

Write your name here

Surname	Other names
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Pearson Centre Number Candidate Number

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AS and A level Further Mathematics
Decision Mathematics 1

Practice Paper
Dijkstra and Floyd

<p>You must have: Mathematical Formulae and Statistical Tables (Pink)</p>	<p>Total Marks</p>
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Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
- There are 9 questions in this question paper. The total mark for this paper is 82.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1.

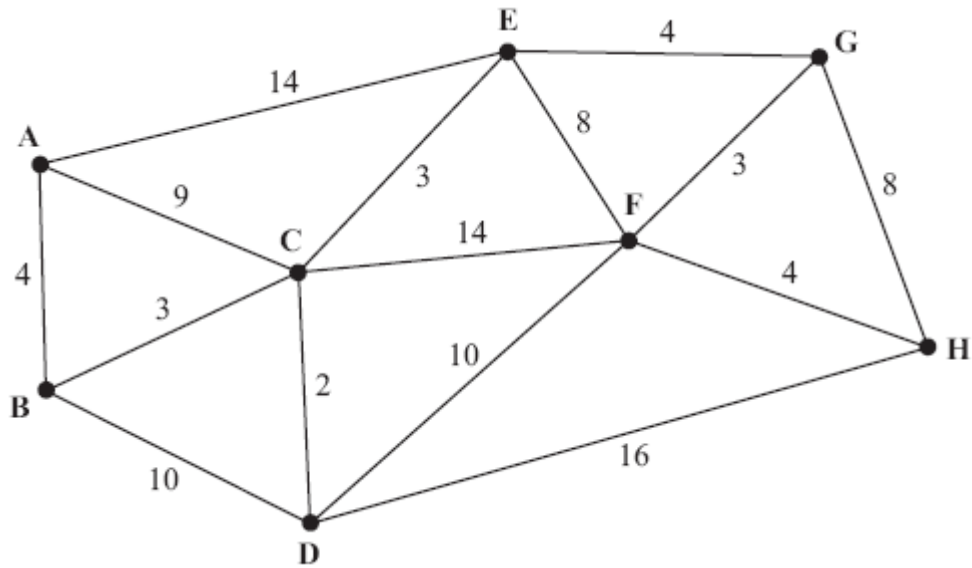


Figure 1

Figure 1 shows a network of roads between eight villages, **A**, **B**, **C**, **D**, **E**, **F**, **G** and **H**. The number on each arc gives the length, in miles, of the corresponding road.

- (a) Use Dijkstra's algorithm to find the shortest distance from **A** to **H**. (5)
- (b) State your shortest route. (1)
- (c) Write down the shortest route from **H** to **C** and state its length. (2)

(Total 8 marks)

2.

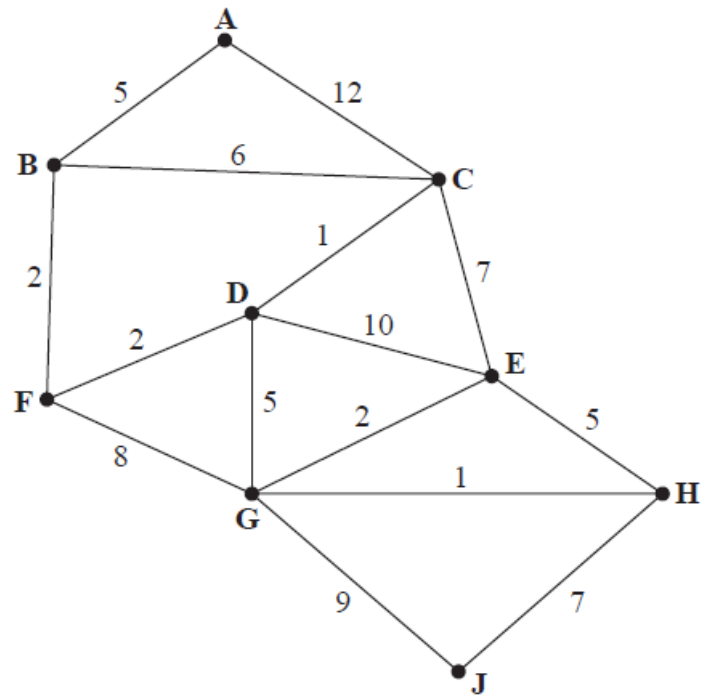


Figure 2

Figure 2 represents a network of roads. The number on each arc is the length, in km, of the corresponding road.

