IN DISCRETE MATHEMATICS

Using Discrete Mathematics in the Classroom

Speaking discretely...

by Joseph G. Rosenstein

In the last few years a number of teachers have tried to introduce topics of discrete mathematics into their classrooms. If you are one of these teachers, then this newsletter is designed for you!

We hope to serve as a forum where teachers across the country can share their ideas, their classroom activities and experiences, their successes and failures, and their questions about implementing discrete mathematics in the schools.

We also hope to assist you by informing you about resources on which you can draw. Not too much is available about teaching discrete mathematics in the schools -- although that is changing -- and what there is may be hard for you to locate. We hope to be of some assistance in showing you where to look.

Many of you teach in schools where you are the only one that has become enthusiastic about discrete mathematics, and some of you have had to exercise much patience and perseverance in order to get to teach these topics. This newsletter is intended to provide you with a national network of teachers who have had similar experiences.

Most of you, we hope, have found teaching discrete mathematics rewarding. It provides lots of opportunities to try the student-oriented instructional techniques advocated in the NCTM *Standards*; for example, many discrete mathematics problems (like the Traveling Salesman Problem above) lend themselves readily to experimentation and conjecture, to hands-on activities, and to group learning settings, and have many easily understood applications. We intend to use this newsletter to advocate using discrete mathematics to implement the *Standards*.

Find the shortest route that begins at city A, visits the other four cities and returns to A. Distances between cities are as indicated.

(Solution -- page 8)

In This Issue

Have-you-seen...

by Joseph Malkevitch

... two recent articles in the New York Times and the Wall Street Journal dealing with the Traveling Salesman Problem.

When you use a public phone, you deposit a coin in a box; eventually the coin box fills up and the phone company must have an employee collect the coins. PROBLEM: Given a collection of phone booths to visit, design the most efficient route, visiting each phone booth site once and only once to pick up the coins, and starting and ending at the collector's place of work. See the example in the diagram at the left.
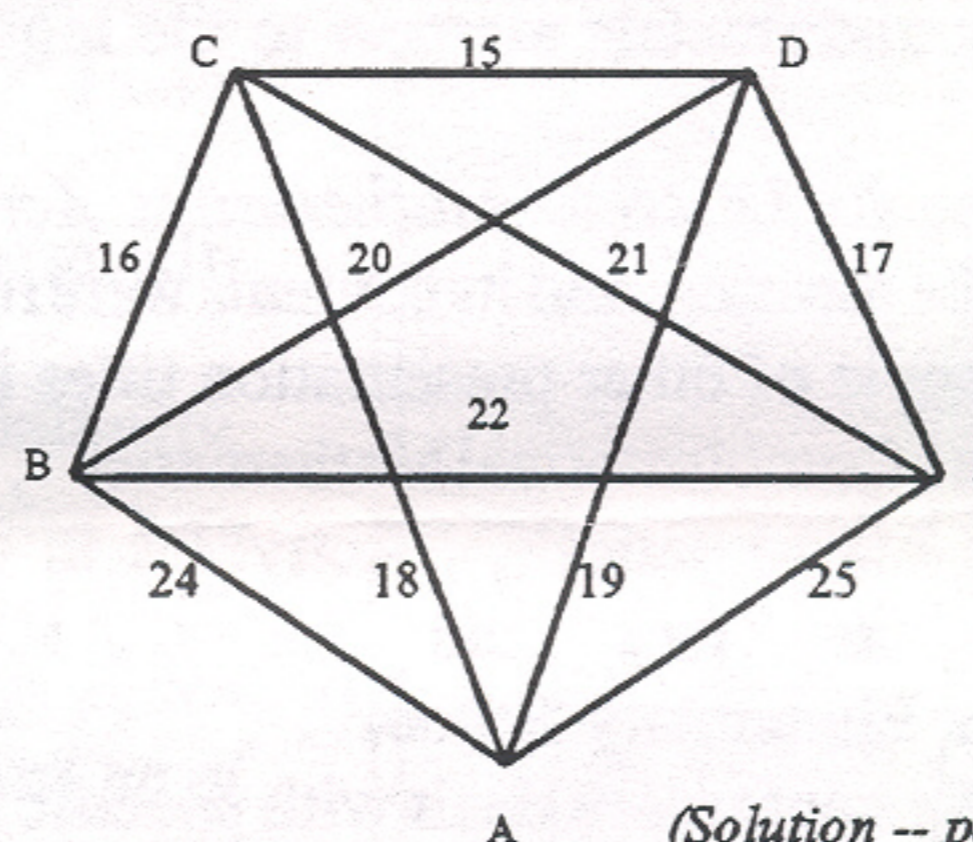
We can abstract the essential features of this situation. We are given a collection of sites which must be visited once and only once, starting and returning to a home base. To go from site i to site j requires the payment of a "cost," $c(i,j)$. Often $c(i,j) = c(j,i)$, but sometimes these two costs are not equal. (For example, in driving, the distance from i to j is usually different from the distance from j to i due to the presence of one way streets.) Thus, there are two versions of the problem to consider, depending on whether or not the cost function is symmetric.

The Traveling Salesman Problem (or TSP, the traditional name for this problem) calls for finding the route used to visit the collection of sites which involves the minimum total cost. The reason for the name is that a salesperson must solve a TSP in order to find the minimum cost of visiting his/her territory. Other situations requiring the solution of a TSP include picking up fish catch from sites where nets have been set, parcel post deliveries, gas meter reader routes, meals-on-wheels routes, picking up kids to take them