

Heuristics

Question 1a

The Euclidian Distance is the distance between two points calculated with: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ for points (x_1, y_1) and (x_2, y_2) . Usually used when the movement is unrestricted (up, down, left, right, diagonal).

Question 1b

The Manhattan Distance is the distance between two points calculated with: $|x_2-x_1|+|y_2-y_1|$ for points (x_1, y_1) and (x_2, y_2) . Usually used when the movement is restricted to a grid (up, down, left, right).

Question 2a

- Visited = []; Unvisited = [A, B, C, D, E, F, Z]
- initial state

Vertex	Distance	Previous
A	0	-
B	∞	-
C	∞	-
D	∞	-
E	∞	-
F	∞	-
Z	∞	-

- Visited = [A]; Unvisited = [B, C, D, E, F, Z]
- from A to B: $0+4=4$
- from A to C: $0+3=3$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A
D	∞	-
E	∞	-
F	∞	-

Vertex	Distance	Previous
Z	∞	-

- Visited = [A, C]; Unvisited = [B, D, E, F, Z]
- from C to D: $3+7=10$
- from C to E: $3+10=13$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A
D	10	C
E	13	C
F	∞	-
Z	∞	-

- Visited = [A, C, B]; Unvisited = [D, E, F, Z]
- from B to E: $4+12=16$
- from B to F: $4+5=9$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A
D	10	C
E	13	C
F	9	B
Z	∞	-

- Visited = [A, C, B, F]; Unvisited = [D, E, Z]
- from F to Z: $9+16=25$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A

Vertex	Distance	Previous
D	10	C
E	13	C
F	9	B
Z	25	F

- Visited = [A, C, B, F, D]; Unvisited = [E, Z]
- from D to E: $10+2=12$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A
D	10	C
E	12	D
F	9	B
Z	25	F

- Visited = [A, C, B, F, D, E]; Unvisited = [Z]
- from E to Z: $12+5=17$

Vertex	Distance	Previous
A	0	-
B	4	A
C	3	A
D	10	C
E	12	D
F	9	B
Z	17	E

- Visited = [A, C, B, F, D, E, Z]; Unvisited = []
- No more vertices to visit

Vertex	Distance	Previous
A	0	-

Vertex	Distance	Previous
B	4	A
C	3	A
D	10	C
E	12	D
F	9	B
Z	17	E

- Shortest path: A -> C -> D -> E -> Z; Cost: 17

Question 2b

- Initial state: G=0, H=14, F=14
- open = [A]; closed = []

- Expand A (F=14)
- Examine B, C
- open = [B, C]; closed = [A]

Node	G	H	F	Previous
B	4	12	16	A
C	3	11	14	A

- Expand C (F=14)
- Examine D, E
- open = [B, D, E]; closed = [A, C]

Node	G	H	F	Previous
B	4	12	16	A
C	3	11	14	A
D	10	6	16	C
E	13	4	17	C

- Expand B (F=16)
- Examine E, F
- open = [D, E, F]; closed = [A, C, B]

Node	G	H	F	Previous
B	4	12	16	A

Node	G	H	F	Previous
C	3	11	14	A
D	10	6	16	C
E	13	4	17	C
F	9	11	20	B

- Expand D (F=16)
- Examine E
- open = [E, F]; closed = [A, C, B, D]

Node	G	H	F	Previous
B	4	12	16	A
C	3	11	14	A
D	10	6	16	C
E	12	4	16	D
F	9	11	20	B

- Expand E (F=16)
- Examine Z
- open = [F, Z]; closed = [A, C, B, D, E]

Node	G	H	F	Previous
B	4	12	16	A
C	3	11	14	A
D	10	6	16	C
E	12	4	16	D
F	9	11	20	B
Z	17	0	17	E

- Shortest path: A -> C -> D -> E -> Z; Cost: 17