- (a) Use Dijkstra's algorithm to find the shortest route from **A** to **J**. State the shortest route and its length. (6)

- (b) Explain how you determined the shortest route from your labelled diagram. (2)

- (c) Find the shortest route from **A** to **J** via **E** and state its length. (2)

(Total 10 marks)

3.

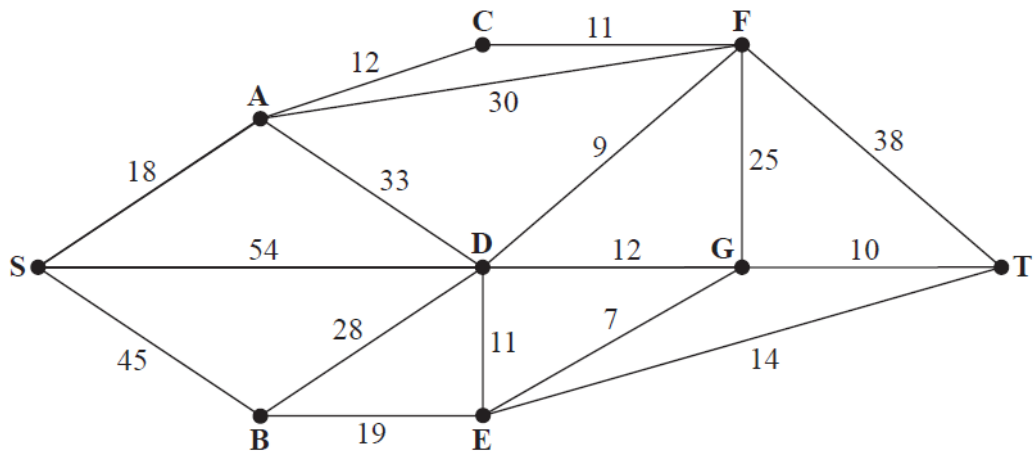


Figure 3

Figure 3 represents a network of roads. The number on each arc represents the time taken, in minutes, to traverse each road.

- (a) Use Dijkstra's algorithm to find the quickest route from S to T. State your quickest route and the time taken. (6)

It is now necessary to include E in the route.

- (b) Determine the effect that this will have on the time taken for the journey. You must state your new quickest route and the time it takes. (3)

(Total 9 marks)

4.

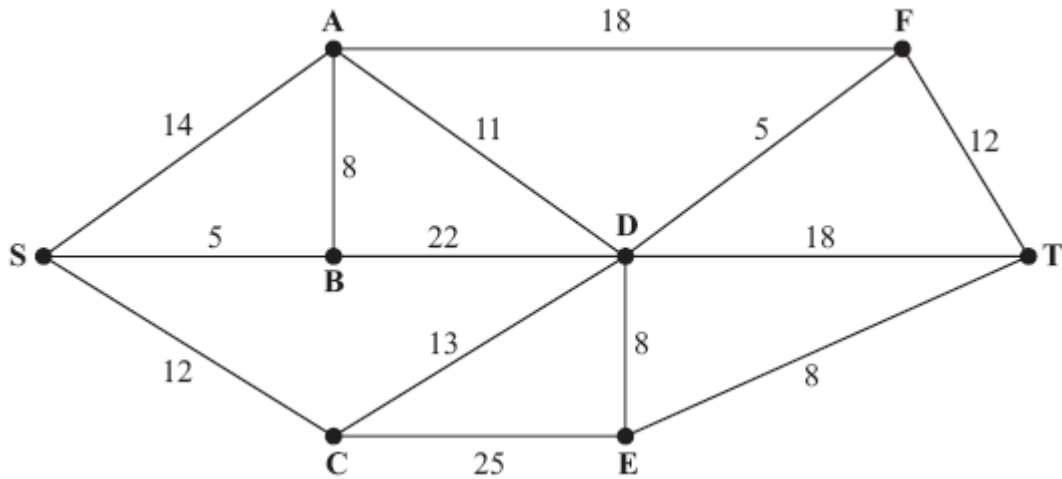


Figure 4

- (a) Explain what is meant, in a network, by the term **path**. (2)

Figure 4 represents a network of canals. The number on each arc represents the length, in miles, of the corresponding canal.

