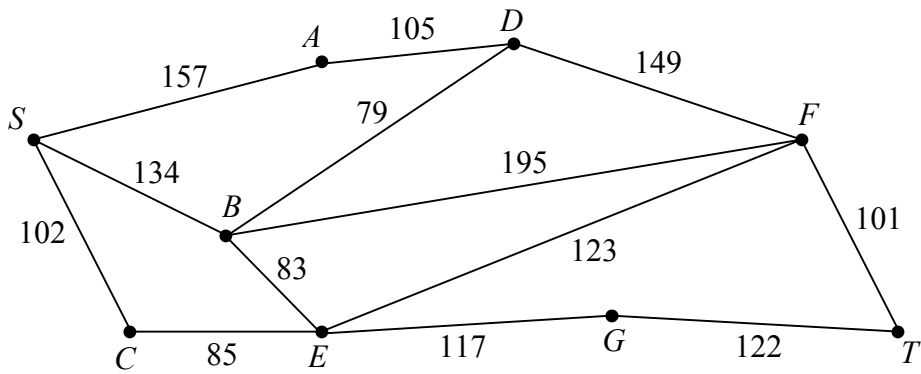


SHORTEST ROUTE PROBLEMS

1)



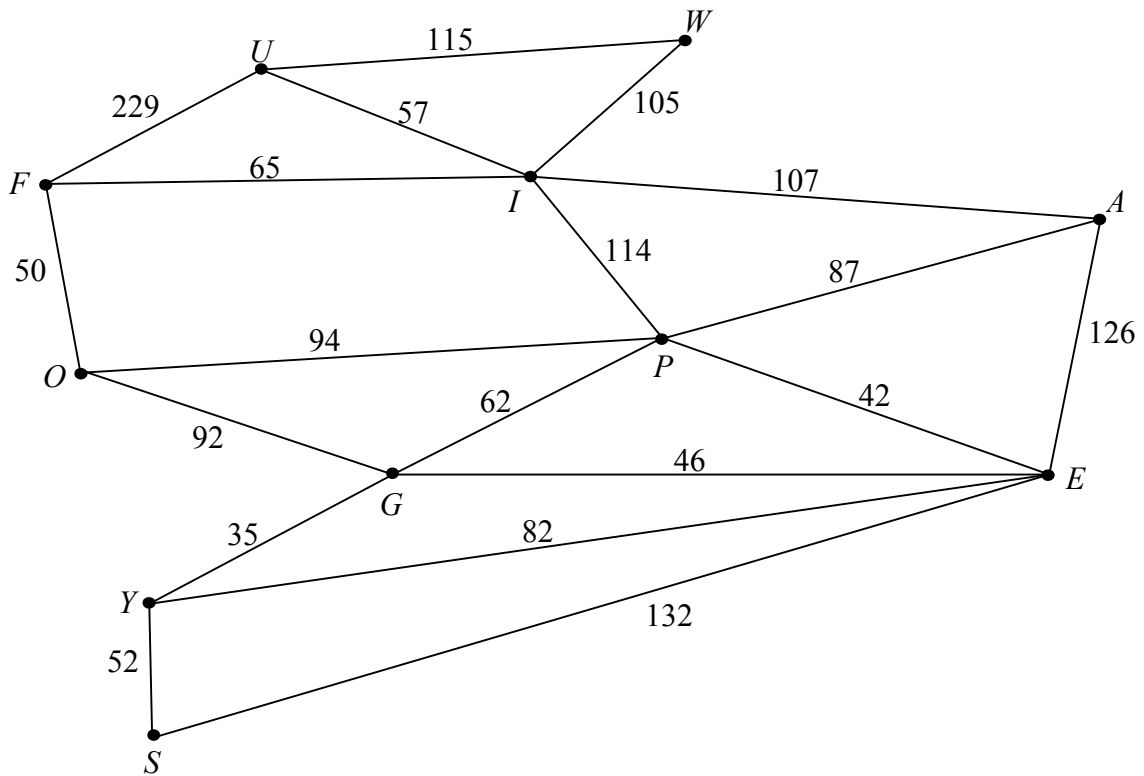
The network above shows the distances, in miles, between nine cities.

a) Use Dijkstra's algorithm to determine the shortest route, and its length, between cities S and T .

You must indicate clearly the order in which the nodes are labelled.

b) Suppose someone wished to travel from S to T but wished to stop off at city D along the way. Explain briefly how you would find the quickest route in this case.

2)

