Lynchburg Mathathon

Bus Routes

9 - 12th Grade

Lynchburg City Schools needs your help! Bus 21 needs to pick up a student at each of the stops shown, but there are so many roads in Lynchburg and so many different routes to choose from. Can you find the shortest path from EC Glass to every stop and back? The letters indicate the stops, and the numbers mark the distance of each path. Try each of the following four strategies and calculate the total distance traveled by each. Put your findings in the table on page 2.

1. Guess: Use your intuition to connect each dot by a single continuous path, then add up all the distances traveled.
2. Nearest Neighbor: Starting from the school, compare the distance to each of the possible paths to the next immediate stop and take the shorter path. Once at that stop, repeat this process until returning to the school.
3. 2-opt: Find any overlapping paths from the Nearest Neighbor solution and separate them.

For discussion: This is a well known problem studied in the field of graph theory called the traveling salesman problem. There is no known answer, only different heuristics or rules by which to solve the problem.

1. Who found the shortest path? Please send your solution to the LCS Transportation Department.
2. Nearest Neighbor often works well, but for this particular problem, the result is a disaster. In fact if you follow it strictly, you'll just get stuck looping around I,J,H.
3. Could you simply compute the distance of every possible route? How many possible routes are there?
4. Can you think of a better strategy?

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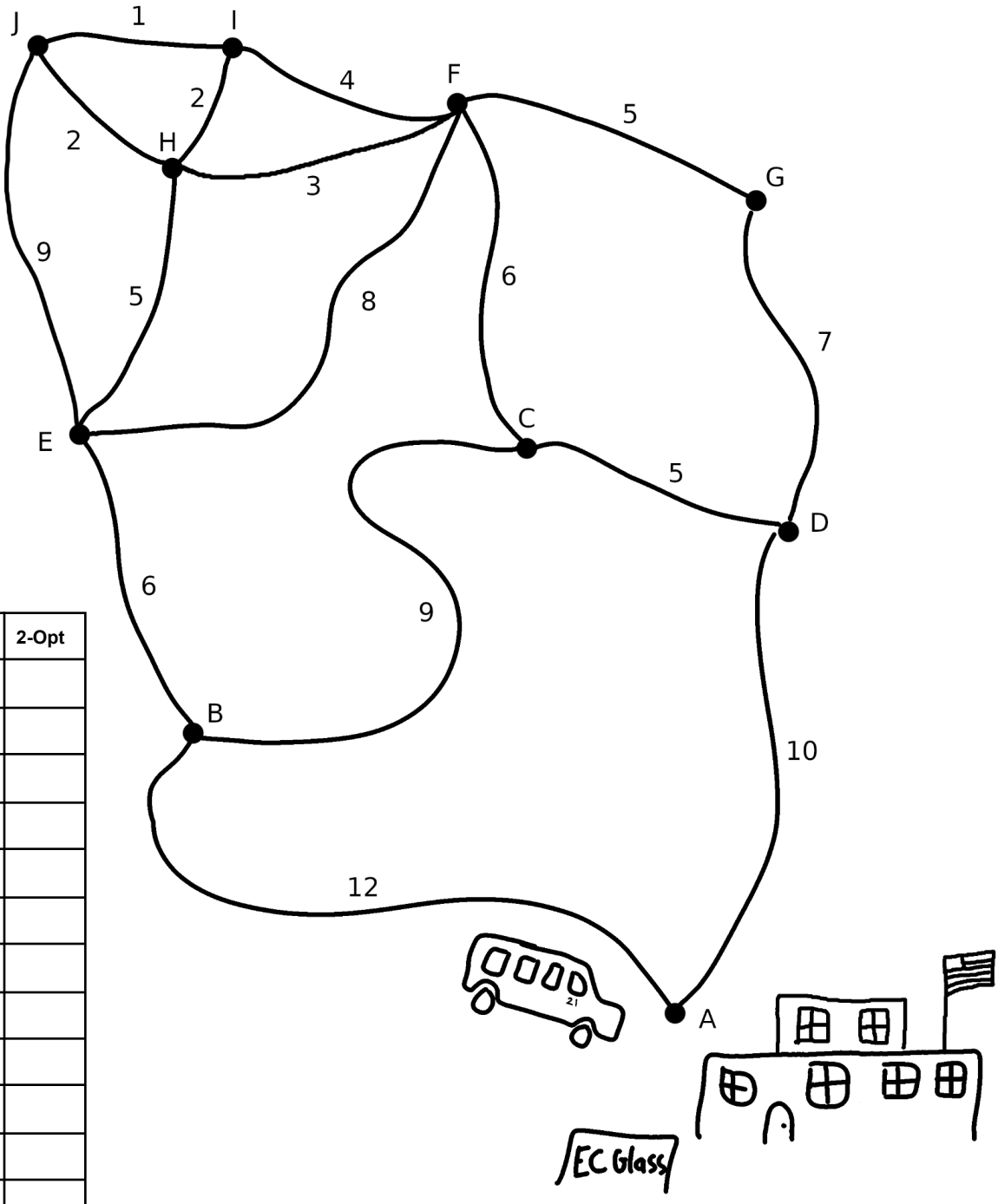
VECTOR SPACE



Path	Guess	NN	2-Opt
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
Total			