Week 3 Quiz [Fall 2019]

Due Sep 13 at 11:59pm **Points** 20 **Questions** 20 **Time Limit** None

Instructions

Submission Guidelines

This assignment has multiple-choice and numeric response questions. Only one submission is allowed, however as long as the quiz is not submitted, it is automatically saved and can be resumed.

Upon submission, make sure you have a record of the submission (with timestamp) on the assignment/quiz page on Canvas. If we do not have your submission in Canvas, you will **not** receive credit.

It is essential to follow these instructions to provide answers for this assignment. **Students who do not follow these guidelines will lose points.**

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	29 minutes	18 out of 20

Score for this quiz: **18** out of 20
Submitted Sep 13 at 9:33pm
This attempt took 29 minutes.

Question 1 — 1 / 1 pts

In class we've talked about networks, which are made up of nodes* and edges**. Consider any arbitrary network. Given a *single* edge, what is the maximum number of nodes that edge can connect?

*Nodes are also equivalently called vertices or vertexes. These are synonyms - there is no conceptual difference between the terms.

**Similarly, edges are also equivalently called links.

Correct!

- (•) 2

Yes! We're talking about a single edge, and any given edge can only have two end points.

- 1
- 4
- No theoretical limit, but real-world considerations may factor in.

Question 2

1 / 1 pts

Again consider an arbitrary network. Given an *single* node, what is the maximum number of edges which can connect to that node?

Correct!

- No theoretical limit, but real-world considerations may factor in.

Correct! Theoretically, any number of edges can connect to a single node.

- 2
- 4
- 1

Question 3

1 / 1 pts

Recall that unless otherwise specified, the length of a path is the number of edges contained therein. Given two nodes in an arbitrary undirected, connected graph, there must exist some shortest path between them.

True or false: there may exist multiple such shortest paths.

False

Correct!

True

Question 4

1 / 1 pts

Mapping software like Google Maps work by finding "optimal" paths through a network formed by roads. In such networks, road intersections form the nodes, with edges coming from road segments between intersections.

Consider an undirected, unweighted network created as above from the following map of Manhattan surface roads:

The grid-like structure of this network means that most nodes have the same degree. What is the most common degree for nodes in this network?

2

Correct!

4

6

8

Question 5

1 / 1 pts

Consider again the Manhattan road network from the previous question. Which of the following features, if we wanted to model its effect, would require us to use a **directed** graph?

Sidewalks

Correct!

One-way streets

Traffic volume

Question 6

1 / 1 pts

Consider again the Manhattan road network from a previous question. Which of the following features, if we wanted to model its effect, would require us to use a **weighted** graph?

Sidewalks

One-way streets

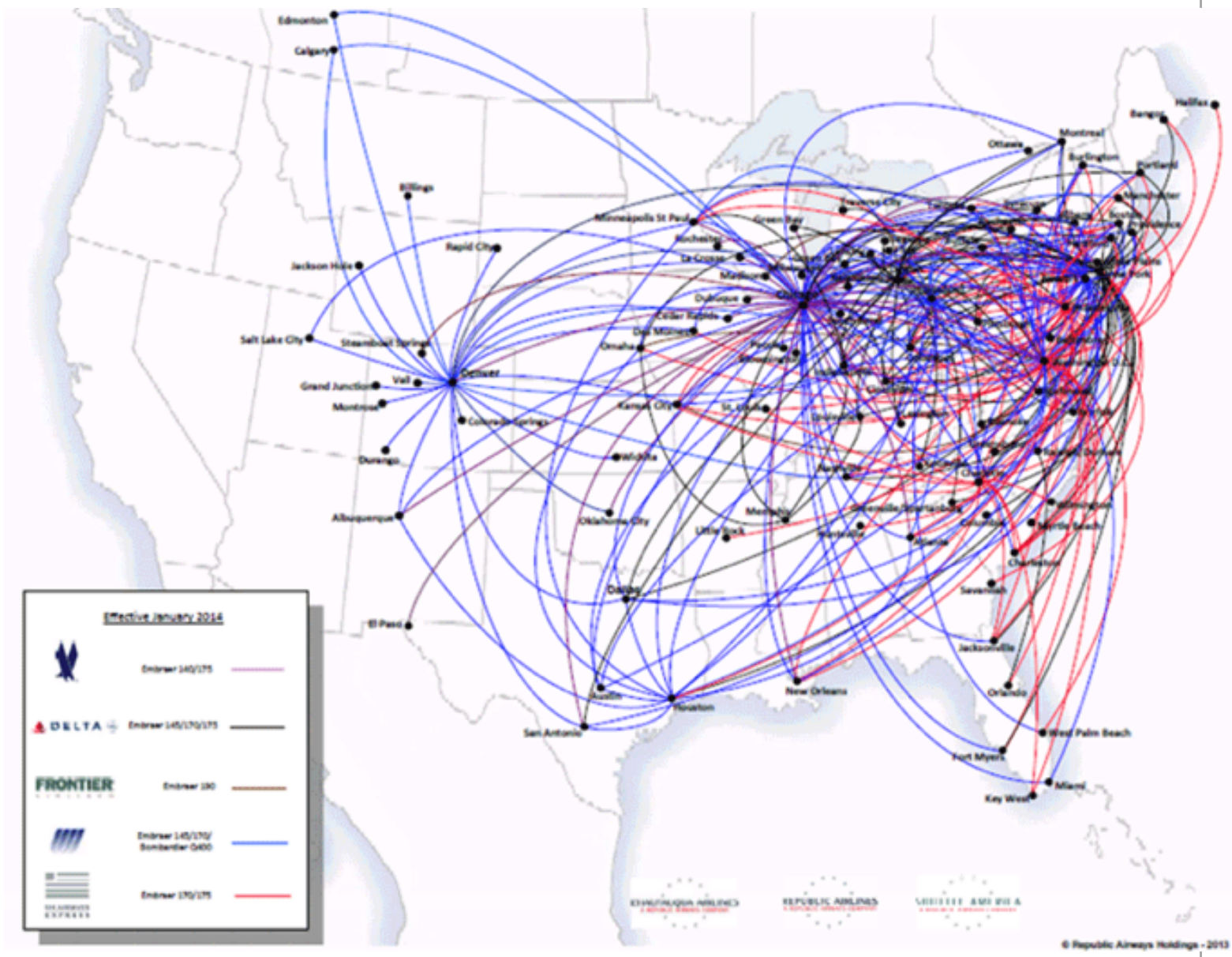
Correct!

