



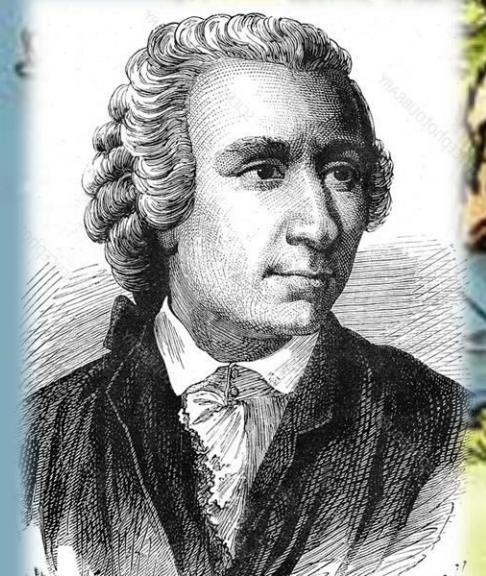
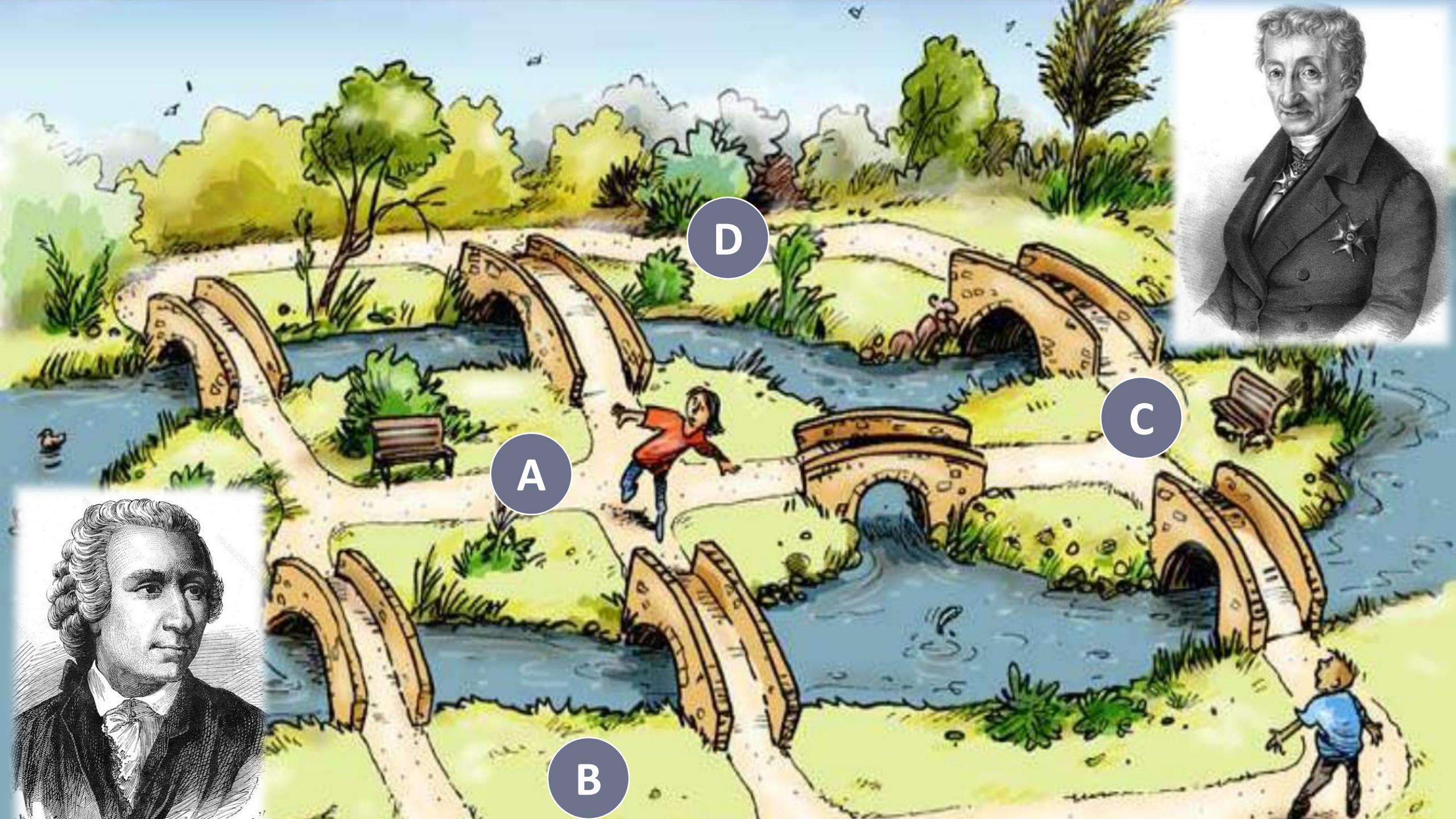
# GRAPH THEORY

