Pearson Edexcel AS Further Mathematics 8FM0

Decision 1 – 2 AlgorithmsOnGraphs 1

Time allowed: 45 **minutes**

School: www.CasperYC.club

Name:

Teacher:

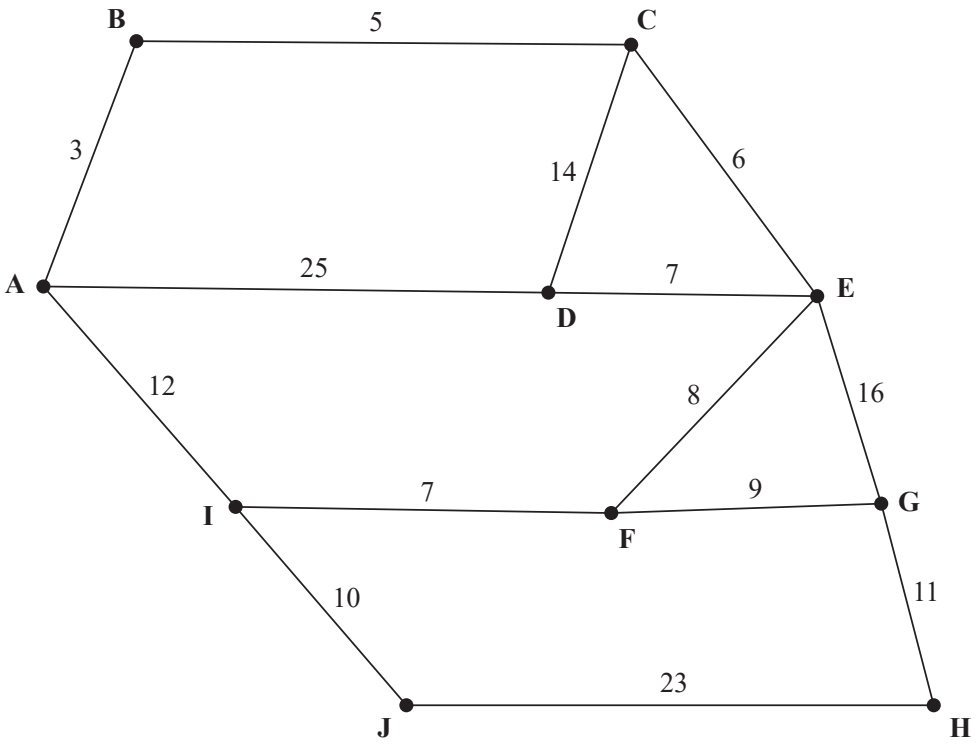
Question	Points	Score
1	9	
2	10	
3	10	
4	11	
Total:	40	

How I can achieve better:

-
-
-

Last updated: February 3, 2026

1. Figure below represents a network of roads. The number on each arc represents the time taken, in minutes, to drive along the corresponding road.



(a) i. Use Dijkstra's algorithm to find the shortest time needed to travel from **A** to **H**. [6]

ii. State the quickest route.

For a network with n vertices, Dijkstra's algorithm has order n^2.

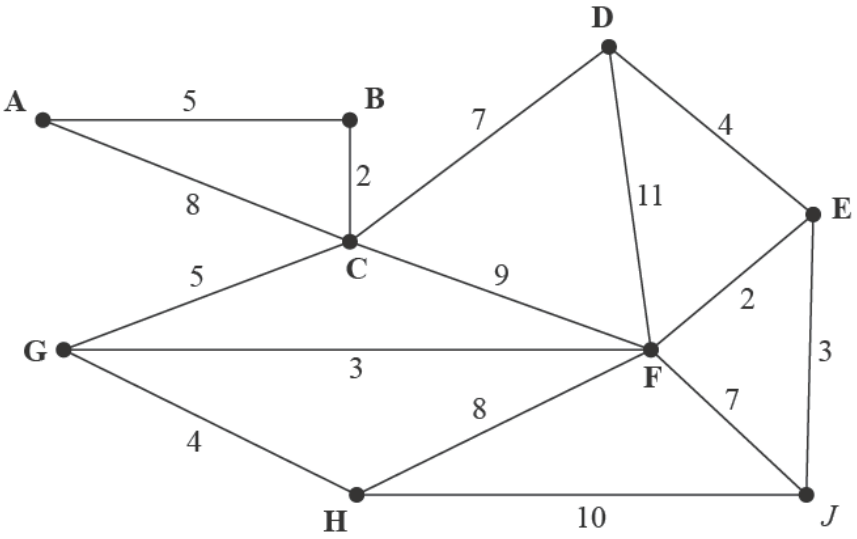
(b) If it takes 1.5 seconds to run the algorithm when $n = 250$, calculate approximately how long it will take, in seconds, to run the algorithm when $n = 9500$. You should make your method and working clear. [2]

(c) Explain why your answer to part (b) is only an approximation. [1]

Total: 9

(Q1 continued . . .)

2. The weights on the arcs in Figure below represent distances.



(a) i. Use Dijkstra's algorithm to find the shortest path from A to J. [5]

ii. State the length of the shortest path from A to J.

An arc of weight 6 is added to the network between nodes C and H. An inspection route of minimum length that traverses each arc at least once needs to be found. The inspection route must start and finish at vertex A.

