

Bangladesh University of Business & Technology



Presentation On **Graph Coloring**

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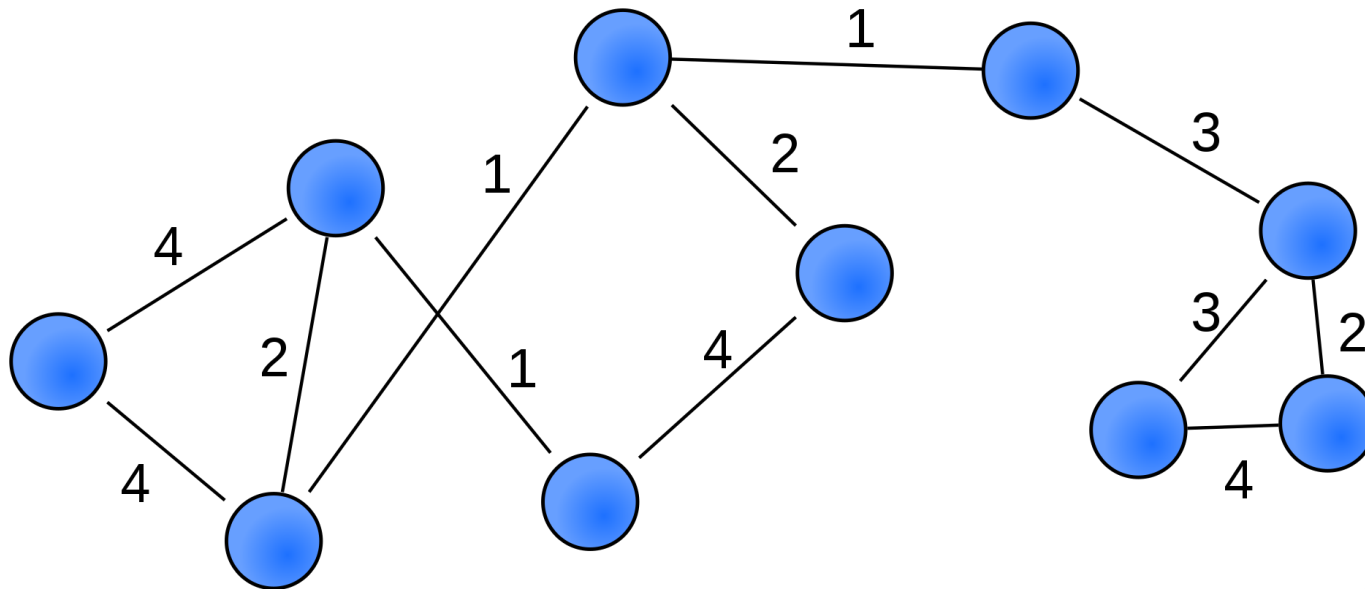
Objective

- ▶ Graph coloring is an important concept in graph theory, which is the study of graphs, their properties, and their applications.
- ▶ Graph coloring is often used as a tool for optimization problems, such as scheduling and resource allocation.
- ▶ Graph coloring is an important concept in computer science, as it is used in various algorithms and data structures.
- ▶ Graph coloring is a topic of interest in mathematics which has led to significant research in the field of mathematics.

Perquisite Knowledge!!!

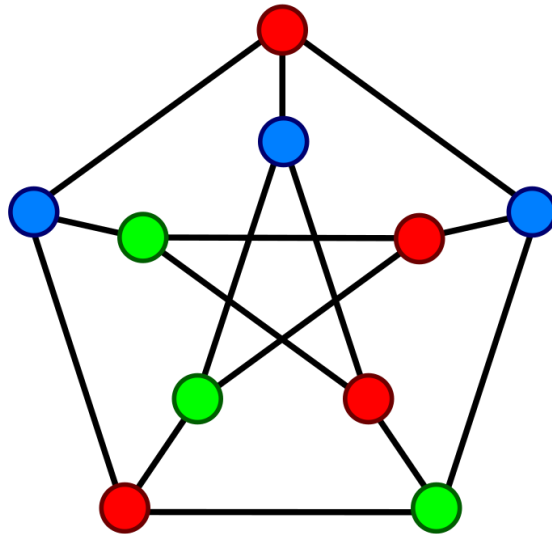
► What is a Graph?

In discrete mathematics, a graph is a collection of vertices and edges, where the edges connect pairs of vertices which can be used to model relationships between objects or entities.



