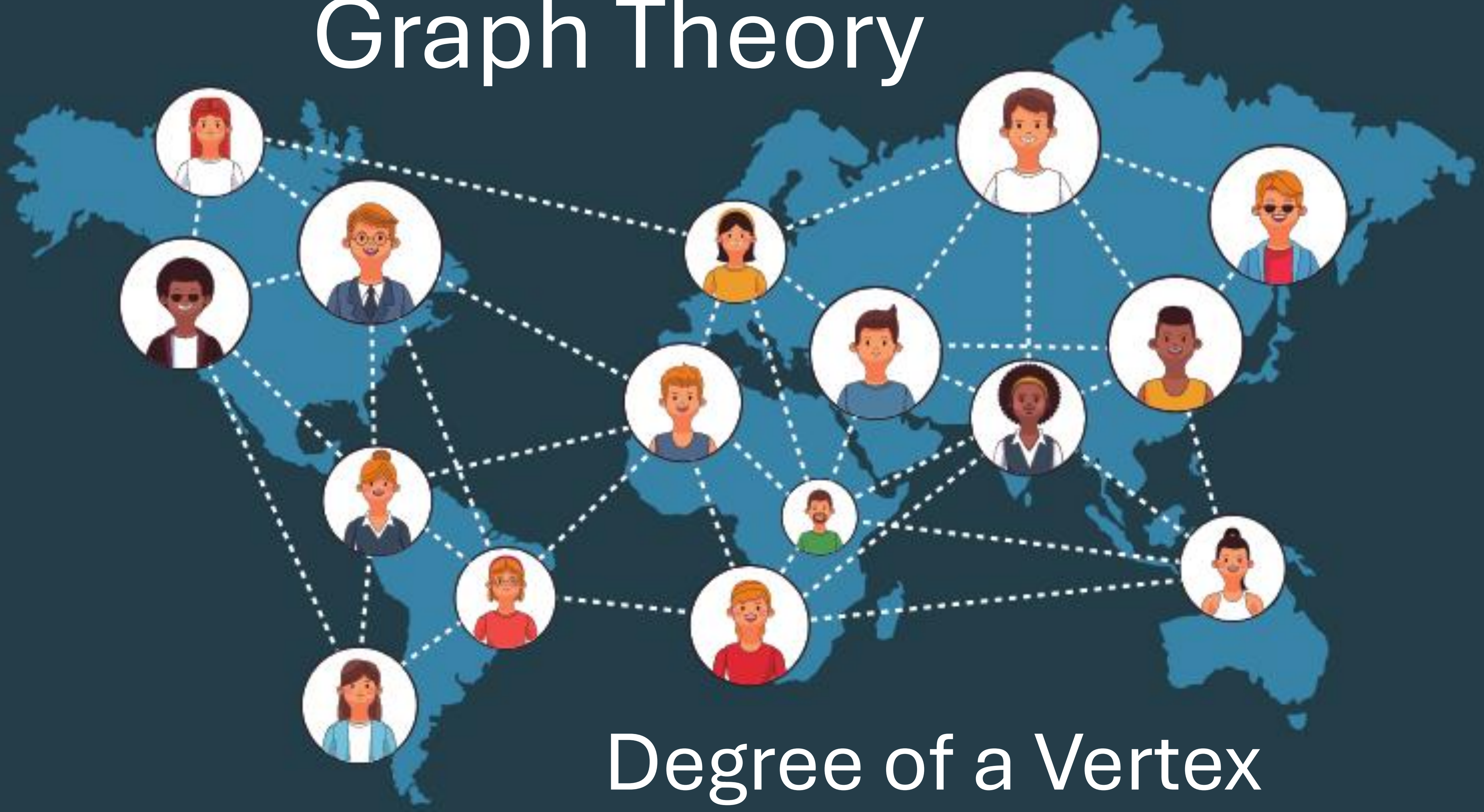
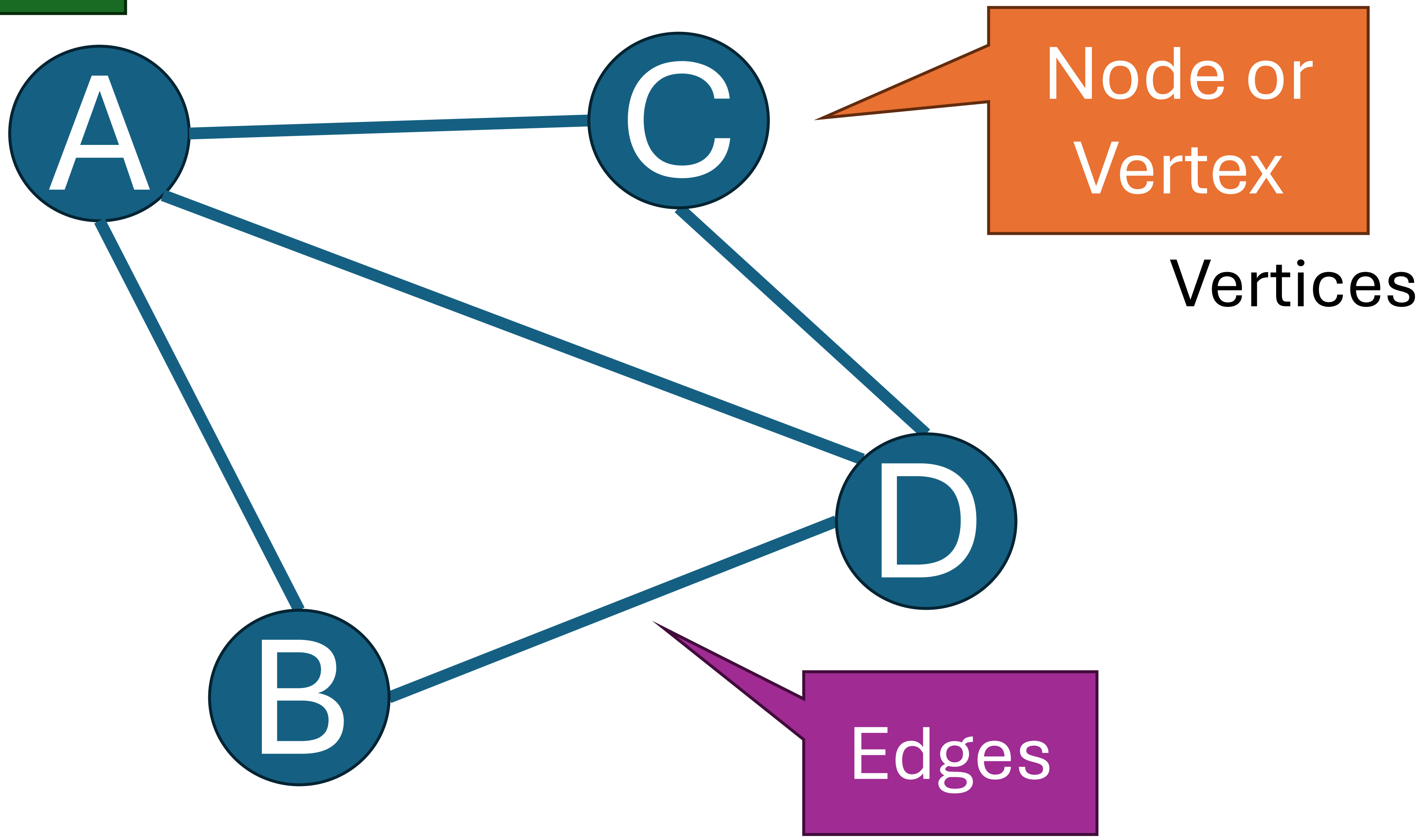
Graph Theory