- (b) Use Dijkstra's algorithm to find the shortest path from **S** to **T**. State your path and its length. (6)
- (c) Write down the length of the shortest path from **S** to **F**. (1)

Next week the canal represented by arc **AB** will be closed for dredging.

- (d) Find a shortest path from **S** to **T** avoiding **AB** and state its length. (2)

(Total 11 marks)

5.

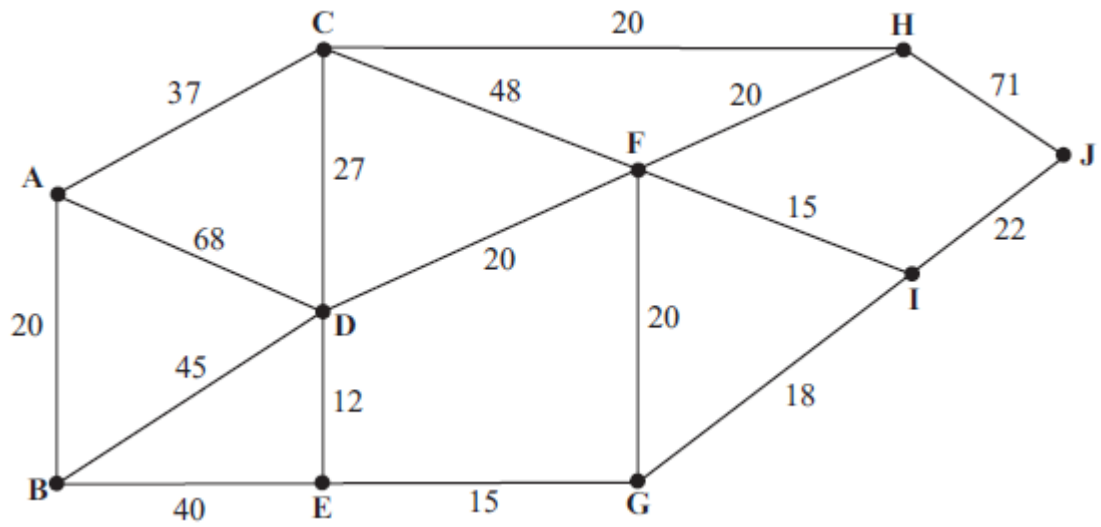


Figure 5

Figure 5 models a network of roads. The number on each edge gives the time, in minutes, taken to travel along that road. Olivia wishes to travel from **A** to **J** as quickly as possible.

- (a) Use Dijkstra's algorithm to find the shortest time needed to travel from **A** to **J**. State the shortest route. (7)

On a particular day Olivia must include **G** in her route.

- (b) Find a route of minimal time from **A** to **J** that includes **G**, and state its length (2)

(Total 9 marks)

6.

