① Graph: is a set of Vertices and a set of Edges.
As a graph algorithm, it is designed to work with data kept in a graph structure

Vertice: One of the points on which the graph is defined and which may be connected by graph edges. It is also a node of a graph

Edge: An unordered pair of nodes that specify a line joining these two nodes are said to form an edge.

Undirected Graph: Can be viewed as a directed graph where both (u, v) and (v, u) exist for all Vertices u and v.

Directed Graph: Edge (u, v) goes from vertex u to vertex v, usually denoted as $u \Rightarrow v$

Path: is a sequence of Vertices.

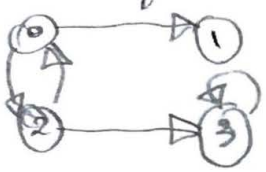
e.g. - $u_1, u_2, u_3, \ldots, u_n$ such that $(u_i, u_{i+1}) \in E$ for $1 \leq i < n$

- A path can go from a vertex to itself.
- A path can be from (u, u), which is a self-loop.

A graph is a structure amounting to a set of objects in which some pairs of the objects are related

Loop : A loop is an edge with both ends as the same vertex.

Cycle : are closed walks which do not repeat edges or vertices except for the starting and ending vertex.

ex: 

cycle: 2, 0, 1, 2

Acyclic : is a graph having no graph cycles. They are bipartite.

Connected : an undirected graph is connected if there is a path from every vertex to every other vertex.

Sparse : most graphs are sparse. A graph in which the number of edges is much less than the possible number of edges.

Weight : associates weights with either the edges or the vertices.

(2) When we can answer fast to questions regarding if a specific edge between two vertices belongs to the graph as an O(1) lookup often, and we can also have a quick insertions and deletions of edges.

Generally, adjacency list is the best because we are using vertices and edges which are linked lis.

(3) - Computer Networks
- Pathing and maps
- Molecules.

(4) Directed graph. It is, also a cyclic graph because cycle is created in the graph. Connected graph because every vertex in graph is connected.

(5) Loop is $V_1 - V_4 - V_3 - V_1$

(6) Vertices: 7 $(V_1, V_2, V_3, V_4, V_5, V_6, V_7)$
Edges: 17

(7) a) NO
b) Yes
c) NO

(8) Directed, acyclick connected graph

(9) - Depth first utilizes the stack and where as breadth first search utilizes the queue.
- BFS is slower than DFS
- BFS requires more memory, Compare to DFS
- BFS Good for finding shortest.

(10) A→B→D→F→E→C is the shortest route (12)

Distance	Priority Queue
0	A
5	A B
7	A B D
10	A B D F
11	A B D F E
12	A B D F E C

(11) Largest degree: MAD 2104 = 8
highest indegree: CDA 4101 = 3
highest outdegree: MAD 2104 = 6

sort output: MAC 3311, COP 3210, MAD 2104, COP 3400, COP 3337, CAP 3750, MAD 3512, MAD 3305, CDA 4101, COP 4555, COP 3530, COP 4540, CIS 4610, COP 5621, CDA 4400, COP 4610, COP 4225.