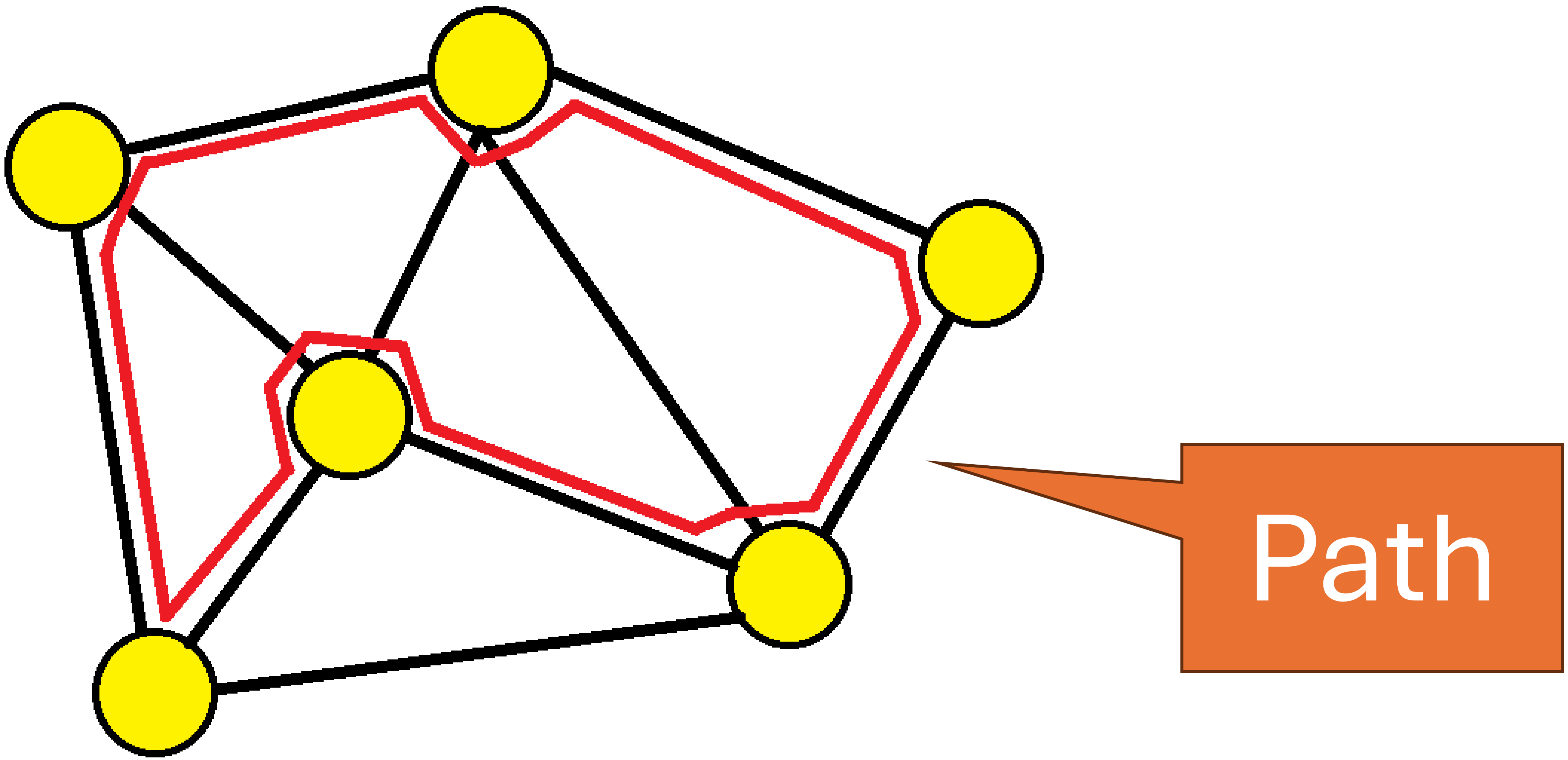


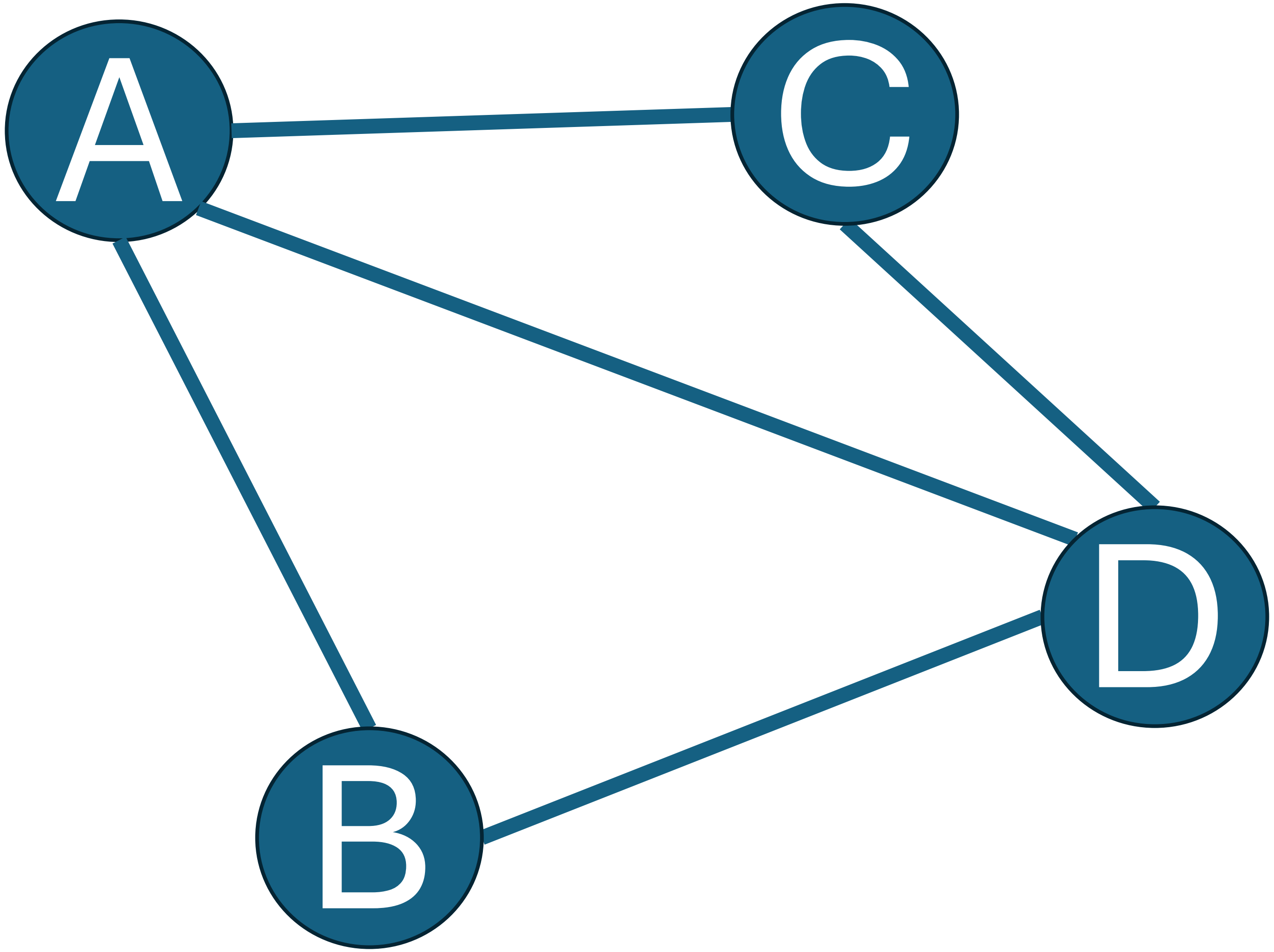
Degree of a Vertex

Recall:

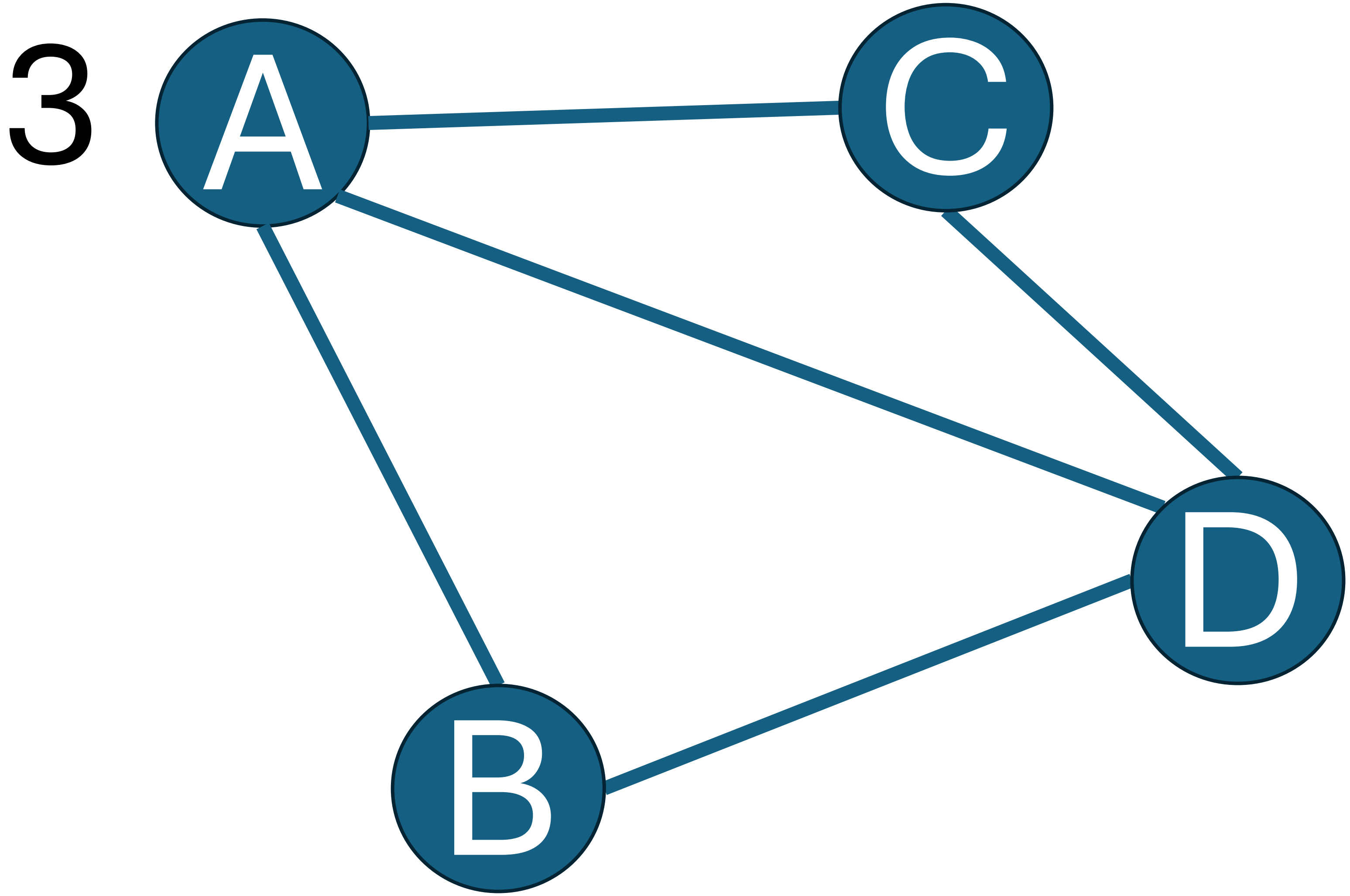


Recall:





The degree of a vertex is the number of edges connected to it.



