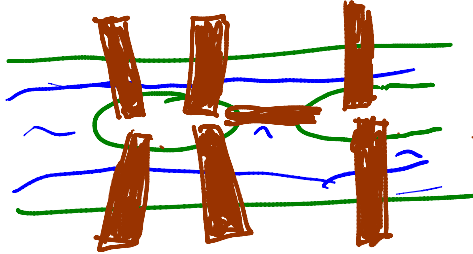


15.1 – Graphs, Paths, and Circuits

In the 18th century the townspeople of the Prussian Town of Königsberg wanted to see if they could find a path through town that would cross each of their bridges in town exactly once. A Swiss mathematician named Leonhard Euler published a paper about the problem. He replaced each piece of land with a point and the bridges with a curve.



There are many situations where the study of graphs can be used in the Real World.

- Transportation like Airlines, Bus, or Train routes between cities.
- Delivery service like US Postal Service or UPS.
- Telecommunication or computer networks.
- Community planning snow removal or street cleaning.

Graph is a diagram that consists of a finite set of points called **vertices** that are connected by lines or curves called **edges**. (Single point is **vertex**)

Loop is an edge that starts and ends at the same vertex.

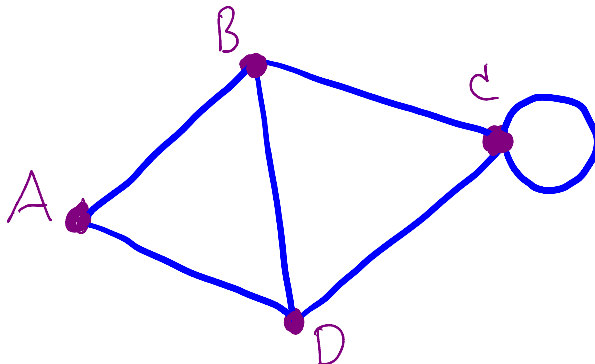
Adjacent Vertices are connected by at least one edge.

Graph Theory is the study of graphs and their applications.

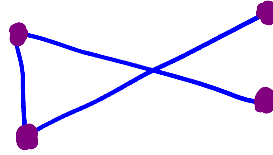
The **Degree of a Vertex** is the number of edges at a vertex.

Odd Vertex – vertex with an odd number of edges attached to it.

Even Vertex – vertex with an even number of edges attached to it.



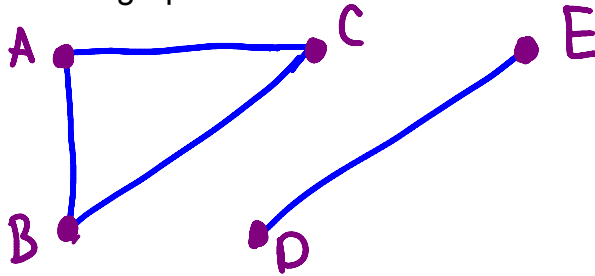
Vertices will always have dots.



Path is a route along edges that start at a vertex and end at a vertex.

Circuit is a path that begins and ends at the same vertex.

A graph is **connected** if for any two vertices there at least one path connecting them. Otherwise graph is **disconnected**.



Bridge is an edge that if removed will result in a disconnected graph.