

This chapter introduces a subject called graph theory, which is used to solve many **routing problems**, *i.e.* to find routes for goods or services like mail delivery and trash pick-up.

- **Graph:** Collection of dots (**vertices**) and lines (**edges**) that connect some of the dots.

What is important about a graph is which vertices are connected, not details of how the graph is laid out. For example, we can lay out the bridges-of-Königsberg graph several ways.

- **Adjacent vertices:** Two vertices connected by an edge
- **Adjacent edges:** Two edges sharing a common vertex
- **Multiple edges:** Two edges connecting the same two vertices
- **Degree of a vertex:** Number of edges associated with the vertex
- **Path:** Sequence of vertices with the property that each vertex in the sequence is adjacent to the next one
- **Circuit:** Path that starts and ends at the same point
- **Connected graph:** Graph that has a path between *every* pair of vertices
- **Bridge:** Edge necessary to maintain a connected graph (Erasing a bridge makes a connected graph disconnected.)
- **Loop:** Edge that connects a vertex back to itself
- **Euler path:** Path that passes through *every edge* of a connected graph exactly once
- **Euler circuit:** Circuit that passes through *every edge* of a connected graph exactly once