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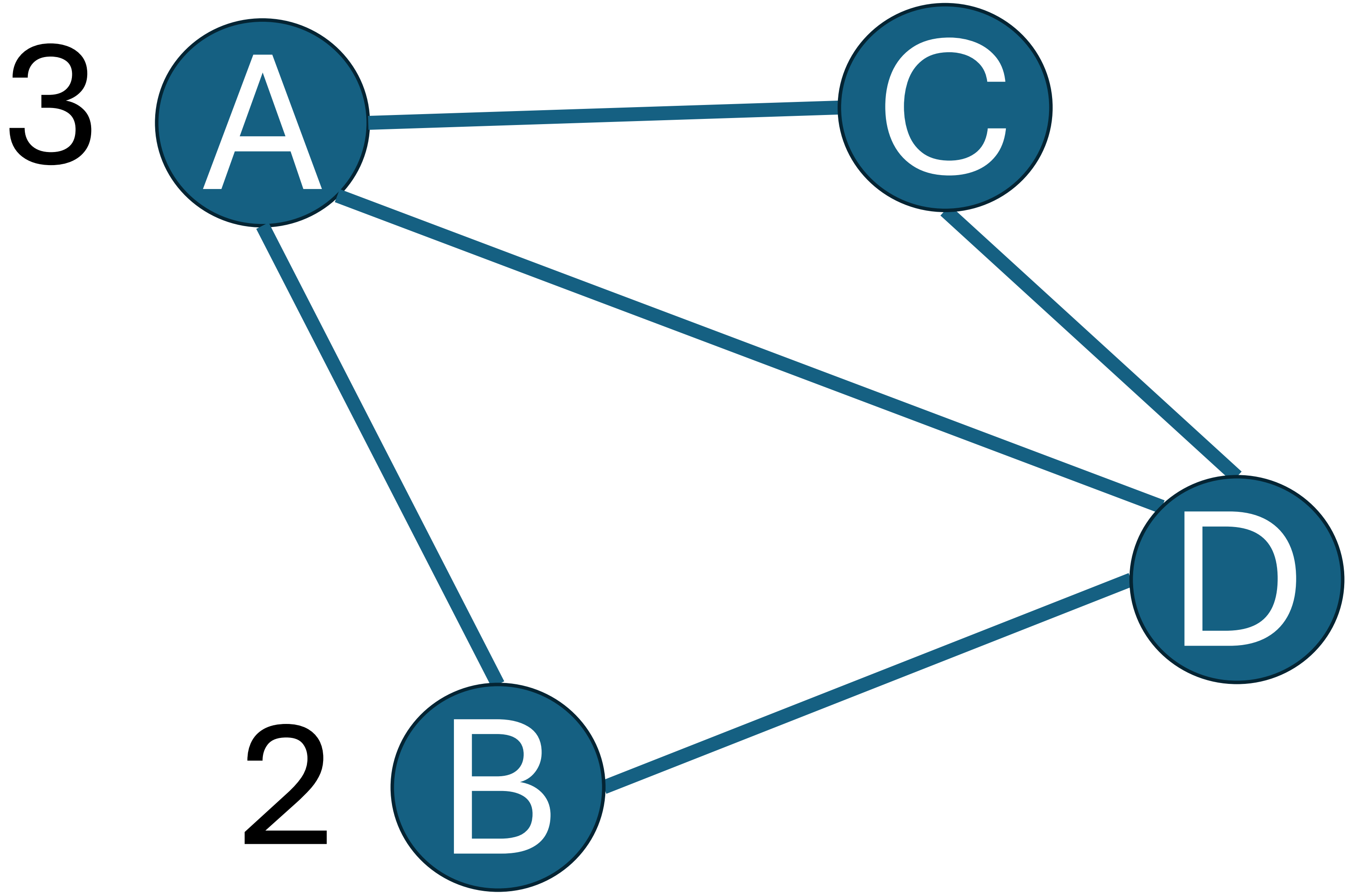

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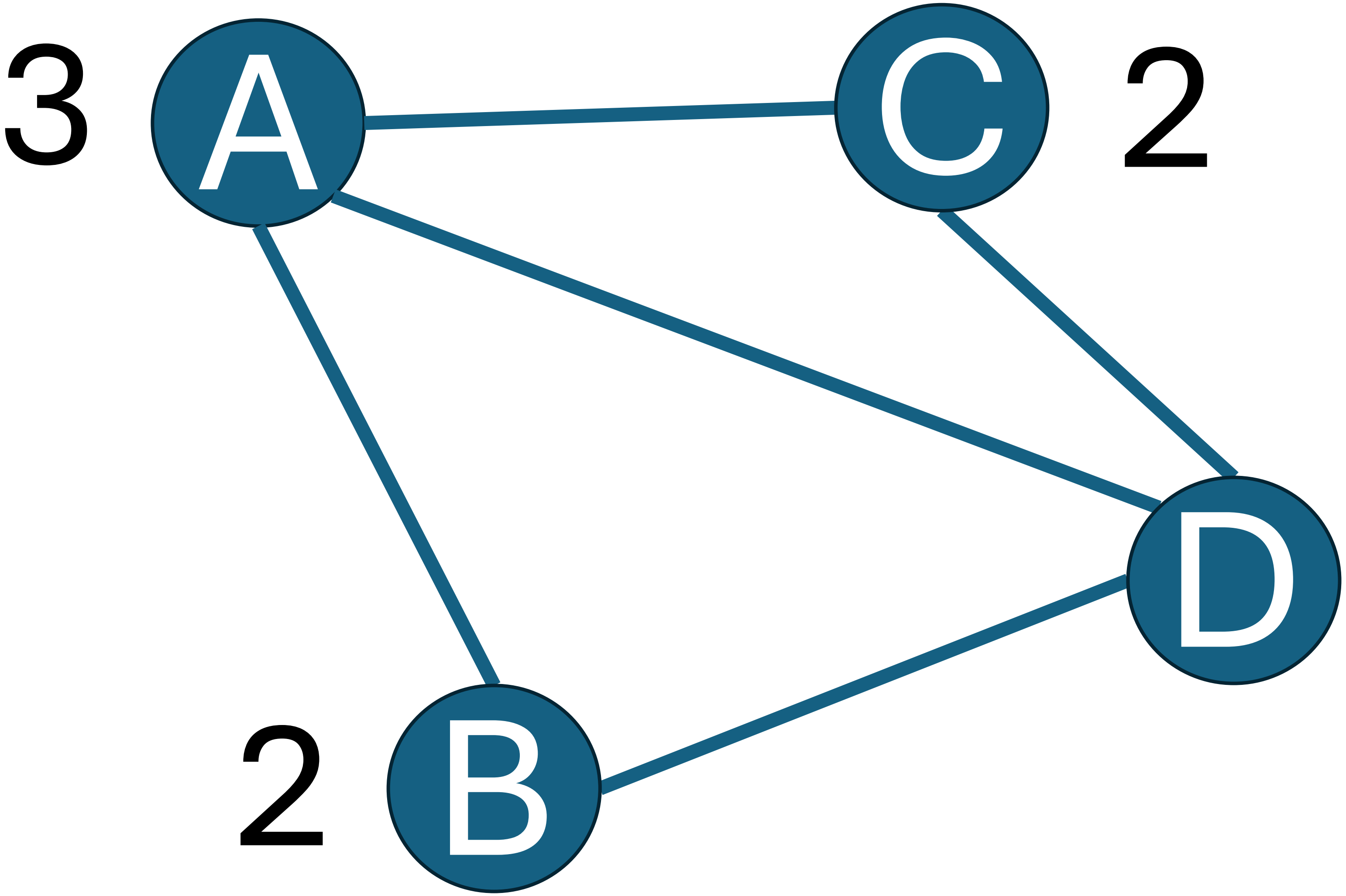

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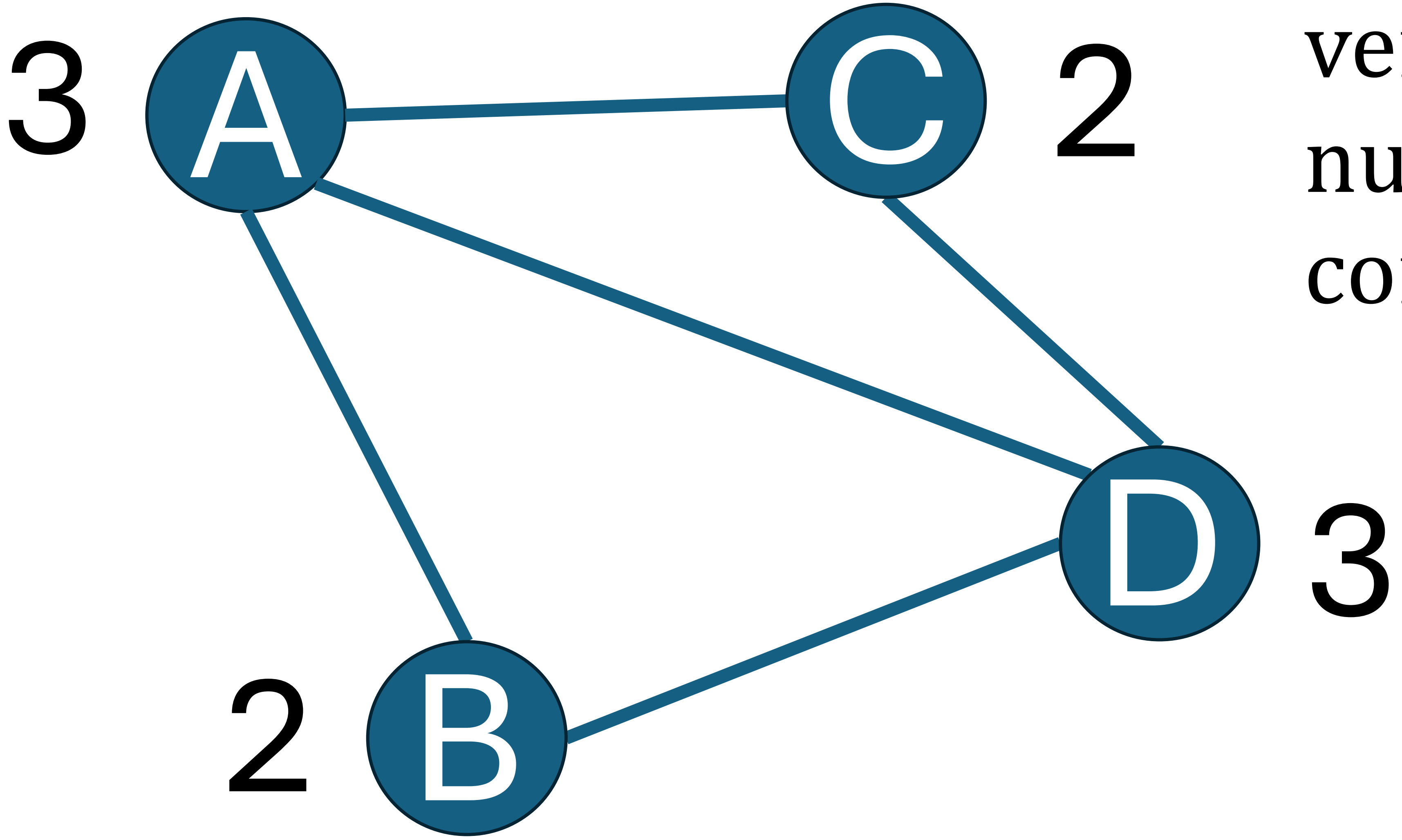


