AQA Computer Science A-Level
4.2.4 Graphs
Past Paper Questions

10   A graph can be drawn to represent a maze. In such a graph, each graph vertex represents one of the following:

- the entrance to or exit from the maze
- a place where more than one path can be taken
- a dead end.

Edges connect the vertices according to the paths in the maze.

Figure 6 shows a maze and **Figure 7** shows one possible representation of this maze. Position 1 in **Figure 6** corresponds to vertex 1 in **Figure 7** and is the entrance to the maze. Position 7 in **Figure 6** is the exit to the maze and corresponds to vertex 7. Dead ends have been represented by the symbol ⊣ in **Figure 7**.

Figure 8 shows a simplified undirected graph of this maze with dead ends omitted.
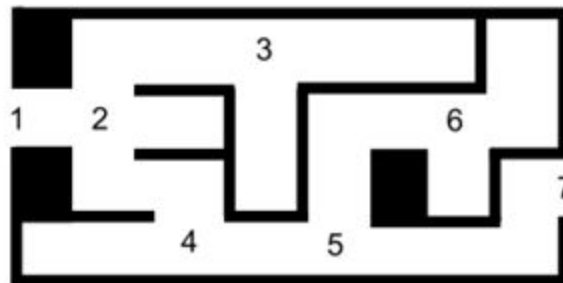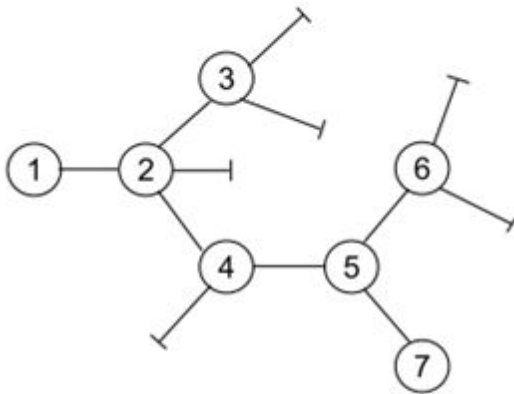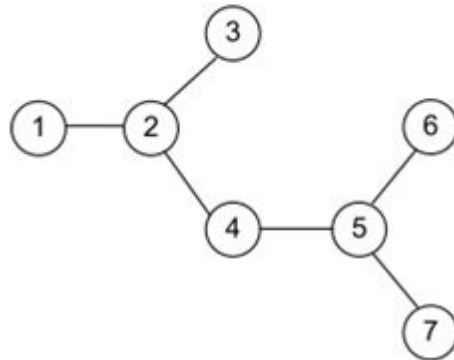
Figure 6

Figure 7

Representation of maze
including dead ends

Figure 8

Graph representing maze
with dead ends omitted

10 (c) Complete the table below to show how the graph in **Figure 8** would be stored using an adjacency matrix.

|						

(2 marks)

| 0 | 3 | The Cat transportation company (CTC) is a business that specialises in preparing cats for cat shows.

They need to take five cats to the AQA cat show. They will transport the cats in their van. CTC owns only one van.

They cannot put all the cats in their van at the same time because some of the cats get stressed when in the company of some of the other cats. The cats would not therefore arrive in top condition for the cat show if they were all in the van at the same time.

The graph in **Figure 3** shows the relationships between the five cats (labelled 1 to 5). If there is an edge between two cats in the graph then they **cannot** travel in the van together at the same time.

Figure 3
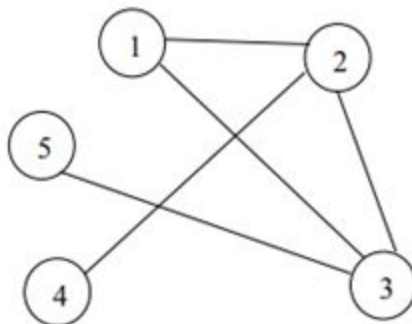
| 0 | 3 | . | 1 | Explain why the graph in **Figure 3** is **not** a tree.

[1 mark]

| 0 | 3 | . | 2 | Represent the graph shown in **Figure 3** as an adjacency list by completing **Table 3**.

Complete **Table 3** and copy the table into the Electronic Answer Document.

[2 marks]

Table 3

Vertex (in Figure 3)	Adjacent vertices
1	
2	
3	
4	
5	

Table 4 shows how the graph in **Figure 3** can be represented as an adjacency matrix.

Table 4

Vertex (in Figure 3)	1	2	3	4	5
1	0	1	1	0	0
2	1	0	1	1	0
3	1	1	0	0	1
4	0	1	0	0	0
5	0	0	1	0	0

| 0 | 3 | . | 3 | Explain the circumstances in which it is more appropriate to represent a graph using an adjacency list instead of an adjacency matrix.

[2 marks]