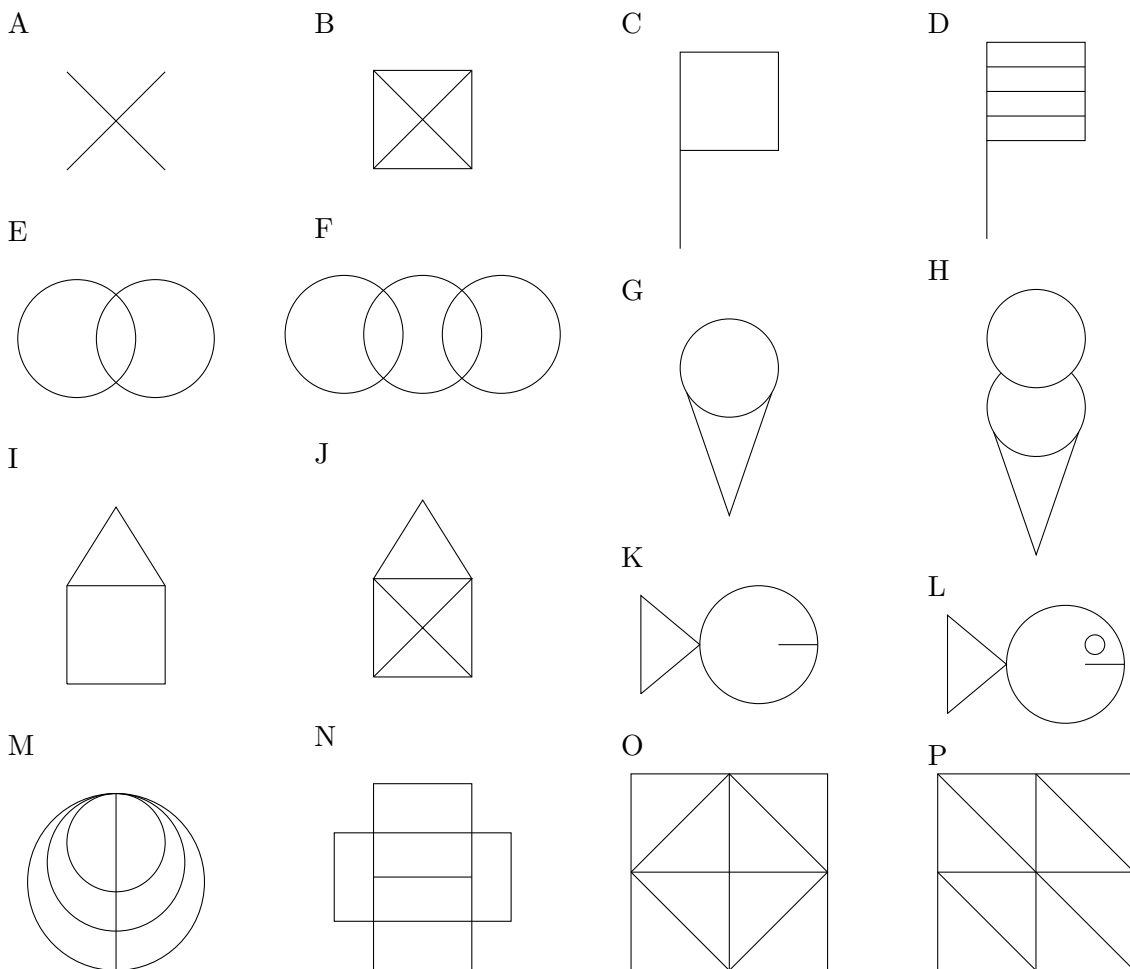


DRAWING, BRIDGES, AND EULERIAN TOURS

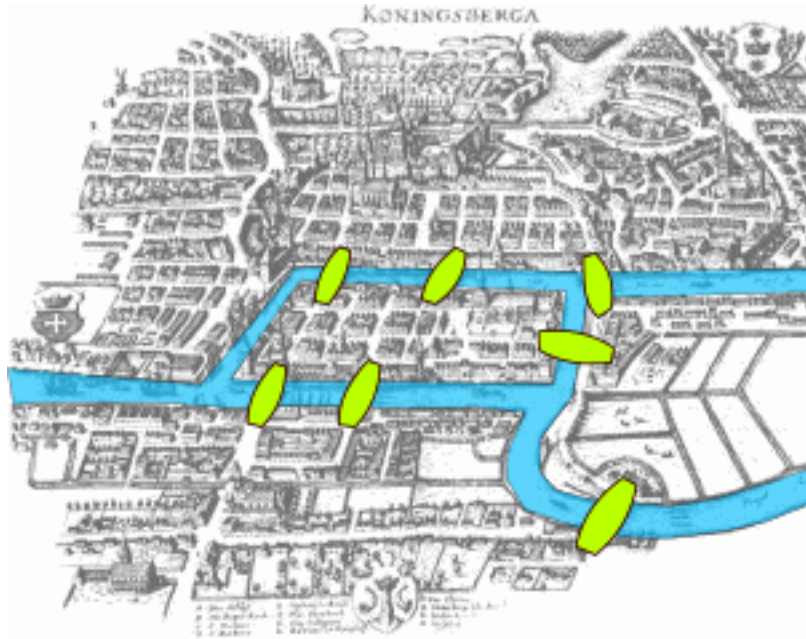
Problem 1: Let's say a figure "can be drawn without lifting or retracing" if it is possible to draw it without lifting your pencil from the paper, and without retracing any lines. You can pass through a point multiple times, as long as you are traveling along a different line each time. For each of the figures below, consider the following questions:

- (1) Can the figure be drawn without lifting or retracing?
- (2) If the figure can be drawn without lifting or retracing, does it matter where you start? How many possible starting (and ending) points are there? Is it possible to start and end at the same point?



Problem 2: Come up with a rule for deciding if a figure can be drawn without lifting or retracing.

Problem 3: Now we'll consider a question that Euler was asked back in the 1700's. In the town of Königsberg, Prussia (now Kaliningrad, Russia) there was a river with two islands in the middle, and seven bridges crossing it, as shown in the picture below. The residents of this town wanted to know if it was possible to design a route that would cross all the bridges exactly once (you can start and end wherever you like). Is this possible?



Problem 4: Is there a connection between the the drawing problem and the bridge problem?