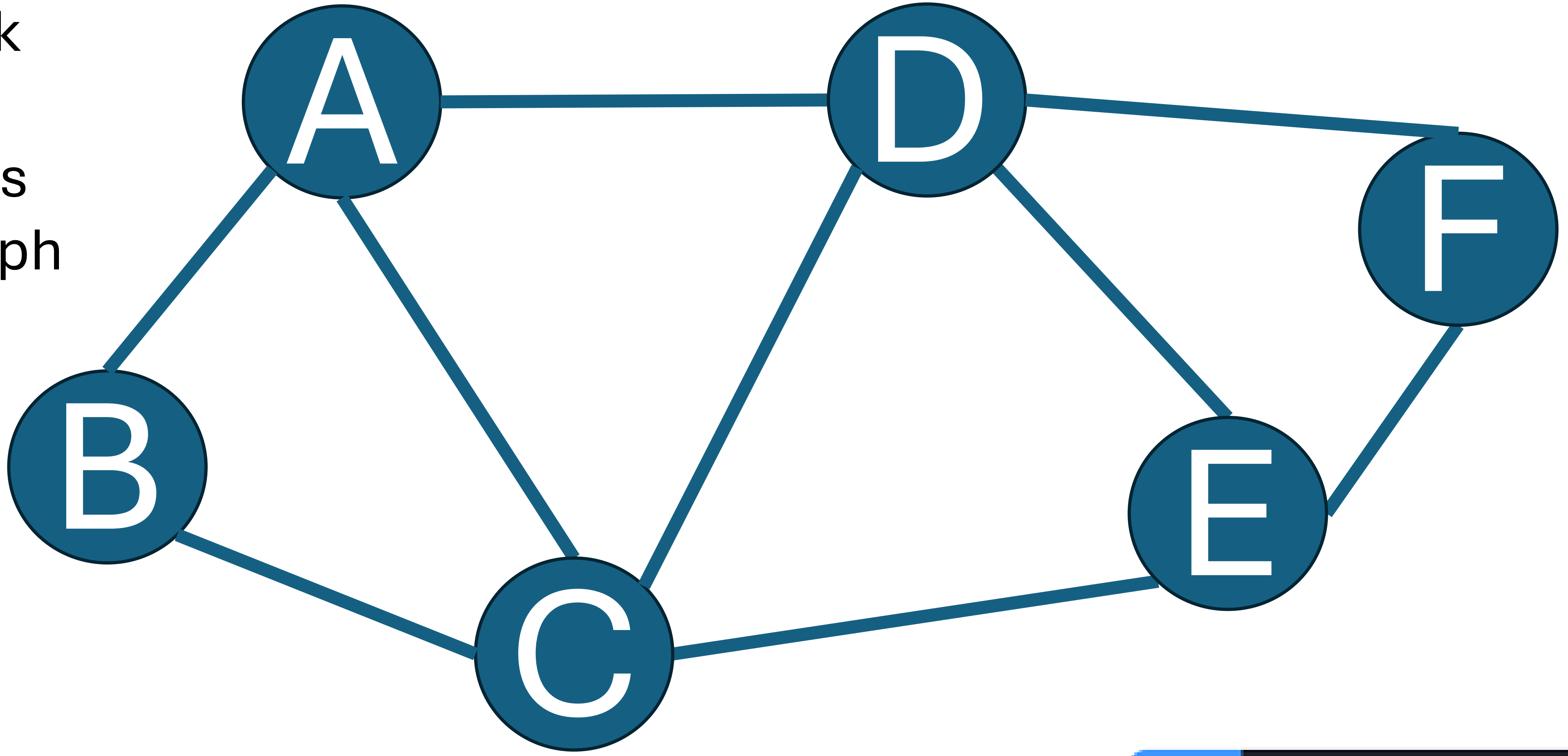
The degree of a vertex is the number of edges connected to it.

In networks, the nodes with many edges are well connected.

In social networks, these people are often useful to identify for marketing purposes. They are influencers.

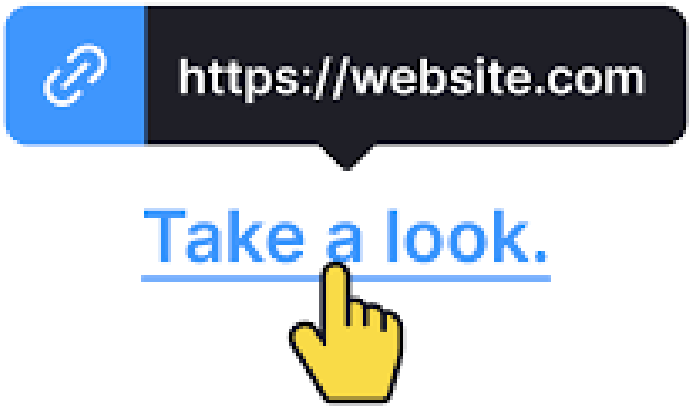
Google made its name on finding the degree of vertices, not for marketing but for sorting.

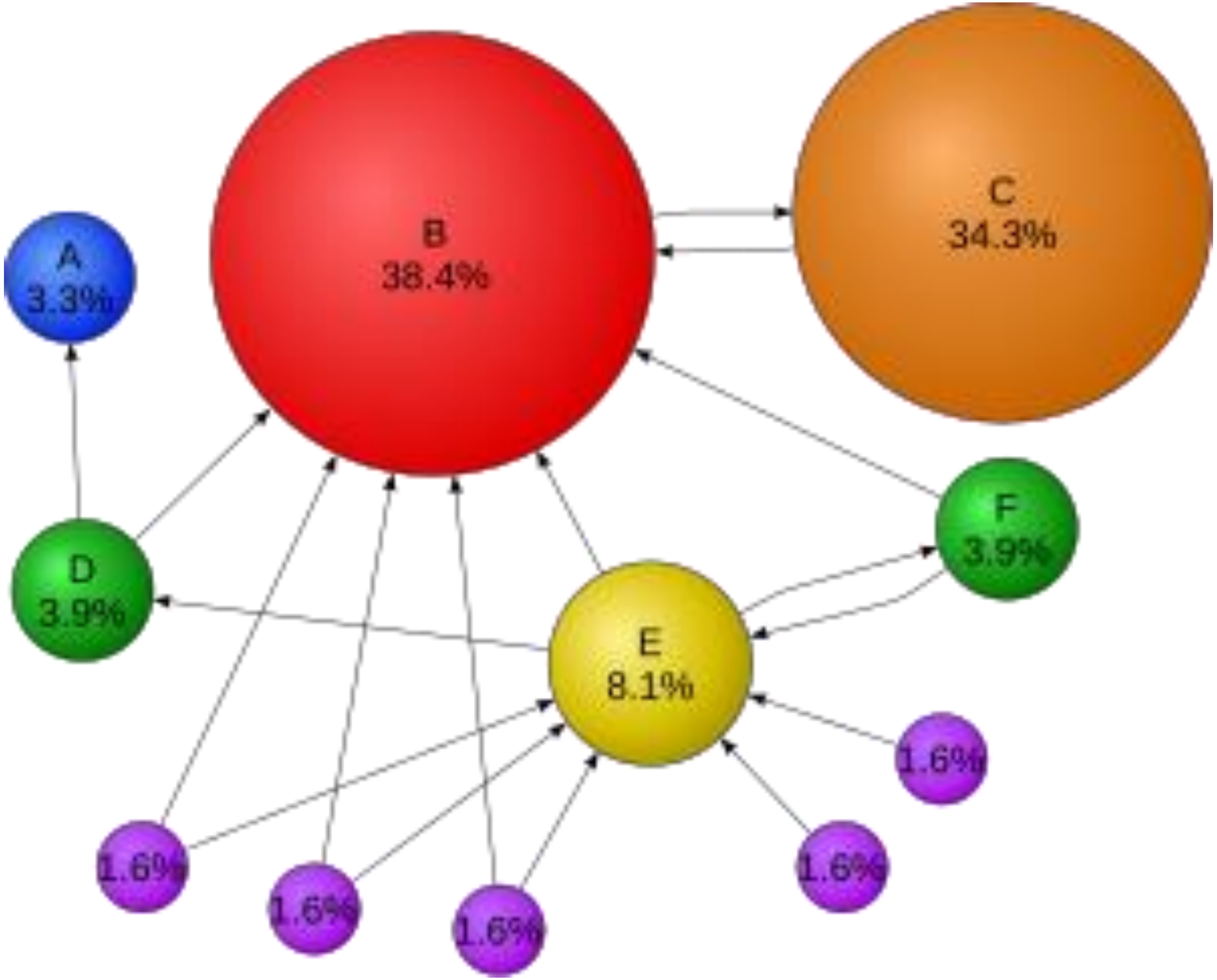
PageRank models webpages using graph theory.



The nodes are websites.

The edges are hyperlinks.



