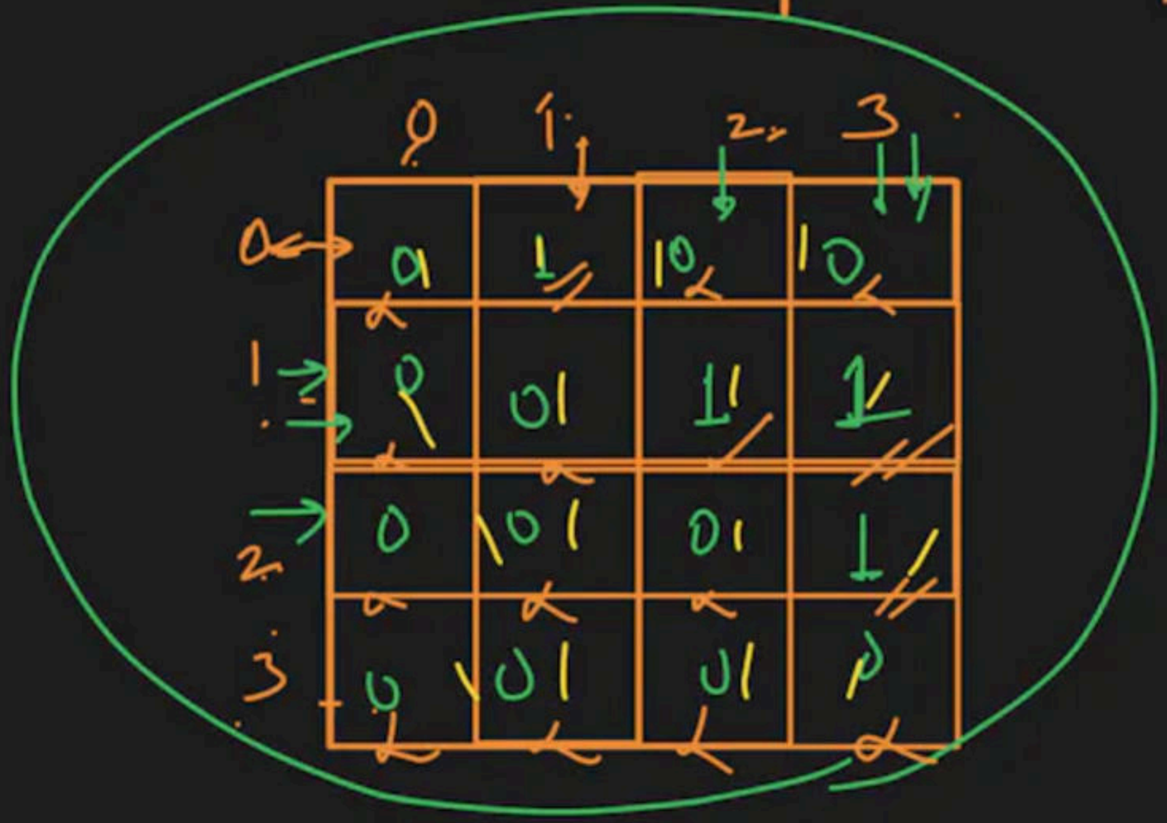
edge list



Adjacency matrix

n x n

no of node = 4 node



T.C → $O(n^2)$

```
void solve ( vector<pair<int,int>> edgelist )
{
    int n = edgelist.size
    vector<vector<int>> adj (n, vector<int>(n,0));
    for ( auto i : edgelist )
    {
        int u = i.first;   int v = i.second;
        adj[u][v] = 1;
    }
}
```

