1 Distance

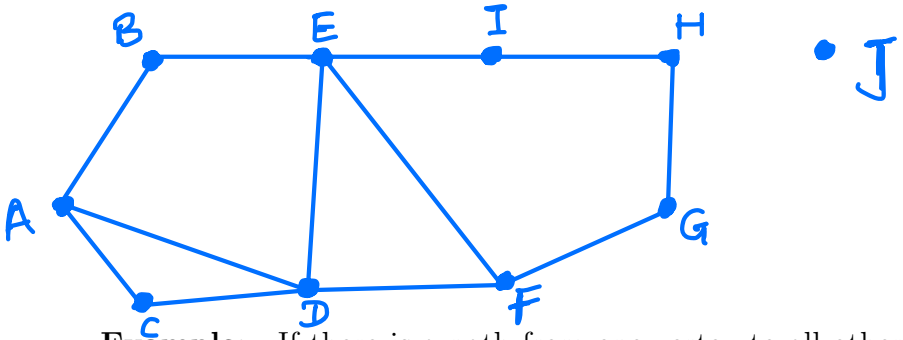
How should we define distance in a graph?

Definition:

The smallest possible number of edges in a path between two vertices S and T is the distance between vertices S and T.

How can we find the shortest path between vertices?

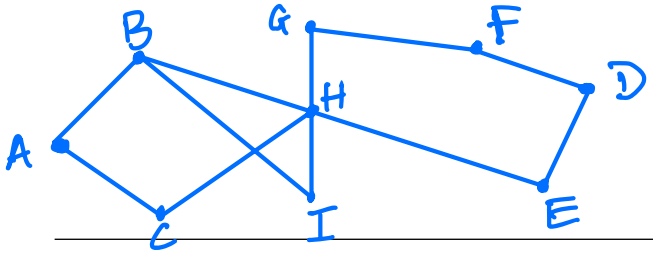
Example: Using the graph below, find the distance from A to G. What is a shortest path from A to G? Is the graph connected? Why or why not?



Example: If there is a path from one vertex to all others in the graph, is that sufficient to say the graph is connected? Why or why not?

Example: Must the shortest path between two vertices in a graph be unique? Why or why not?

Example: Using the graph below, find the distance from B to D. What is a shortest path from B to D? Is the graph connected? Why or why not?

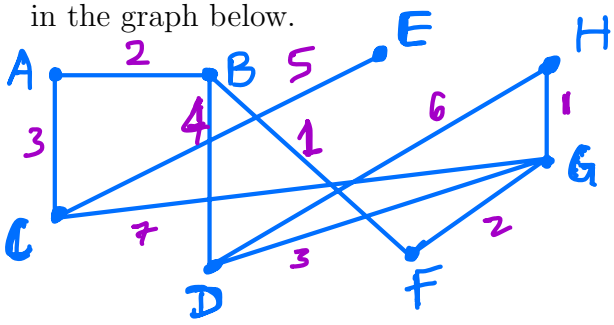


2 Weighted Graphs

Definitions:

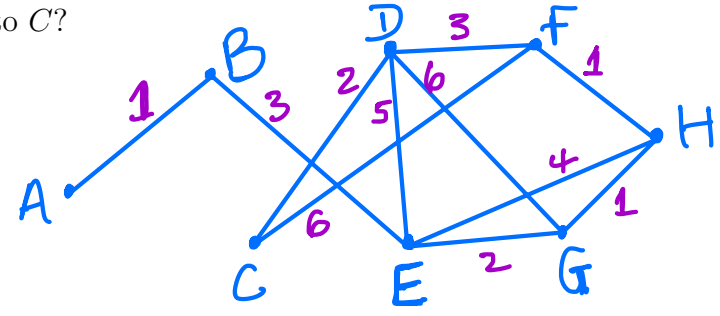
A weighted graph is a graph in which a number called the weight is assigned to each edge. The weight of a path is the sum of the weights of the edges in the path. A path of smallest weight is called a shortest path between those two vertices and the weight of that path is called the distance between them.

Example: Determine the weight of the path A, B, D, G and the weight of the path C, G, F, B, D, H in the graph below.



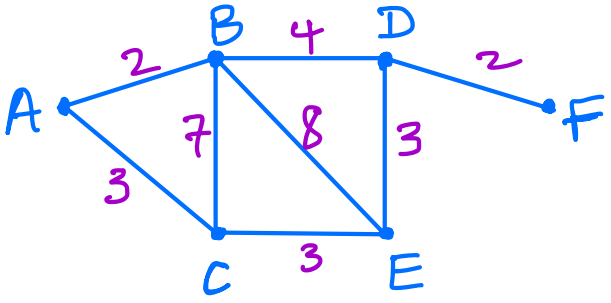
How can we find the shortest path between two vertices, when the weights are important?

Example: What is the distance from B to every other vertex? What is the shortest path from B to C?

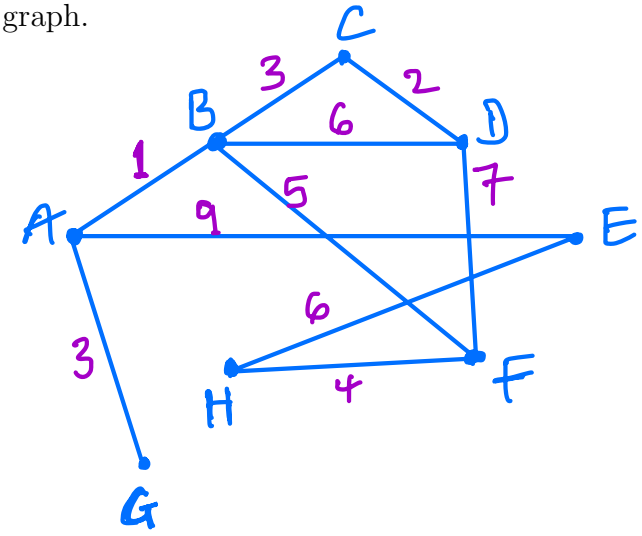


Rachel Rupnow. Compiled: October 20, 2022

Example: What is the distance from B to every other vertex? What is the shortest path from B to C?



Example: Find a shortest path from A to G that goes through the vertex C in the weighted graph.



Example: Find a shortest path from A to G that goes through the vertex C in the weighted graph.