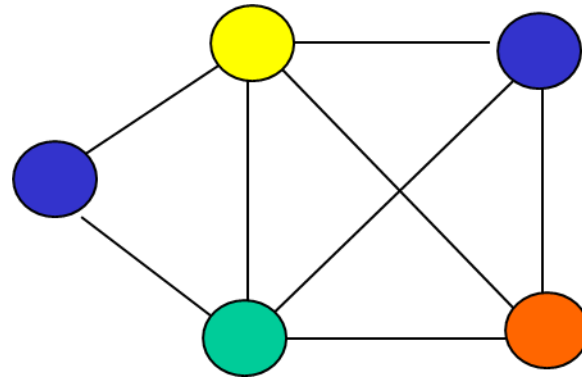
What is Graph Coloring?

In a simple sentence, it is a way of coloring the vertices of a graph such that no two adjacent vertices are of the same color.



Chromatic Number

- ▶ it is the smallest number of colors needed to color each vertex of the graph so that no two adjacent vertices have the same color.

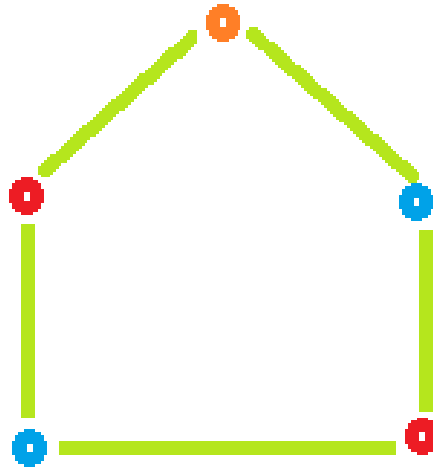
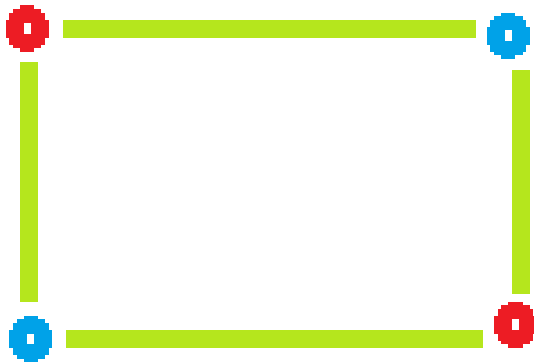


In the example above, the chromatic number is 4.

Chromatic Number of Some Common Types of Graph

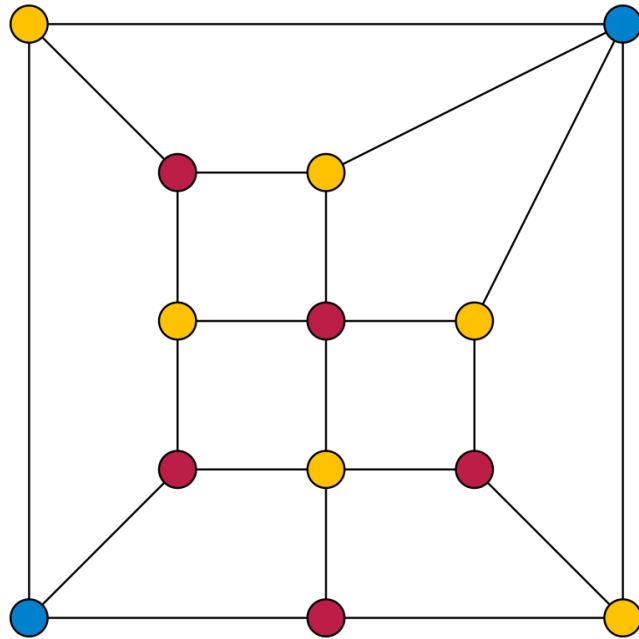
Chromatic Number of Cycle Graph

- ▶ If the Number of Vertices in the Cycle Graph is even, then its Chromatic Number is 2
- ▶ If the Number of Vertices in the Cycle Graph is odd, then its Chromatic Number is 3



