Seven Bridges of Königsberg

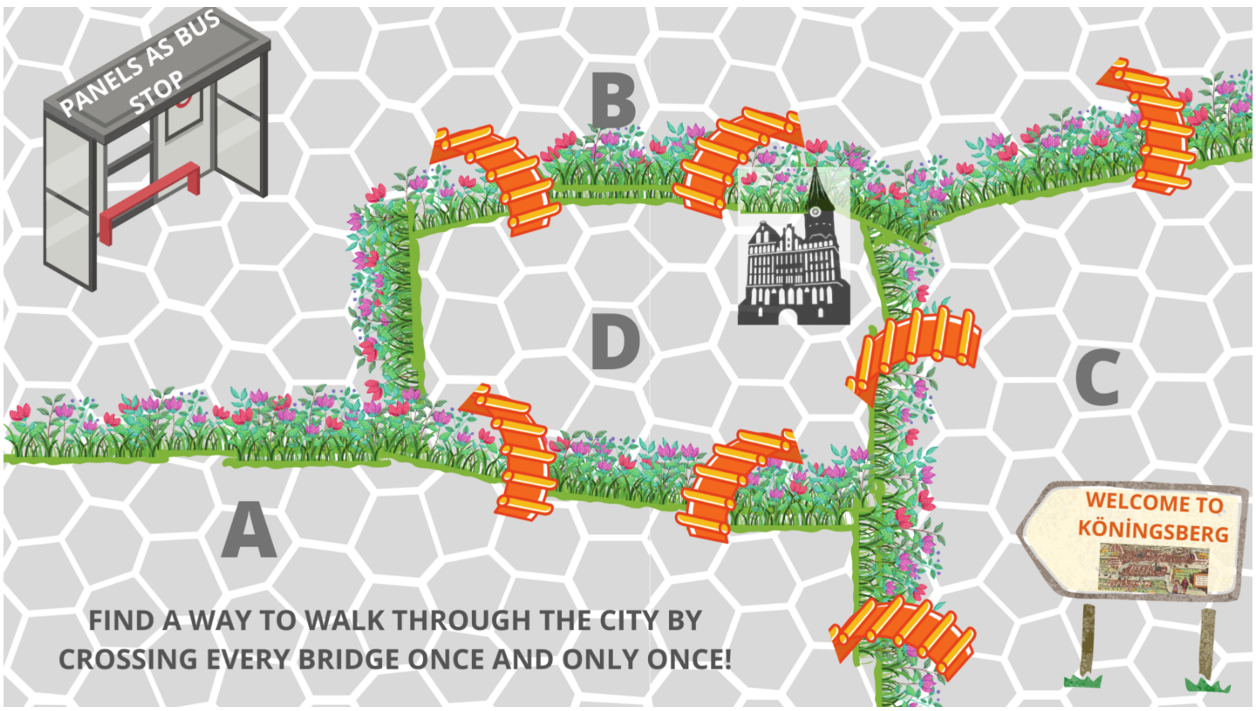
The Icon of the Graph Theory of Mathematics:

Goal: The Seven Bridges of Königsberg is a historically notable problem in mathematics. I plan to introduce the topology and the graph theory which laid the foundations by Leonhard Euler in 1736 with the solution of this problem. The visitors of the mini-park can create their individual experience by literally walking on the bridges while trying to solve the problem as well as using the informational panels for the variations of the problem.

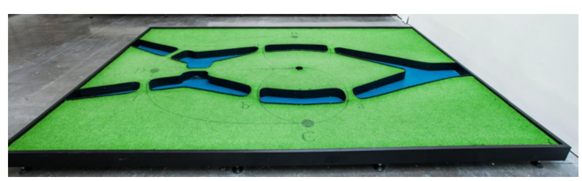
Design ideas:

Outdoor* Mini park

A 26 ft x 33ft park area



*If outdoor option is not applicable, indoor version can be designed on a mat (like an indoor miniature golf course).



