Quiz, 5 questions



# Congratulations! You passed!

Next Item



1/1 point 1. Consider a directed graph with distinct and nonnegative edge lengths and a source vertex s. Fix a destination vertex t, and assume that the graph contains at least one s-t path. Which of the following statements are true? [Check all that apply.]

The shortest  $s ext{-}t$  path must exclude the maximum-length edge of G.

#### Un-selected is correct

The shortest  $s ext{-}t$  path must include the minimum-length edge of G.

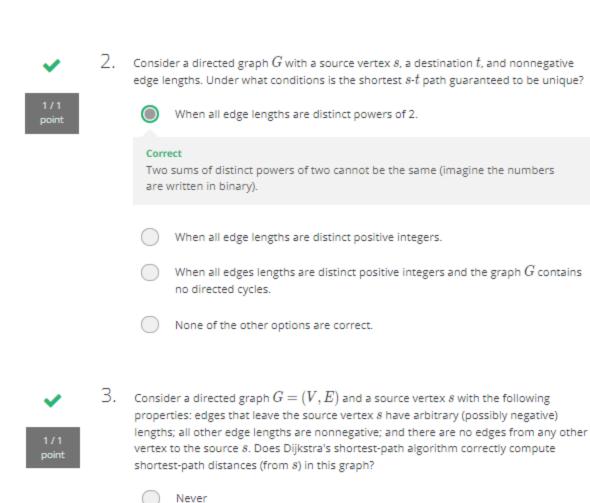
#### Un-selected is correct

There is a shortest  $s ext{-}t$  path with no repeated vertices (i.e., a "simple" or "loopless" such path).

# Correct

The shortest (i.e., minimum-length)  $s ext{-}t$  path might have as many as n-1 edges, where n is the number of vertices.

# Correct



Maybe, maybe not (depends on the graph)

One approach is to see that the proof of correctness from the videos still works. A slicker solution is to notice that adding a positive constant M to all edges incident to s increases the length of every s-v path by exactly M, and thus preserves the

Only if we add the assumption that G contains no directed cycles with negative

Always

shortest path.

total weight.

Correct



1/1 point 4. Consider a directed graph G and a source vertex s. Suppose G has some negative edge lengths but no negative cycles, meaning G does not have a directed cycle in which the sum of the edge lengths is negative. Suppose you run Dijkstra's algorithm on G (with source s). Which of the following statements are true? [Check all that apply.]

It's impossible to run Dijkstra's algorithm on a graph with negative edge lengths.

#### Un-selected is correct



Dijkstra's algorithm always terminates, but in some cases the paths it computes will not be the shortest paths from  $\it 8$  to all other vertices.

#### Correct

Nonnegativity of the edge lengths was used in the correctness proof for Dijkstra's algorithm; with negative edge lengths, the algorithm is no longer correct in general.



Dijkstra's algorithm always terminates, and in some cases the paths it computes will be the correct shortest paths from  $\it 8$  to all other vertices.

### Correct

See Question 3.



Dijkstra's algorithm might loop forever.

## Un-selected is correct

Consider a directed graph G and a source vertex s. Suppose G contains a negative cycle 0.50 / 1 (a directed cycle in which the sum of the edge lengths is negative) and also a path from  $\it 8$ to this cycle. Suppose you run Dijkstra's algorithm on G (with source s). Which of the following statements are true? [Check all that apply.] Dijkstra's algorithm always terminates, and in some cases the paths it computes will be the correct shortest paths from 8 to all other vertices. Un-selected is correct It's impossible to run Dijkstra's algorithm on a graph with a negative cycle. Un-selected is correct Dijkstra's algorithm might loop forever. This should not be selected The algorithm always halts after n-1 iterations, where n is the number of vertices. Dijkstra's algorithm always terminates, but in some cases the paths it computes will not be the shortest paths from 8 to all other vertices.

This should be selected