# Graph Theory Fundamentals

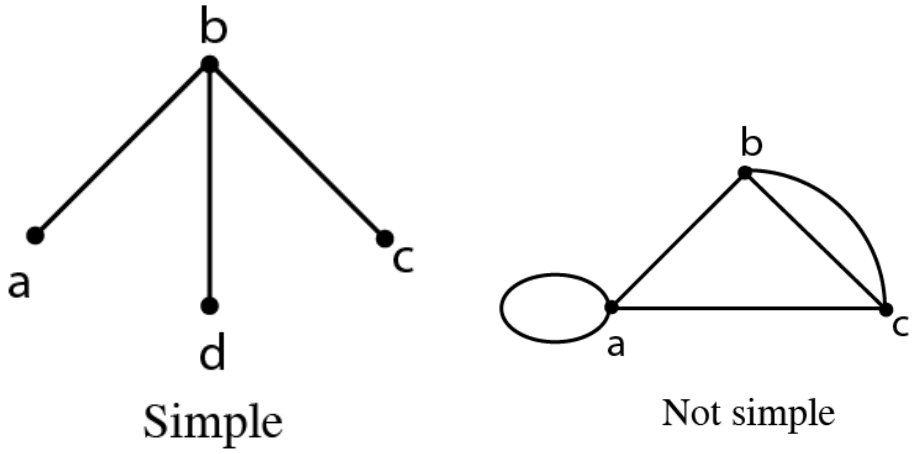
## Graph

Notation: G = (V, E)

Where G is the graph, V represents the set of vertices and E represents the set of edges.

## Simple Graph

A simple graph has no loops or multiple edges.




## Neighborhood

A set of all vertices adjacent to a vertex.

Using the simple graph above:

N(b) = {a, d, c}

N(a) = {b}

## Degree

Cardinality (count) of a neighborhood.

Using the simple graph shown earlier:

deg(b) = |N(b)| = 3

deg(a) = 1

## Handshaking Theorem

The sum of the degrees of a graph is equal to twice the the number of edges.

Using the simple graph shown earlier:

$$2|E| = \sum_{v \in V} deg(v)$$

$$2 \times 3 = deg(a) + deg(b) + deg(c) + deg(d)$$

$$2 \times 3 = 1 + 3 + 1 + 1$$

### Complete Graph

Contains exactly one edge between every pair of different vertices.

Notation: $K_n$ where n is the number of vertices.