i → pair <int, int>

u

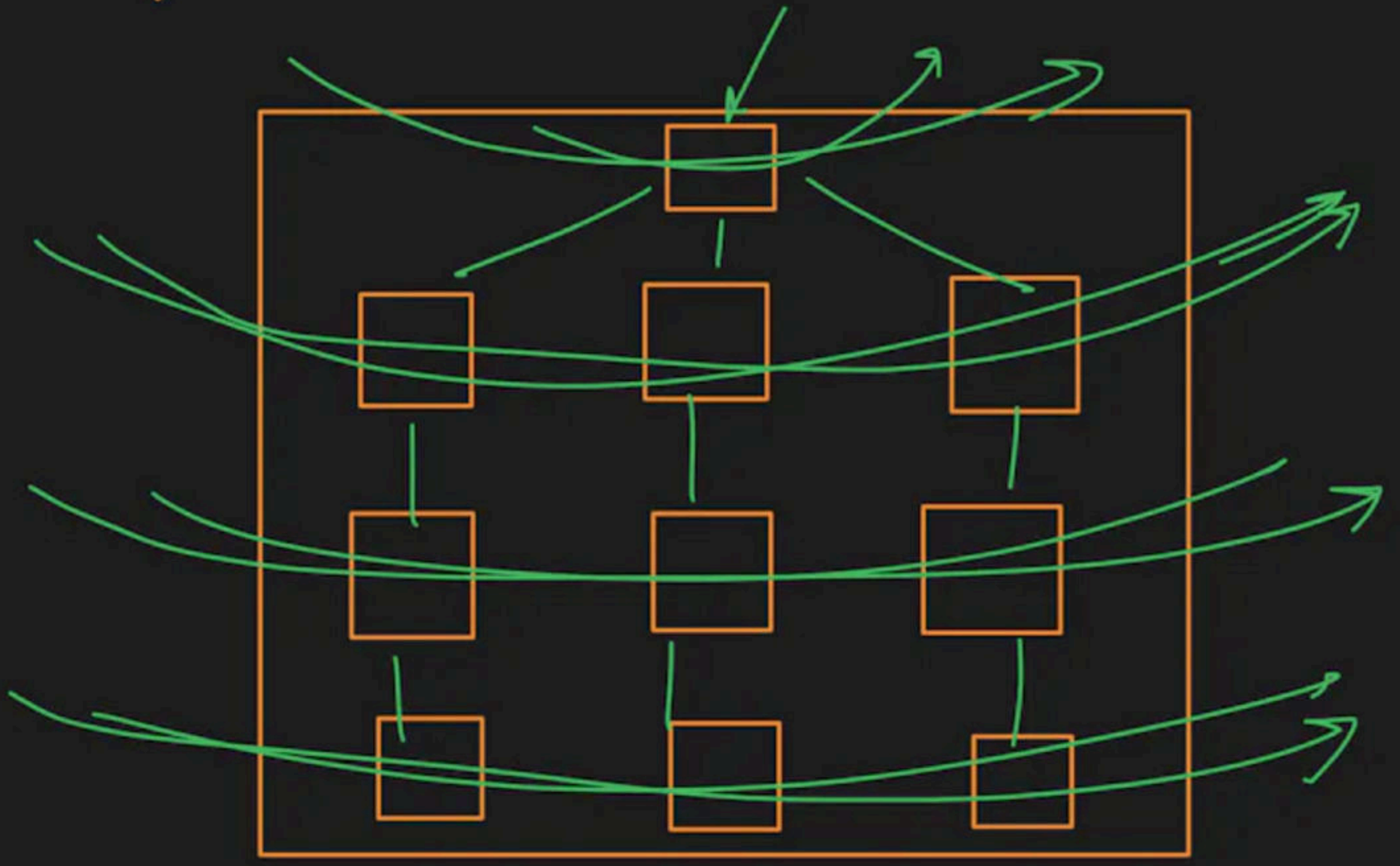
v

u → v

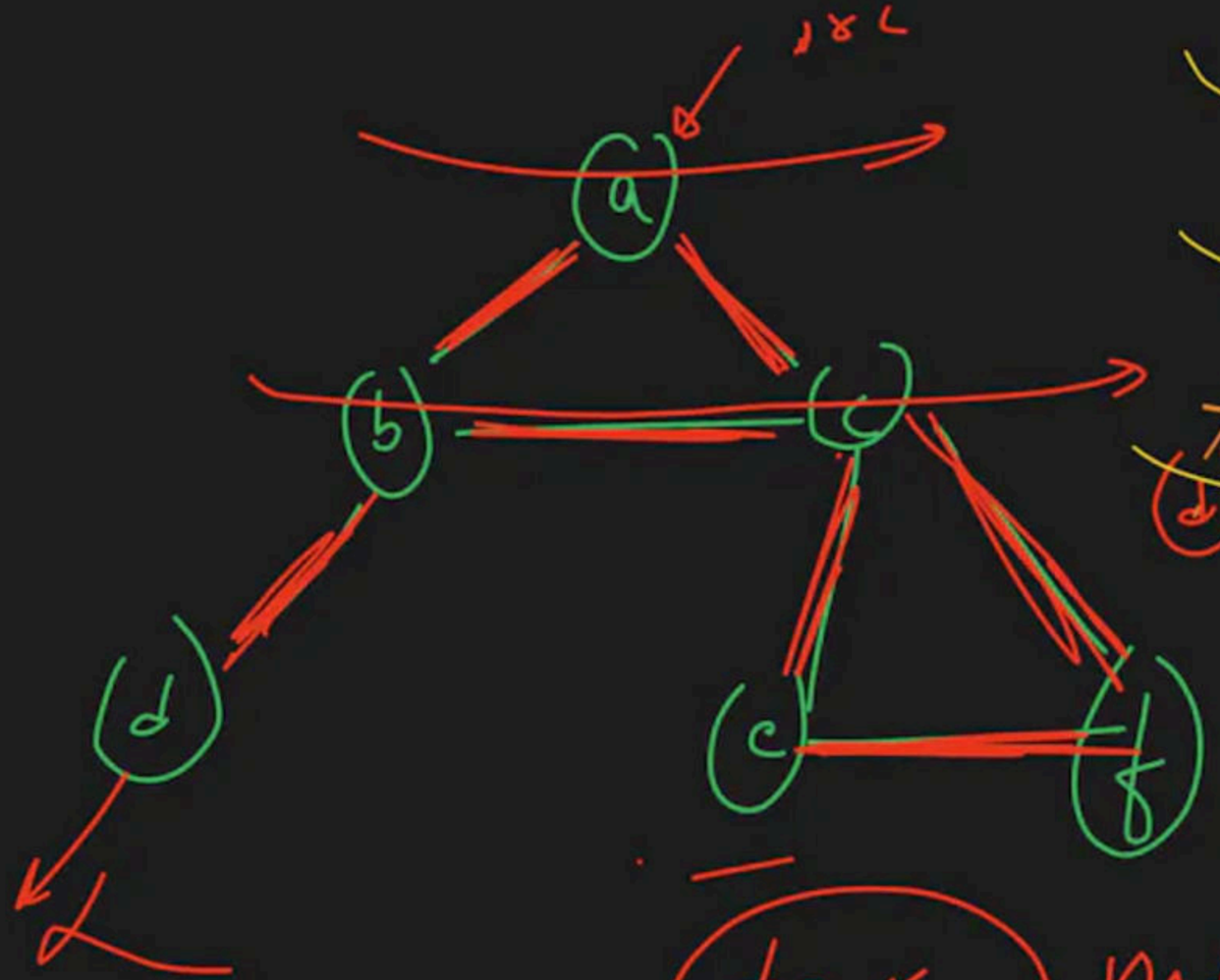
S.C → $O(n^2)$

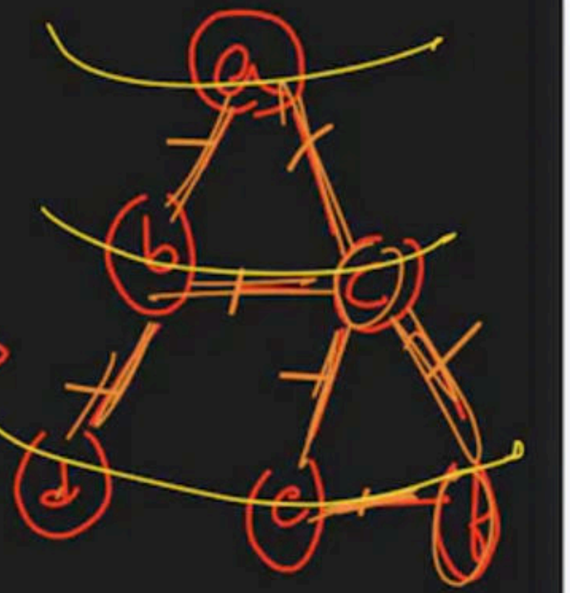
BFS :- Breadth first Search

queue



a
b c
d e f





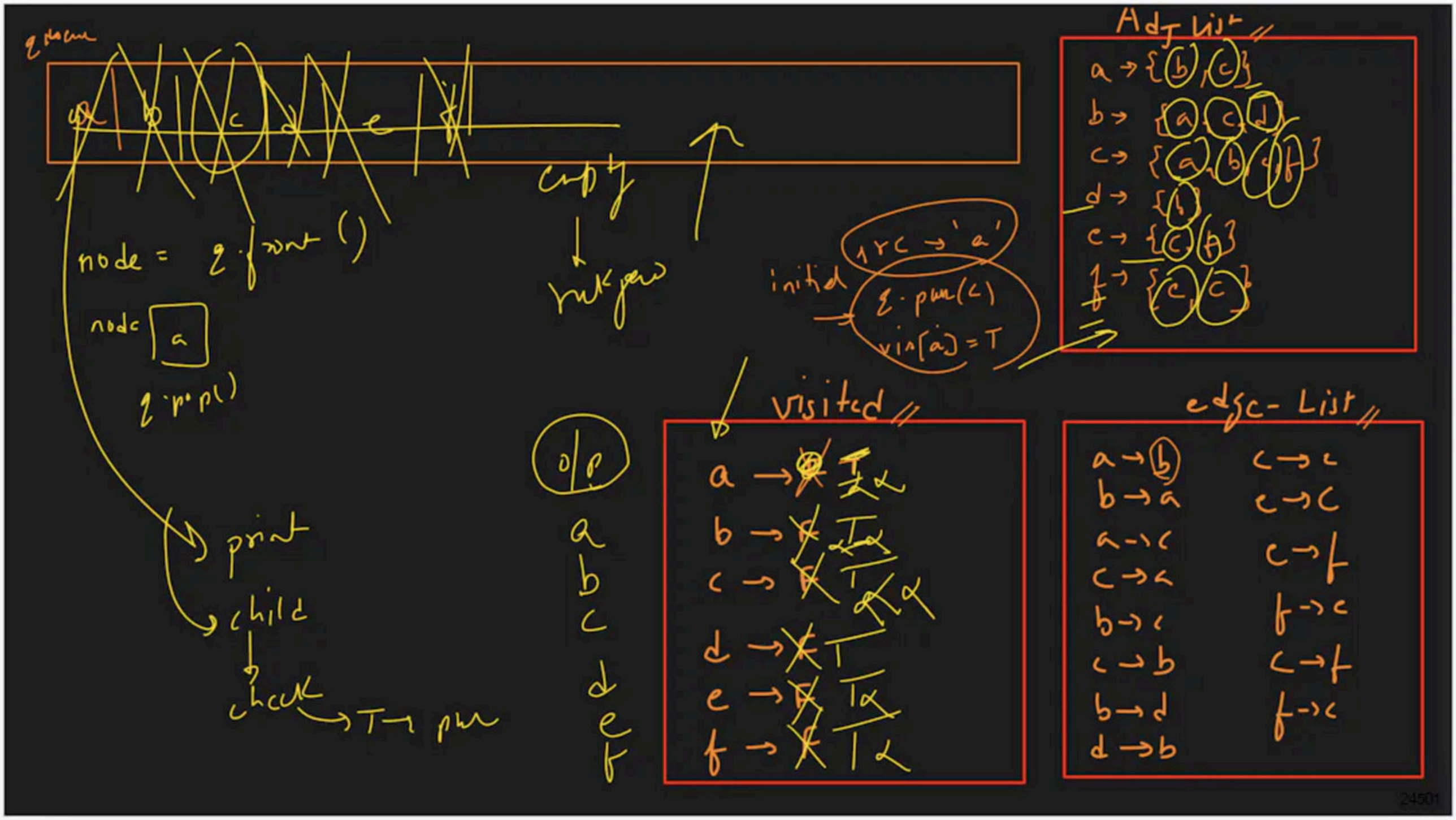
track

node

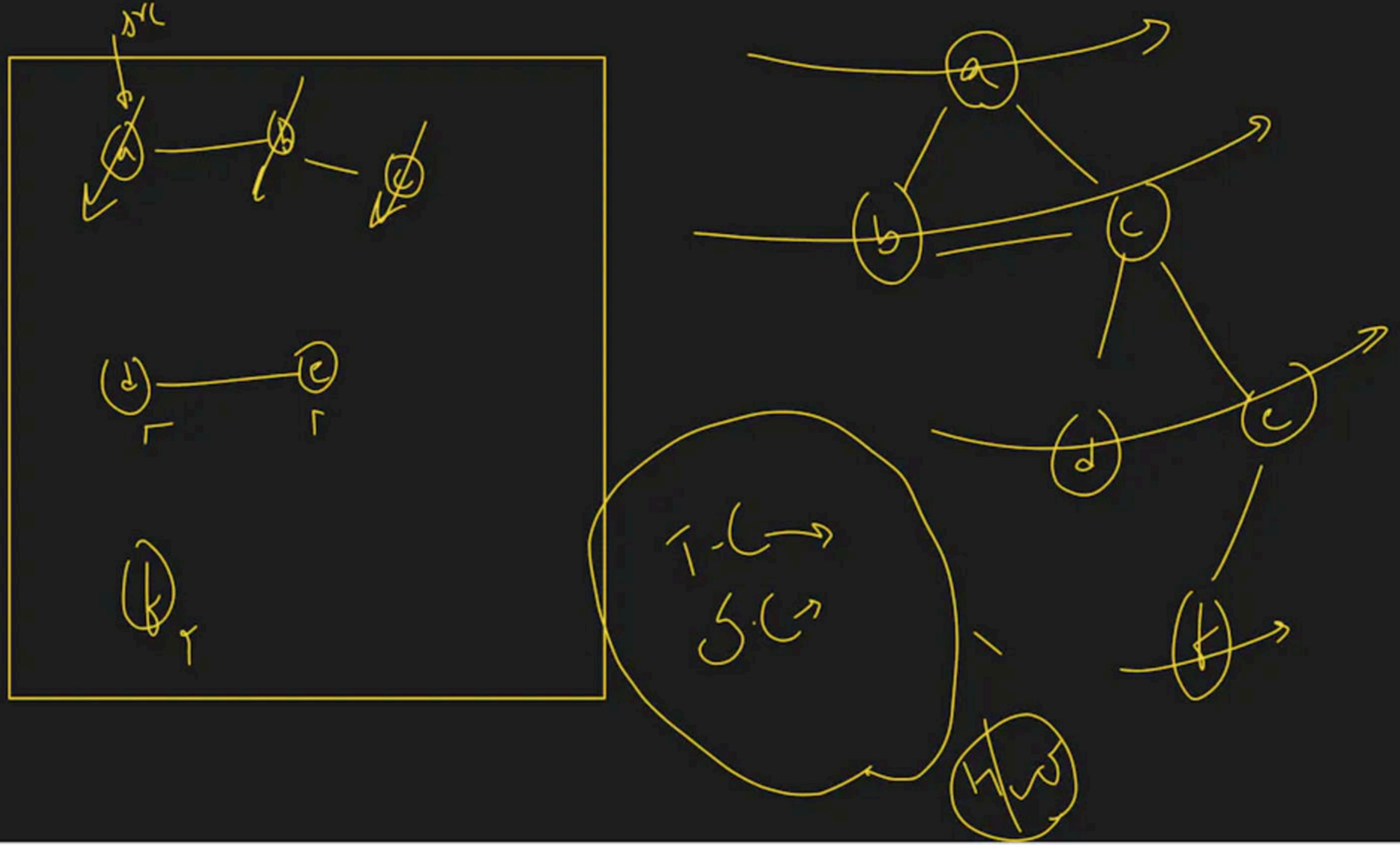
visited

! visited

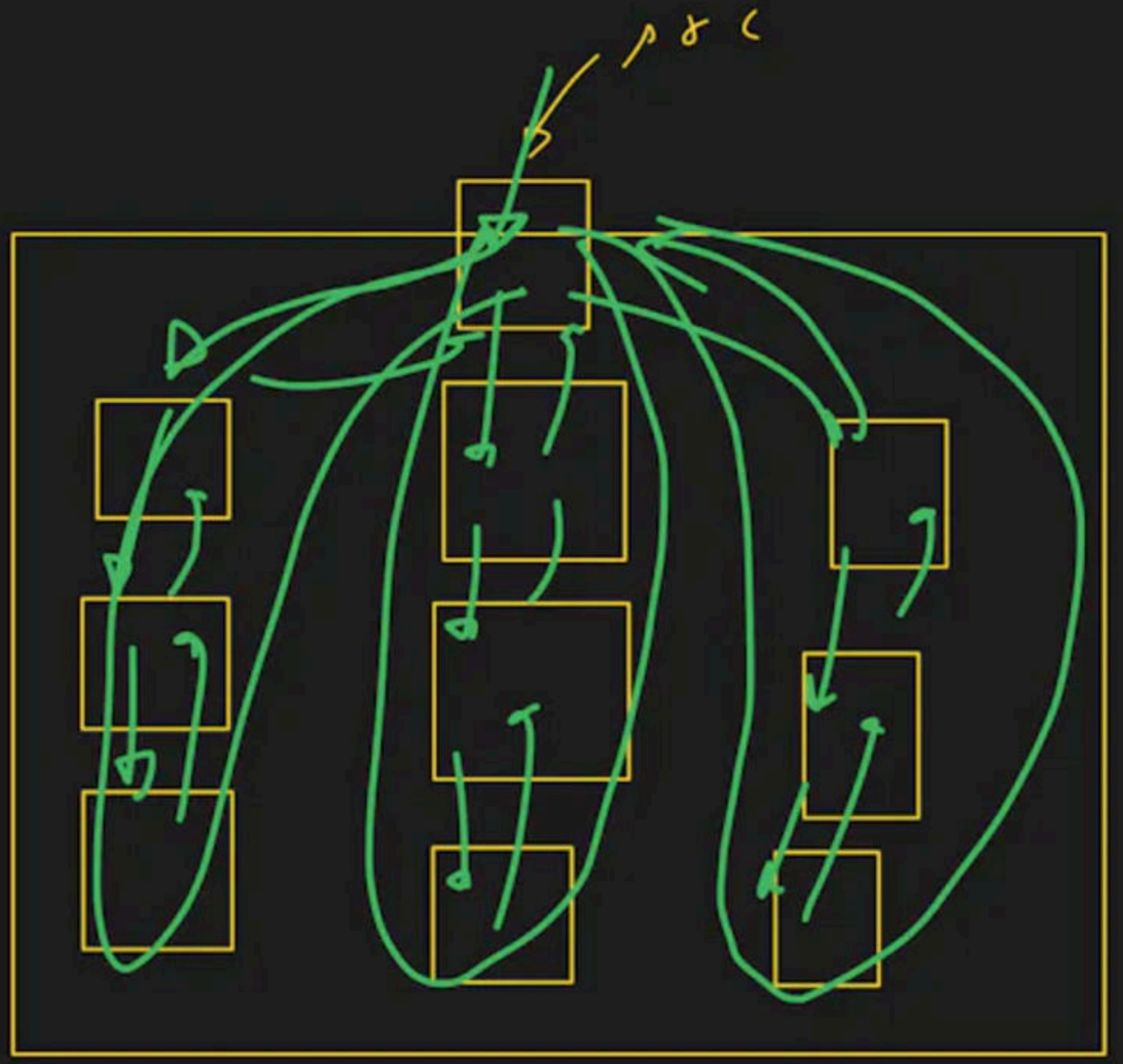
