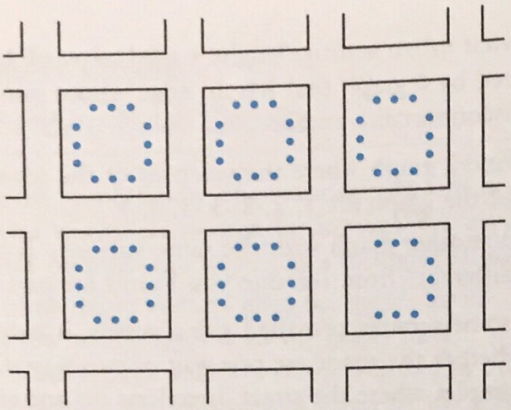
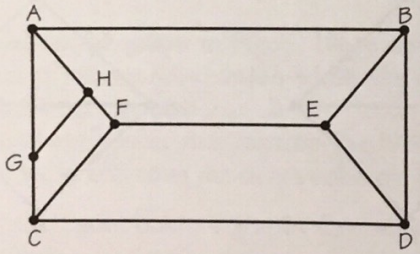
23. For the street network shown below, draw the graph that would be useful for finding an efficient route for checking parking meters. (*Hint:* Notice that not every sidewalk has a meter; see Figure 1.12.)



24. (a) For the street network in Exercise 23, draw a graph that would be useful for routing a garbage truck. Assume that all streets are two-way and that passing once down a street suffices to collect from both sides.

(b) Do the same problem on the assumption that one pass down the street suffices to collect from only one side.

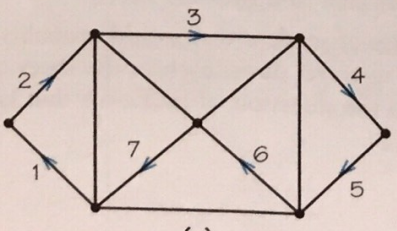
25. (a) In the graph below, find the largest number of paths from A to F that do not have any edges in common.



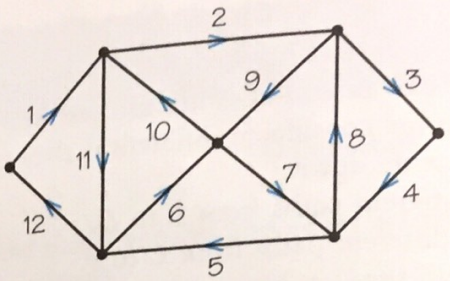
(b) Verify that the largest number of paths with no edges in common between any pair of vertices in this graph is the same.

(c) Why might one want to be able to design graphs such that one can move between two vertices of the graph using paths that have no edges in common?

26. Examine the paths represented by the numbered sequences of edges in both parts of the figure below. Determine whether each path is a circuit. If it is a circuit, determine if it is an Euler circuit.



(*a*)



(*b*)

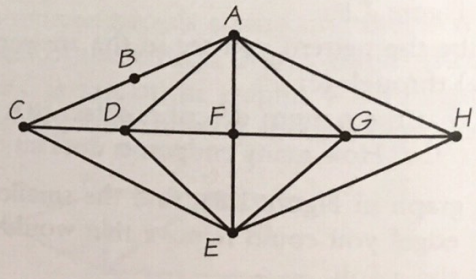
27. In Figure 1.13c, suppose we started an Euler circuit using this sequence of edges: 6, 7, 8, 9 (ignore existing arrows on the edges). What does our guideline for finding Euler circuits tell you *not* to do next?

28. In Figure 1.8b, suppose we started an Euler circuit using this sequence of edges: 14, 13, 8, 1, 4 (ignore existing arrows on the edges). What does our guideline for finding Euler circuits tell you *not* to do next?

29. Find an Euler circuit on the graph of Figure 1.15c (including the blue edges).

30. Find Euler circuits in the right-hand graphs in Figures 1.17a and 1.17b.

31. In the following graph, we see a territory for a parking-control officer that has no Euler circuit. How many sidewalks (edges) need to be omitted in order to enable us to find an Euler circuit? What effect would this have in the associated real-world situation?



32. An Euler circuit visits a four-valent vertex X, such as the one in the accompanying graph, by using the edges AX and XB consecutively, and then using CX and XD consecutively. When this happens, we say that the Euler circuit cuts through at X.