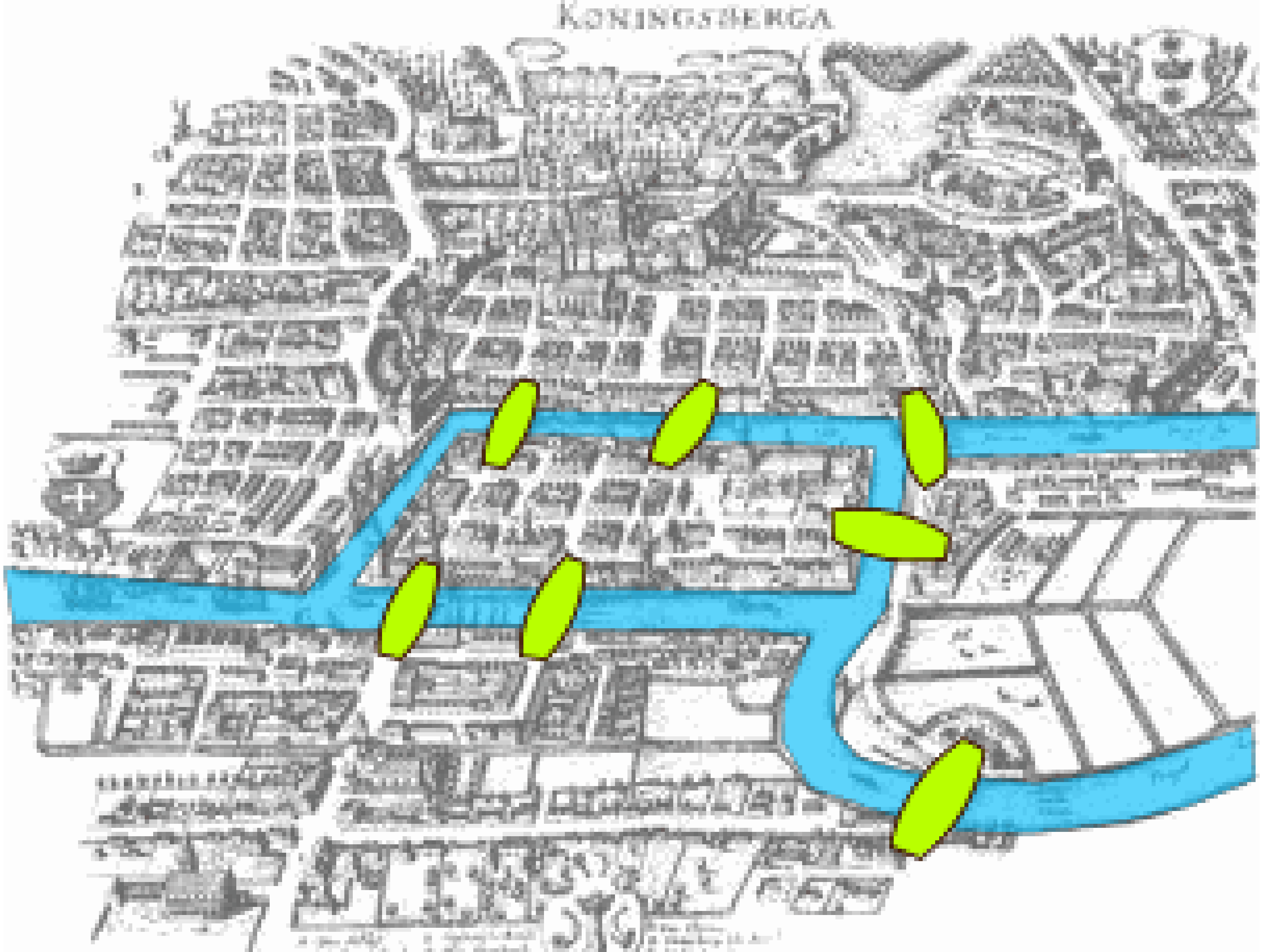


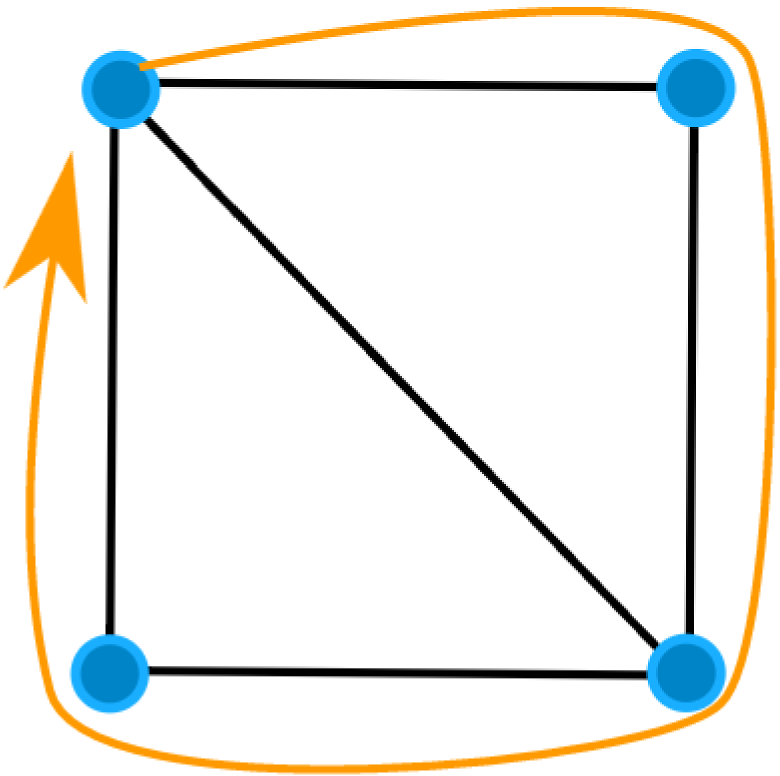
With PageRank, not only is the degree of each vertex important, but also the degree of the vertex that connects to it.

PageRank: Took search results and ordered them

Google worth $632 billion in 2020

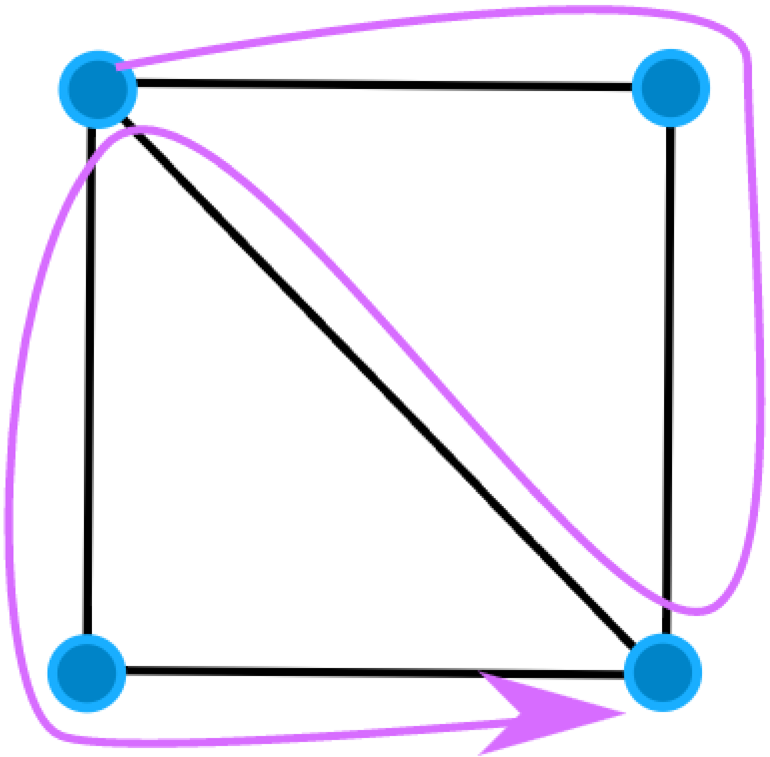
The city of Königsberg in Prussia was on the Pregel River, which had two large islands. The islands and shores were connected by seven bridges. Your problem is to devise a walk through the city that would cross each of those bridges once and only once.





Simple Path

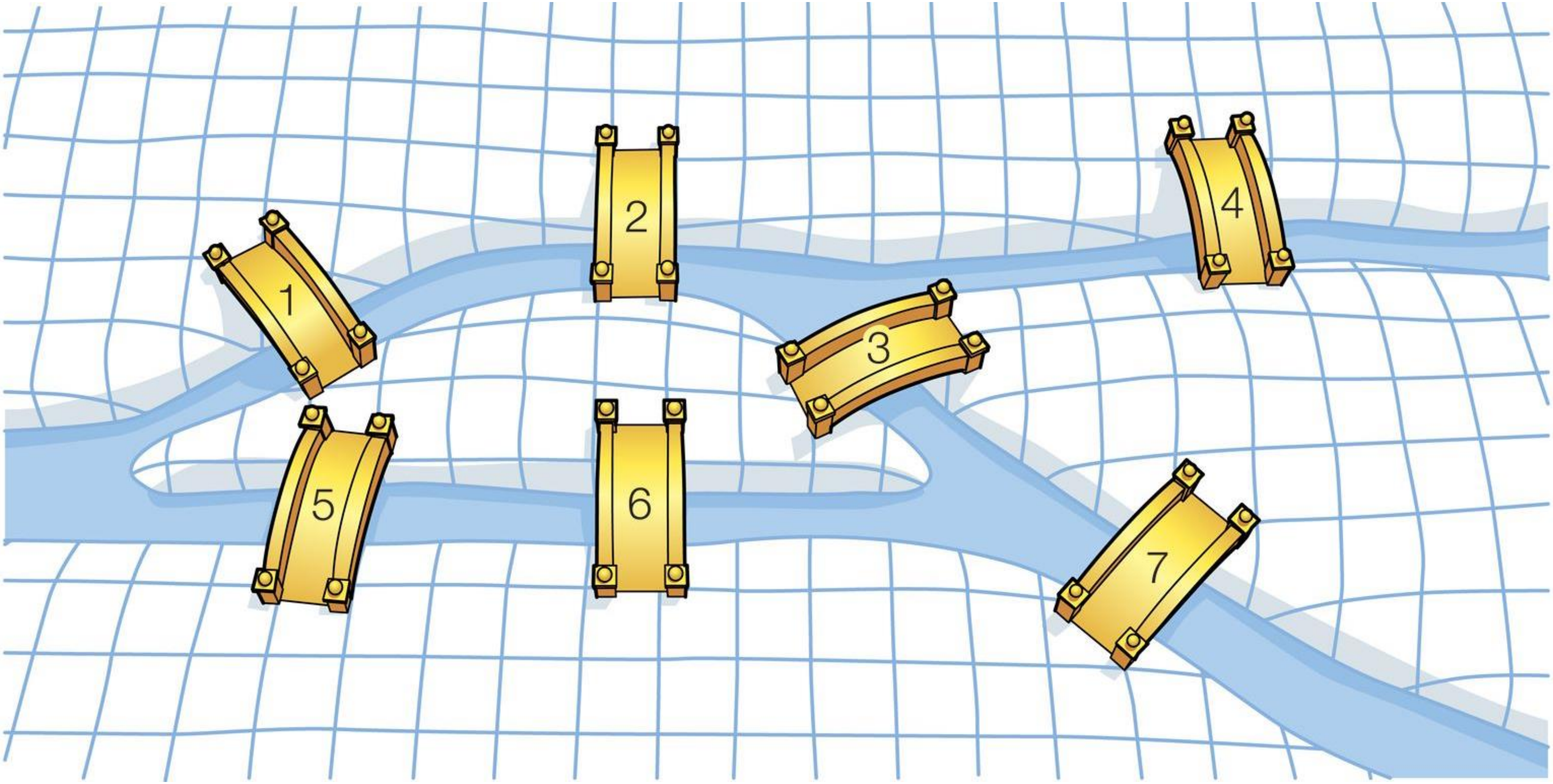
Go to all nodes.



Euler Path

Travel on all edges.