DFS → T/F

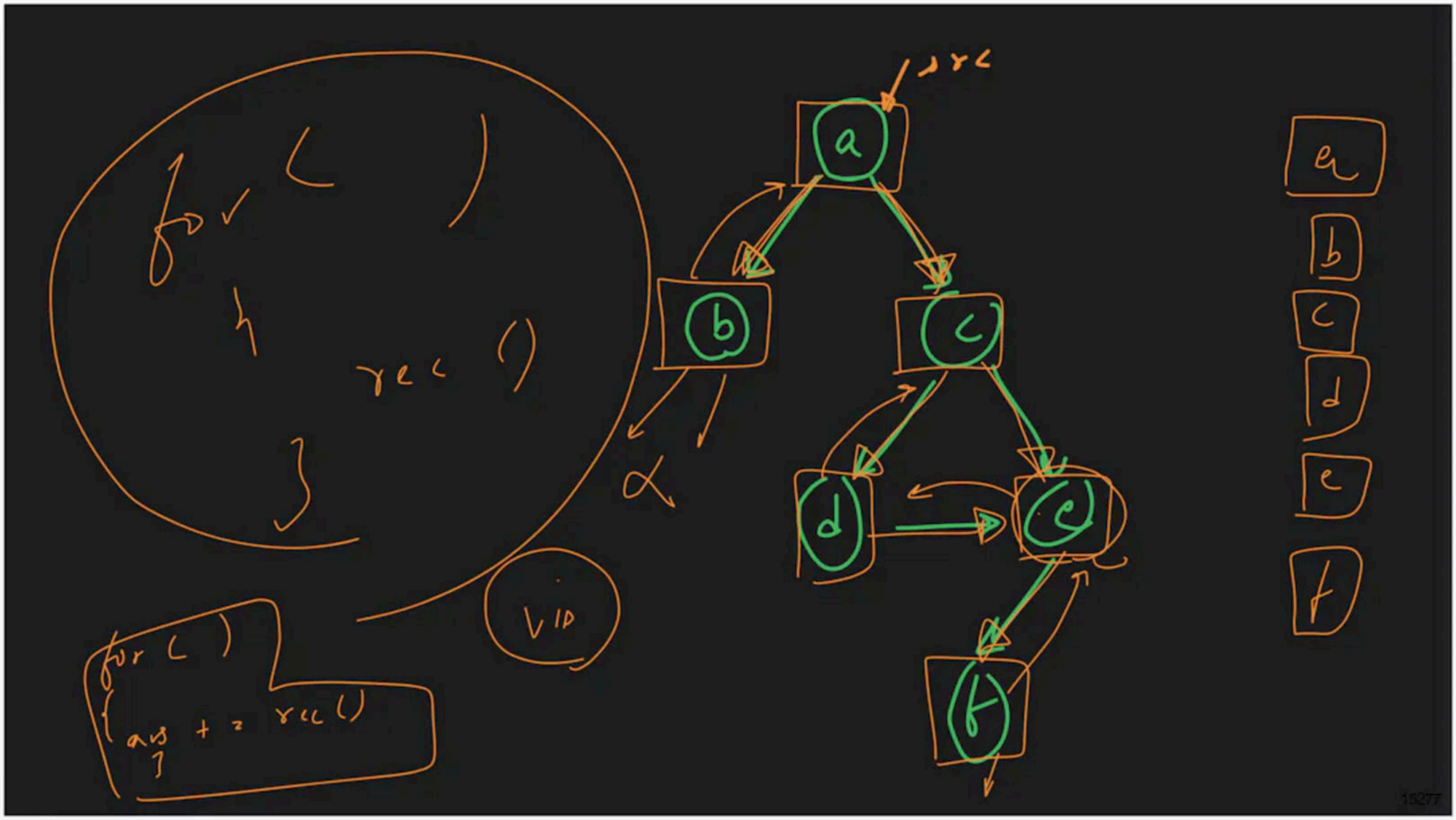

queue
a
b
c
e
f
node = q.front()
node
a
q.pop()
copy
neighbours
print
child
check
T → push
o/p
a
b
c
d
e
f
visited
Adj List
a → {b, c}
b → {a, c, d}
c → {a, b, e, f}
d → {b}
e → {c, f}
f → {c, e}
src → 'a'
initial
q.push(c)
vis[a] = T
edge - List
a → b
b → a
a → c
c → a
b → e
e → b
b → d
d → b
c → e
e → c
c → c
c → f
f → e
e → f
f → c