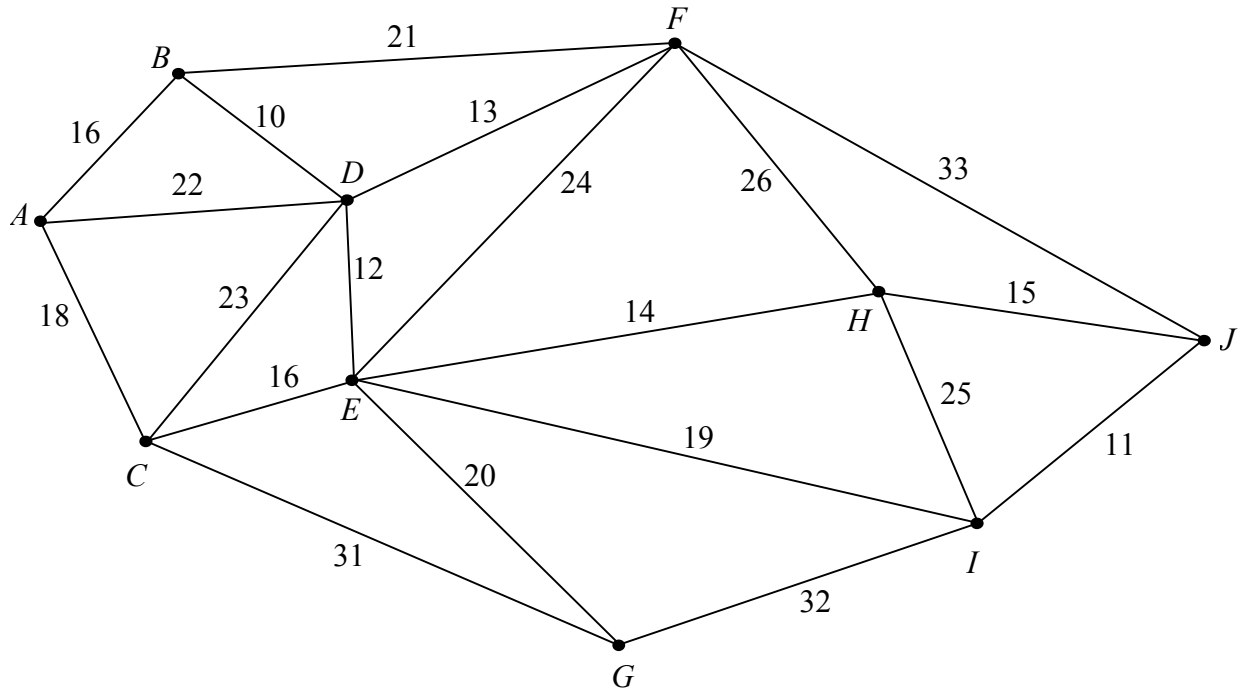


The network above represents the distances, in miles, between eleven places $A, E, F, G, I, O, P, S, U, W$ and Y .

a) Use Dijkstra's algorithm to find the shortest route, and its length, from W to S . You must state clearly the order in which you labelled the vertices

b) Explain how Dijkstra's algorithm could have been used so that the distance from A to S could also have been obtained without further calculation. (You are not required to find this distance.)

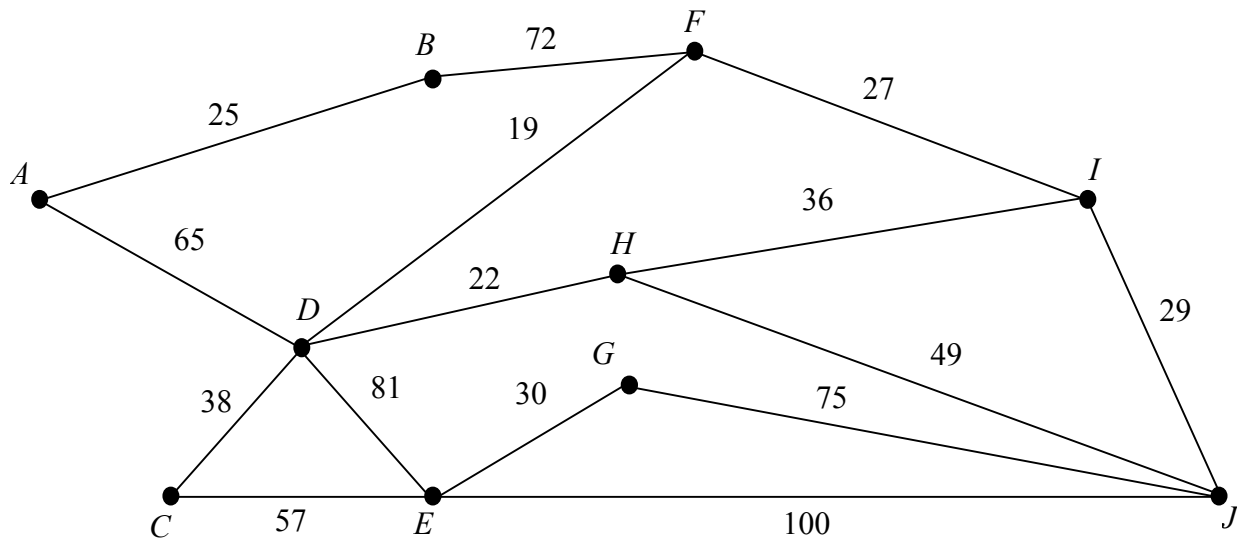
3)



The network above represents the journey time, in minutes, between ten Midland towns.

- Use Dijkstra's algorithm to find a quickest route between A and J . Your solution must indicate clearly how you applied the algorithm, including the order in which the vertices were labelled.
- Is the route you have found the only quickest route? Give a reason for your answer.

4)



The network above represents the journey time, in minutes, between ten Yorkshire towns.

- Use Dijkstra's algorithm to find a quickest route between A and J . Your solution must indicate clearly how you applied the algorithm, including the order in which the vertices were labelled.
- Is the route you have found the only quickest route? Give a reason for your answer.

ANSWERS.

- 1)
 - a) *SCEFT*, length = 411 miles.
 - b) Use Dijkstra's algorithm between *S* and *D* and then again between *D* and *T*.

- 2)
 - a) Shortest route = *WIPGYS*; length = 368 miles.
 - b) Start from *S*.

- 3)
 - a) Quickest route takes 63 minutes. *AC* (or *D*) *EHJ*.
 - b) No. Whilst *backtracking* through the network, it is apparent that there are two possible routes.