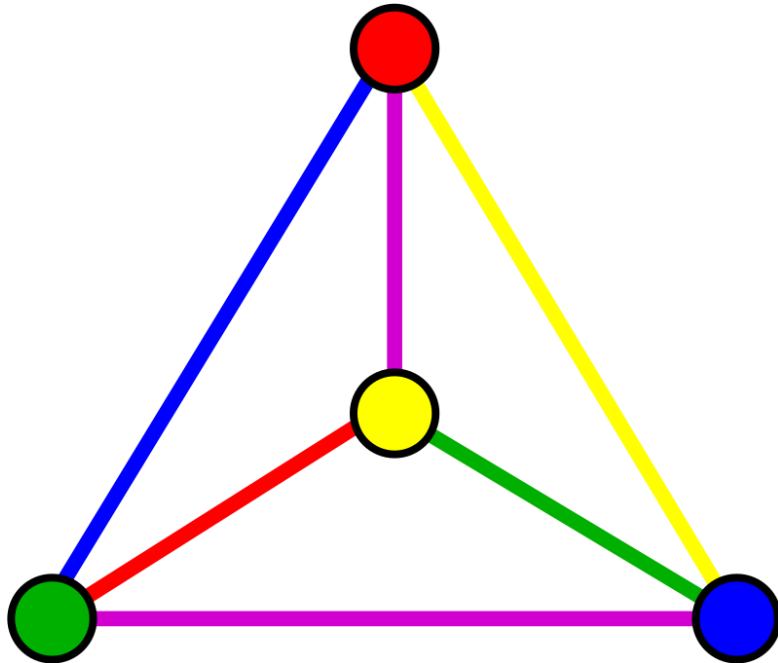
Chromatic Number of Planer Graph

- The Chromatic Number of any Planer Graph is less than or Equal to 4. (All the Cycle graphs are also Planer Graph)



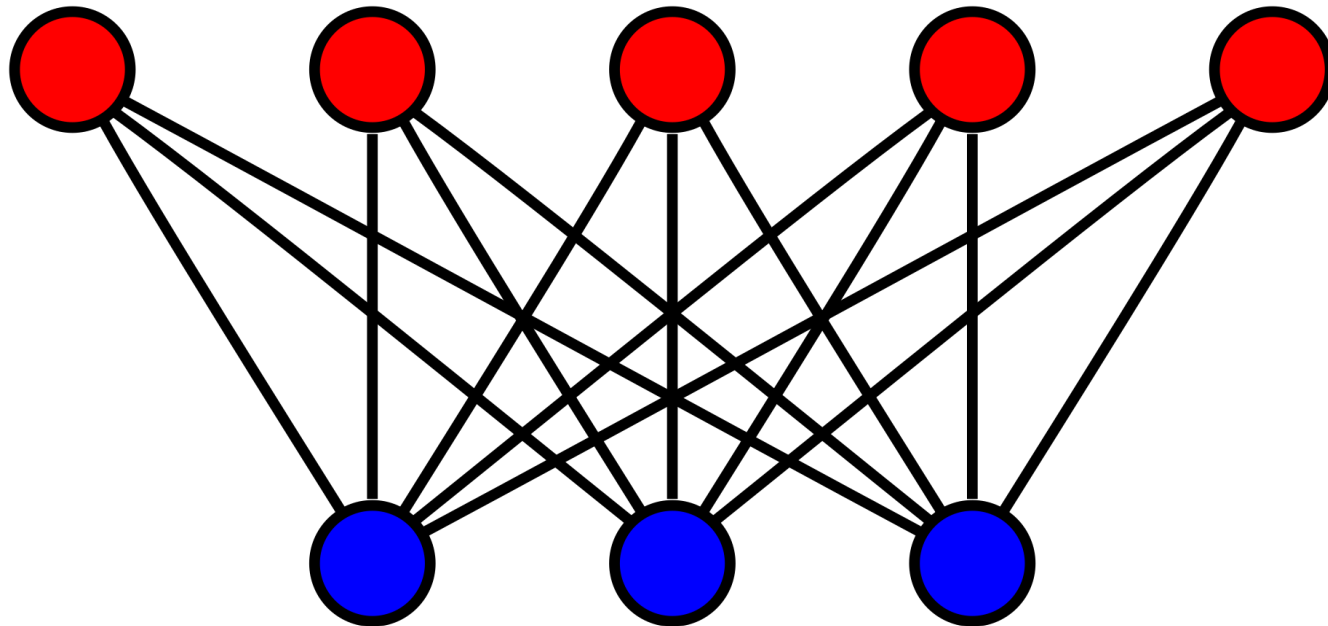
Chromatic Number of Complete Graph

- The Chromatic Number of any Complete Graph is the number of vertices in that complete graph.



Chromatic Number of Bipartite Graph

- The Chromatic Number of any Bipartite Graph is 2.



But what are the techniques
of Graph Coloring?

The Basic Steps for Graph Coloring

- ▶ Order the vertices
- ▶ Assign the first color
- ▶ Assign colors to the remaining vertices
- ▶ Repeat step 3 for all remaining vertices
- ▶ Determine the chromatic number

The Others Different Technique and Algorithm for Graph Coloring

- ▶ Greedy Algorithm
- ▶ Back-Tracking
- ▶ Branch and Bound
- ▶ Integer Programming
- ▶ Welsh-Powell Algorithm
- ▶ Tabu Search
- ▶ Genetic Algorithm

The background of the slide features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the right side and bottom, creating a modern, layered effect. The main text is centered on a white background.