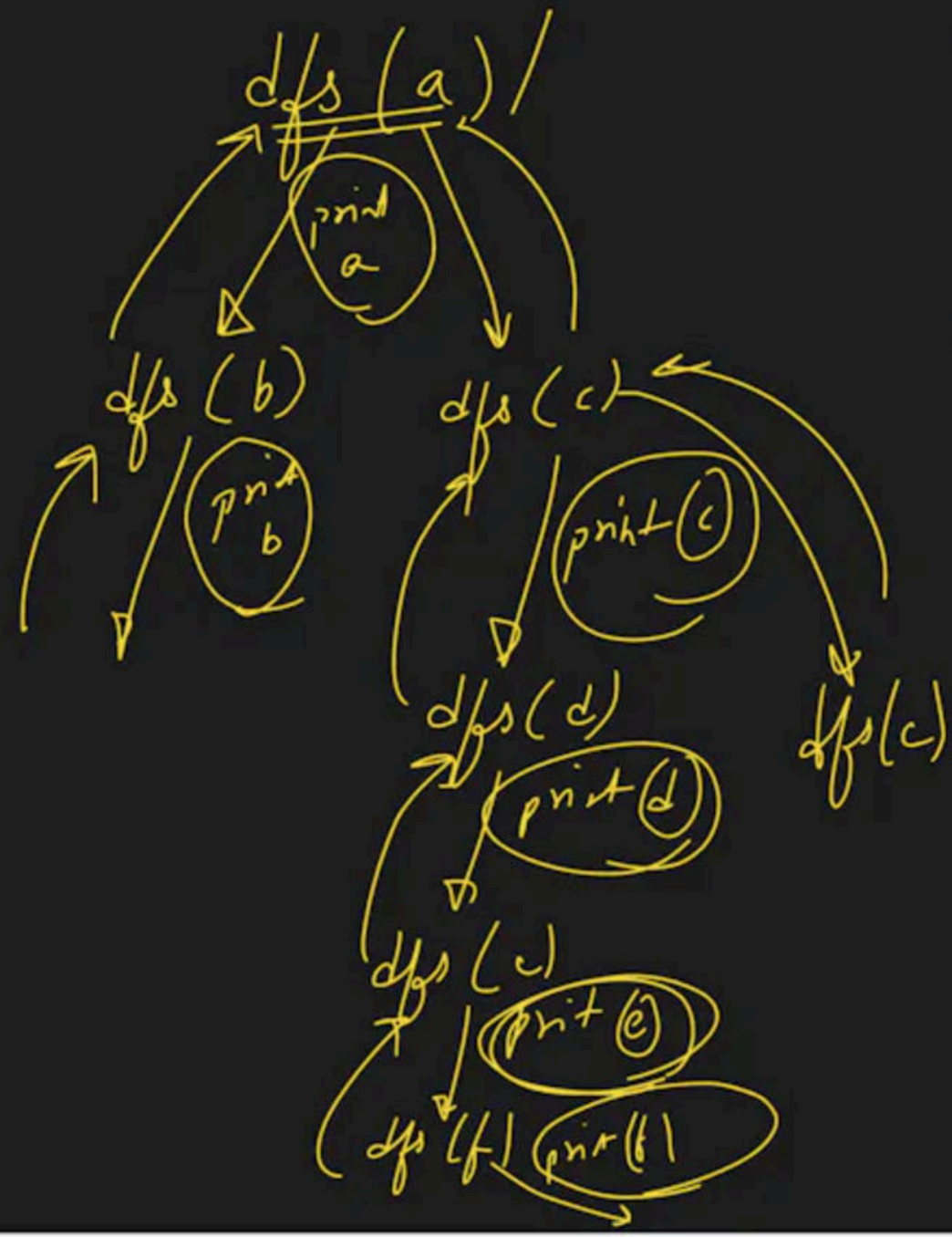
24501

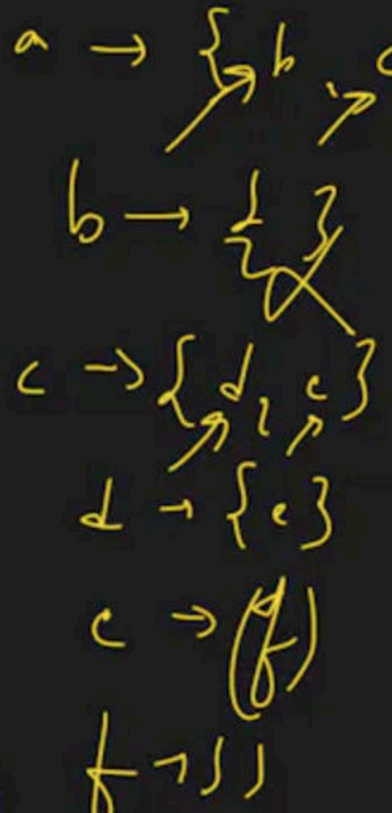


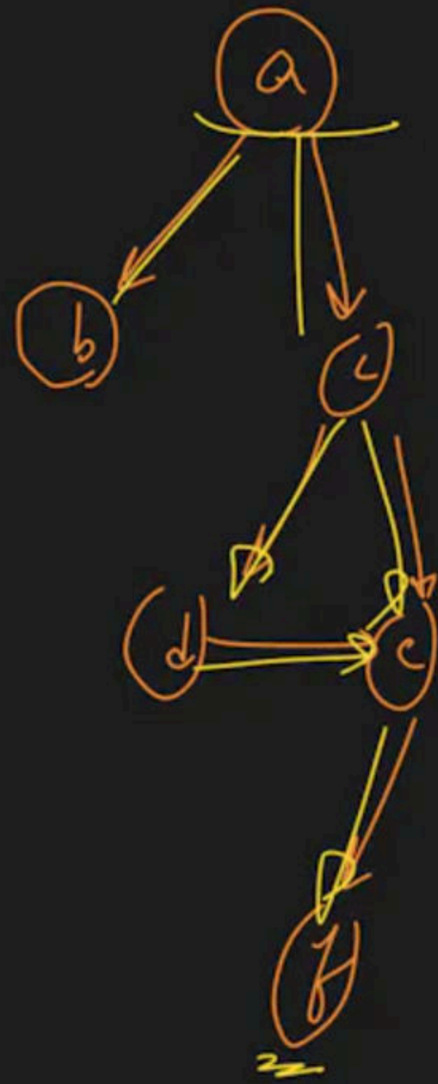
DFS

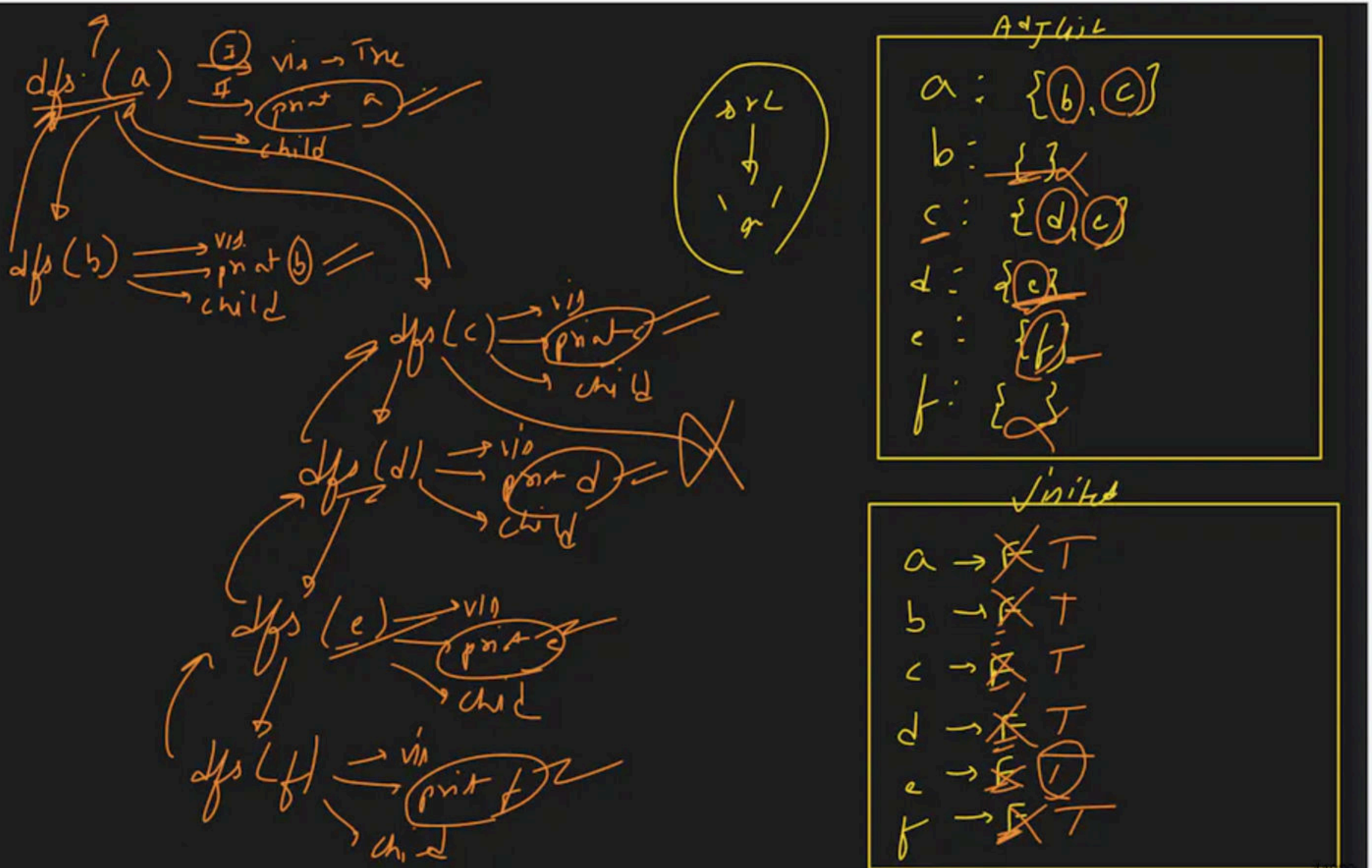


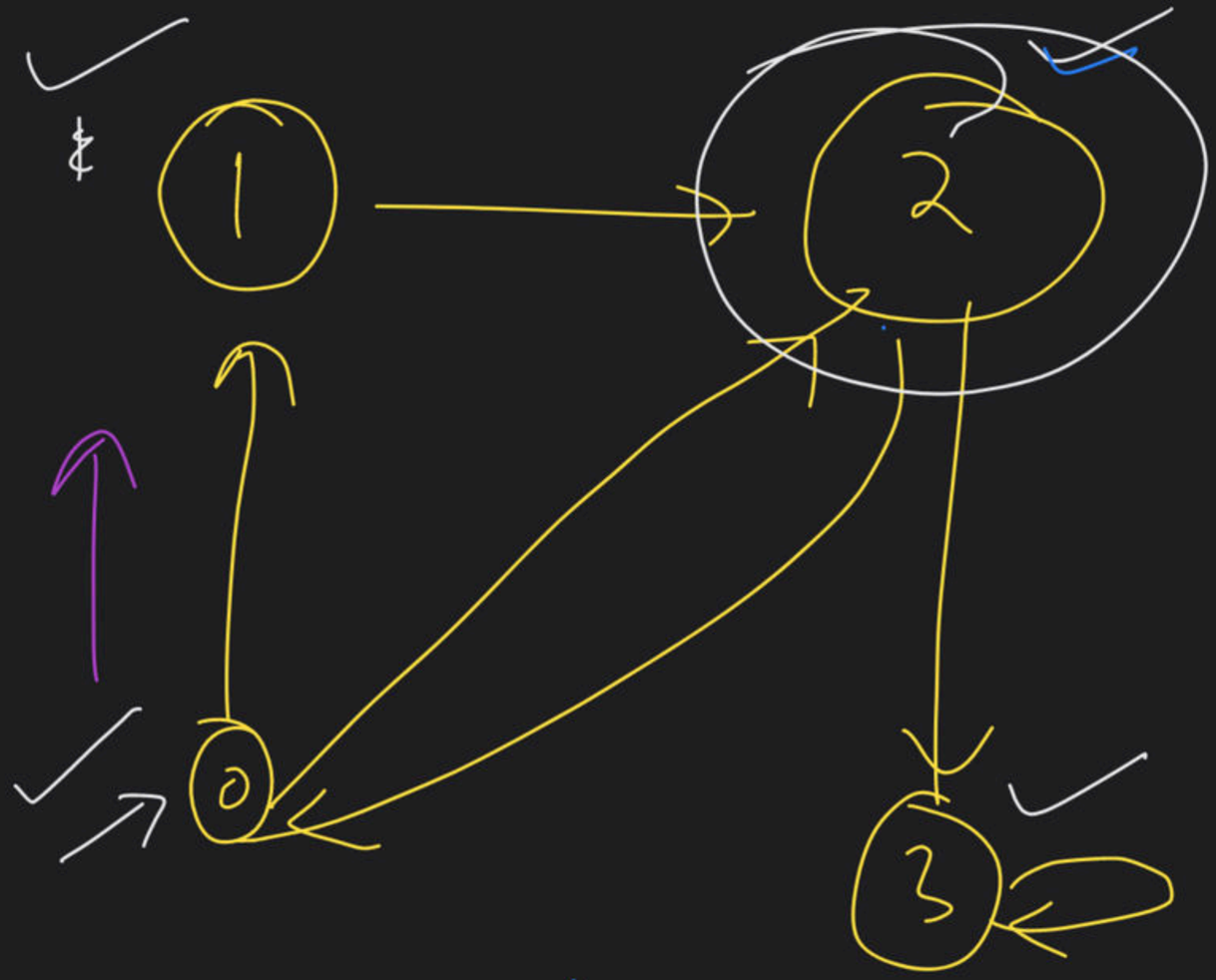

for ( )
{
rec ()
}
VID
for ( )
{
ans += rec()
}
a
b
c
d
e
f
a
b
c
d
e
f


dfs (a)
print a
dfs (b)
print b
dfs (c)
print c
dfs (d)
print d
dfs (e)
print e
dfs (f)
print f
dfs (c)


a → {b, c}
b → {}
c → {d, e}
d → {e}
e → {f}
f → {}


a
b
c
d
e
f


dfs(a)
vis → True
print a
child
dfs(b)
vis
print b
child
dfs(c)
vis
print c
child
dfs(d)
vis
print d
child
dfs(e)
vis
print e
child
dfs(f)
vis
print f
child
src
b
a
Adjlist
a: {b, c}
b: { }
c: {d, e}
d: {c}
e: {f}
f: { }
visited
a → F T
b → F T
c → F T
d → F T
e → F T
f → F T



$\Rightarrow$

dfs(0) → T

dfs(1)

dfs(2)

dfs(3)

if (N <= 0)

return 0

dfs( )

{ if (N > 0)

Graph Class - 2

Special class

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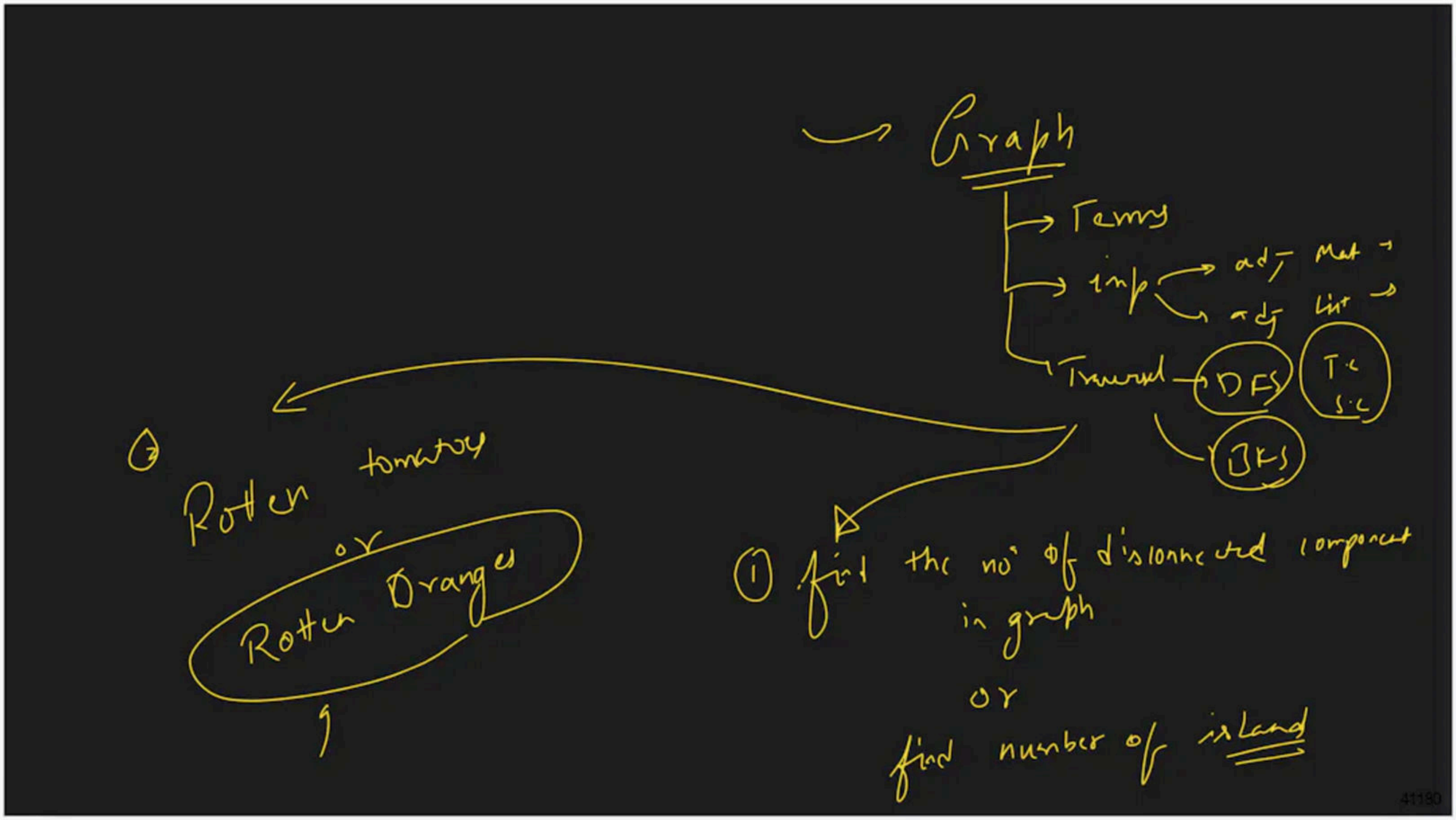

Graph
Terms
inp
adj Mat
adj List
Traversal
DFS
T.C
S.C
BFS
Rotten tomatoy
or
Rotten Oranges
find the no of disconnected component in graph
or
find number of islands

```
for(i ∈ [0, V-1])
{
  if(visited[i]==0)
    { dfs(i) }
}
```

DFS chalaa kee nahi

i=0 : ✓

i=1 = ✓

i=2 = X

i=3 = ✓

i=4 = ✓ (3)