- Traffic volume

Question 7

1 / 1 pts

Consider this map from Republic Airways:



What are the **nodes** in this network?

- Airplanes
- People

Correct!

- Cities/Airports
- Available flights between cities/airports

Question 8

1 / 1 pts

Consider the Republic Airways map from the previous question. What are the **edges** in this network?

- Airplanes
- People
- Cities/airports
- Available flights between cities/airports

Correct!

Question 9

0 / 1 pts

Now compare the Republic Airways network with the Manhattan road map from the previous set of questions. The Republic Airways network displays a distinguishing feature that the Manhattan road network **lacks**. What is this key characteristic?

- Hub nodes with many edges

orrect Answer

- Singleton nodes with no edges
- Multiple routes between nodes

ou Answered

- Nodes with more than one connected edge

Question 10

1 / 1 pts

In a social graph from Facebook, which type of edge best represents the "friend" relation?

- Directed
- Correct! Undirected

Question 11

1 / 1 pts

In a social graph from Twitter, which type of edge best represents the "follows" relation?

- Correct! Directed
- Undirected

Question 12

1 / 1 pts

Consider a Twitter *retweet* graph, where users are nodes and we want to show how many times a given user has retweeted another user. What edge type best captures this relation?

- Correct! Directed, weighted
- Undirected, weighted
- Directed, unweighted
- Undirected, unweighted

Question 13

1 / 1 pts

Consider a hashtag cooccurrence graph from Twitter. In this graph, hashtags are the nodes, and edges between hashtags show how often those two hashtags appear in tweets together. What edge type would best capture this relation?

Correct!

- (•) Undirected, weighted
- ( ) Undirected, unweighted
- ( ) Directed, weighted
- ( ) Directed, unweighted

Question 14

1 / 1 pts

Consider a social network with people as nodes and friendship relations as undirected edges. Examining this network, you notice a subgraph of 25 people where every person in the subgraph is friends with every other person in the subgraph. What is such a (sub)graph called?

Note on terminology: A subgraph of a graph is also, itself, a graph.

- ( ) Tree

Correct!

- (•) Clique
- ( ) Disconnected graph
- ( ) None of these

Question 15

1 / 1 pts

How many edges are contained in the subgraph from the previous question?

Correct!

300

orrect Answers

300 (with precision: 3)

Question 16

1 / 1 pts

Consider an undirected, connected graph with N nodes. What is the **maximum** number of edges that graph can have?

Correct!

- (•) N(N-1) / 2
- ( ) 1
- ( ) N - 1
- ( ) N(N-1)
- ( ) N
- ( ) N^2

Question 17

1 / 1 pts

If we do not require that the graph from the previous question be connected, does the upper bound on the number of edges change?

Correct!

- (•) No
- ( ) Yes
- ( )
- ( )

Question 18

0 / 1 pts

Again consider an undirected, connected graph with N nodes. What is the **minimum** number of edges that graph can have?

orrect Answer

- ( ) N - 1
- ( ) 1
- ( ) N

ou Answered

- (•) N(N - 1) / 2
- ( ) N(N - 1)
- ( ) N^2

Question 19

1 / 1 pts

If we do not require the graph from the previous question be connected, does the lower bound on the number of edges change?

Correct!

- (•) Yes

No

Question 20

1 / 1 pts

Recall that in a complete graph (also called a clique), there exists an edge between each pair of nodes. We know a complete graph of N nodes has N (N 1) / 2 edges.

True or False: Any undirected graph of N nodes and N (N 1) / 2 edges must be complete.

Correct!

True

False

Quiz Score: **18** out of 20