Programming, Problem Solving, and Algorithms

CPSC203, 2023 W2

Announcements

- Project 2 is released!
  - Due
- Next week is a “catch-up” week!
  - Classes → Extra Student Hours
  - Labs → Extra Student Hours
  - Student hours → Student hours
- I will endeavour to post some course videos for following weeks

Today's Plan...

1. Announcements! (5 mins)
2. Introduction to Project 2 (10 mins)
3. Weekly Videos Review/Questions (10 mins)
4. Types of Graphs (10 mins)
5. Exploration of Graphs (30 mins)

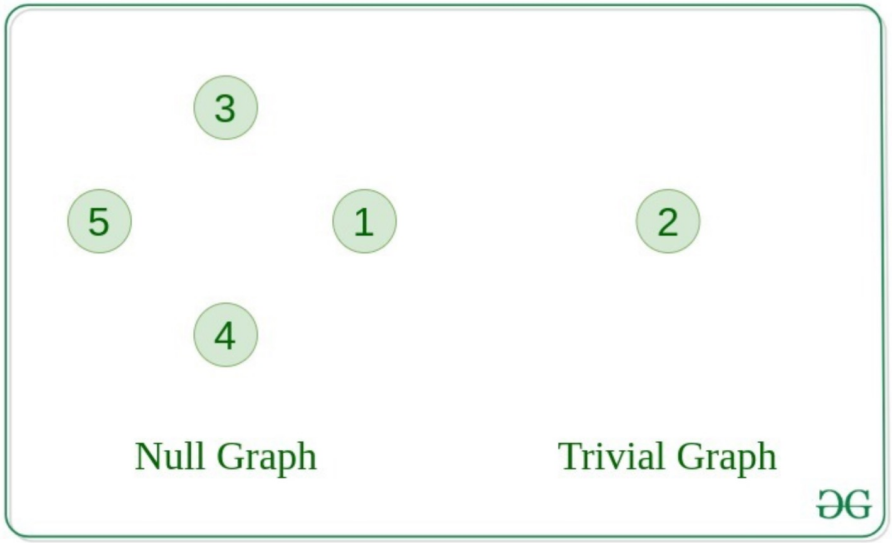
Types of Graphs

1. Null Graph

A graph is known as a null graph if there are no edges in the graph.

2. Trivial Graph

Graph having only a single vertex, it is also the smallest graph possible.



Reference: GeeksforGeeks

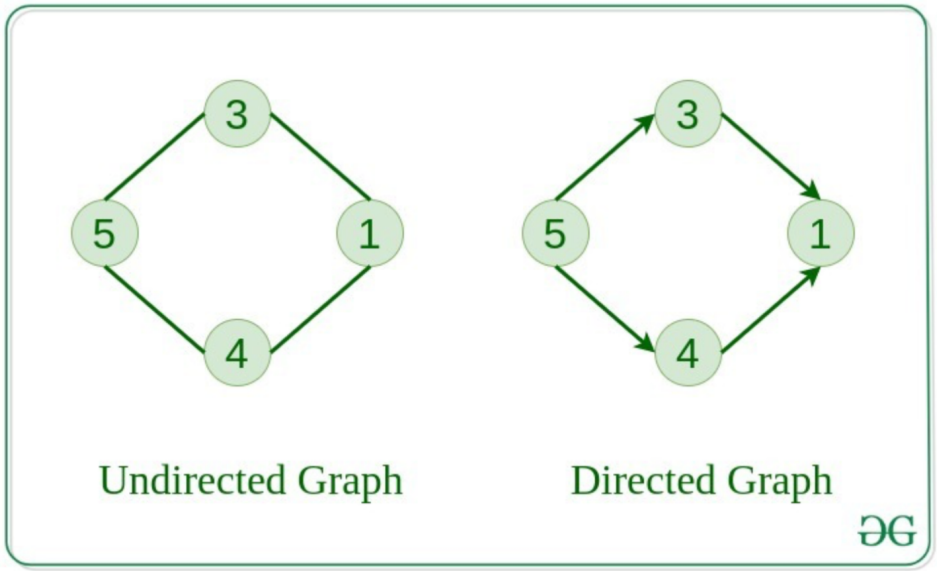
Types of Graphs

3. Undirected Graph

A graph in which edges do not have any direction. That is the nodes are unordered pairs in the definition of every edge.

4. Directed Graph

A graph in which edge has direction. That is the nodes are ordered pairs in the definition of every edge.