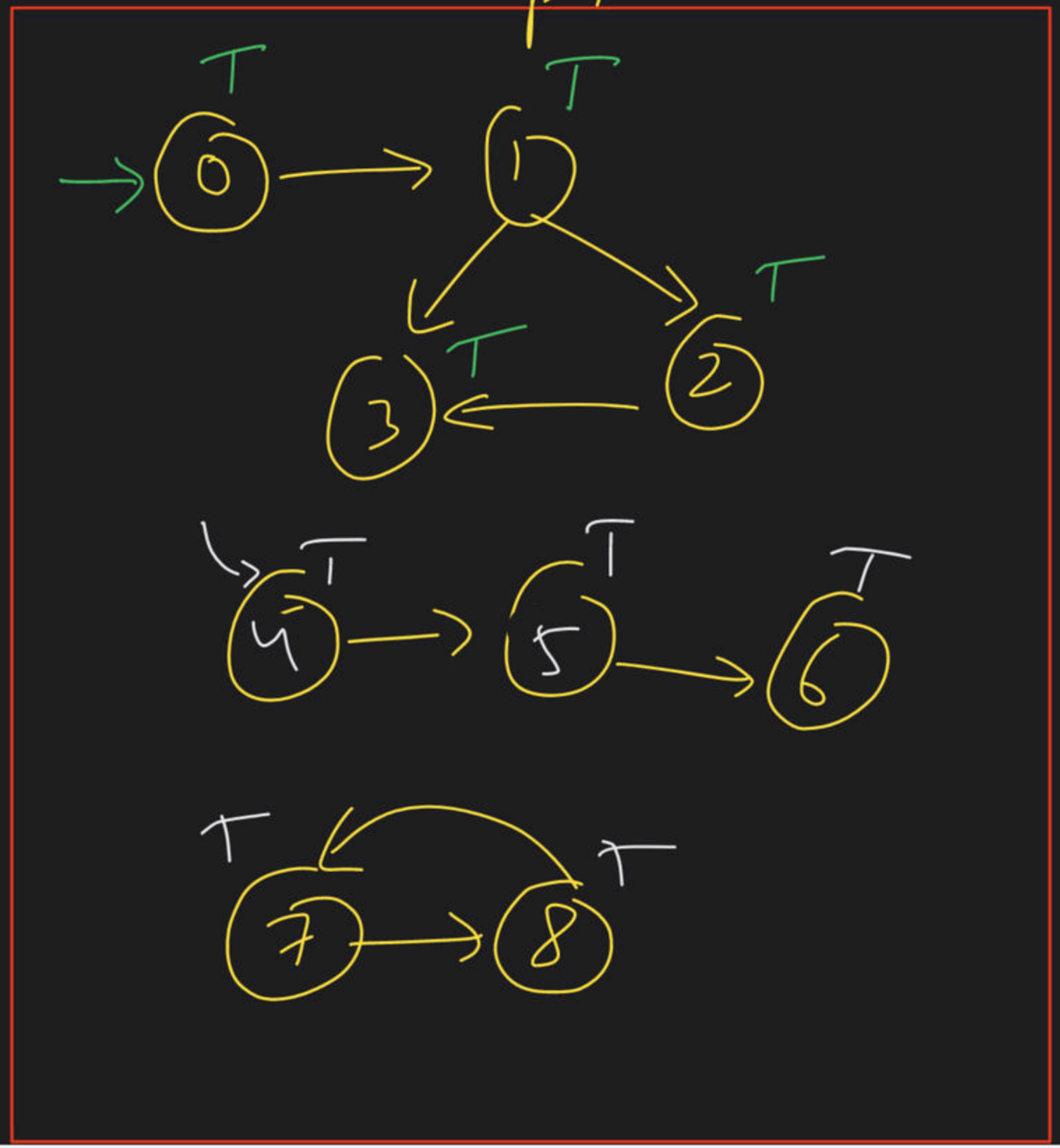
i=5 X

i=6 X ✓

7

8 = X

Graph



Visited map

0: T

1: T

2: T

3: T

4: T

5: T

6: T

7: T

8: T

H.W

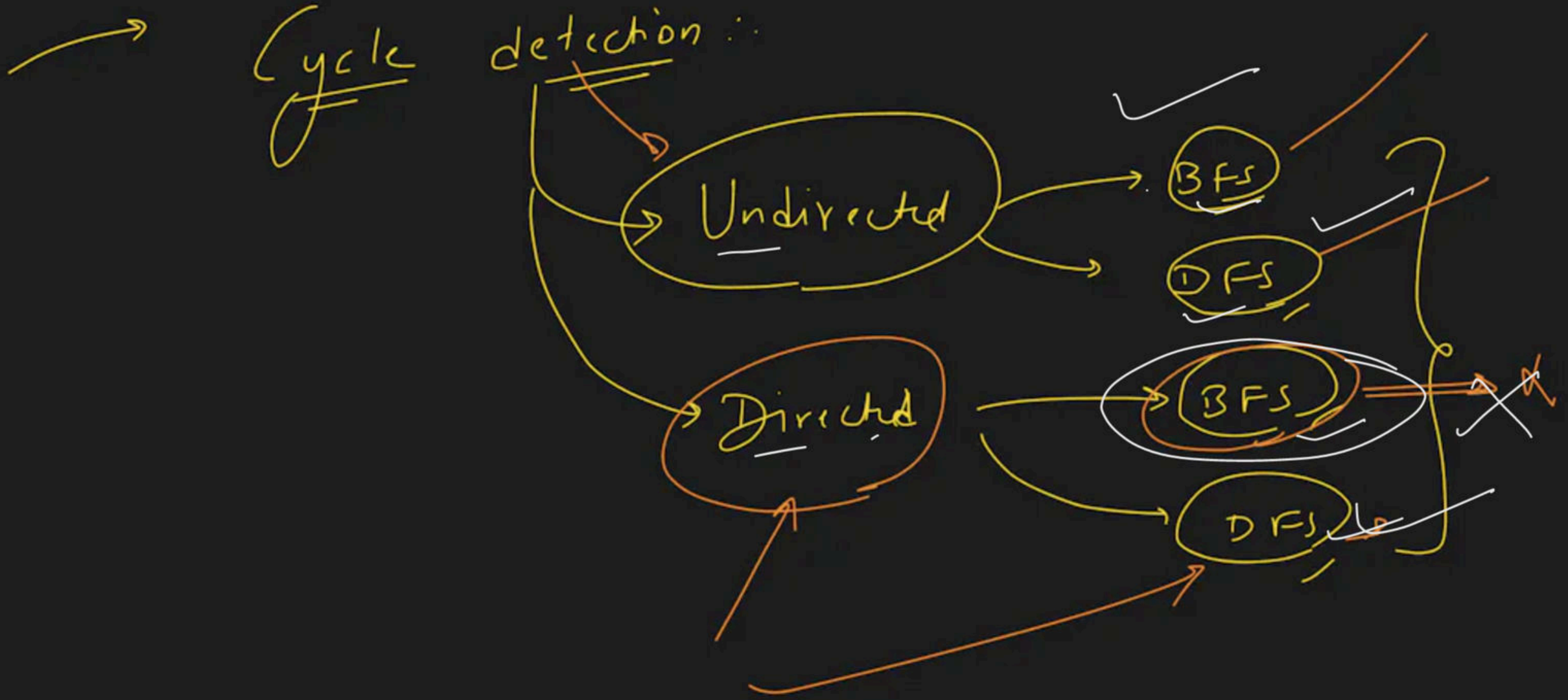
LC = 1319

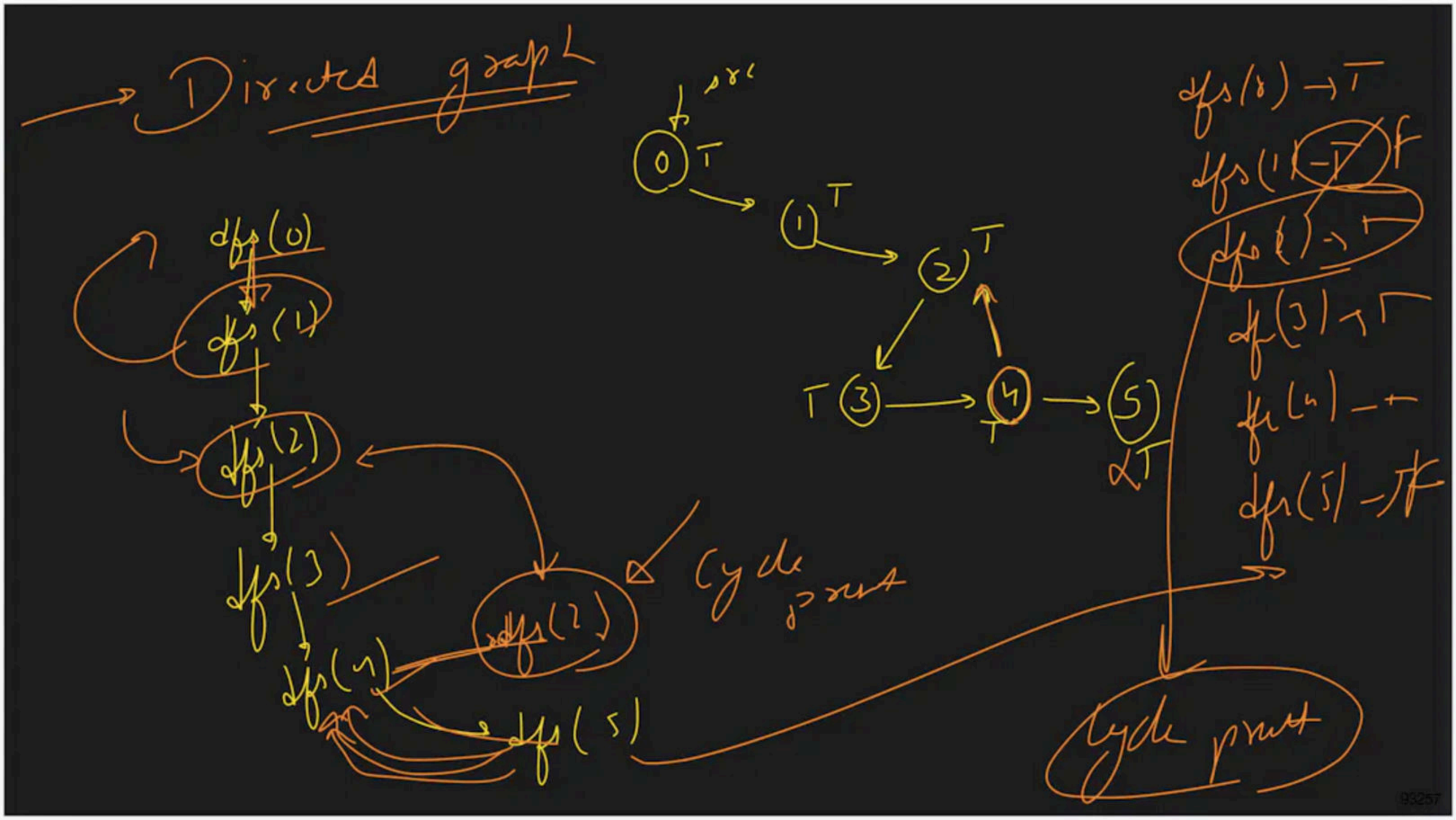
Nu. of Island

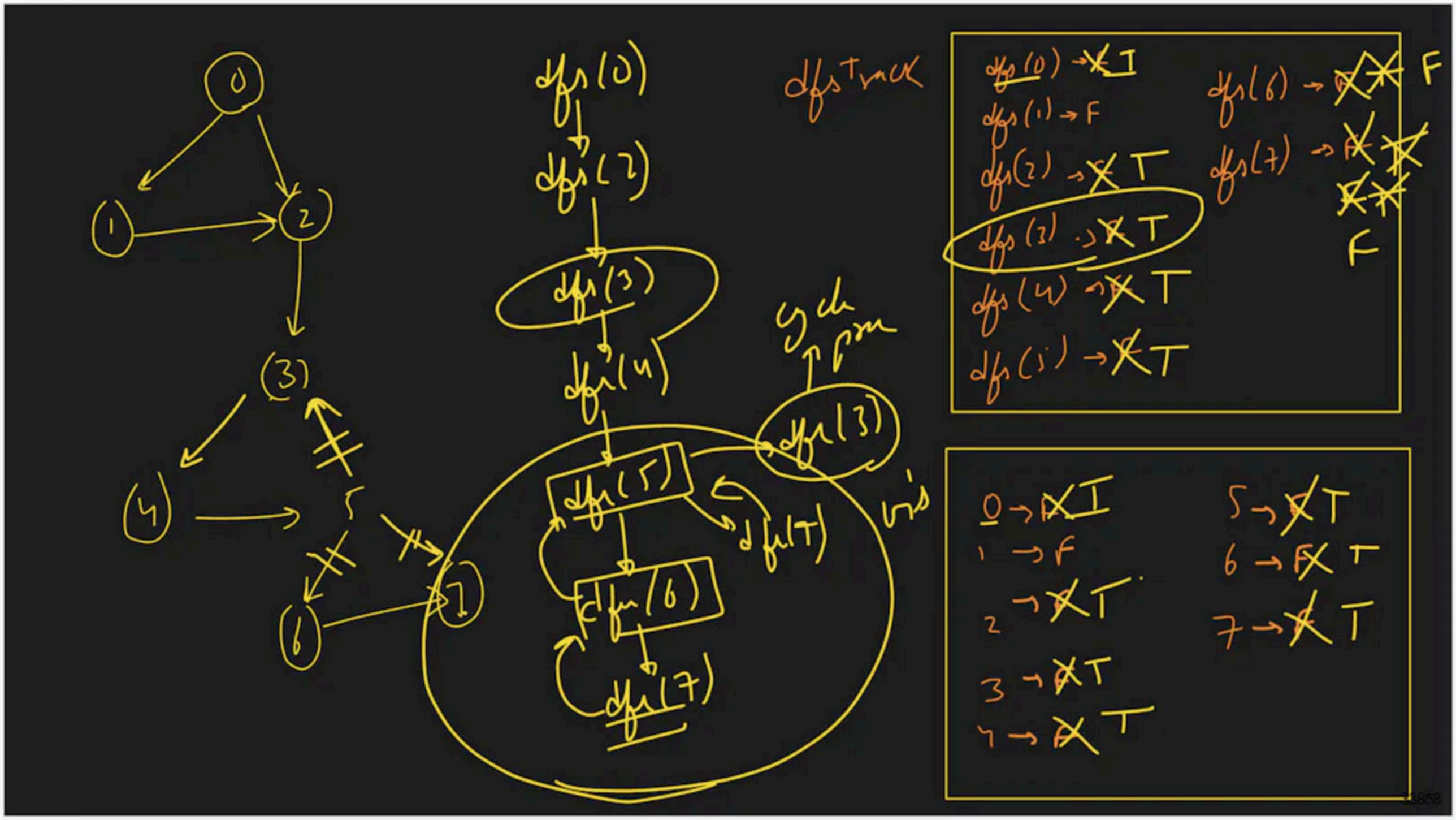
LC = 200

LL = 994 → Rotten On

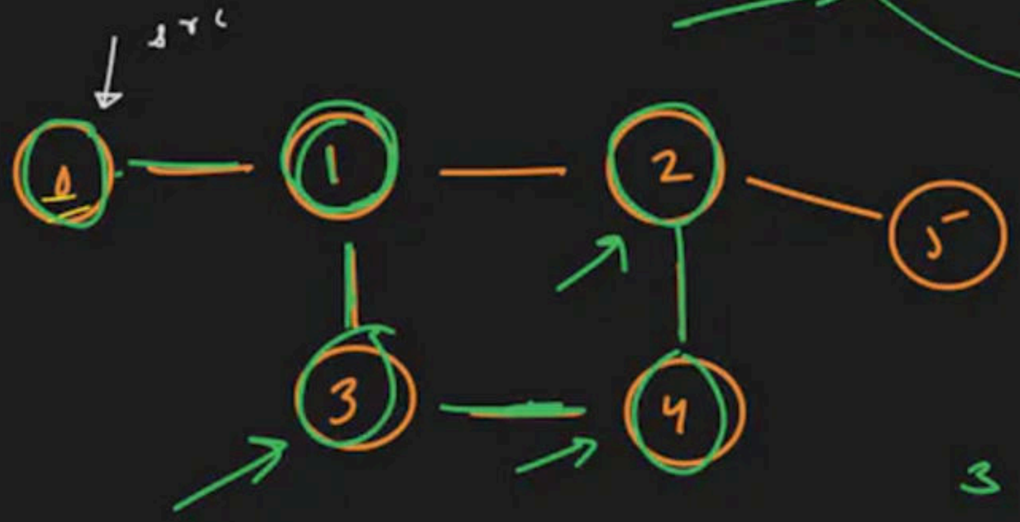
Cycle detection ::




Directed graph
src
0
T
1
T
2
T
3
T
4
T
5
dfs(0)
dfs(1)
dfs(2)
dfs(3)
dfs(4)
dfs(2)
dfs(5)
cycle present
dfs(0) → T
dfs(1) → T
dfs(2) → T
dfs(3) → T
dfs(4) → T
dfs(5) → T
cycle present
93257


0
1
2
3
4
5
6
7
dfs(0)
dfs(2)
dfs(3)
dfs(4)
dfs(5)
dfs(6)
dfs(7)
dfs(T)
dfs(3)
cycle from
vis
dfsTrack
dfs(0) → X I
dfs(1) → F
dfs(2) → X T
dfs(3) → X T
dfs(4) → X T
dfs(5) → X T
dfs(6) → X X F
dfs(7) → X X X F
0 → X I
1 → F
2 → X T
3 → X T
4 → X T
5 → X T
6 → F X T
7 → X T

Undirected :-



visited [child] == T
&&
child != parent [front]

