4.1 Networks

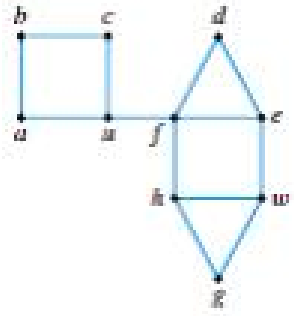
Practice Tasks

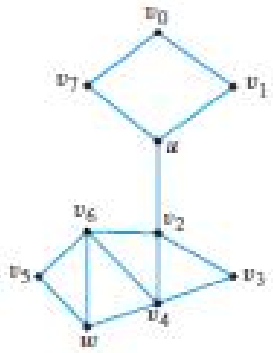
I. Concepts and Procedures

1. A _____ is a set of objects called _____ that are connected together. The connections between them are called _____. In mathematics, networks are often referred to as _____.

2. The route around a graph that visits *every edge once* is called a/an _____ path. A route around a graph that visits *every vertex once* is called a/an _____ path.

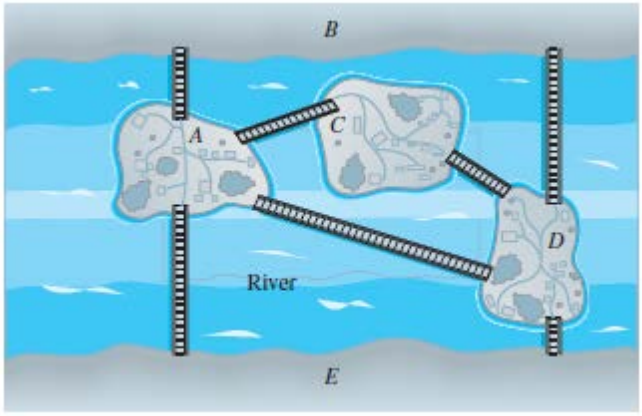
3. Which of the following graphs have Euler paths? If there is an Euler path, find it.



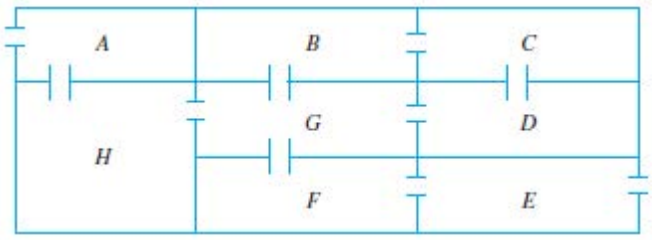


II. Problem Solving

1. Is it possible to take a walk around the city whose map is shown below, starting and ending at the same point and crossing each bridge exactly once? If so, how can this be done?



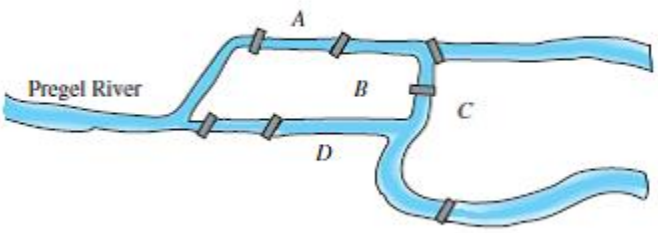
2. The following is a floor plan of a house. Is it possible to enter the house in room *A*, travel through every interior doorway of the house exactly once, and exit out of room *E*? If so, how can this be done?



3. A traveler in Europe wants to visit each of the cities shown on the map exactly once, starting and ending in Brussels. The distance (in kilometers) between each pair of cities is given in the table. Find a path that minimizes the total distance traveled. (Hint: Use the map to narrow the possible circuits down to just a few. Then use the table to find the total distance for each of those.)

	Berlin	Brussels	Düsseldorf	Luxembourg	Munich
Brussels	783				
Düsseldorf	564	223			
Luxembourg	764	219	224		
Munich	585	771	613	517	
Paris	1,057	308	497	375	832

III. Reasoning



1. Where could the people of Konigsberg build a bridge to change the answers?

2. Which bridge could they remove to change the answers?

IV. Modeling

1. Imagine an organization that wants to set up teams of three to work on some projects. In order to maximize the number of people on each team who had previous experience working together successfully, the director asked the members to provide names of their past partners. This information is displayed below in a table. Create a network that models this situation.

Name	Past Partners
Ana	Dan, Flo
Bev	Cai, Flo, Hal
Cai	Bev, Flo
Dan	Ana, Ed
Ed	Dan, Hal
Flo	Cai, Bev, Ana
Gia	Hal
Hal	Gia, Ed, Bev, Ira
Ira	Hal