

NAME:..... DATE:.....

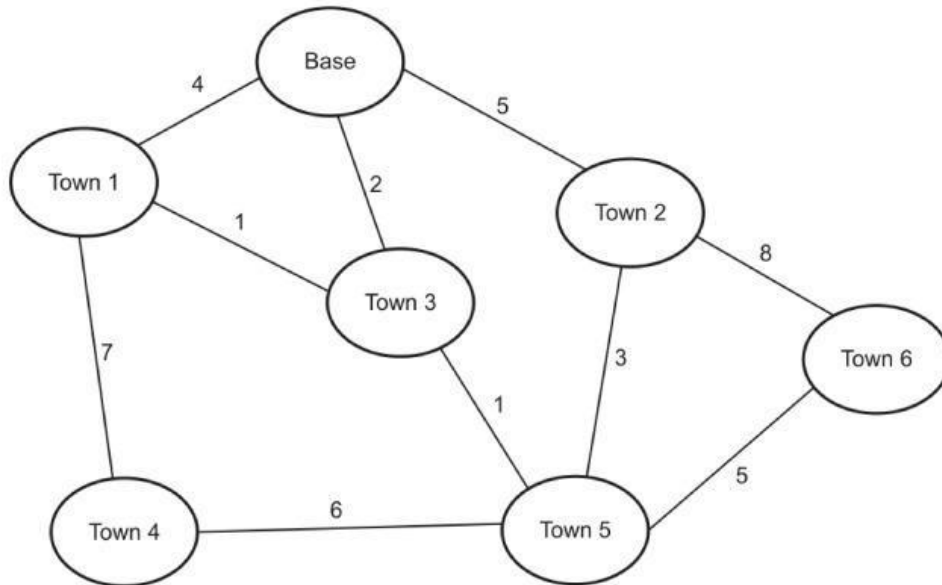
## PTES 9618 Computer Science Worksheet

## A\* and Dijkstra's algorithm and Artificial Intelligence Paper 3

Source: 9618\_s21\_qp\_31.pdf (Page 7)

- 5 (a) Calculate the shortest distance between the base and each of the other towns in the diagram using Dijkstra's algorithm.

Show your working **and** write your answers in the table provided.



Answers

| Town 1 | Town 2 | Town 3 | Town 4 | Town 5 | Town 6 |
|--------|--------|--------|--------|--------|--------|
|        |        |        |        |        |        |

[5]

Source: 9618\_s23\_qp\_33.pdf (Page 3)

- 2 (a) Draw **one** line from each machine learning category to its **most appropriate** description.

## Machine learning category

## Description

Supervised learning

Reinforcement learning

Deep learning

Unsupervised learning

simulates the data-processing capabilities of the human brain to make decisions

enables learning by mapping an input to an output based on example input-output pairs

enables information related to errors produced by the neural network to be transmitted

enables learning in an interactive environment by trial and error using its own experiences

enables learning by allowing the process to discover patterns on its own that were previously undetected

(b) Describe the purpose of both the A\* algorithm and Dijkstra's algorithm.

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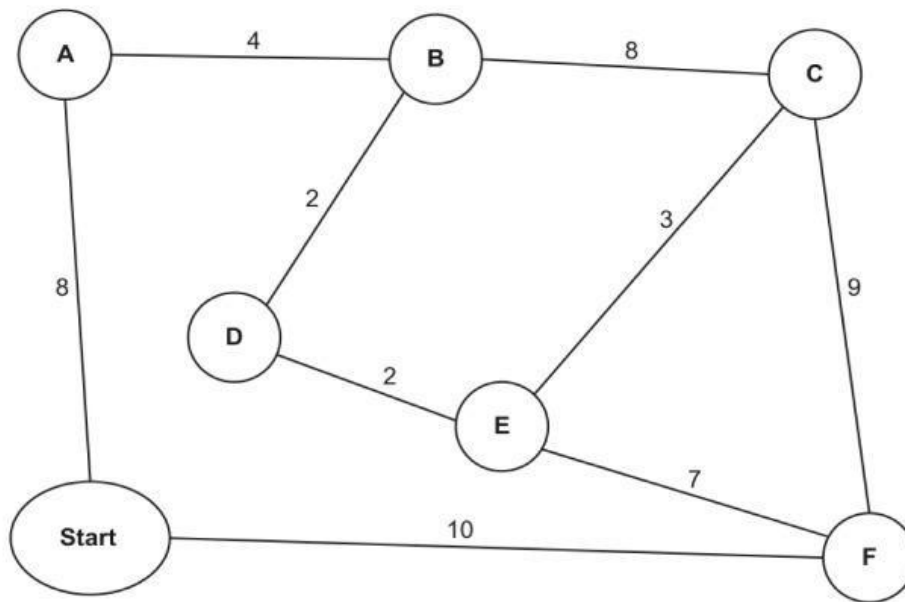
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Source: 9618\_w23\_qp\_32.pdf (Page 7)