cycle present

adj list

0 : {1}
1 : {0, 2, 3}
2 : {1, 4, 5}
3 : {1, 4}
4 : {2, 3}
5 : {2}

parent

0 : -1
1 : 0
2 : 1
3 : -1
4 : 2
5 : 2

Visited

0 → F T
1 → F T
2 → F T
3 → F T
4 → F T
5 → F T

Queue

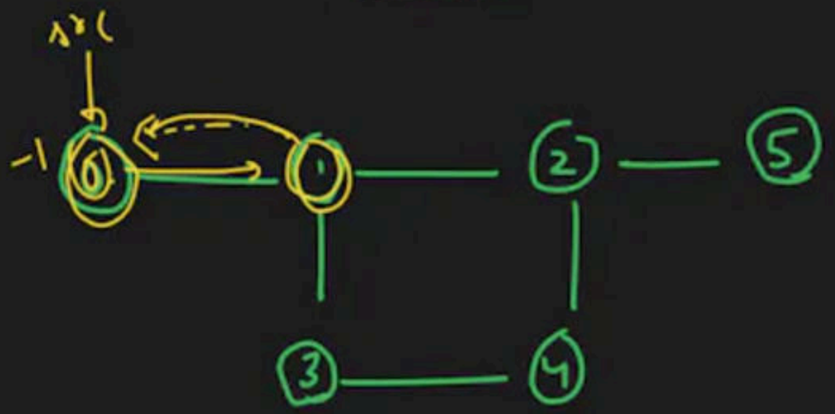
q.push(src)
vis[0] = T
par = -1

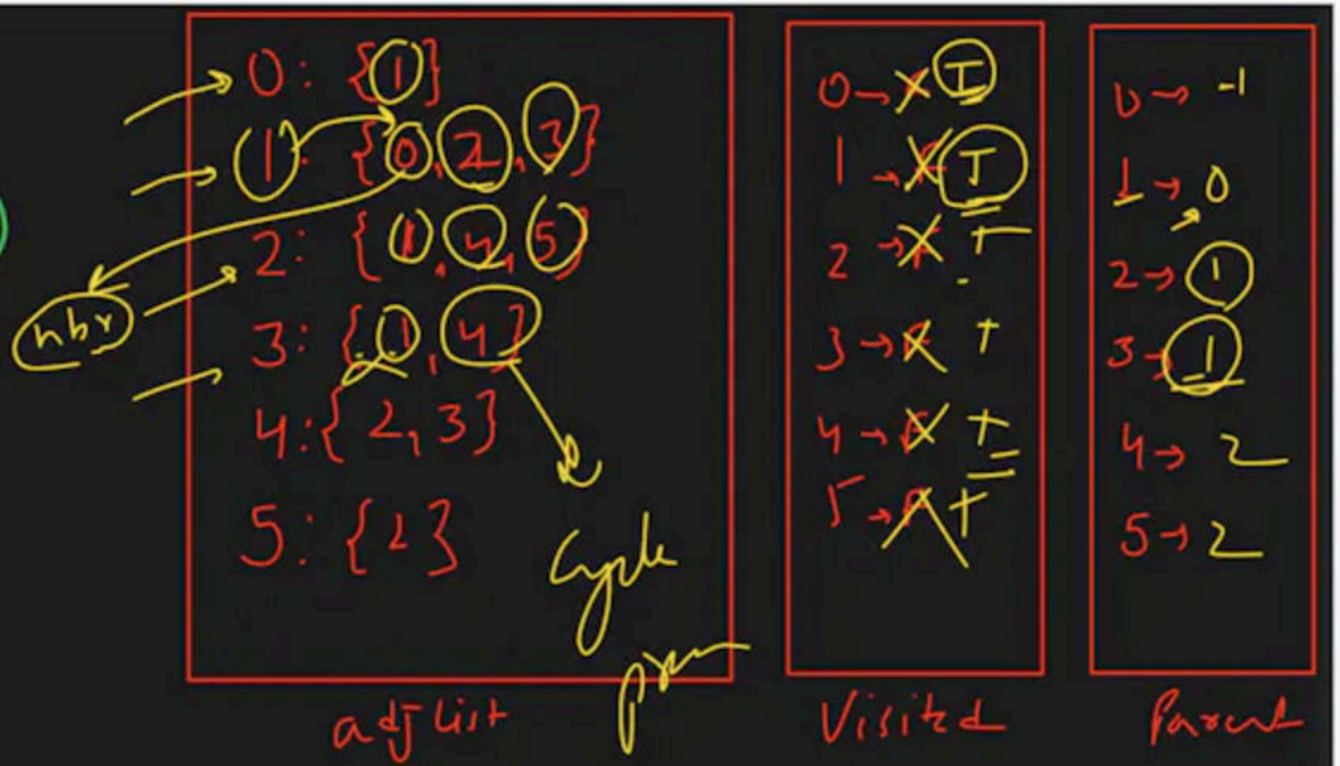
| 0 | 1 | 2 | 3 | 4 | 5 |

0 1 2 3

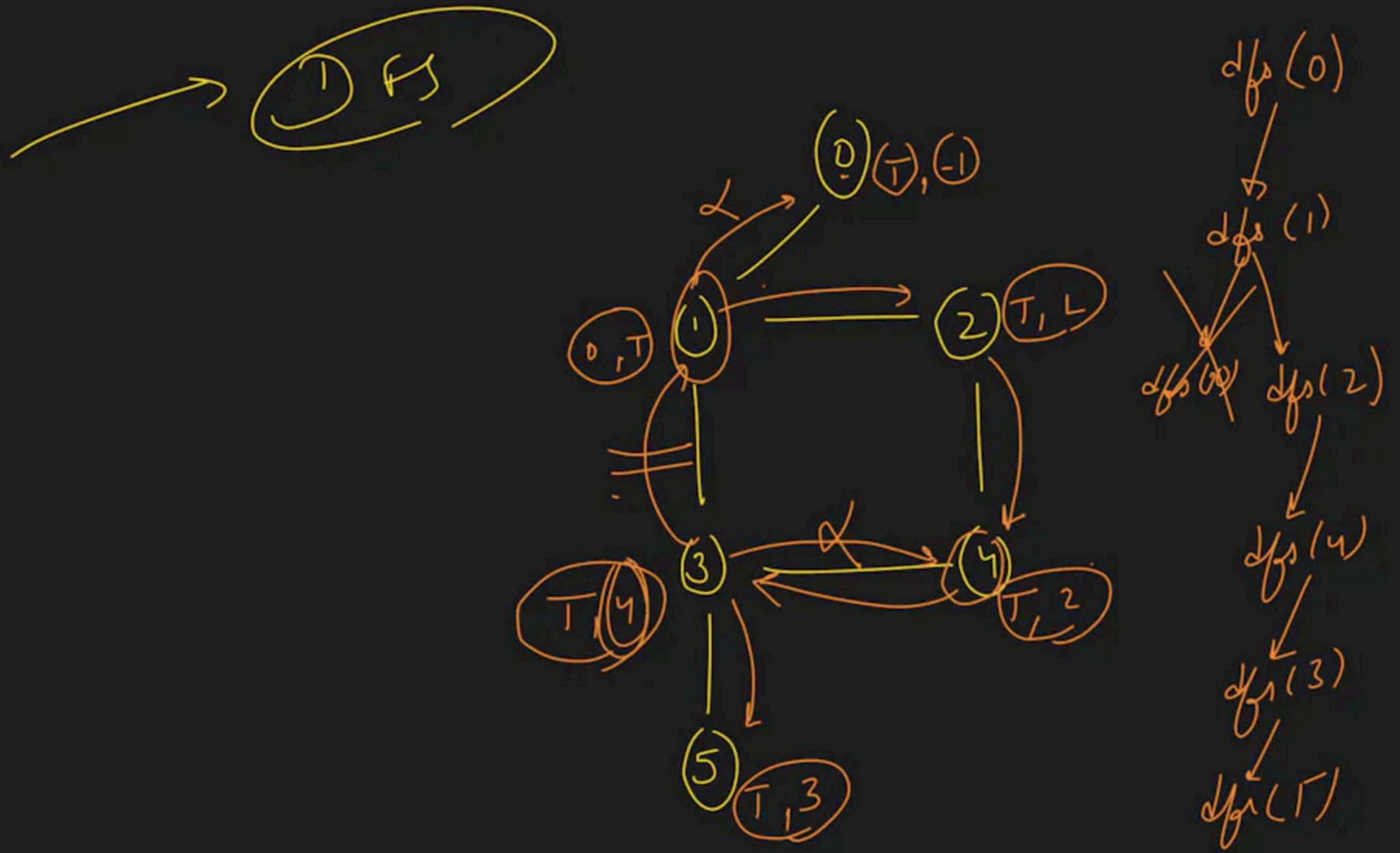
2 ← 1

