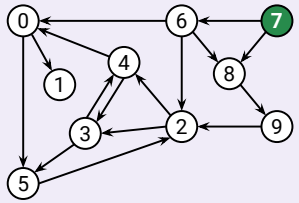
Q Shortest Paths in a Directed Graph

Run BFS from 7 and give the values of the resulting edgeTo map.

- edgeTo[0] =
- edgeTo[1] =
- edgeTo[2] =
- edgeTo[3] =
- edgeTo[4] =
- edgeTo[5] =
- edgeTo[6] =
- edgeTo[7] =
- edgeTo[8] =
- edgeTo[9] =



Q1: Run BFS from 7 and give the values of the resulting edgeTo map.

edgeTo[0] =

edgeTo[1] =

edgeTo[2] =

edgeTo[3] =

edgeTo[4] =

edgeTo[5] =

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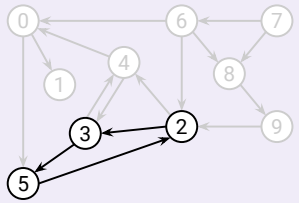
edgeTo[7] =

edgeTo[8] =

edgeTo[9] =

Q Shortest Directed Cycle

Given a digraph, design an algorithm to find a directed cycle with the minimum number of edges (or report that the graph is acyclic) in O(EV) time.



?: What is the runtime for graph traversal given an adjacency list representation?

?: How many graph traversals can be completed in O(EV) time?

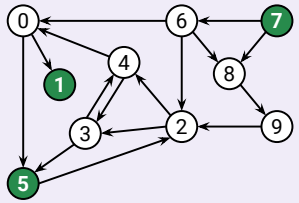
Q1: Given a digraph, design an algorithm to find a directed cycle with the minimum number of edges (or report that the graph is acyclic) in O(EV) time.

Q Multiple-Source Shortest Paths

Given a digraph and a **set** of source vertices, find shortest path from **any** vertex in the set to every other vertex.

S = {1, 5, 7}.

- Shortest path to 0 is 7-6-0.
- Shortest path to 2 is 5-2.
- Shortest path to 4 is 5-2-4.



?: Give a runtime bound for this problem.

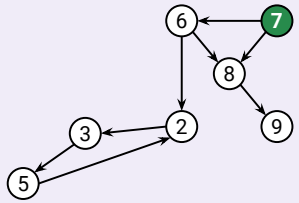
Q1: Given a digraph and a set of source vertices, find shortest path from any vertex in the set to every other vertex.

Q Even-Length Paths

Given a digraph G and a source vertex s, design a linear-time algorithm to determine all vertices that are reachable from s via a path with an even number of edges. This path may contain a cycle.

Suppose the source vertex is 7.

- Path to 2 is 7-6-2.
- Path to 3 is 7-6-2-3-5-2-3.
- Path to 5 is 7-6-2-3-5.



?: Give a runtime bound for this problem.

?: Consider modifying a graph traversal algorithm.

?: Consider introducing additional edges or vertices.

Q1: Given a digraph G and a source vertex s, design a linear-time algorithm to determine all vertices that are reachable from s via a path with an even number of edges. This path may contain a cycle.