Reference: GeeksforGeeks

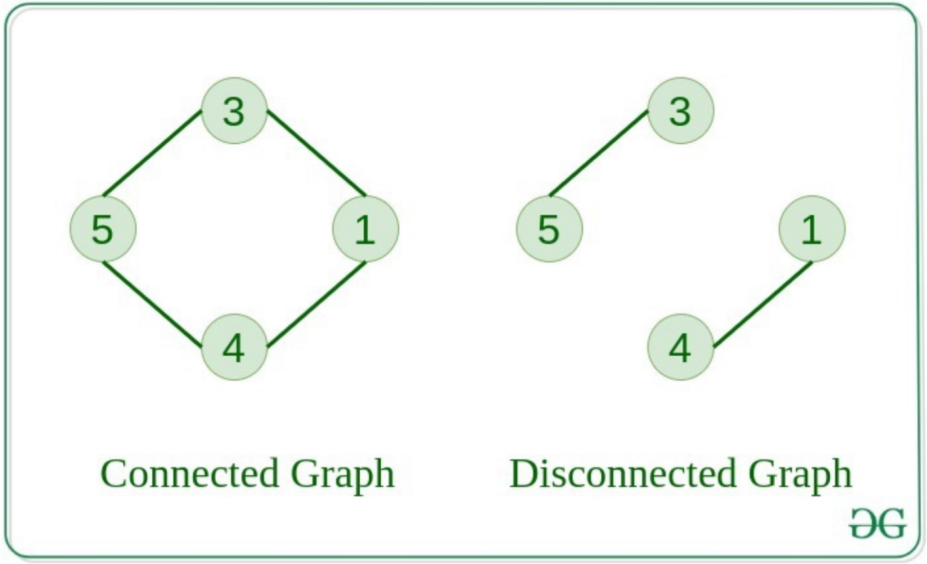
Types of Graphs

5. Connected Graph

The graph in which from one node we can visit any other node in the graph is known as a connected graph.

6. Disconnected Graph

The graph in which at least one node is not reachable from a node is known as a disconnected graph.



Reference: GeeksforGeeks

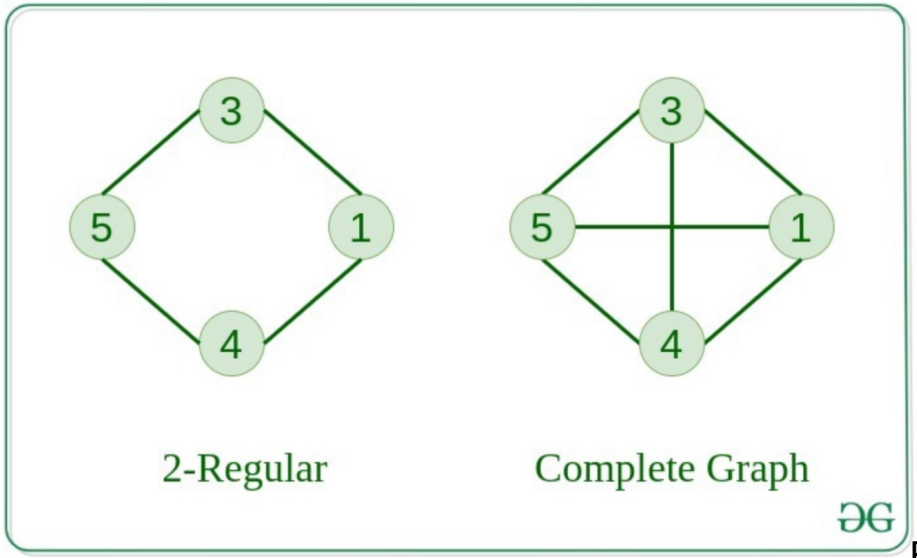
Types of Graphs

7. Regular Graph

The graph in which the degree of every vertex is equal to K is called K regular graph.

8. Complete Graph

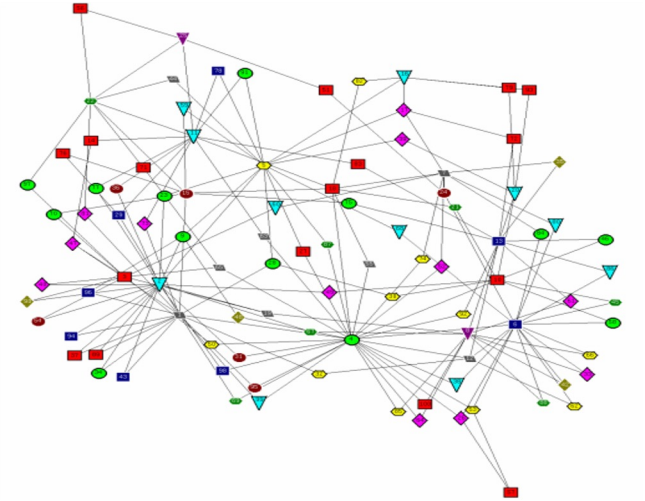
The graph in which from each node there is an edge to each other node.



Reference: GeeksforGeeks

Slides from the Assigned Videos

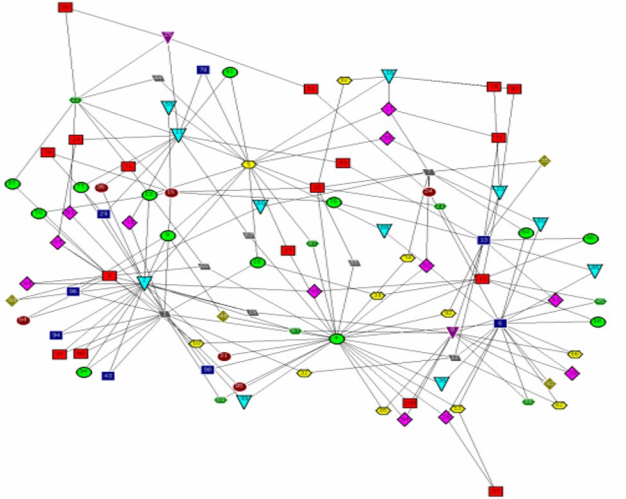
Explorations with Graphs:



Suppose I tell you a graph has 100 vertices. What do we know about the number of edges?