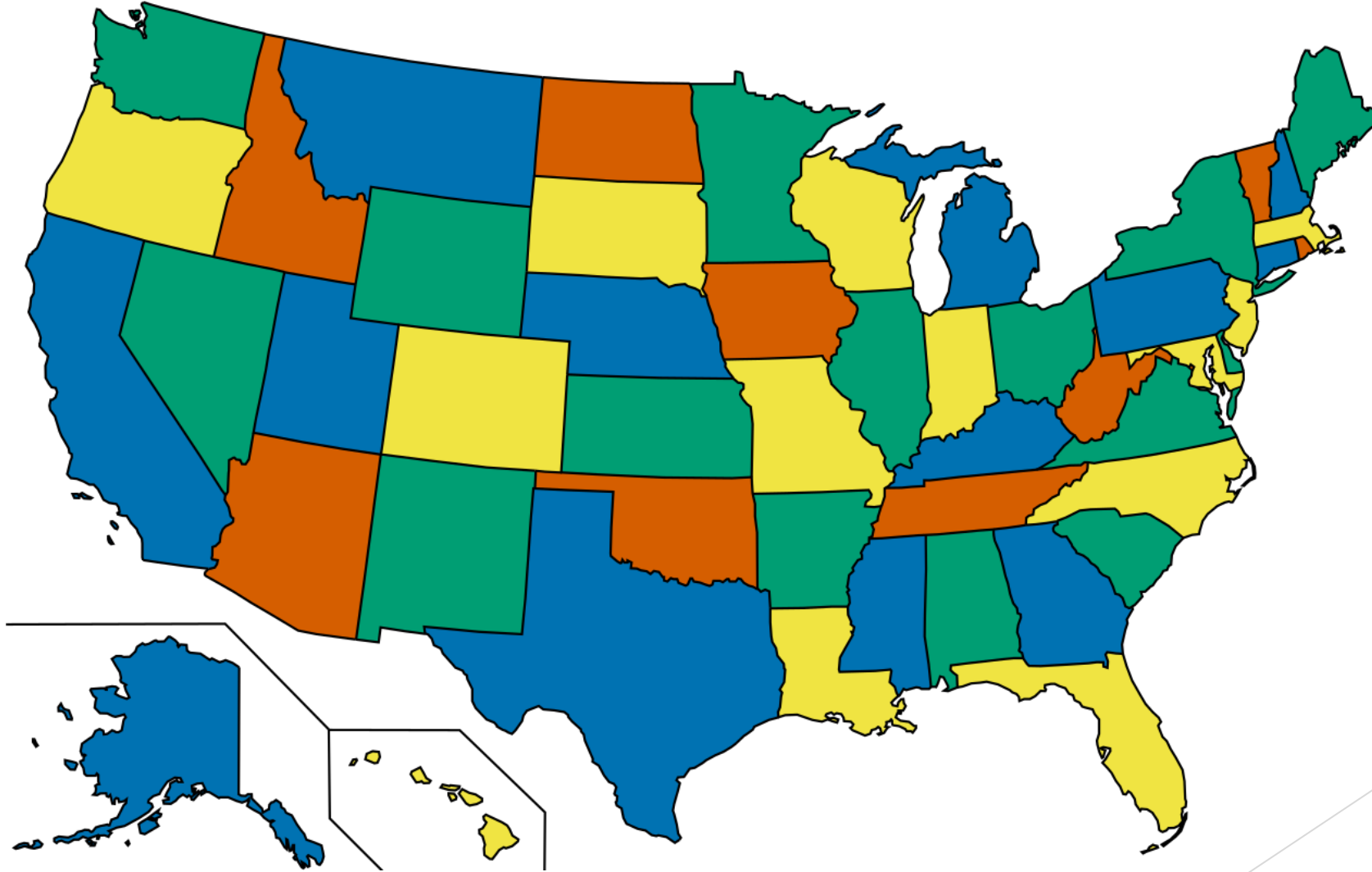
What is the Four Color Theorem?

The Four Color theorem

The Four Color Theorem also known as The Four Color Map Theorem states that no more than four colors are required to color the regions of any map so that no two adjacent regions have the same color.

The four-color theorem was proved in 1976 by Kenneth Appel and Wolfgang Haken after many false proofs.

Example of Four Color Theorem



Applications of Graph Coloring

- ▶ Map Coloring
- ▶ Register Allocation
- ▶ Frequency Assignment
- ▶ Scheduling
- ▶ Timetabling
- ▶ Sudoku
- ▶ Traffic Light Scheduling
- ▶ Resource Allocation

That's all from us!
Thank everyone for the
Patience