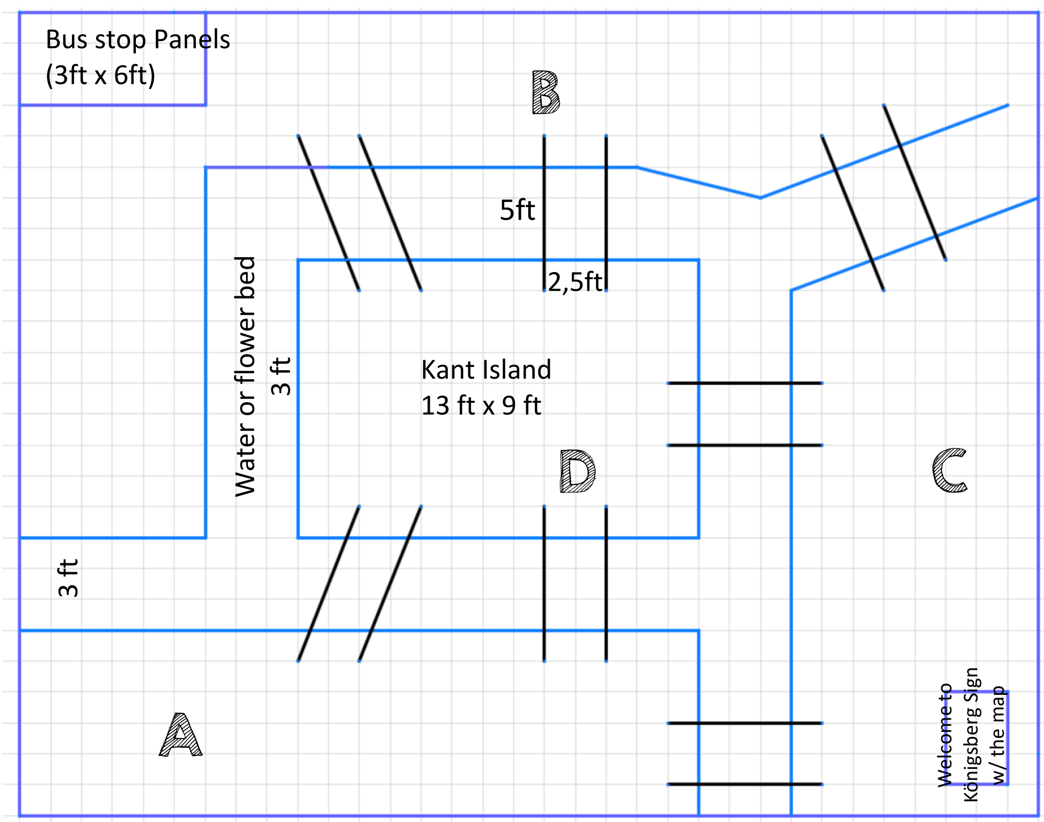
Plan and the Materials:

26 ft x 33 ft outdoor area designed as a park.
Instead of water, grass & flower area can be used for practical purposes. All other areas can be concrete or tiles. On the center of each region, the letters are written on tiles. All the measurements are written below. Each unit square represents one square feet. Each wooden bridge is 2,5 ft wide by 5ft long.

At the bottom right corner, there will be a "Welcome to Königsberg" city sign with the old map and the problem explanation which I wrote in detail as Panel 1.

At the top left corner, a 1m x 2m bus stop can be installed and used as a seating area and contain the panel 2 and 3. Information Panel 2 shows today's Kaliningrad's bridges and asks if it is possible to solve the problem at the current number of bridges. That's a simple interactive display where the visitors use a rope to draw the path. Information panel 3 is another interactive board with the magnetic property, that allow kids to insert another bridge to the initial map to solve the problem. At the bus stop there will be a box for flyers that includes the same problem with different kinds of maps

On the central island (Kant Island) a miniature model of Kaliningrad Cathedral with the Immanuel Kant's monument can be added to create more realistic experience.



PANEL #1: Welcome to Königsberg City Sign

The Seven Bridges of Königsberg is a historically notable problem in mathematics. Its solution by **Leonhard Euler** in 1736 laid the foundations of **graph theory** and **topology**.

Konigsberg is a town on the Preger River (Pregolya River), which in the 18th century was a German town, but now is Russian. Within the town there are four regions that are connected to each other with **seven bridges.** The Famous problem asks you to,

FIND A WAY TO WALK THROUGH THE CITY BY CROSSING EACH BRIDGE ONCE AND ONLY ONCE.

Imagine A, B, C, D areas of the park are landmasses separated by water (flowers that you cannot step on), and the only way to go between these landmasses is to use a bridge. We may add other questions to the famous Konigsberg Problem;

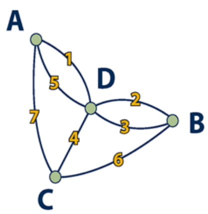
CAN YOU CROSS 5 BRIDGES AND RETURN TO THE START, WITHOUT GOING OVER A BRIDGE MORE THAN ONCE?

IF YOU DO NOT HAVE TO RETURN TO WHERE YOU STARTED, CAN YOU CROSS 6 BRIDGES?