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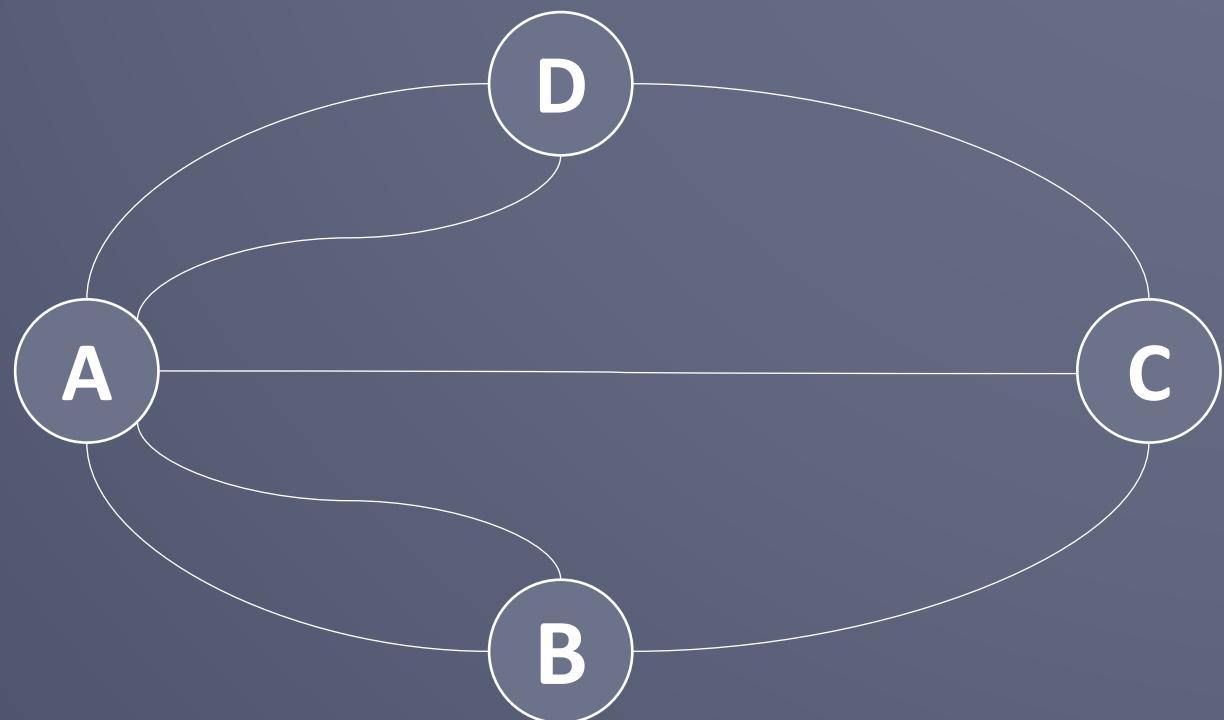
Department of Computer Science and Engineering

Varendra University



# Bridge Of Konigsberg

DEGREE OF A :	5
DEGREE OF B: 3	
DEGREE OF C: 3	
DEGREE OF D:	3



# Euler Path and Circuit

- A graph has an Euler path if and only if there are at most two vertices with odd degree.



- A graph has an Euler circuit if and only if the degree of every vertex is even.



