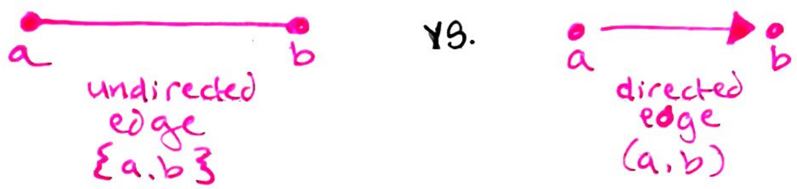
Introduction to Graphs

an undirected graph consists of a set of vertices, V, and a set of edges, E where each edge is an unordered pair of vertices

- useful for modelling symmetric relationships

ex: edges ab = ba

edge notation: $\{a,b\}$ (as opposed to (a,b) in a digraph)



parallel edges are multiple edges between the same pair of vertices

a self-loop is an edge between a vertex and itself

a simple graph has no parallel edges and no self-loops

adjacent vertices are vertices that share an edge

an endpoint vertex of an edge is a vertex connected to the edge

an incident edge to a vertex is a edge connected to that vertex

a vertex **v** is a neighbor to vertex **u** if an edge connects them

the degree of a vertex is the number of neighbors the vertex has

the total degree of a graph is the sum of the degrees of all vertices

in a regular graph, all vertices have the same degree

in a d-regular graph, all vertices have degree of d

a subgraph H of graph G uses edges that are a subset of G's edges and vertices that are a subset of G's vertices

* note: G is always a subgraph of G

Theorem: Number of edges and total degree

Let $G=(V,E)$ be an undirected graph. Total degree $= 2\cdot$(# of edges)

i.e. $\sum_{v\in V} \deg(v) = 2\cdot|E|$