

CSC 236 A13: How Graphic!

Enter your name:

Some rules and procedures:

- This assignment is to be done individually, although you may discuss the work with the professors, the TAs, and even your classmates as long as what you submit is your own work. Any copies of your work or allowing anyone else to copy your work is academic dishonesty and will be treated as such.
- Make a copy of this worksheet in your private Google account.
- Replace <username> in the document name with your Berea username.

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What is a Graph Data Structure?

Note that absolutely NO use of AI is permitted in this assignment!

1. Read [Programiz: Graph Data Structure](#) and [W3 Schools: DSA Graphs](#). In the second of these, try the interactive graph and the example to better understand graph terminology. Then explain how a graph differs from a tree? Be sure to explain what makes graphs more flexible, and what constraints do trees have that graphs do not?

2. We recently learned about trees. Are all trees also graphs? Explain. Are all graphs also trees? Explain.

3. You likely know that Instagram is a social networking platform that contains profiles. Instagram tracks relationships between one profile and another as follow or follower or friends. Describe Instagram as a graph data structure. What would be the vertices? What would be the edges? What types of edges are there? What do the “follows” or “follower” or “friends.” each represent in terms of the graph data structure? How does this help Instagram to model social connections? Explain.

4. Read [Programiz: Spanning Tree and Minimum Spanning Tree](#). After reading this, describe a spanning tree in your own words. Is it a graph? Explain. How does it differ from the original graph, what property must it maintain, and why? Explain.

5. Read [W3 Schools: DSA Minimum Spanning Tree](#). Given a weighted graph, describe in your own words what makes one spanning tree a "minimum spanning tree" compared to other spanning trees? Be sure to use the concept of edge weights in your explanation.

6. Describe why a graph would be more appropriate than a tree for modeling a city's road network. What specific property of graphs makes them better suited for this task?

7. Describe the difference between a directed graph and an undirected graph. Give a real-world example of each type of graph that is NOT mentioned in the readings and explain why it is of the type that you indicate.

8. The readings mention several additional real-world applications of graphs. Pick one application that was not explored above, and explain specifically what the vertices represent, what the edges represent, and what kind of problem you might solve with this graph.

9. With the following directed graph.

- a. Create the adjacency matrix for this graph. (Note that on an undirected graph, all edges are considered length of 1.)

		A	B	C	G
	A				
	B				
	C				
	G				

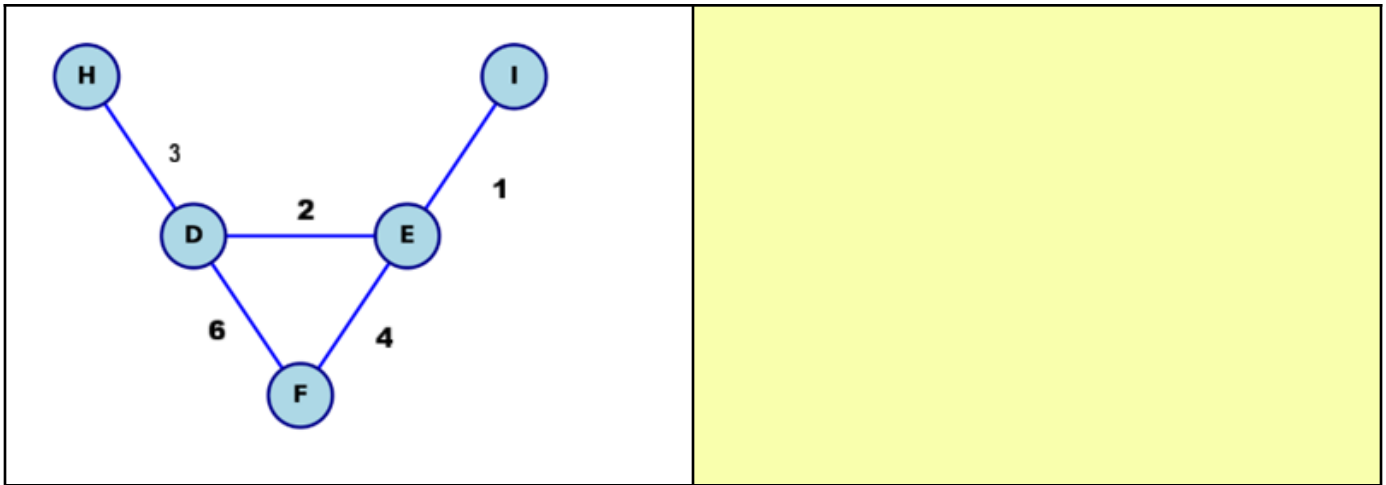
b. Identify the in-degree and out-degree of all nodes in the graph shown above.

Node	In-degree	Out-degree
A		
B		
C		
G		

c. Is the following a spanning tree for the above graph? (Hint: Go look back at the readings for the definition of a spanning tree.) Then explain why or why not.

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10. In the following, the minimum spanning tree can be created by removing one edge. Which edge should be removed? Explain.



11. Describe the graph data structure in your own words as if you were a TA explaining the data structure to a student who is taking CSC 226.

12. Reflect on how well this assignment helped you to understand the readings on graphs. Do you have any suggestions for improvement?

Integrity statement

Please briefly describe ALL help you received and all help you gave to others in completing this assignment, including any help from AI or other online tools. Also, describe ALL additional external resources that you used. Do not leave this blank. If you used and gave no help, be sure to say so.

To Submit:

- Download this document as a pdf and submit it to Moodle by the due date.