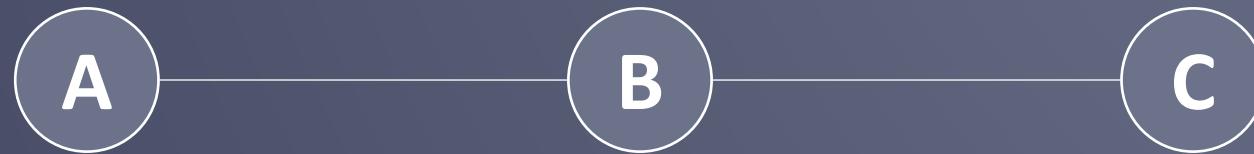
# The Geometry of Position

The Geometry of Position aka Graph Theory is the study of graphs, which are mathematical structures used to model pairwise relations between objects.

A graph is a collection of **vertices** (also called nodes or points) which are connected by **edges** (also called links or lines) to represent complex problems in a simpler manner.

# Adjacent Node

Any two nodes connected by an edge or any two edges connected by a node are said to be adjacent.



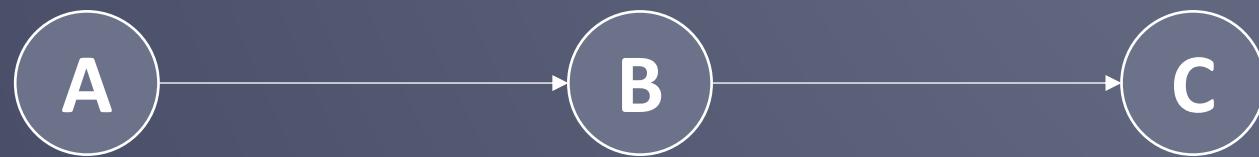
In this graph, A & C both are the adjacent node of B.

B is the adjacent node of A

Also, B is the adjacent node of C

# Directed & Undirected Graph

Directed graph are the ones with unidirectional edges.

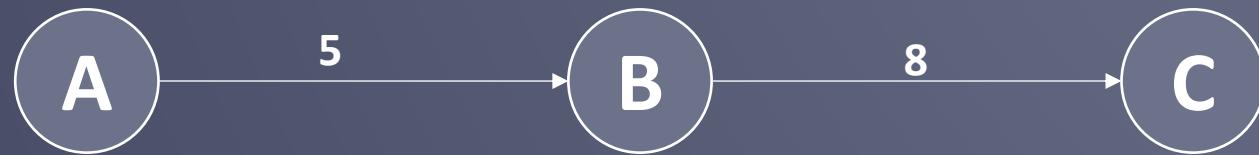


Undirected graph are the ones with bidirectional edges.



# Weighted & Unweighted Graph

If the edges has a weight or cost it is called weighted graph.

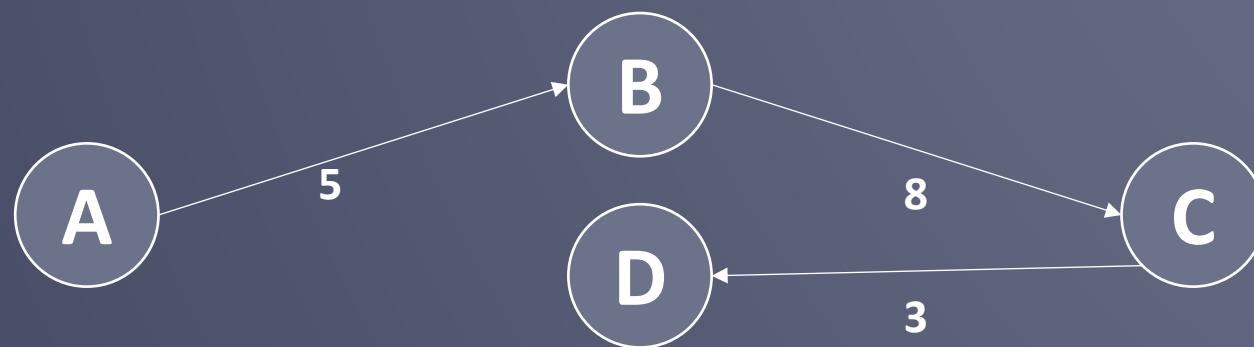


If the edges has no weight or cost it is called unweighted graph.