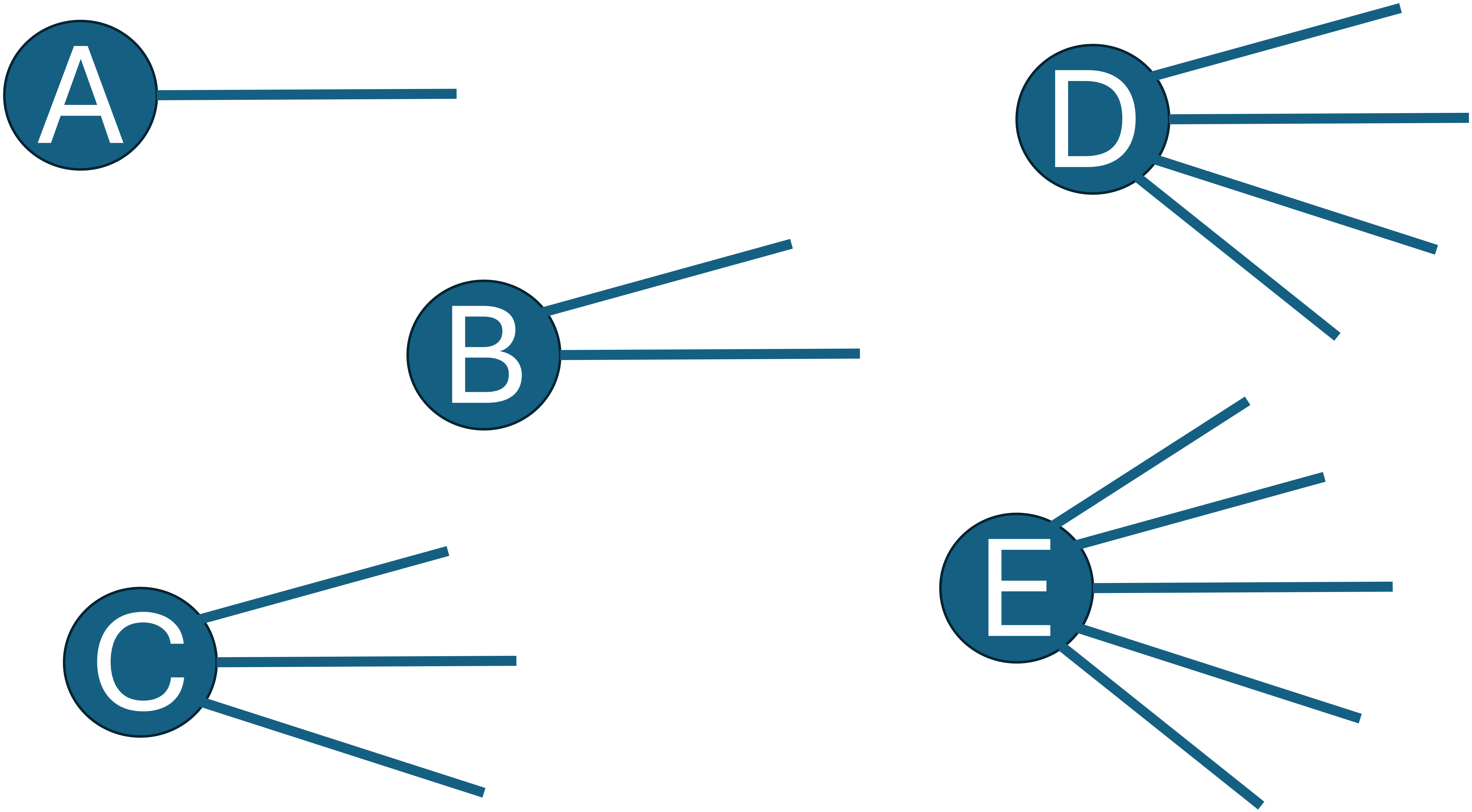
The city of Königsberg in Prussia was on the Pregel River, which had two large islands. The islands and shores were connected by seven bridges. Your problem is to devise a walk through the city that would cross each of those bridges once and only once.

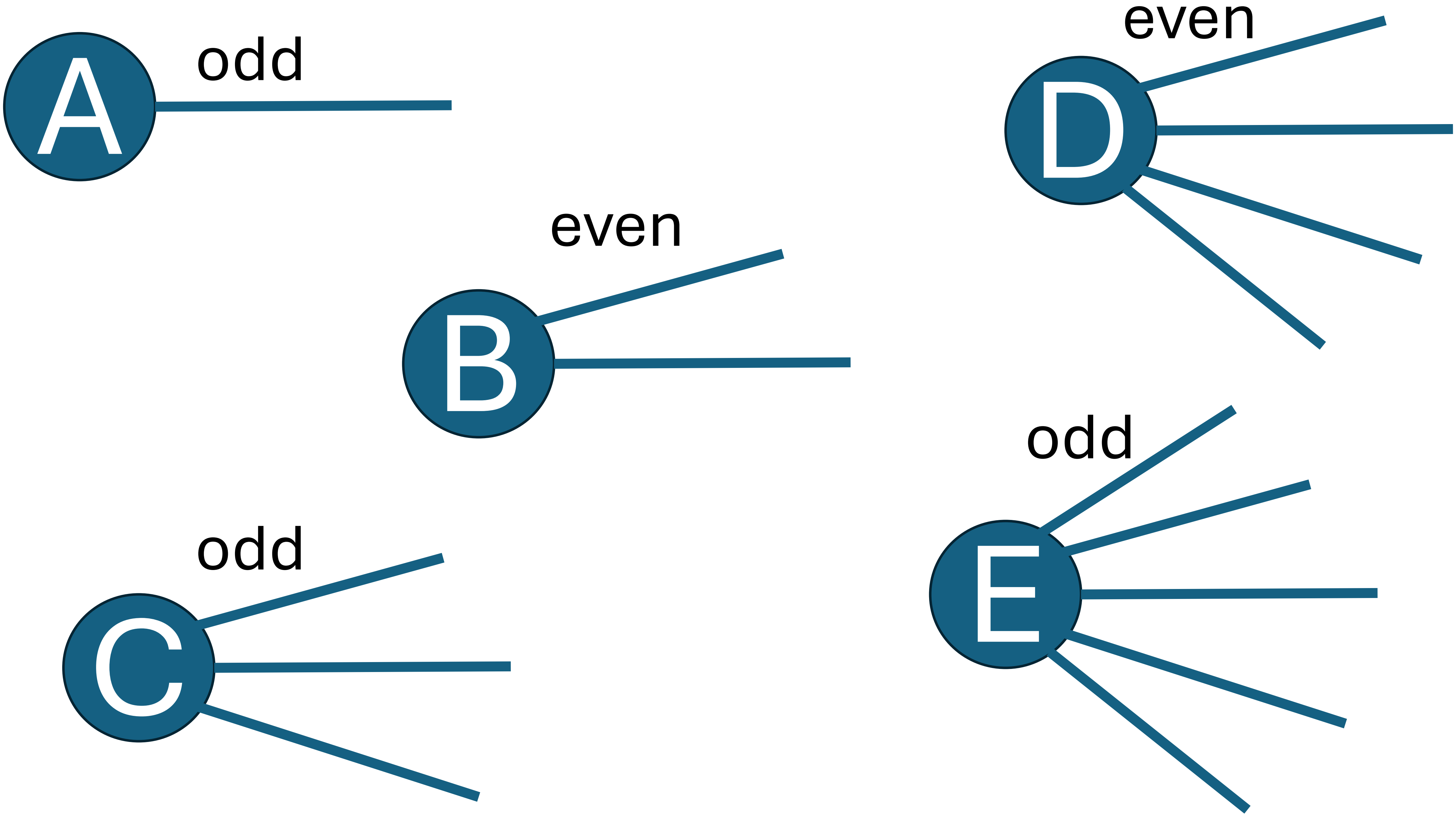


Leonhard Euler

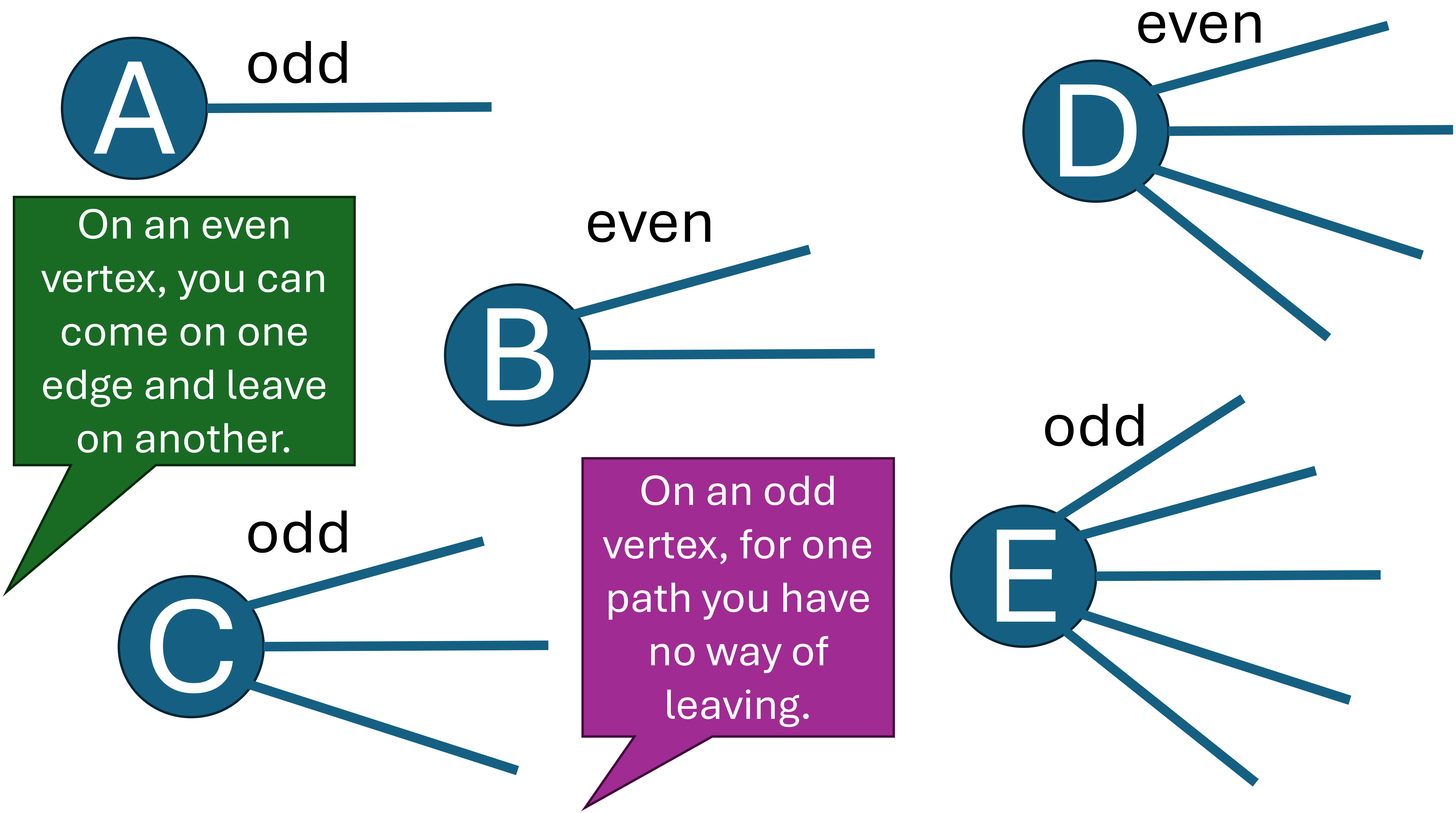
(5 April 1707 – 18 September 1783)

was a Swiss mathematician, physicist, astronomer, geographer, logician, and engineer who founded the studies of graph theory and topology and made pioneering and influential discoveries in many other branches of mathematics such as analytic number theory, complex analysis, and infinitesimal calculus.