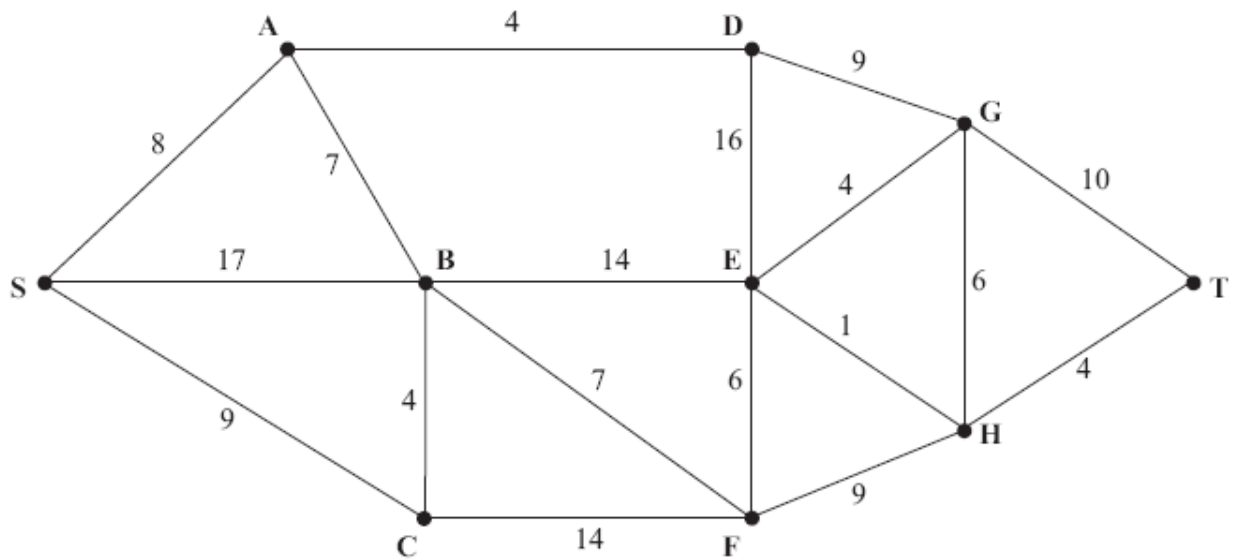


Figure 6

Figure 6 represents a network of roads. The number on each arc represents the length, in miles, of the corresponding road. Liz wishes to travel from **S** to **T**.

(a) Use Dijkstra's algorithm to find the shortest path from **S** to **T**. State your path and its length.

(6)

On a particular day, Liz must include **F** in her route.

(b) Find the shortest path from **S** to **T** that includes **F**, and state its length.

(2)

(Total 8 marks)

7.

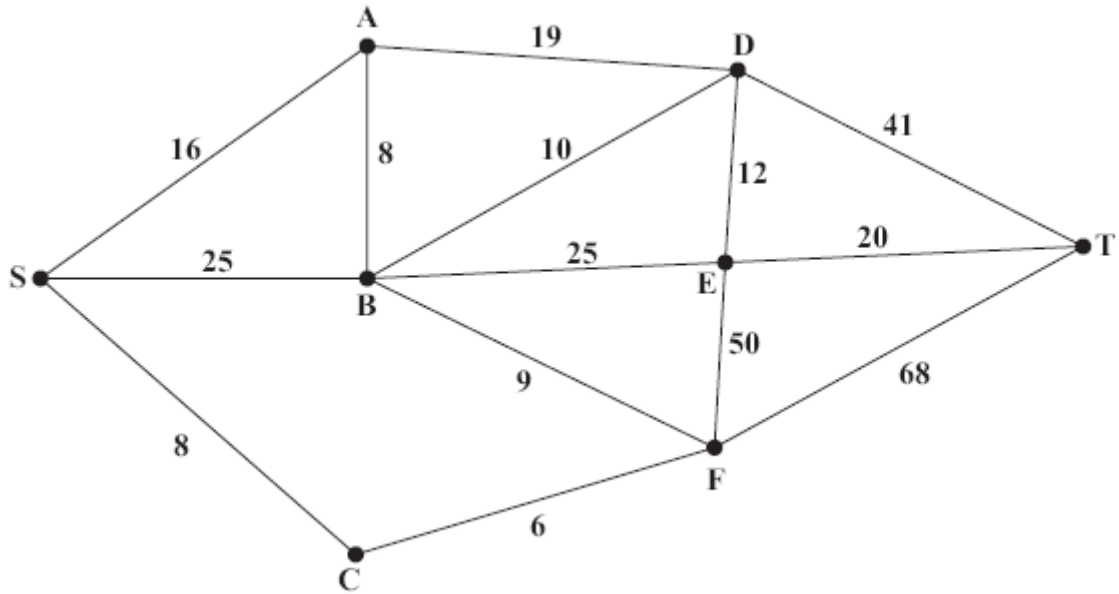


Figure 7

Figure 4 shows a network of roads. The number on each arc represents the length, in miles, of the corresponding road.

- (a) Use Dijkstra's algorithm to find the shortest route from **S** to **T**. State your shortest route and its length. (6)
- (b) Explain how you determined your shortest route from your labelled diagram. (2)

Due to flooding, the roads in and out of **D** are closed.

- (c) Find the shortest route from **S** to **T** avoiding **D**. State your shortest route and its length. (2)
- (Total 10 marks)**
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8.