# Path

Path can be defined as the list of edges by which we can visit one node to another.

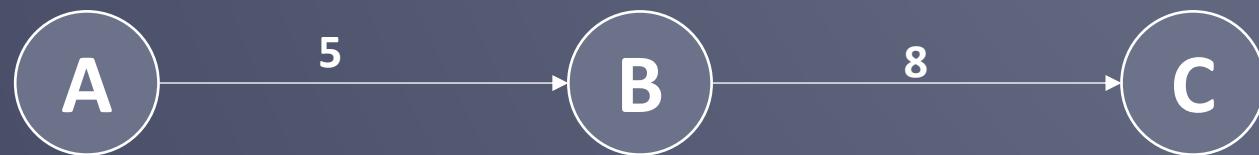


In this graph, To visit D from A. The path will be:

A -> B -> C -> D

# Degree

It is the number of vertices adjacent to a vertex V. In directed graph, the number of head ends adjacent to a vertex is called the indegree of the vertex and the number of tail ends adjacent to a vertex is its outdegree

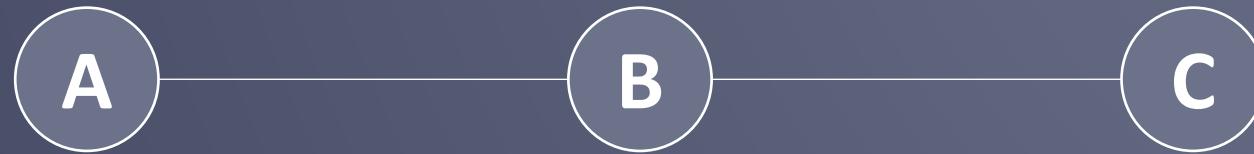


In undirected graph, indegree = outdegree



# Tree

A tree is an undirected graph in which any two vertices are connected by exactly one path.



