Question 1

1 pts

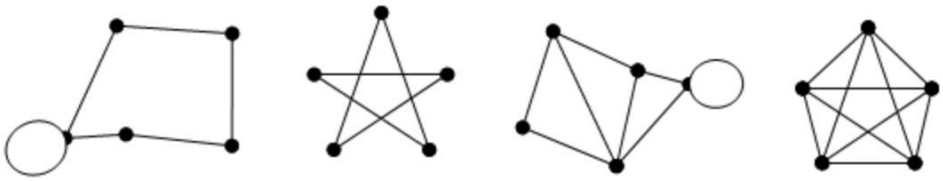
What is an Eulerian graph?

- An Eulerian graph is a *two component graph* in which you can make a walk, in which *all edges* occur exactly once.
- An Eulerian graph is a *complete graph* in which you can walk all edges twice.
- An Eulerian graph is a *connected graph* in which you can make a walk, in which *all vertices* occur exactly once.
- An Eulerian graph is a *complete graph* in which all vertices are connected with each other.
- An Eulerian graph is a *connected graph* in which all edges have a direction towards a vertice.
- **An Eulerian graph is a *connected graph* in which you can make a walk, in which *all edges* occur exactly once.**
- An Eulerian graph is a *two component graph* in which you can make a walk, in which *all vertices* occur exactly once.

Question 2

3 pts

Which of the following graphs contain an Eulerian cycle?



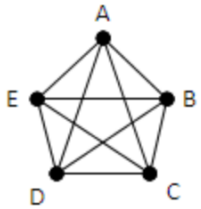
A B C D

- [x] A
- [x] B
- [ ] None of the graphs contain an Euler-Cykel.
- [ ] C
- [x] D

Question 3

2 pts

Find two Hamilton circuits in the graph below.



- [ ] A-B-A-E-D-C-B
- [ ] A-B-C-E
- [ ] A-C-E-B-D
- [ ] A-B-C-E-A
- [x] A-B-C-D-E-A
- [x] A-C-E-B-D-A
- [ ] A-D-B-E-A
- [ ] A-B-C-D-E
- [ ] A-D-B-E

Question 4

1 pts

Suppose that there is a global network of one hundred airports, and that between each pair of airports there is a direct connection. In connection with the cuts the governments of various countries want to eliminate connections as far as possible. It must, however, still be possible to travel from one airport to another one, where appropriate after transfer.

How many connections can you eliminate if you *do not* take into account the maximum number of times to transfer?

- 49
- 99
- 2425
- 50
- 4851
- 2475
- 4850
- 2424
- 100!-99!
- 99!

How many connections can you eliminate if you *do not* take into account the maximum number of times to transfer?

- 49
- **99**
- 2425
- 50
- 4851
- 2475
- 4850
- 2424
- 100!-99!
- 99!

Initially you have 4950 $\left(= \frac{n(n-1)}{2} \right)$ connections. If you connect all airports along a line then you need only 99 connections. So, you can eliminate 4851 connections.

Question 5

1 pts

Suppose that there is a global network of one hundred airports, and that between each pair of airports there is a direct connection. In connection with the cuts the governments of various countries want to eliminate connections as far as possible. It must, however, still be possible to travel from one airport to another one, where appropriate after transfer.

How many connections do you need if you want to transfer *only one time*?

- 100!-99!
- 2424
- 50
- 49
- 99!
- 2475
- 99
- 2425
- 4850
- 4851

Question 6

1 pts

4	13	25	33	38	41	55	71	73	84	86	92	97

In the above sequence we are searching for the number 25 with *binary search* and *linear search*. Which of the following statements is true?

- (●) Linear search in this case is faster than binary search.
- ( ) Binary search in this case is faster than linear search.
- ( ) Linear search and binary search in this case are equally fast.

Question 7

1 pts

4	13	25	33	38	41	55	71	73	84	86	92	97

What is the *minimum* number of comparisons needed to search number 25 in the above sequence for binary search?

- 7
- 11
- 12
- 9
- 6
- 3
- 4
- 5
- 8
- 10

Question 8

2 pts

3	9	6	7	5	4	1	8	2	10

The above sequence is sorted with quicksort. Select **two** of the following stages involved in sorting of the above sequence.

Note: The underlined digit/number is the pivot.

