

Computer Science Problem of the Month September 2008

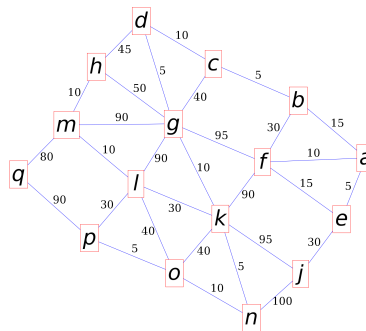
Background

A graph is a set of nodes and a set of edges between those nodes. Graphs have many applications in computer science, especially in the fields of computer networking and database design. The edges of a graph can be represented using triples of the form (source, destination, weight) where *source* and *destination* are nodes in the graph and *weight* is an integer describing the cost to cross that arc. The weight might represent the distance between nodes or the delay between two routers on a network. An alternative representation is a pictorial one in which the nodes are represented by shapes and the edges are represented by lines connecting the shapes.

One important problem in graph theory is that of finding the shortest path between two nodes in a graph. The shortest path is defined to be the path along which the sum of weights is minimal. It is possible for a graph to have two “shortest” paths between the nodes, but this can only occur when the paths are of equal length.

Problem

Find the shortest path from node *a* to node *q* in the graph shown below. You may write a program to do so or you may compute the path by hand, but you must provide a complete justification of your answer as well as the list of nodes through which the shortest path passes.



Solutions

To submit a solution to the problem of the month, e-mail your answer (and a complete, rigorous justification) to robert@narnia.homeunix.com. The first correct student solution will be awarded a cash prize of \$1. Subsequent solutions and solutions by faculty and staff will be recognized on the web site. This problem is also available online at <http://narnia.homeunix.com/~robert/PoTM/>.