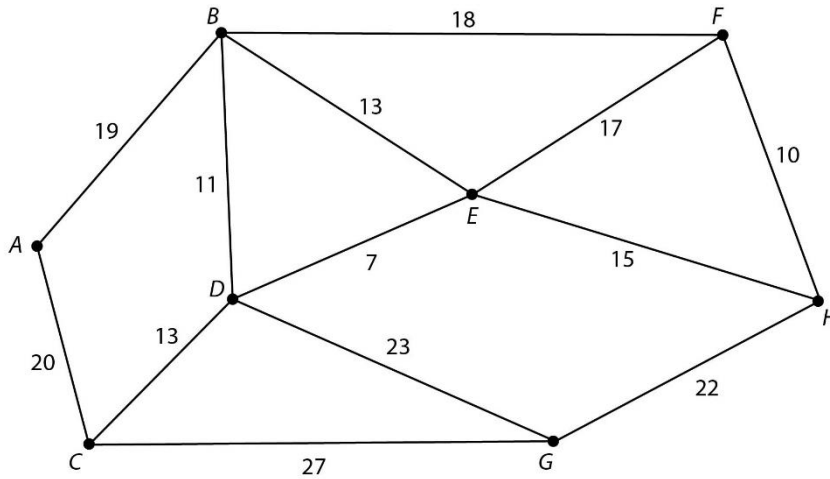


Decision Mathematics 1 Unit Test 2: Algorithms on graphs I

- 1 a Define the term *minimum spanning tree*. (1 mark)
- b State two differences between Kruskal's algorithm and Prim's algorithm, to find a minimum spanning tree. (2 marks)

2

Figure 1



- a Complete Matrix 1 to represent the network shown in Figure 1. (2 marks)

	A	B	C	D	E	F	G	H
A								
B								
C								
D								
E								
F								
G								
H								

- b Starting at A, use Prim's algorithm and your completed Matrix 1 to find a minimum spanning tree.

Clearly state the order in which you selected the arcs for your tree.

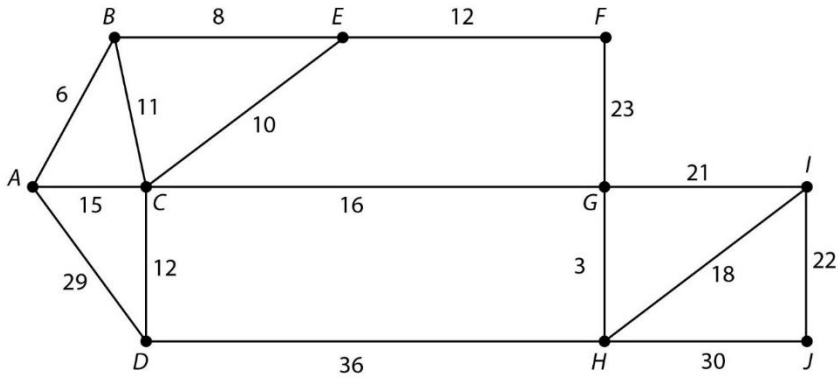
State the weight of the minimum spanning tree.

(4 marks)

- 3** The network in Figure 2 shows a plan of possible paths to be built between buildings in a school. The numbers on each arc are lengths in metres.

The paths are to form a network along the arcs, using the least possible length.

Figure 2



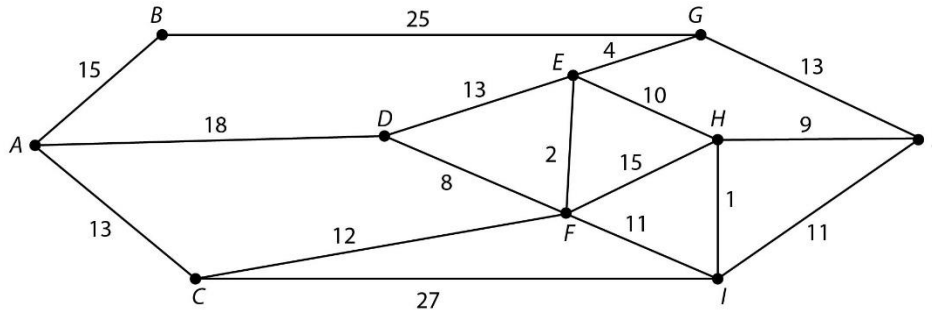
- a** Find a minimum spanning tree for the network, showing clearly the order in which you selected the arcs for your tree using
- i** Kruskal's algorithm **(3 marks)**
 - ii** Prim's algorithm, starting from A. **(3 marks)**

Footpaths have already been built along AD and AB and so should be included in the spanning tree.

- b** Explain which algorithm you would choose to complete the tree, and how the method should be adapted. (You do **not** have to find the tree.) **(2 marks)**

- 4 Figure 3 shows a network of roads between towns. The number on each arc represents the length of the road in km.

Figure 3



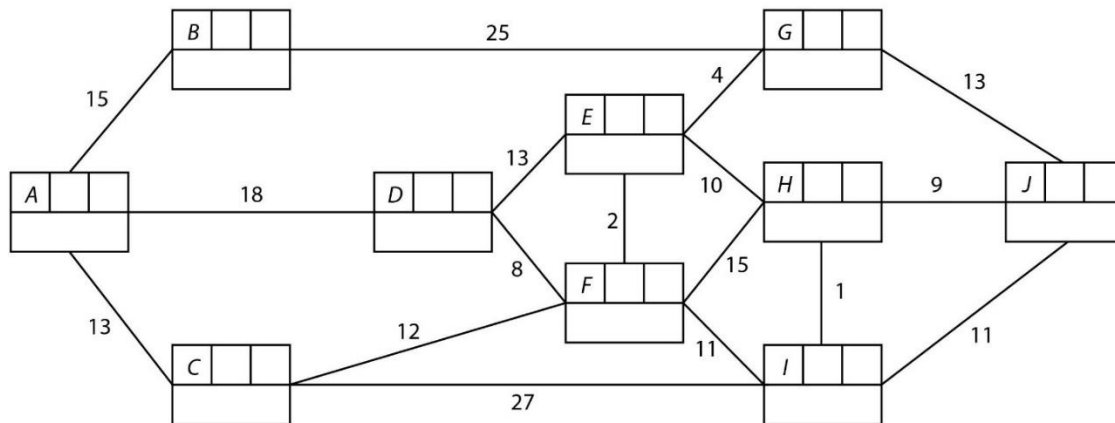
Shiv lives in town *A* and works in town *J*.

- a Complete Figure 4 using Dijkstra's algorithm to find the shortest route from *A* to *J*.

State your shortest route and its length.

(6 marks)

Figure 4



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

The route from *C* to *F* will be closed for repairs on Wednesday.

- c Find the shortest route for Shiv from *A* to *J* avoiding *CF* and state its length. **(3 marks)**

- d On another day, Shiv needs to collect her dry-cleaning from town, *I*, on her way to *J*.

Find the shortest route that includes *I* and state its length.

(2 marks)