8 Calculate the shortest distance between the **Start** and each of the destinations in the diagram using Dijkstra's algorithm.

Show your working **and** write your answers in the table provided.



Answers:

| A | B | C | D | E | F |
|---|---|---|---|---|---|
|   |   |   |   |   |   |

[5]

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10 (a) State the purpose of the A\* and Dijkstra's algorithms.

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..... [1]

(b) Outline the difference between the A\* and Dijkstra's algorithms.

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..... [2]

(c) Explain how unsupervised learning takes place in machine learning.

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..... [3]

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9 (a) State the subset of Artificial Intelligence (AI) which makes use of an artificial neural network.

..... [1]

(b) The A\* and Dijkstra's algorithms are used to perform searches on a graph.

(i) Outline how the A\* algorithm is different from Dijkstra's algorithm.

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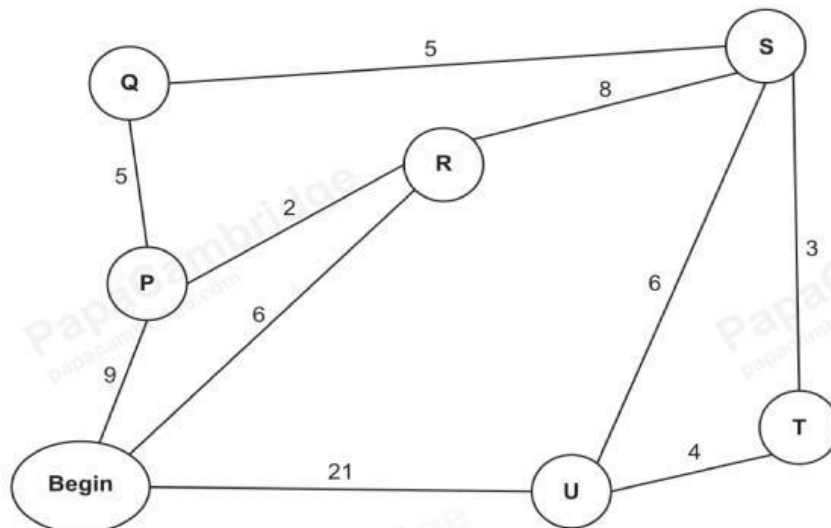
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(b) Calculate the best path between the Begin node and each of the nodes in the diagram using Dijkstra's algorithm.

Show your working and write your answers in the table provided.



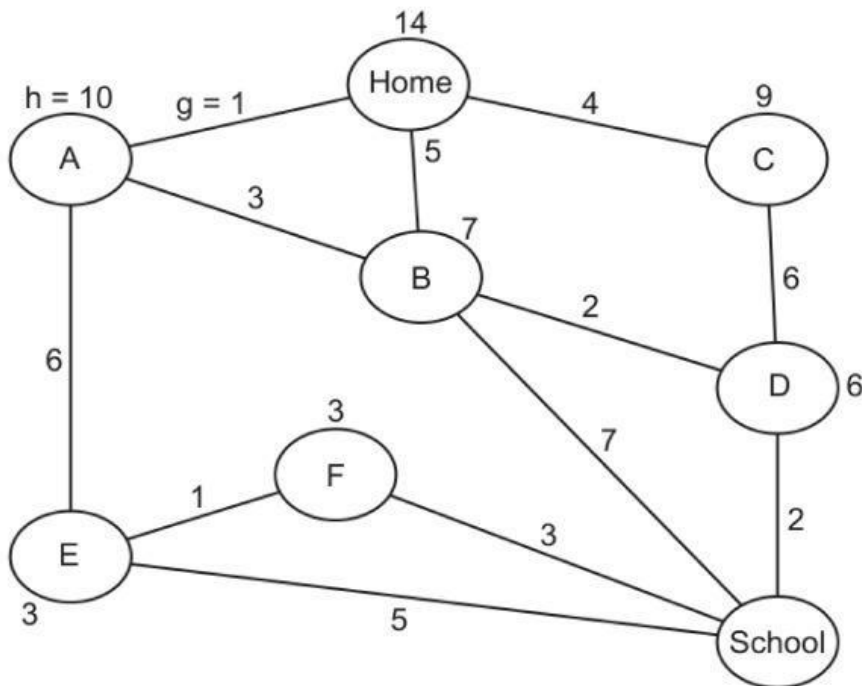
answers:

| P | Q | R | S | T | U |
|---|---|---|---|---|---|
|   |   |   |   |   |   |

[5]

- (b) Find the shortest path between the Home and School nodes using the A\* algorithm. Show your working in the table provided.

The first two rows in the table have been completed.



| Node | Cost from Home node (g) | Heuristic (h) | Total (f = g + h) |
|------|-------------------------|---------------|-------------------|
| Home | 0                       | 14            | 14                |
| A    | 1                       | 10            | 11                |
|      |                         |               |                   |
|      |                         |               |                   |
|      |                         |               |                   |
|      |                         |               |                   |
|      |                         |               |                   |
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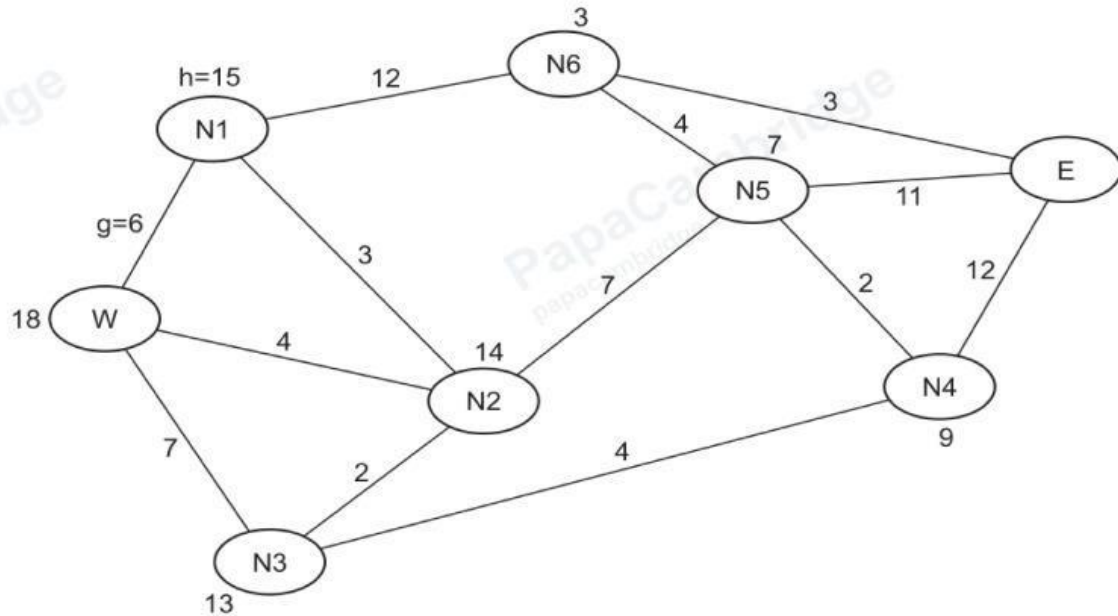
Final path      ➡ ➡ ➡ ➡

[5]

(b) The A\* algorithm is used to perform searches on a graph.

Calculate the best path between the W and E nodes on the following diagram using the A\* algorithm.

Show your working in the table provided.  
The first two rows have been done for you.



| current path | destination node | cost of current path (g) | heuristic (h) | total (f = g + h) |
|--------------|------------------|--------------------------|---------------|-------------------|
| W            | W                | 0                        | 18            | 18                |
| W            | N1               | 6                        | 15            | 21                |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |
|              |                  |                          |               |                   |

final path



[5]