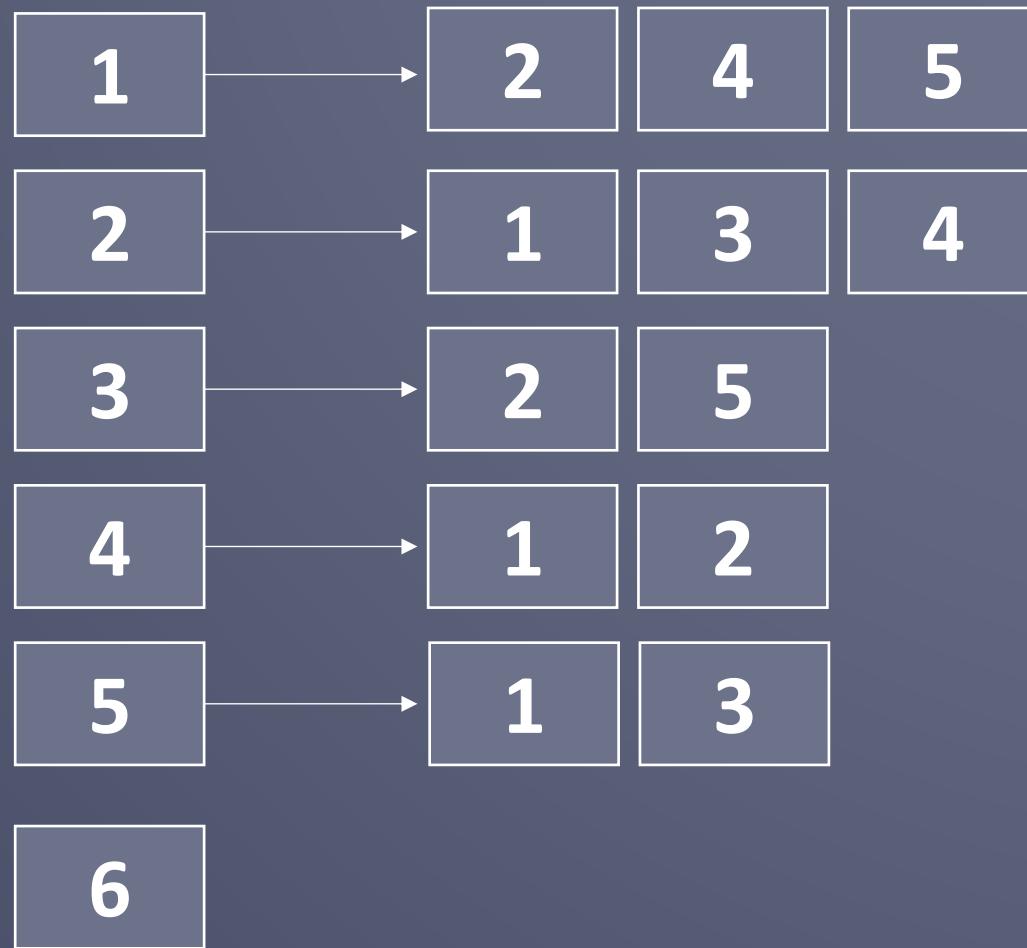
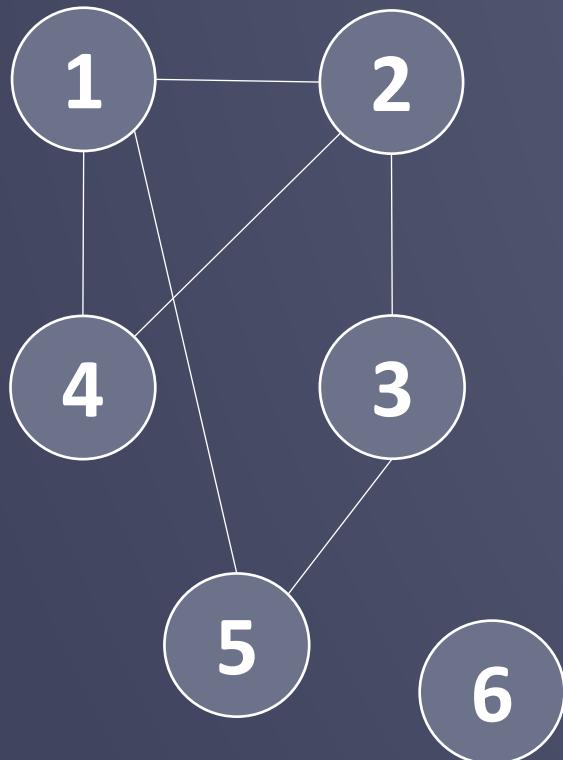
In Tree, for **n-node there will be exactly (n-1) edges**. We can also create a forest combining two or more trees.

# Graph Representation

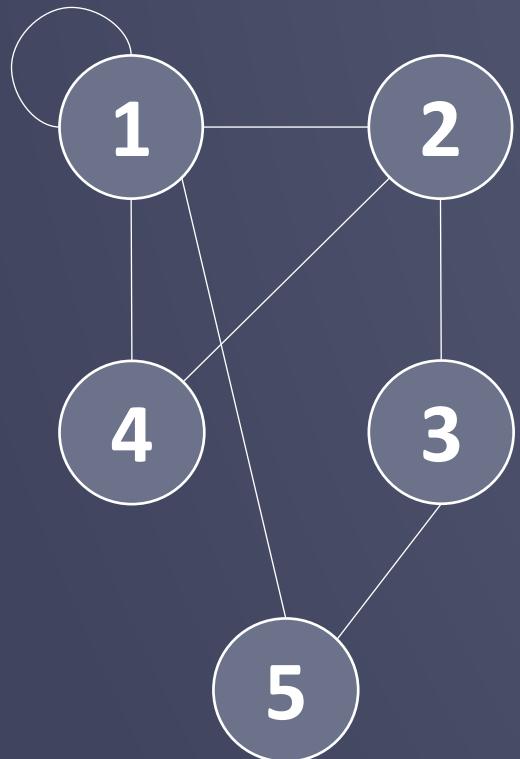
In code , we can represent graph with

- Adjacency Matrix (2D Array)
- Adjacency List (STL Vector/List)

# Adjacency List



# Adjacency Matrix



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

# Level

