0 1 . 1 For each of the statements in **Table 2**, complete each row to indicate if the statement is true or false for Dijkstra's algorithm.

Table 2

	True or False?
Calculates the shortest path between a node and other nodes in a graph.	
Can be used to prove that the Halting Problem cannot be solved.	
Can be used with both directed and undirected graphs.	
Can be used with both weighted and unweighted graphs.	

Copy the contents of the unshaded cells in **Table 2** into the table in your Electronic Answer Document.

[2 marks]

Figure 3 shows a subroutine represented using pseudo-code. The subroutine makes use of an array `Visited` and an array `ConnectedNodes` that stores a graph represented as an adjacency list.

Figure 3

```
FUNCTION G(V, P)
  Visited[V] ← True
  FOR EACH N IN ConnectedNodes[V]
    IF Visited[N] = False THEN
      IF G(N, V) = True THEN
        RETURN True
      ENDIF
    ELSE IF N ≠ P THEN
      RETURN True
    ENDIF
  ENDFOR
  RETURN False
ENDFUNCTION
```

0 1 . 2 The subroutine `G` uses recursion.

Explain what is meant by a recursive subroutine.

[1 mark]

Figure 3 (repeated)

```
FUNCTION G(V, P)
  Visited[V] ← True
  FOR EACH N IN ConnectedNodes[V]
    IF Visited[N] = False THEN
      IF G(N, V) = True THEN
        RETURN True
      ENDIF
    ELSE IF N ≠ P THEN
      RETURN True
    ENDIF
  ENDFOR
  RETURN False
ENDFUNCTION
```

Figure 4 shows a subroutine represented using pseudo-code. The subroutine makes use of the array `Visited`.

Figure 4

```
FUNCTION F()
  FOR Count ← 0 TO LENGTH(Visited) - 1
    IF Visited[Count] = False THEN
      RETURN False
    ENDIF
  ENDFOR
  RETURN True
ENDFUNCTION
```

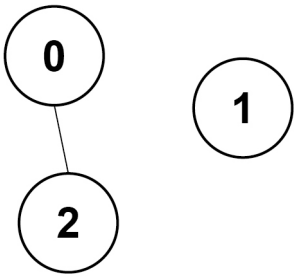
Figure 5 shows a subroutine represented using pseudo-code. The subroutine makes use of the subroutine `G` shown in **Figure 3**, the subroutine `F` shown in **Figure 4** and the array `Visited`.

Figure 5

```
FUNCTION E()
  Set all elements of Visited to False
  IF G(0, -1) = True THEN
    RETURN False
  ELSE
    RETURN F()
  ENDIF
ENDFUNCTION
```

Figure 6 shows a graph consisting of three nodes, the contents of the array `ConnectedNodes` when it is used to represent this graph, and the contents of the array `Visited` after the subroutine call `G(0, -1)`.

Figure 6



ConnectedNodes

[0]	[1]	[2]
2		0

Visited

[0]	[1]	[2]
True	False	True

0 1 . 3 Complete the unshaded cells in **Table 3** to show the result of the subroutine call `F()` when it is applied using the graph shown in **Figure 6**.

Table 3

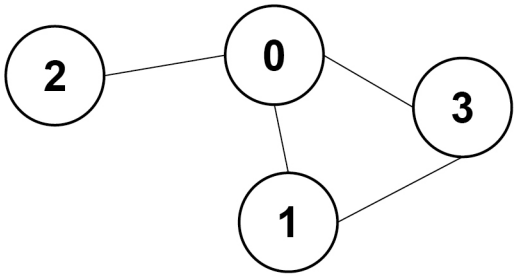
Count	Value returned

Copy the contents of the unshaded cells in **Table 3** into the table in your Electronic Answer Document.

[2 marks]

Figure 7 shows a graph consisting of four nodes and the contents of the array `ConnectedNodes` when it is used to represent this graph.

Figure 7



ConnectedNodes

[0]	[1]	[2]	[3]
1,2,3	0,3	0	0,1

0 1 . 4 Complete the unshaded cells in **Table 4** to show how the graph in **Figure 7** would be represented as an adjacency matrix.

Table 4

	0	1	2	3
0				
1				
2				
3				

Copy the contents of the unshaded cells in **Table 4** into the table in your Electronic Answer Document.

[1 mark]

Figure 3 (repeated)

```
FUNCTION G(V, P)
  Visited[V] ← True
  FOR EACH N IN ConnectedNodes[V]
    IF Visited[N] = False THEN
      IF G(N, V) = True THEN
        RETURN True
      ENDIF
    ELSE IF N ≠ P THEN
      RETURN True
    ENDIF
  ENDFOR
  RETURN False
ENDFUNCTION
```

0 1 . 5 Complete the unshaded cells in **Table 5** to show the result of the subroutine call `G(0, -1)` on the graph shown in **Figure 7**. Some parts of the table, including the initial values in the `Visited` array, have been completed for you.

Table 5

			Visited				
Subroutine call	**V**	**P**	**[0]**	**[1]**	**[2]**	**[3]**	**N**
			False	False	False	False	
G(0, -1)							
Final value returned:							

Copy the contents of the unshaded cells in **Table 5** into the table in your Electronic Answer Document.

[6 marks]

0 1 . 6 What is the purpose of the subroutine `G`?

[1 mark]

0 1 . 7 State the type of graph traversal used in subroutine `G`.

[1 mark]

0 1 . 8 If the graph represented by `ConnectedNodes` is undirected, what can you determine about the graph when a value of `True` is returned by subroutine `E`?

[1 mark]