- [ ] 1 - 3 - 7^{i} - 5 - 4 - <u>6</u> - 8^{j} - 2 - 9 - 10
- [ ] 1 - 2 -3 -7^{i} - <u>5</u> - 4^{j} - 6 - 8 - 9 - 10
- [ ] 3^{i} - <u>9</u> - 6^{j}
- [x] 3 - 2 -1 -7^{i} - 5 - <u>4^{j}</u> - 6 - 8 - 9 - 10
- [ ] 1 - 2 -3 -7^{i} - 5 - 4 - <u>6</u> - 8^{j} - 9 - 10
- [x] 3^{i} - <u>2</u> - 1^{j}
- [ ] 3^{i} - 7 - <u>2</u> - 8^{j}

Question 9

4 pts

	A	B	C	D	E	F	G
A	-	8	-	9	-	-	-
B	8	-	5	-	5	7	8
C	-	5	-	6	3	3	-
D	9	-	6	-	10	-	-
E	-	5	3	10	-	6	11
F	-	7	3	-	6	-	4
G	-	8	-	-	11	4	-

Select **four** properties of the graph that is represented by the distance table.

- [ ] A mixed graph.
- [x] A connected graph.
- [ ] A complete graph.
- [ ] A graph with an Euler cykel.
- [x] An undirected graph.
- [ ] A directed graph.
- [x] A weighted graph.
- [ ] A graph with two components.
- [ ] A graph that is not connected.
- [x] A graph with a Hamilton cykel.

Question 10

2 pts

	A	B	C	D	E	F	G
A	-	6	5	7	-	-	-
B	6	-	3	-	3	5	6
C	5	3	-	4	1	-	-
D	7	-	4	-	8	-	-
E	-	3	1	8	-	4	9
F	-	5	-	-	4	-	2
G	-	6	-	-	9	2	-

Determine, using Dijkstra's algorithm, the **two** shortest paths from A to G.

- [ ] A-C-E-B-F-G
- [ ] A-B-C-E-G
- [ ] A-B-E-G
- [ ] A-D-C-E-G
- [ ] A-C-B-G
- [x] A-C-E-F-G
- [ ] A-B-F-G
- [ ] A-C-B-E-F-G
- [ ] A-D-E-G
- [x] A-B-G

Question 11

1 pts

	A	B	C	D	E	F	G
A	-	12	-	14	-	-	-
B	12	-	6	-	-	10	12
C	-	6	-	8	2	-	-
D	14	-	8	-	16	-	-
E	-	-	2	16	-	8	18
F	-	10	-	-	8	-	4
G	-	12	-	-	18	4	-

Determine the weight of the minimum spanning tree for the graph which is represented by the distance table.

- 42
- 52
- 40
- 46
- 50
- 48
- 66
- 64
- 36
- 38

Question 12

1 pts

Two cows stand 100 meters from each other. A fly is sitting on the nose of one of the cows. At a certain moment the cows start walking towards each other at a speed of 4 km per hour. At that same moment, the fly flies at a speed of 50 km per hour. He flies from the nose from one cow to another cow and then back again. He keeps doing this until the cows have reached each other.

What is the total distance in meters that the fly has traveled?

- 62.5
- 50
- 475
- 625
- 100
- 12.5
- 42.5
- 75
- 425
- 125

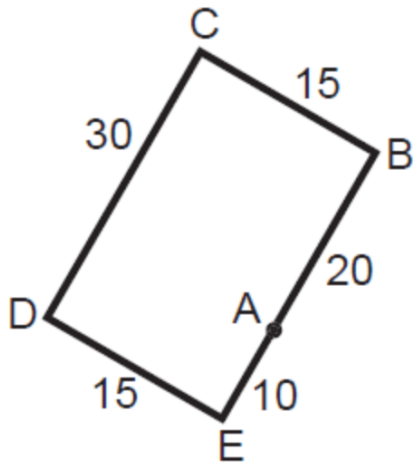
Question 13

1 pts

John lives in Gluckstadt and he gets offered a job in Jackson. Before he accepts the job he wants to know how far it is to drive from Gluckstadt to Jackson. He has the following details of his future employer.

Gluckstadt is located 20 km south-southwest of Nashville. From Nashville to Springfield you have to drive 15 km to the west-northwest direction. Springfield is located 30 km north-northeast of Little Rock. Jackson is located 15 km east-southeast of Little Rock.

To calculate the distance between Gluckstadt and Jackson, he translated the text into a map.



where

A = Gluckstadt
B = Nashville
C = Springfield
D = Little Rock
E = Jackson

Which solution strategy is used by John to calculate the distance between Gluckstadt and Jackson?

where

A = Gluckstadt
B = Nashville
C = Springfield
D = Little Rock
E = Jackson

Which solution strategy is used by John to calculate the distance between Gluckstadt and Jackson?

- ○ Prim's algorithm
- ○ Divide and conquer
- ○ Dijkstra's algorithm
- ○ Use formulas/equations
- ○ Divide the problem into several subproblems or steps
- ○ Explore all possibilities
- ◉ Modeling
- ○ Discover a structure or pattern
- ○ Shortest paths
- ○ Guess and check