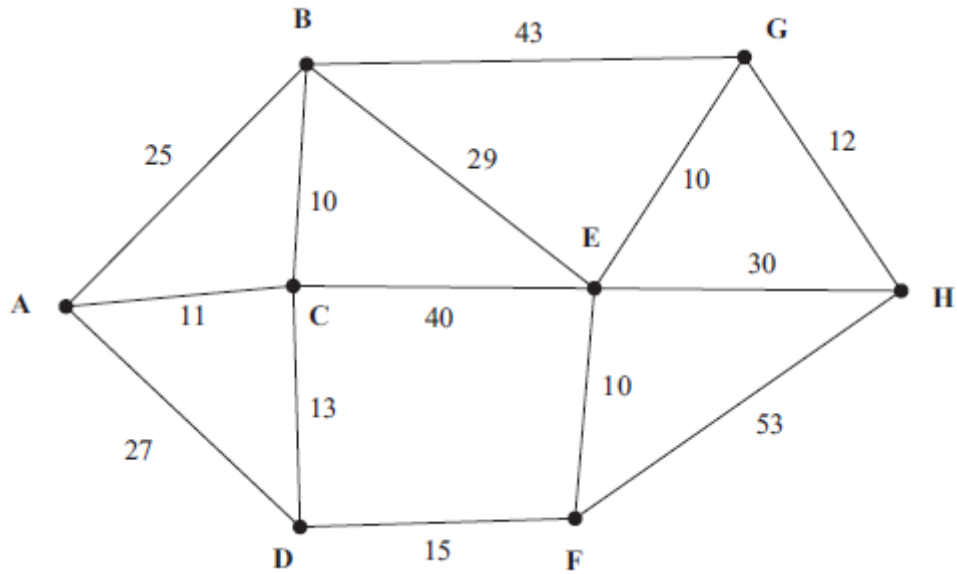


Figure 8

Figure 8 shows a network of cycle tracks. The number on each arc gives the length, in km, of that track.

- (a) Use Dijkstra's algorithm to find the shortest route from **A** to **H**. State your shortest route and its length. (6)
- (b) Explain how you determined your shortest route from your labelled diagram. (2)

The track between **E** and **F** is now closed for resurfacing and cannot be used.

- (c) Find the shortest route from **A** to **H** and state its length. (2)

(Total 10 marks)

9.

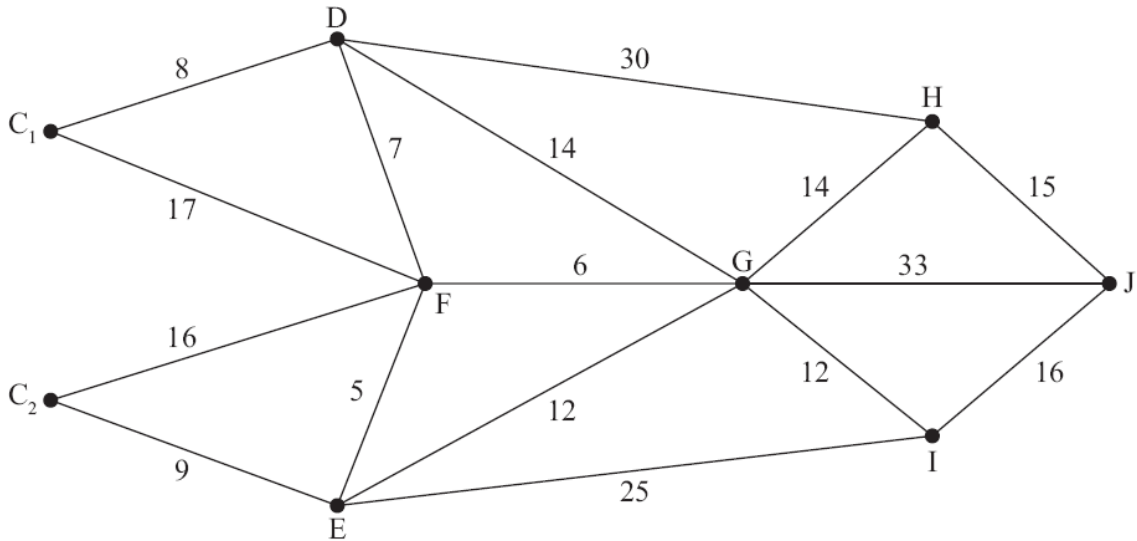


Figure 9

Figure 9 represents a network of roads. The number on each arc represents the length, in miles, of the corresponding road. A large crane is required at J and it may be transported from either C_1 or C_2 . A route of minimum length is required.

It is decided to use Dijkstra's algorithm to find the shortest routes between C_1 and J and between C_2 and J.

(a) Explain why J, rather than C_1 or C_2 , should be chosen as the starting vertex. (1)

(b) Use Dijkstra's algorithm to find the shortest route needed to transport the crane. State your route and its length. (6)

(Total 7 marks)

TOTAL FOR PAPER: 82 MARKS