Quiz 11

What is used?

Queue features
(FIFO queue)

1) Let $Q = [2, 4, 3, 8, 9]$ be a queue. Consider the following operations:

1. fügehinzu/enqueue(6) → 2 4 3 8 9 6
2. entferne/dequeue → 4 3 8 9 6
3. entferne/dequeue → 3 8 9 6
4. fügehinzu/enqueue(7) → 3 8 9 6 7

Which of the following queues correctly represents Q after executing the operations above in order?
(The fügehinzu/enqueue *operation adds an element to the* ***right*** *of the queue)*

Select one:

a. $Q = [3, 8, 9, 6, 7]$
b. $Q = [2, 4, 3, 8, 7]$
c. $Q = [2, 4, 3, 8, 9]$

2) Consider the standard implementation of breadth-first search (BFS) using a queue Q which you have seen in the lecture. Suppose that we run this algorithm on a (unweighted), directed graph $G = (V, E)$, starting at a vertex $s \in V$.

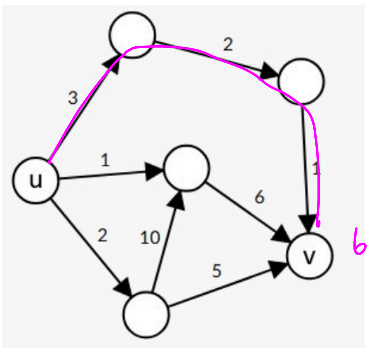
Which of the following statements about Q must be correct directly after a vertex $v \in V$ has been dequeued?

w in Q could be on same level:
dist(w) = dist(v)
could be in next level:
dist(w) = dist(v) + 1

Select one:

?a. $\text{dist}(s, v) < \text{dist}(s, w)$ for all w in Q.
~~b.~~ $\text{dist}(s, v) > \text{dist}(s, w)$ for all w in Q.
?c. $\text{dist}(s, v) = \text{dist}(s, w)$ for all w in Q.
d. None of the above

3)



6

What is the length of a shortest path between vertices u and v in the weighted, directed graph above?

Answer: 6

4) Let $G = (V, E)$ be a weighted, directed graph with positive weights $c : E \to \mathbb{R}_{>0}$.
Recall that $d(v, w)$ denotes the length of a shortest path from v to w in G.

Let $v \neq w$ be two vertices in G with $d(v, w) < \infty$. Which of the following formulas are correct?

Details will be updated next week

Select one:

a. $d(v, w) = \min_{(u,w) \in E} \{d(v, u) + c(u, w)\}$
b. $d(v, w) = \min_{u \in V} \{d(v, u) + d(u, w)\}$
c. Both (a) and (b) are correct.
d. Both (a) and (b) are not correct.

5) Let $G = (V, E)$ be a weighted, directed graph with positive weights $c : E \to \mathbb{R}_{>0}$.
Recall that $d(v, w)$ denotes the length of a shortest path from v to w in G.

Let $s \in V$. In the lecture you have seen the following recursive formula:

$$d(s, v) = \begin{cases} 0 & \text{if } v = s, \\ \infty & \text{if } v \neq s,\ \deg_{\text{in}}(v) = 0, \\ \min_{(u,v) \in E} d(s, u) + c(u, v) & \text{otherwise.} \end{cases}$$

In which order should the vertices of G be processed for this recursive formula to correctly compute $d(s, v)$ for all $v \in V$?

Select one:

a. In a topological order (assuming it exists).
b. In a reverse topological order (assuming it exists).
c. In ascending order of enter-number of a BFS starting at s.
d. In ascending order of leave-number of a BFS starting at s.