Circuit	Total Distance
ABCDA	185 + 174 + 128 + 238 = 725
ABDCA	185 + 205 + 128 + 300 = 818
ACBDA	300 + 174 + 205 + 238 = 917
ACDBA	300 + 128 + 205 + 185 = 818
ADBCA	238 + 205 + 174 + 300 = 917
ADCBA	238 + 128 + 174 + 185 = 725

The shortest circuit is *ABCDA*, or its reverse, *ADCBA*.

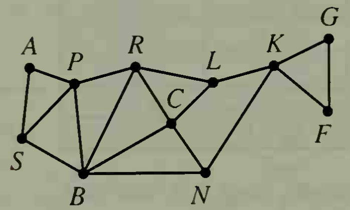
There is no known general rule for deciding when a Hamilton circuit is possible. For a small number of cities, you can use the trial-and-error method as in the Example. For a larger number of cities, a computer can be programmed to use trial and error. For 10 cities, there are $9! = 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 362{,}880$ possible circuits to consider. A computer can check all of these circuits and tell you the shortest one in less than a second. However, with 15 cities, the computation time is about $1\frac{1}{2}$ minutes, and with 20 cities it is almost 4 years! The exercises will help you to understand why even a fast computer will need so much time.

Although the shortest circuit can be found only by testing all circuits, it is possible to get a very good circuit, even though it might not be the shortest, by using the *nearest neighbor algorithm*. With this method, you travel from each city to the nearest city you haven't yet visited. For the traveling salesperson graph, you would go from *A* to *B* to *C* to *D* and back to *A*. This gives a total distance of 725 mi, which in this case *is* the shortest circuit.

Exercises

Tell whether a Hamilton circuit is possible for each graph below. If it is possible, name the vertices in the order visited. (More than one answer may be possible.)

1.



2.