

Eddy and Ethan

Computational Thinking Activity

Section A

Question 1

1a) There are more than one shortest route are RCBAR=17 mins and RABCR=17 mins (start from R and return to R), the cost are both smaller than others routes. Also the lowest value comparing with others and reaches. We can conclude that the paths with the smallest cost are RCBAR and RABCR.

$$\text{RCBAR} = 2+6+5+4=17 \text{ mins}$$

$$\text{RABCR} = 4+5+6+2=17 \text{ mins}$$

$$\text{RBACR} = 3+5+8+2=18 \text{ mins}$$

$$\text{RCABR} = 2+8+5+3=18 \text{ mins}$$

$$\text{RACBR} = 4+8+6+3=21 \text{ mins}$$

$$\text{RBCAR} = 3+6+8+4=21 \text{ mins}$$

1b) The shortest routes algorithm are :

Dijkstra's algorithm and A* algorithm

Dijkstra algorithm

It is a search algorithm for finding the shortest paths between nodes in a graph.

A* algorithm

It's also called best-first search uses an evaluation function to find a heuristic estimation for the shortest path.

A vertex on the graph appears at most once on a path

$$C(V_i, V_j) = (i + j) \cdot W(V_i, V_j)$$

e.g the weight of edge V2-V4 is 4 and the cost from V2 to V4 should be

$$(2 + 4) \cdot 4 = 24$$

Question 2

2a) There are more than one shortest route are RCBAR = 14 mins and RABCR = 14 mins (start from R and return to R)

$$\text{RCBAR} = 1+4+6+3=14 \text{ mins}$$

$$\text{RABCR} = 3+6+4+1=14 \text{ mins}$$

$$\text{RBACR} = 6+6+4+1=17 \text{ mins}$$

$$\text{RACBR} = 3+4+4+6=17 \text{ mins}$$

$$\text{RCABR} = 1+4+6+6=17 \text{ mins}$$

$$\text{RBCAR} = 6+4+4+3=17 \text{ mins}$$

2b) The shortest routes algorithm are :

Dijkstra's algorithm and A* algorithm

Dijkstra algorithm

It is a search algorithm for finding the shortest paths between nodes in a graph

A* algorithm

It's also called best-first search uses an evaluation function to find a heuristic estimation for the shortest path.

A vertex on the graph appears at most once on a path

$$C(V_i, V_j) = (i + j) \cdot W(V_i, V_j)$$

e.g the weight of edge V2-V4 is 4 and the cost from V2 to V4 should be

$$(2 + 4) \cdot 4 = 24$$

Question 3

3a) The shortest route is RABCR

To optimize delivery route, find out the efficient route.

Dijkstra's algorithm is an algorithm for finding the shortest paths between nodes in graph. To find the efficient route, can apply the algorithm to implement, it choose the unvisited vertex with the lowest distance or nearest neighbor, calculates the distance though it to each unvisited neighbor, and updates the neighbor's distance in smaller.