Answer:

In 1736, Euler proved that the walk was not possible to do. He proved this by inventing network diagrams.

You can see that region A is connected to other regions by 3 bridges just like region B and C, whereas island D is connected by 5 bridges.



Resulting Graph

This means that each region has an odd number of bridges, so they are called **odd vertices in Euler's theory.**

He proved that if there are more than two odd vertices in a network diagram, then there is no possible journey that would cross every bridge once and only once.

PANEL #2: Left Panel of the Bus Stop
Now...Five Bridges of Kaliningrad

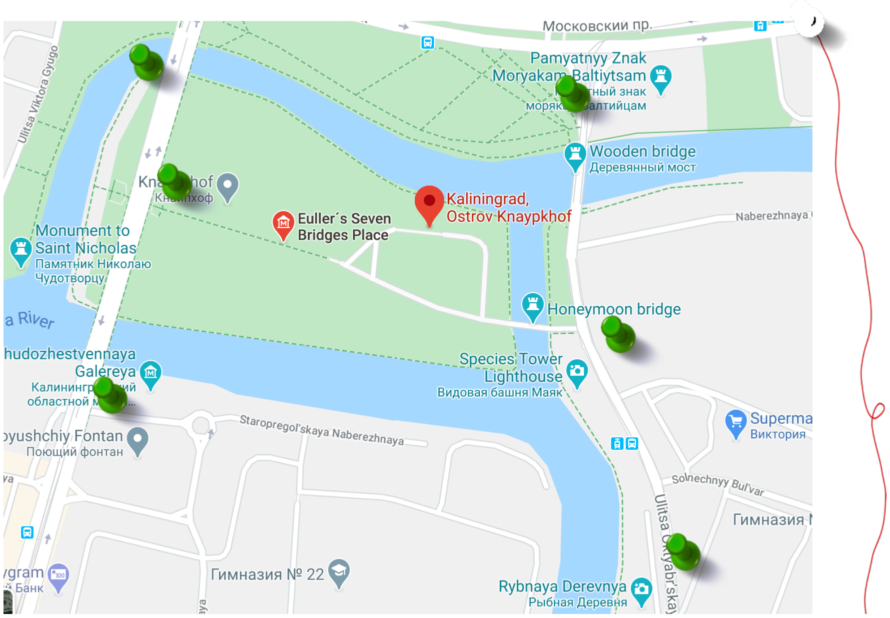
All seven bridges were destroyed in World War II and only five were rebuilt. Königsberg became part of Russia after the WWII and was renamed as **Kaliningrad.**

Now it is **possible** to visit the five rebuilt bridges via a *Euler walk.*

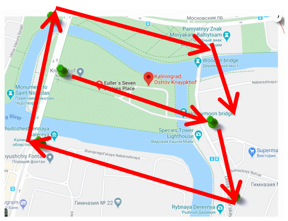
Can you plan a route for the walk?

Starting from any point* on the map, use the rope to mark out a continuous route that crosses every bridge only once.

* Although not applicable, you may start your route from an island, *helicopter drop off and pickup can be arranged for a price.* ☺



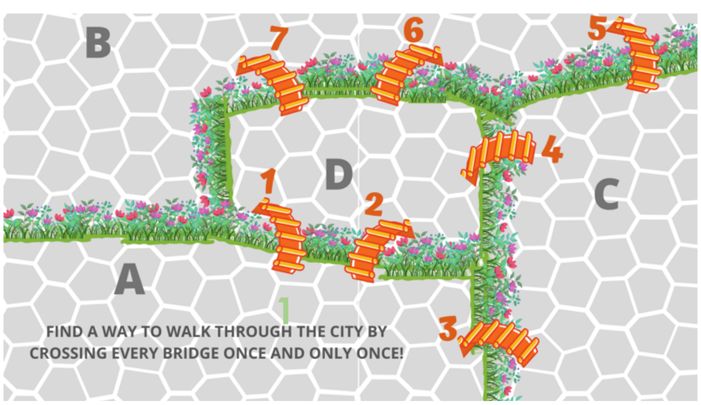
Answer:



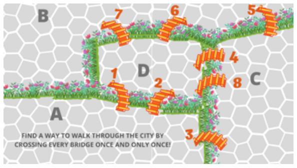
PANEL #3: Right Panel of the Bus Stop

The Eight-Bridge Puzzle - Magnetic Wall with an 8th magnet bridge.

If you are free to add another bridge to Konigsberg where you can complete the path that crosses each bridge only once, where would you add it?



Answer:



In addition to these left and right panels at the bus-stop, a post-it stand can be added with the other possible graph types for visitors to try.