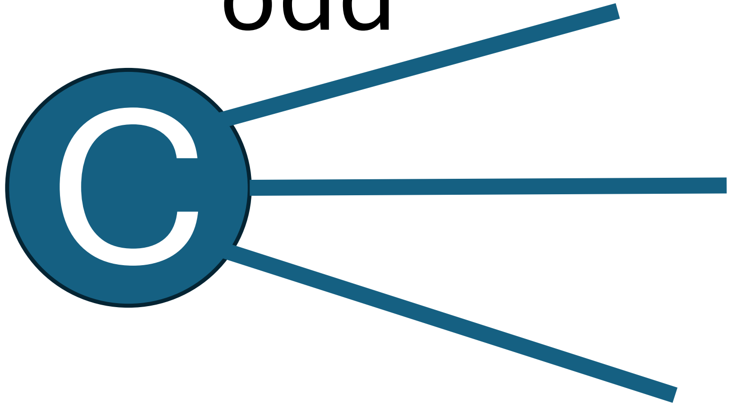

A
B
C
D
E



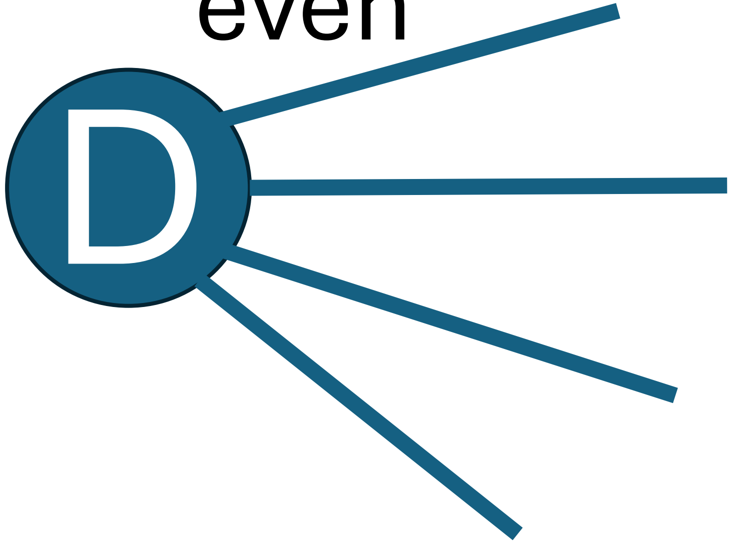
A
odd
B
even
C
odd
D
even
E
odd


A
odd
On an even vertex, you can come on one edge and leave on another.
even
B
D
even
odd
C
odd
On an odd vertex, for one path you have no way of leaving.
E

odd



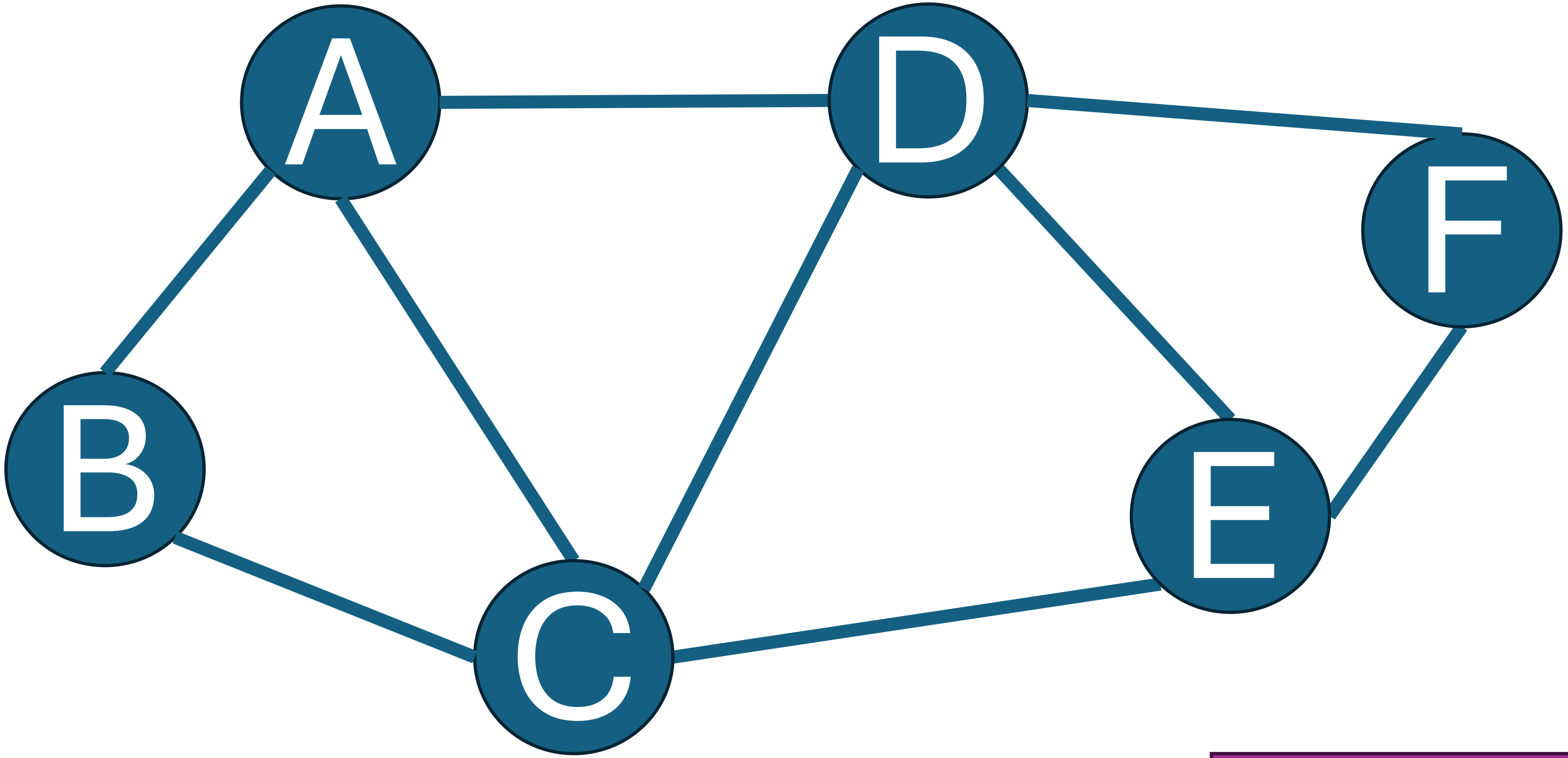
even



You can only have at most two odd vertices.

One will be the start. (so you don’t have to leave)

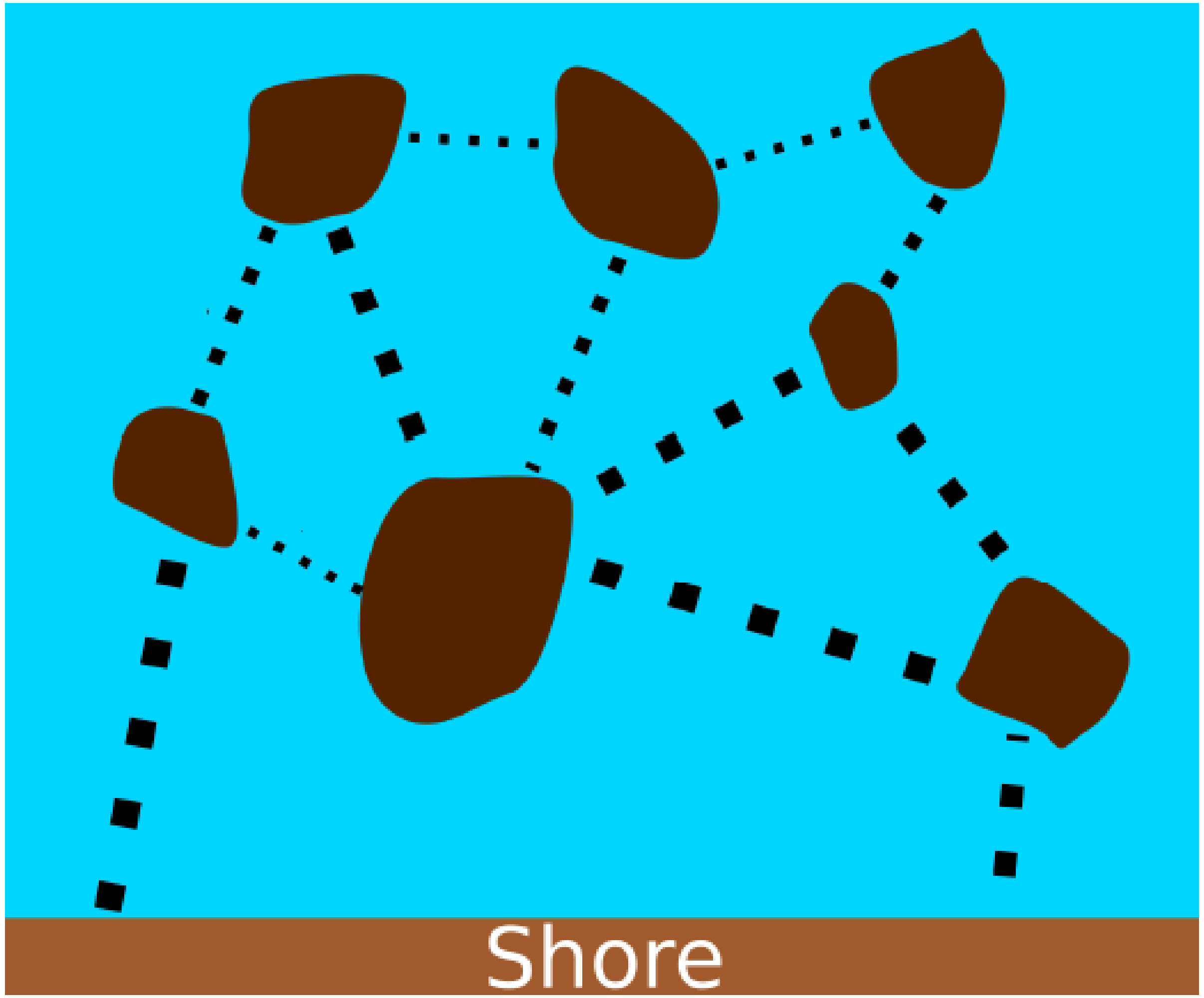
One will be the end. (so you don’t have to leave)



Does this have an Euler path to travel all edges?