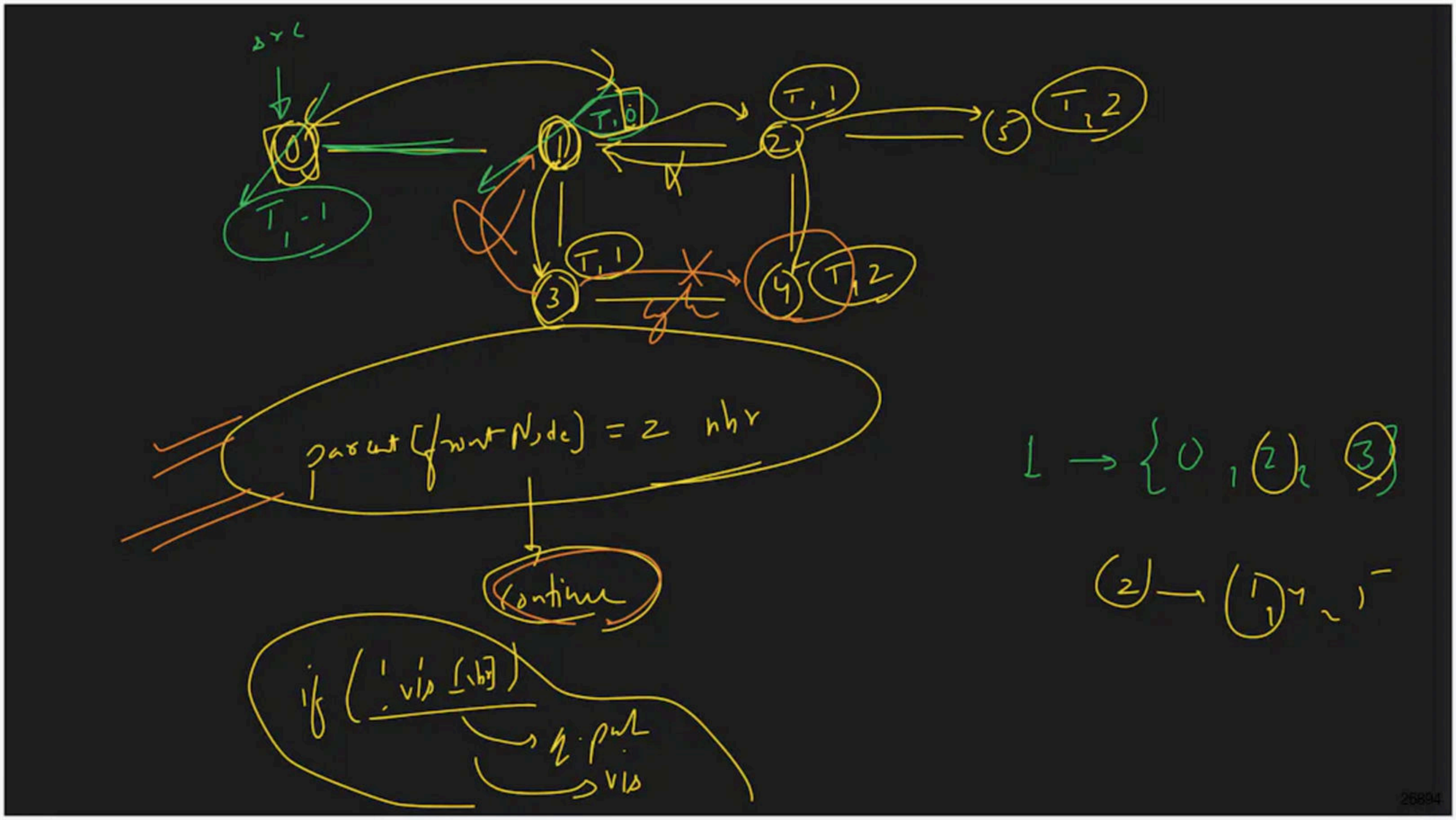
Cond^t → vis[nbr] == true
&&
nbr != parent[frontNode]

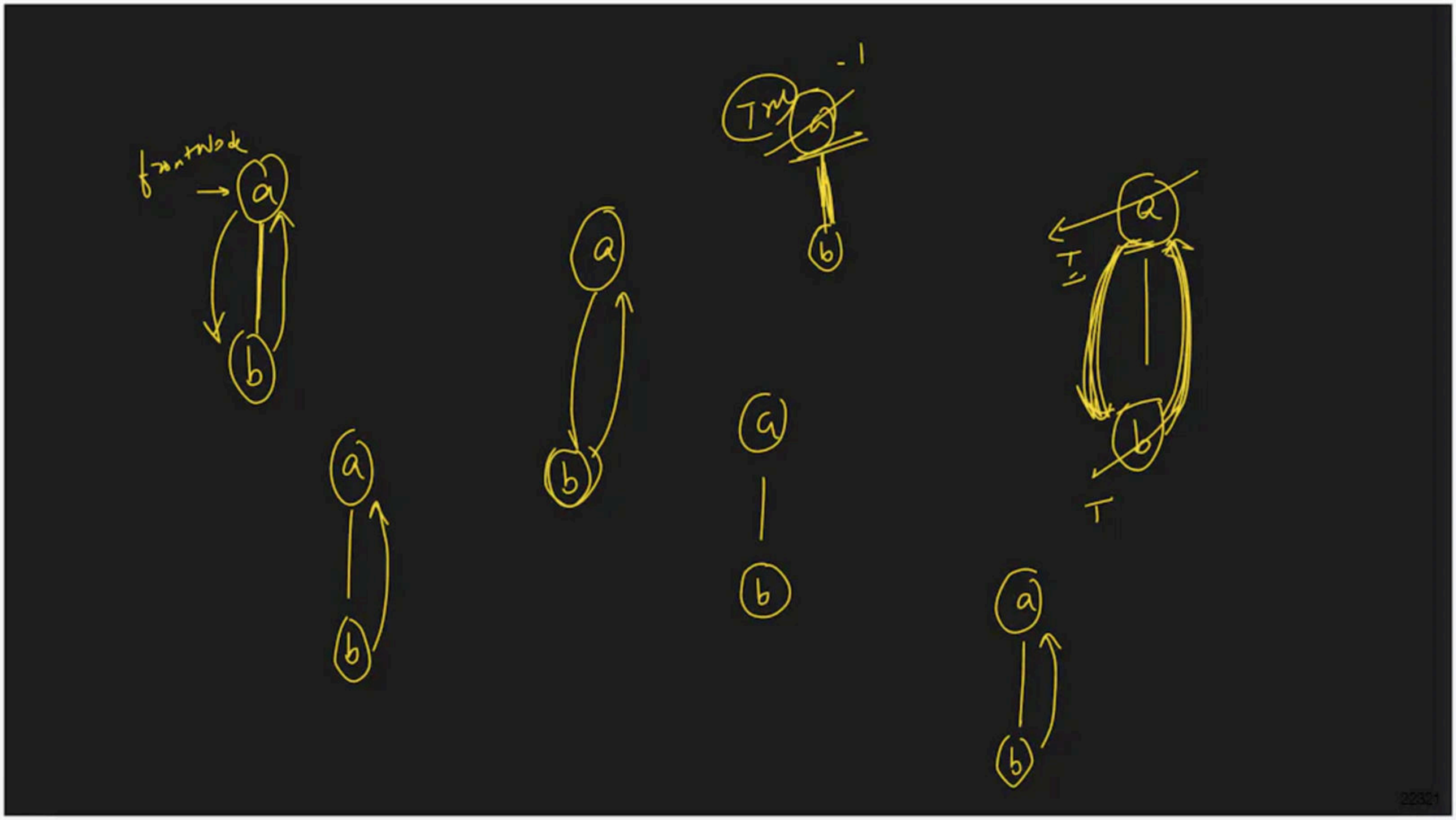


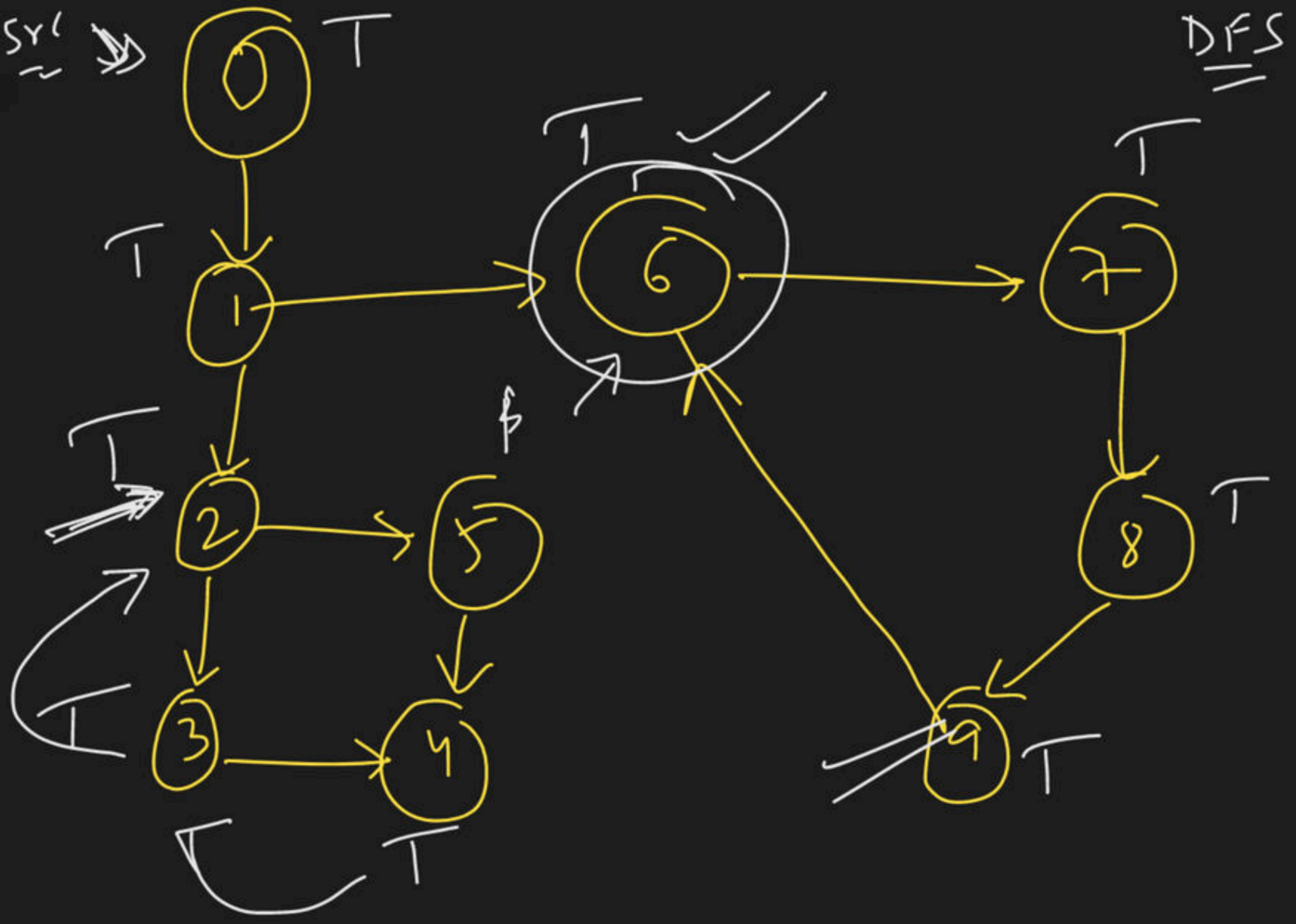


q.push(src)
vis[src] = T
parent[src] = -1


dfs(0)
dfs(1)
dfs(2)
dfs(4)
dfs(3)
dfs(5)


src
0
1
2
3
4
5
T,0
T,1
T,2
T,-1
parent[front Node] = 2 nhr
continue
if (! vis [nbr])
2 push
vis
1 → { 0 , 2 , 3 }
2 → (1)^{n-1}