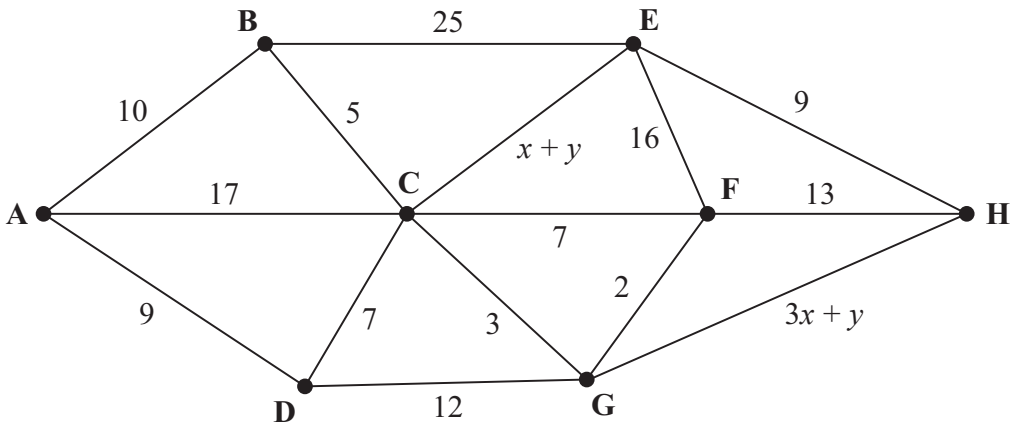
(b) Use an appropriate algorithm to find the arcs that will need to be traversed twice. You must make your method and working clear. [4]

(c) Determine the length of the inspection route. [1]

Total: 10

(Q2 continued . . .)

3. [The total weight of the network is $135 + 4x + 2y$.]



The weights on the arcs in Figure above represent distances. The weights on the arcs **CE** and **GH** are given in terms of x and y, where x and y are positive constants and $7 < x + y < 20$. There are three paths from **A** to **H** that have the same minimum length.

(a) Use Dijkstra's algorithm to find x and y. [7]

An inspection route starting at **A** and finishing at **H** is found. The route traverses each arc at least once and is of minimum length.

(b) State the arcs that are traversed twice. [1]

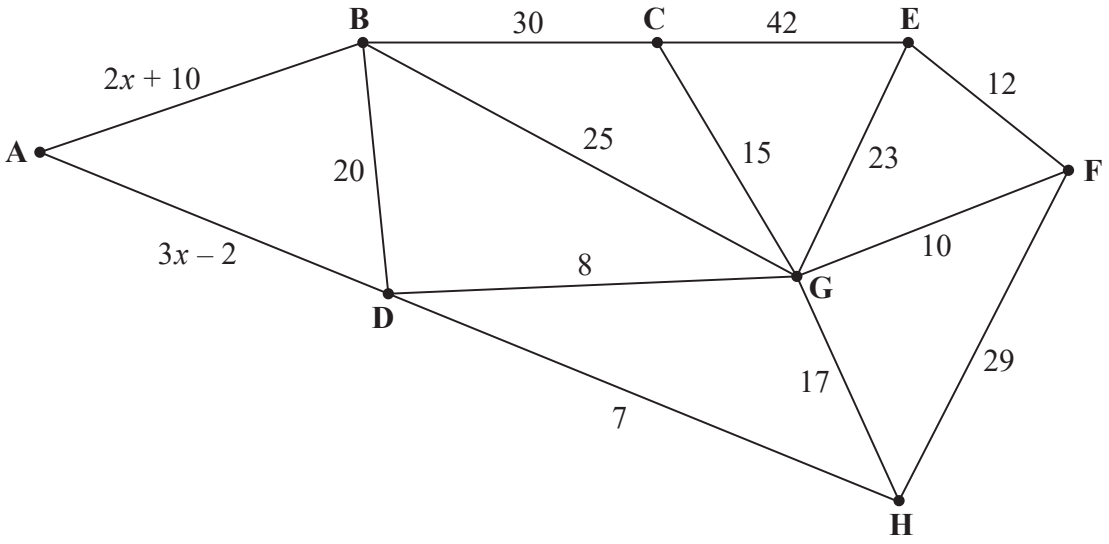
(c) State the number of times that vertex **C** appears in the inspection route. [1]

(d) Determine the length of the inspection route. [1]

Total: 10

(Q3 continued . . .)

4. [The total weight of the network is $5x + 246$]



(a) Explain why it is not possible to draw a graph with an odd number of vertices of odd valency. [2]

Figure above represents a network of 14 roads in a town. The expression on each arc gives the time, in minutes, to travel along the corresponding road. Prim's algorithm, starting at A, is applied to the network. The order in which the arcs are selected is AD, DH, DG, FG, EF, CG, BD.

It is given that the order in which the arcs are selected is unique.

(b) Using this information, find the smallest possible range of values for x, showing your working clearly. [3]

A route that minimises the total time taken to traverse each road at least once is required. The route must start and finish at the same vertex.

Given that the time taken to traverse this route is 318 minutes,

(c) use an appropriate algorithm to determine the value of x, showing your working clearly. [6]

Total: 11

(Q4 continued . . .)