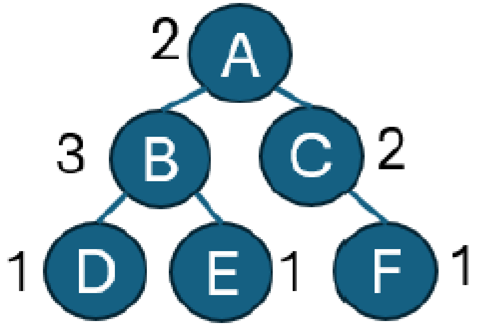
Does this have an Euler path to travel all edges?

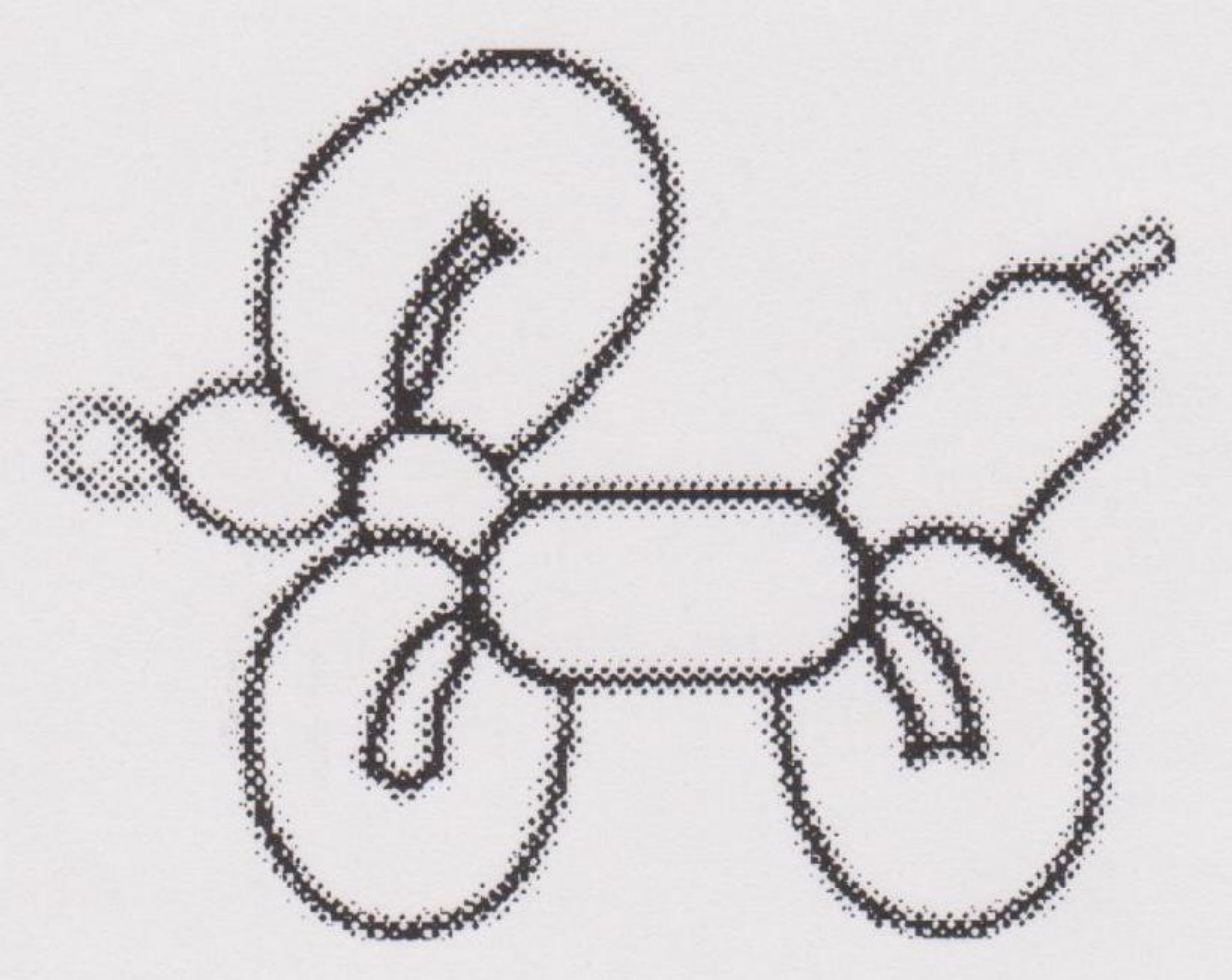
Draw and label the graph.

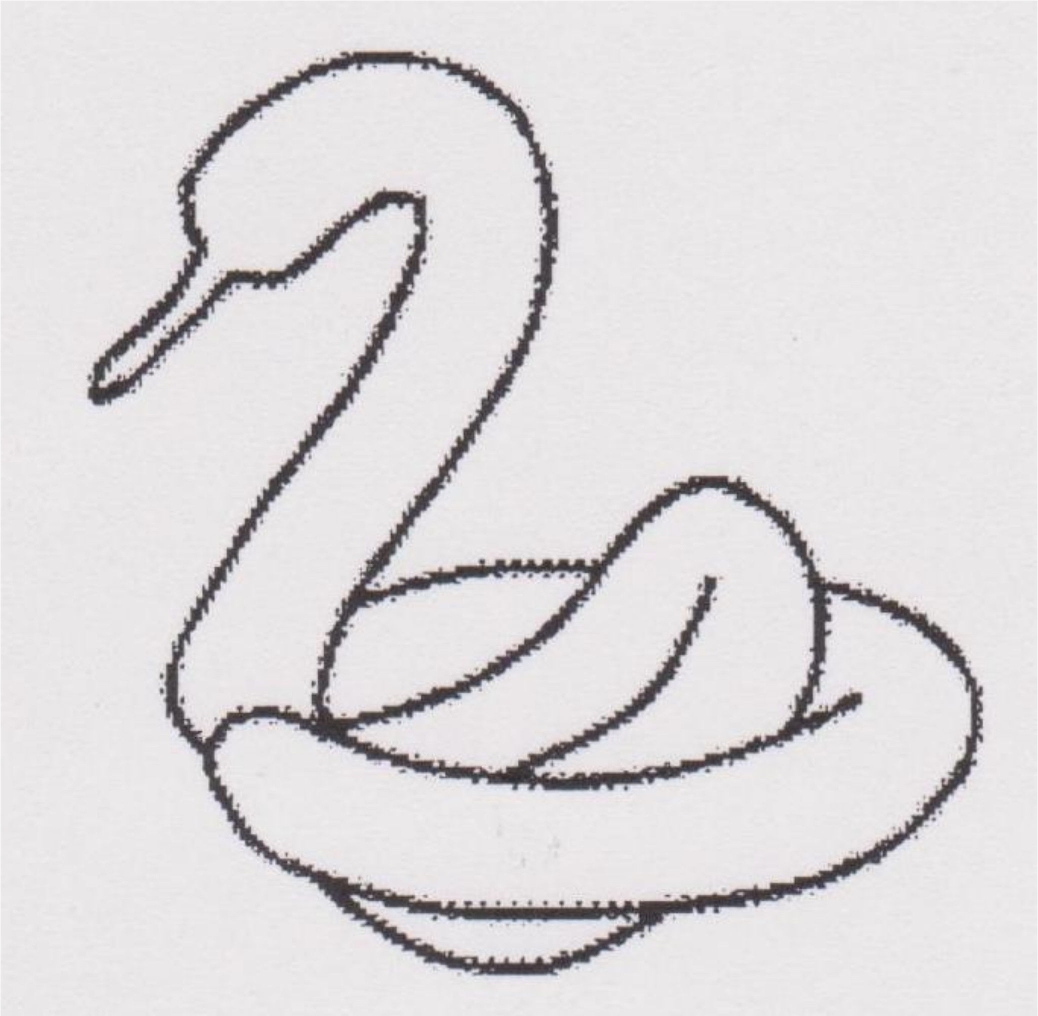


6. Give an example of a graph for each situation. Use the least edges possible.

- Nodes should be circles with letters in them.
- Edges should be lines.
- Provide the degree of each vertex next to it.







8. A floating city is made up of boats connected by bridges. First, draw a map of the city.

- The bridges may not cross. All of the bridges must be straight.
- Each boat has a building or a particular function.
- Six bridges connect The Portside School to six places: the museum, the [illegible] library, Carp Condos, the Market, and even City Hall.
- There are bridges connecting Carp Condos to the Library; Spindrift Villas to the museum, and the City Hall to the Market.
- The Can What We Can Fish Company occupies one barge. It's the city's main employer. It's connected to the Spindrift Villa Apartments, the Market, and the Fat Albatross restaurant.
- The City Hall is connected directly to five other boats. Three of them are Carp Condos, the Fat Albatross and the Library.

A very tricky instruction.

Finally, does this city have a Euler path that can cross all of its bridges once? . . . . (yes or no)

You will need to draw a rough diagram.