a
b
a
b
a
b
a
b
a
b

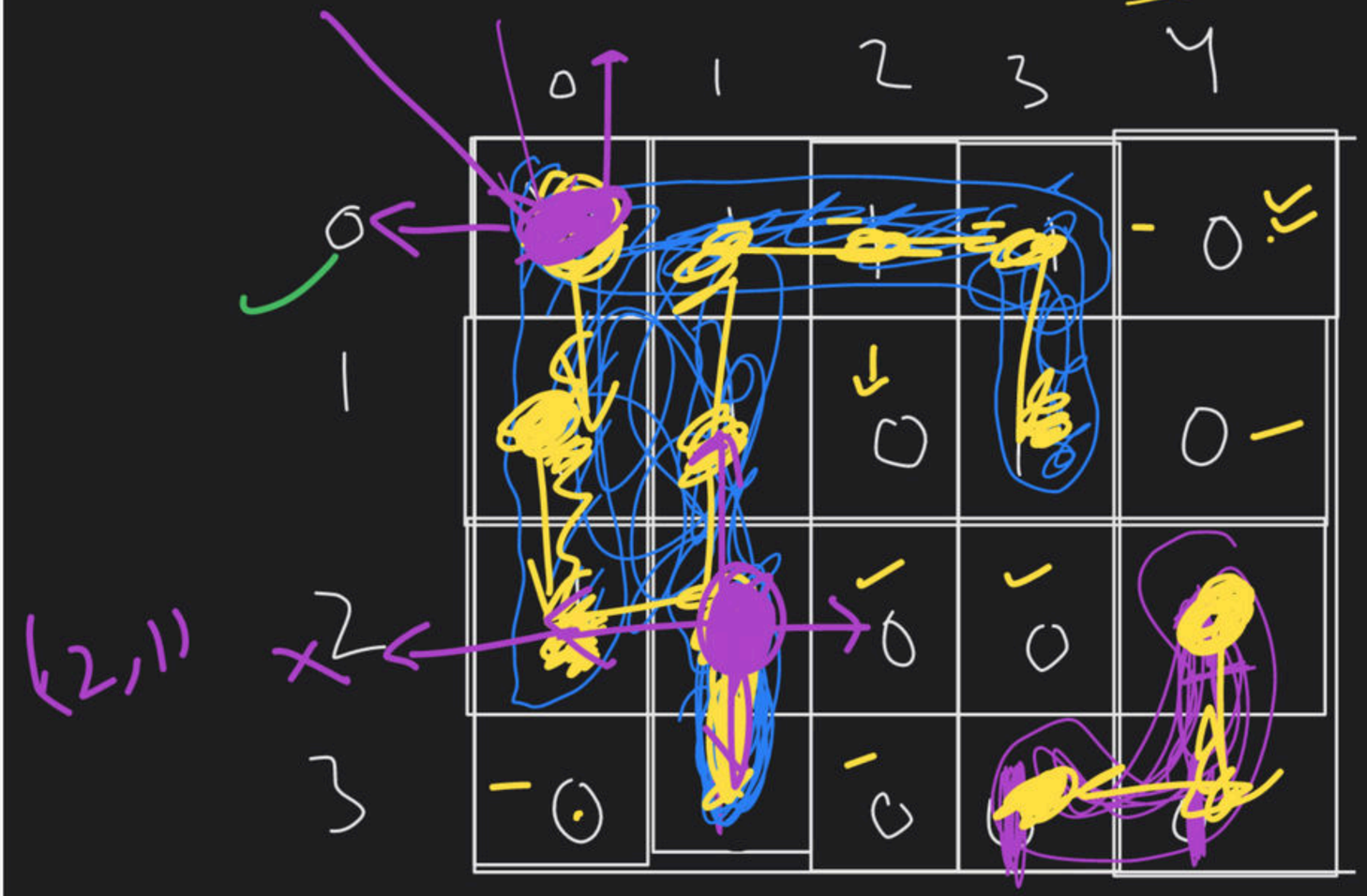


Visited Map

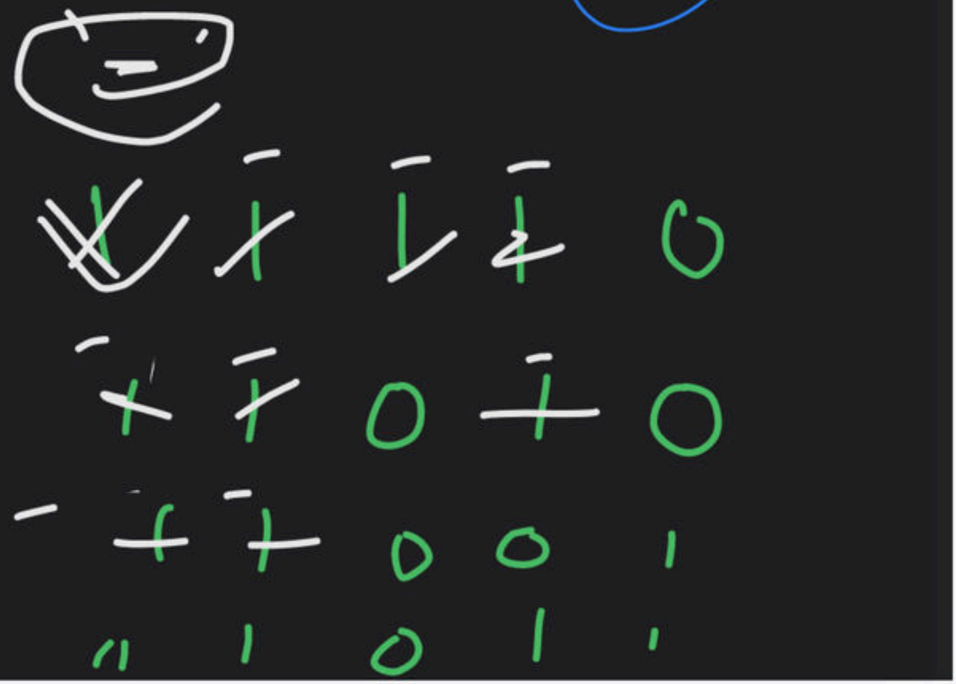
dfsTrue

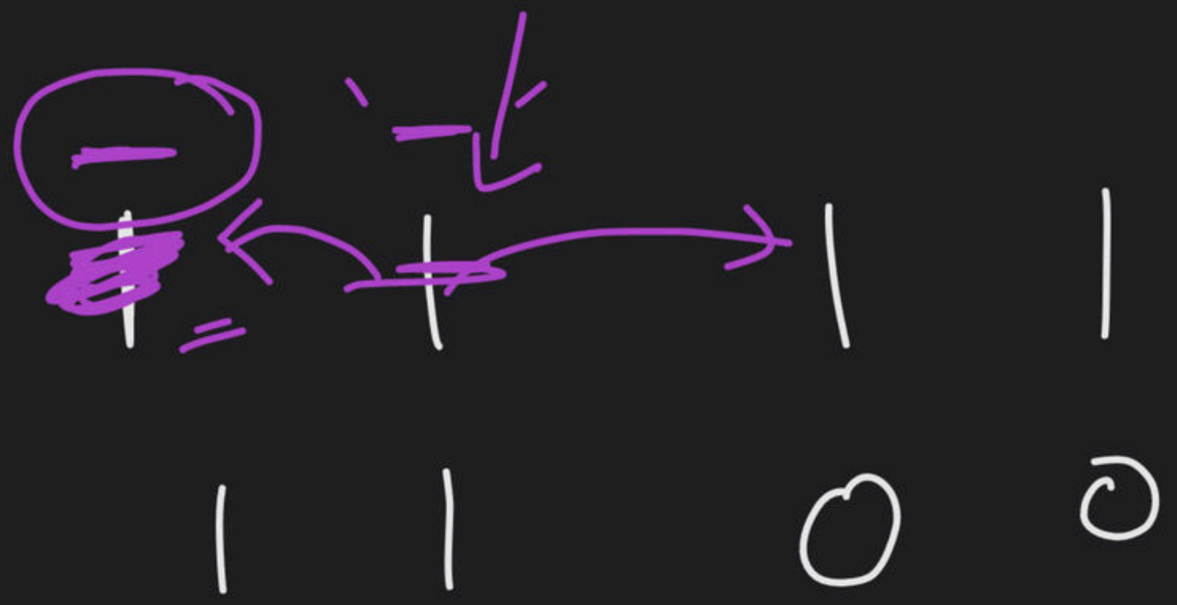
0 T	0 T
1 T	1 T
2 T	2 T
3 T	3
4 T	4
5	5
6	6 T
7	7
8	8
9	9

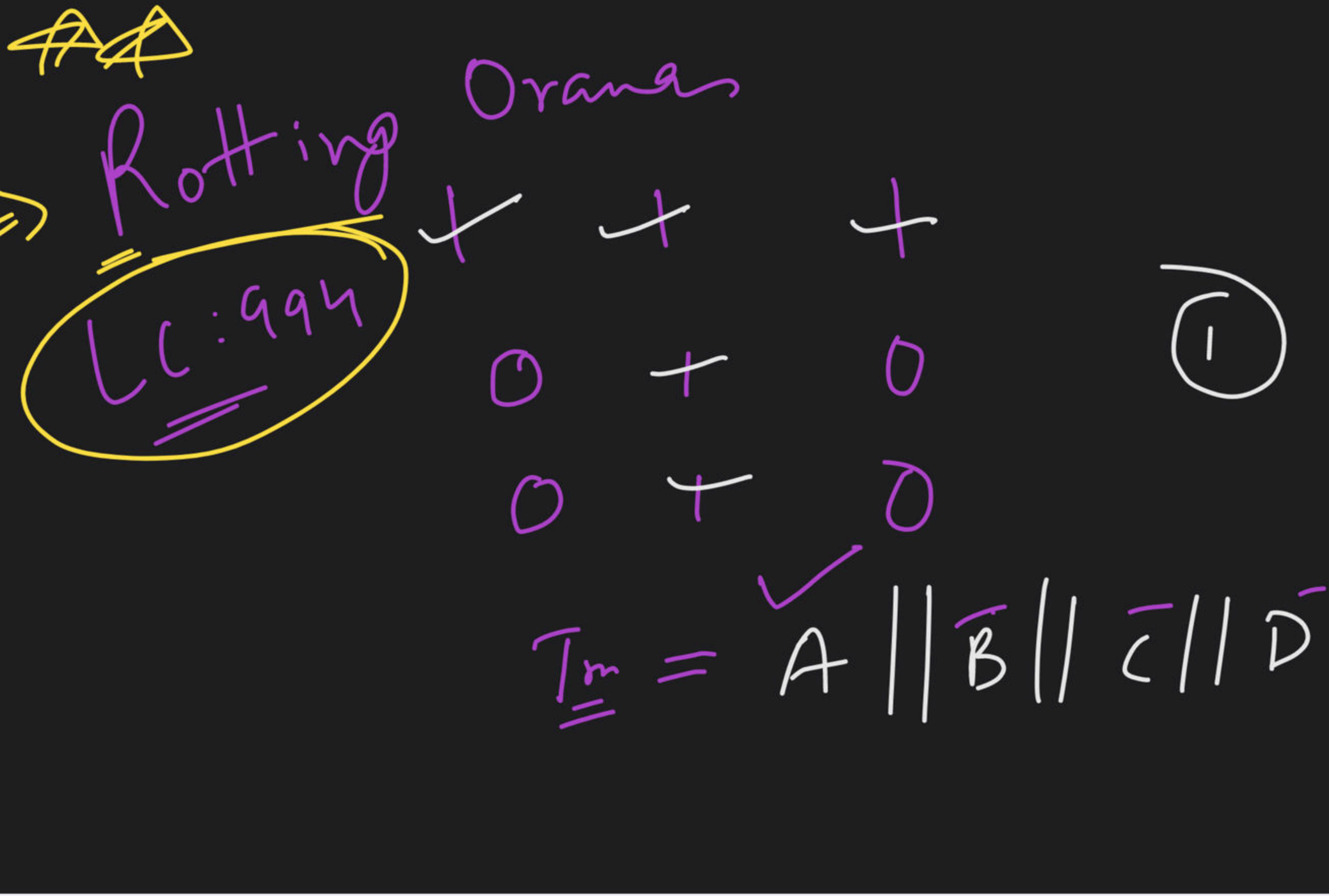
LL = 200 - No. of islands



① Out of range
② Water Rules






Rotting Oranges
LC: 994
1
$Tm = A \,||\, \bar{B} \,||\, \bar{C} \,||\, \bar{D}$