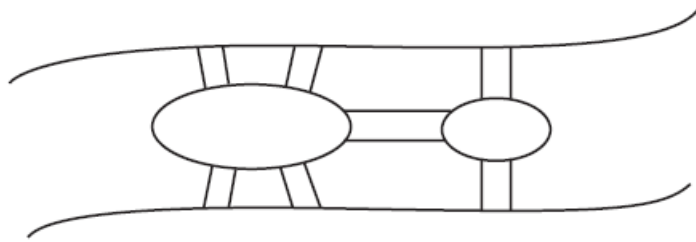


*Konigsberg bridges*

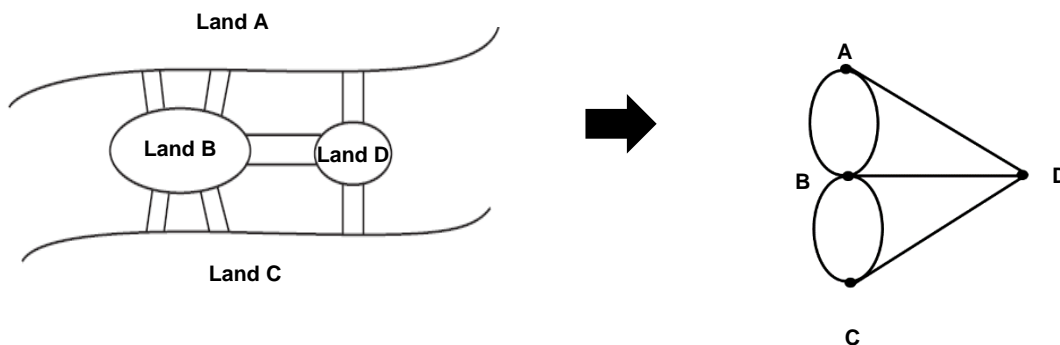
Q: The Konigsberg bridge puzzle is universally accepted as the problem that gave birth to graph theory. It was solved by the great Swiss-born mathematician Leonhard Euler (1707–1783). The problem asked whether one could, in a single stroll, cross all seven bridges of the city of Konigsberg exactly once and return to a starting point. Following is a sketch of the river with its two islands and seven bridges:



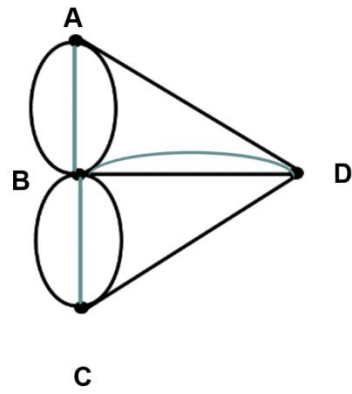
- State the problem as a graph problem.
- Does this problem have a solution? If you believe it does, draw such a stroll; if you believe it does not, explain why and indicate the smallest number of new bridges that would be required to make such a stroll possible.

A:

- The problem is if one can cross all seven bridges exactly once in a single stroll and return to a starting point. This means if the map is seen as a graph, one should find a closed trail (a trail with the initial vertex as the final vertex as well, and no repeating edges) which includes all the seven edges.
- This problem does not have a solution unless each vertex has an even degree. If the given scenario can be illustrated as an Eulerian graph (a connected graph containing a closed trail that includes every edge and has vertices with even degree), then the problem can be solved. So far, all the vertices have an odd degree – Points A, C, and D have a degree of 3 while Point B has a degree of 5. If there were THREE additional edges that will make all four vertices have an even degree (i.e., Edge AB, Edge BC, and Edge BD), a stroll is possible.



Additional Edges:



Stroll:

