

Budapest, Hungary

Rivers and Bridges

This is a map of the Danube flowing through the city of Budapest in Hungary

Can you draw a path that goes over each of the bridges once and only once?

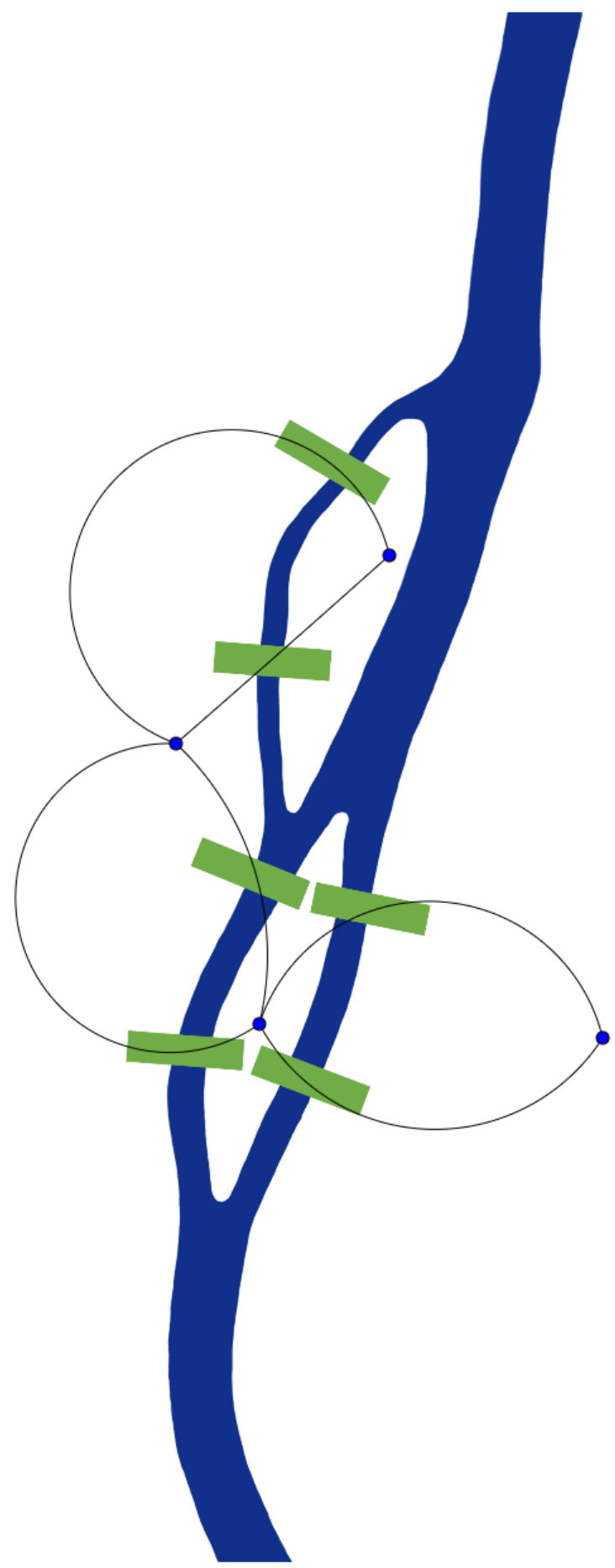
Do you think it is possible?

Can you prove this?

Do you think adding bridges onto either of the stretches of river that go off the page would change whether finding such a path was possible? Why?

We can simplify this problem into one that we can look at mathematically by drawing the system of rivers and bridges as a graph. By a graph we mean a diagram that shows all the important connections. We mark each area of land as a point (called a vertex) and each bridge as a line (called an edge) joining the two points that represent the land that bridge joins.

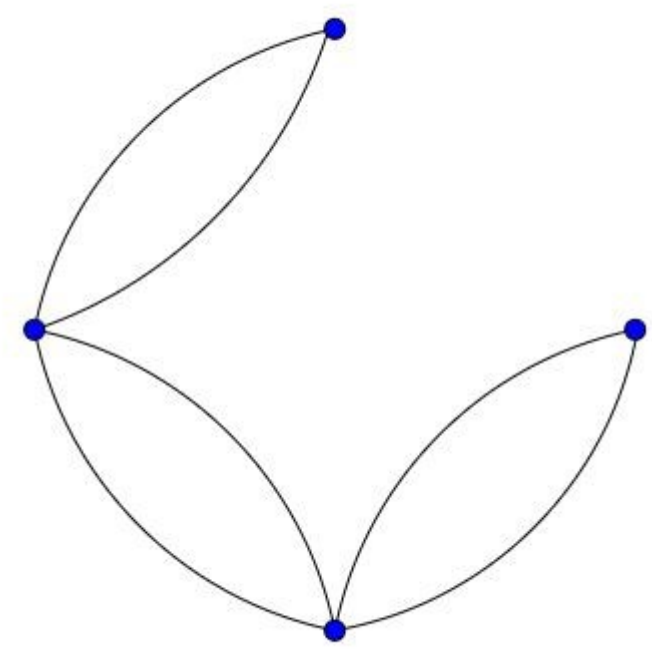
Have a go at drawing this on top of the map and turn over to see if you got it right.



Here is what the graph looks like on top of the map.

Because we have all the important information, we can move the vertices and edges around as much as we like and the graph is the same so long as we don't add or remove edges or vertices.

Try drawing your own version of this graph. Can you make it look more or less complicated while keeping it the same?



Do you think you could change whether a route is possible just by adding or removing one edge (bridge)?

Can you spot any requirements for a path to be possible?