At most _____ edges which occurs when the graph is complete.

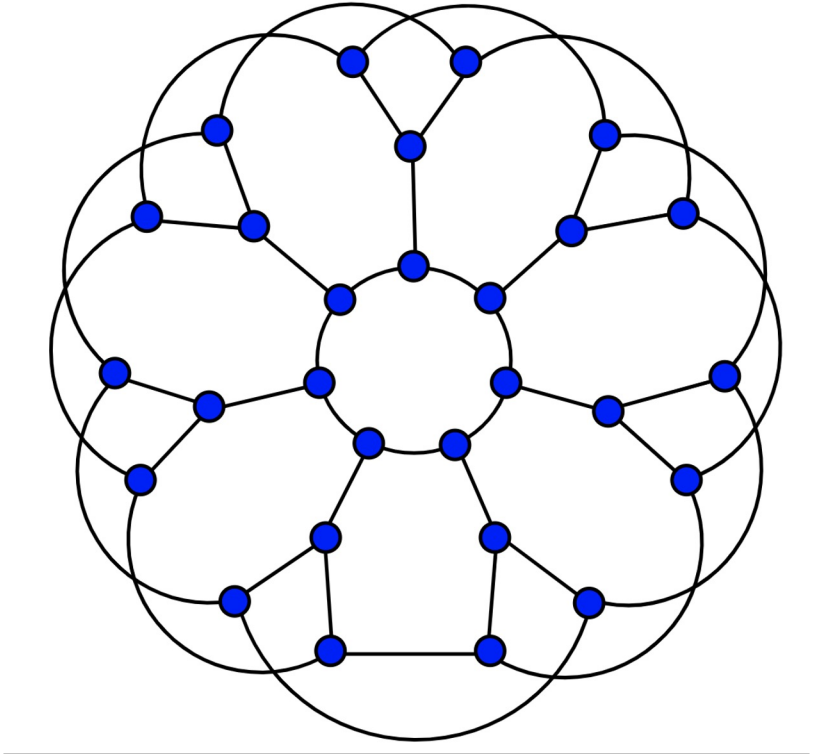
Explorations with Graphs:



Suppose I tell you a graph has 100 vertices. What do we know about the number of edges?

At least _____ edges because the graph is connected.

Handshaking:



The following are equivalent:

1. The number of neighbors of a vertex.
2. The number of incident edges of a vertex.
3. The degree of a vertex.

Suppose a graph has n vertices, v1, v2, ..., vn, and m edges. What is

Degree games:

Suppose I drop my graph and it shatters into pieces. If I tell you the degree of each of the vertices, can you reconstruct the graph?

An algorithm for finding a graph, given a degree sequence, is described in the practice problems.

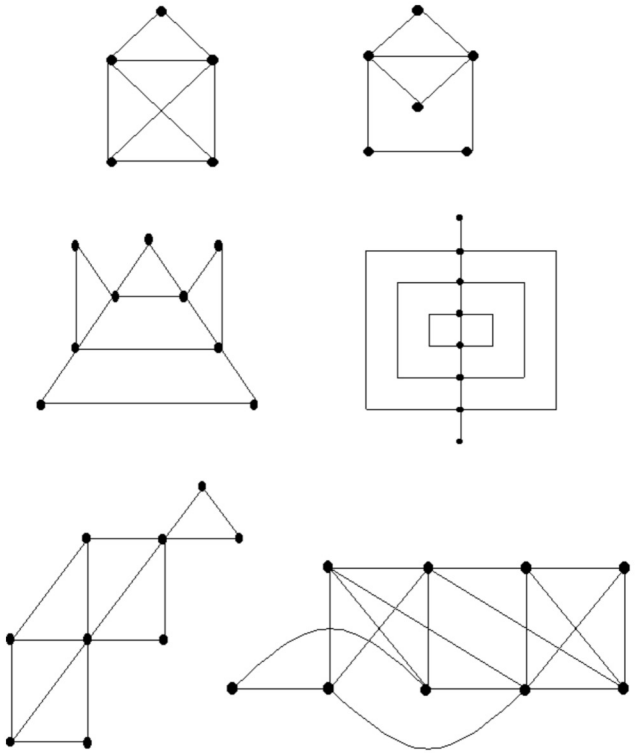
Havel-Hakimi

a	2
b	2
c	2
d	1
e	1

a	3
b	2
c	2
d	1
e	1

a	4
b	4
c	4
d	4
e	4

Pencil Puzzles:



Trace each graph without lifting your pencil and without revisiting an edge.

Can all graphs be traced?

What characterizes those that cannot?