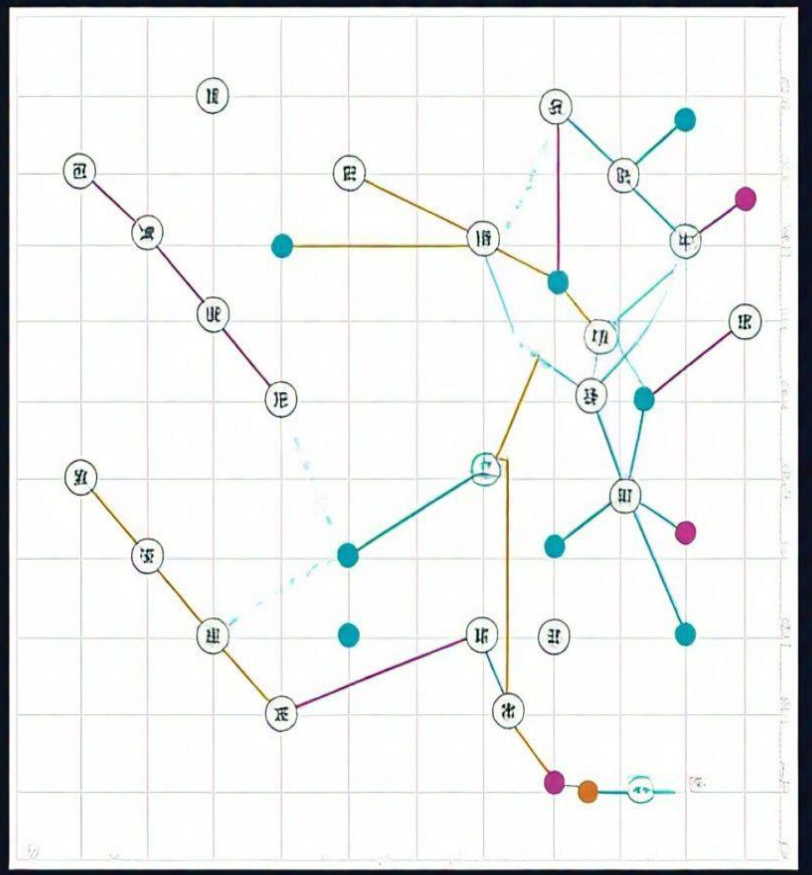
DISCRETE STRUCTURES

PLANAR GRAPHS

Discrete Structures



PLANAR GRAPHS

- A graph is called planar if it can be drawn in the plane without any edge crossed (crossing means the intersection of lines). Such a drawing is called a plane drawing of the graph

PROPERTIES OF PLANAR GRAPHS:

Euler's Formula: For any connected planar graph with V vertices, E edges, and F faces (including the infinite outer face), the relationship is:

$$V - E + F = 2$$

This formula holds for all connected planar graphs.

Edge Bound: For a planar graph:

If the graph is simple (no loops or multiple edges), $E \leq 3V - 6$.

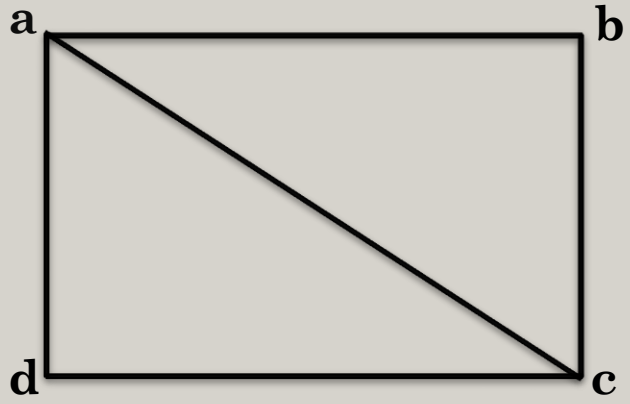
If the graph is bipartite, $E \leq 2V - 4$.

Four Color Theorem: Every planar graph can be colored with at most four colors such that no two adjacent vertices share the same color.

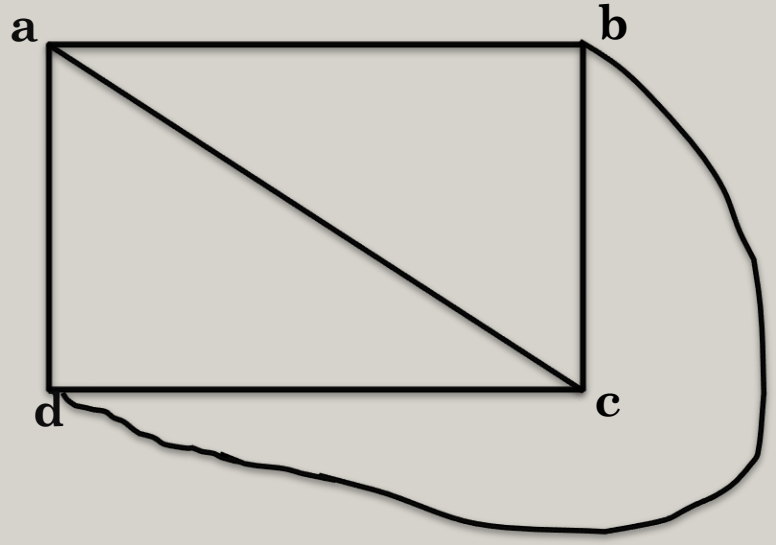
Applications of Planar Graphs:

1. **Network Design**:
    1. Planar graphs model road systems, power grids, and communication networks where crossings are undesirable.
2. **Geographical Mapping**:
    1. Used in creating maps where regions are adjacent and coloring is required (Four Color Theorem).
3. **Computer Graphics**:
    1. Planar graphs are used in mesh generation for 3D modeling.

Examples of Planar Graphs:



This graph is a planar graph because none of its edge crossed each other.
Also V – E + F = 2.



The above graph is also planar graph.


ANY
QUESTIONS


THANK
YOU
FOR
YOUR
ATTENTION