1. A diagram of a network

   Description automatically generated

Show the shortest path from A to G (always remember to include the weighting)

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B | ✔ | ♾ 6 | A |
| C |  | ♾ 13 | B |
| D | ✔ | ♾ 7 6 | A E |
| E | ✔ | ♾ 4 | A |
| F | ✔ | ♾ 10 | B |
| G | ✔ | ♾ 12 11 | B F |

GFBA is A to B to F to G.

A diagram of a triangle

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A |  | 0 | - |
| B |  | ∞ |  |
| C |  | ∞ |  |
| D |  | ∞ |  |
| E |  | ∞ |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B |  | ∞ 7 | A |
| C |  | ∞ |  |
| D |  | ∞ 3 | A |
| E |  | ∞ |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B | ✔ | ∞ 7 5 | A D |
| C | ✔ | ∞ 7 | D |
| D | ✔ | ∞ 3 | A |
| E |  | ∞ 10 8 | D C |

ANSWER SHOWN IN STAGES A -> D -> C -> E costing 8.

1. A close-up of a book

   Description automatically generated

Show the shortest path from A to J including the weighting

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B | ✔ | ∞ 50 | A |
| C | ✔ | ∞ 25 | A |
| D | ✔ | ∞ 75 | B |
| E | ✔ | ∞ 70 | C |
| F | ✔ | ∞ 75 | C |
| G | ✔ | ∞ 100 | E |
| H | ✔ | ∞ 105 100 | E F |
| I | ✔ | ∞ 130 | B |
| J | ✔ | ∞ 180 160 | G I |

A to B to I to J costs 160.

B

E

C

F

A

G

D

4

3

5

7

1

2

5

7

3

2

4

Using this graph, trace Dijkstra’s algorithm to show the shortest path between A and G including the weighting.

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B | ✔ | ∞ 4 | A |
| C | ✔ | ∞ 2 | A |
| D | ✔ | ∞ 5 | C |
| E | ✔ | ∞ 8 6 | B D |
| F | ✔ | ∞ 7 | D |
| G | ✔ | ∞ 13 12 | E F |

Shortest path is A,C,D,F,G at 12

12

7

9

5

8

2

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Visited | Cost from start | Previous node |
| A | ✔ | 0 | - |
| B | ✔ | ∞ 12 10 | A B |
| C | ✔ | ∞ 17 | B |
| D | ✔ | ∞ 2 | A |
| E | ✔ | ∞ 11 | D |

Path is A to D to E at 11.

**A\* Algorithm Questions**

A screenshot of a computer

Description automatically generated

Perform an A\* algorithm on the data structure in Fig. 2.1 to find the shortest distance between H and E. Show each step of the process, and the calculations performed for each node visited.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Node | Est total cost  (F = G + H) | Cost so far (G) | Heuristic cost (H) | Previous node |
|  |  |  |  |  |
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A diagram of a diagram

Description automatically generated

Perform the A\* algorithm on the above graph starting from Node G.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Node** | **Est total cost  (F = G + H)** | **Cost so far (G)** | **Heuristic cost (H)** | **Previous node** |
|  |  |  |  |  |
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