

2.3.3

**ALGORITHMS - PATH
FINDING**

TOPIC WISE EXAM QUESTIONS

ANSWERS

A-LEVEL

OCR

1 (b)

1 mark for final path A, D, G
 1 mark for final distance 14
 1 mark for each SECTION or equivalent working shown.

Node	Distance travelled	Previous node	Marking Guidance
A	0	- / N/A / blank / None	1 Mark
B	5	A	1Mark
C	2	A	
D	10	A	
E	7	B	1 Mark
F	15	E	1 Mark
G	19 14	E D	

5ci

Node	Distance travelled	Previous node	Marking Guidance
A	0 / -	N/A / -	1 Mark
B	3	A	1 Mark
C	13	E	
D	10	B	1 Mark
E	6	B	
F	9	E	1 Mark
G	16	F	
H	24 19	D G	1 Mark

Final Path = A,B,E,F,G,H, Distance = 19 (1 Mark)

- 1ci
- 1 mark per bullet to max 2
e.g:
- A rule of thumb / estimate / guess
 - That estimates the distance / cost from each node to the destination node
 - To speed up the process of finding a solution
 - ...by identify which paths to follow first

1cii

Node	Distance travelled	Heuristic	Distance travelled + Heuristic	Previous node	MARKING GUIDANCE
A (✓)	0	90	90		1 MARK
B (✓)	∞ 21	80	101	A	1 MARK
C (✓)	∞ 42	65	107	A	1 MARK
D (✓)	∞ 21+38=59 42+12=54	50	109 104	B C	1 MARK
E	∞ 21+40=61	50	111	B	1 MARK
F (✓)	∞ 42+12+23=77	30	107	D	1 MARK
G	∞ 42+12+23+33=110	0	110	F	1 MARK

Final path = A,C,D,F,G and Distance = 110 (1 Mark)

1 mark for final solution, max 5 for showing the stages

- Mark A as the current node initially
- Record B = 1, C = 2 (mark A as visited)
- Record E = 5 (and mark B as visited)
- (Record D = 3, F = 5 (and mark B as visited)
- Change E to 4 (overriding previous value, and mark D as visited)
- Record G = 6 (and mark E as visited)
- ...Do not change G as greater than current (mark F as visited)
- (G as visited) H = 10 (Mark G as visited)
- Solution: A-C-D-E-G-H path length 10

Guidance – 1 mark only for stating the solution of A-C-D-E-G-H length 10

6

AO1.2
(1)
AO2.2
(3)
AO2.2
(2)

4c

Node	Visited	From A	Previous Node	
A	✓	0	-	1 Mark
B	✓	1	A	1 Mark
C	✓	2	A	
D	✓	3	C	1 Mark
F	✓	5	C	
E	✓	5 4	B D	2 Marks Initial visit, plus override values
G	✓	6	E	1 Mark
H		10	G	1 Mark

3	(b)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> • Mark A as the initial node and then visit B (5) • Node E (8) is then visited (chosen from C (13), D (14), E (8)) • Node I (12) is then visited after E • Node J (14) is then visited after I • : • Visiting G (18) from I; • Visiting G (15) from C – <u>overriding</u> the previous value of 18 <ul style="list-style-type: none"> • solution A-B-E-I-J path length 14 	<p>7</p> <p>AO1.2 (3) AO2.1 (2) AO2.2 (2)</p>	
3	(c)	<p>Mark Band 3 – High level (7-9 marks) The candidate demonstrates a thorough knowledge and understanding of Dijkstra's and A*; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Mark Band 2 – Mid level (4-6 marks) The candidate demonstrates reasonable knowledge and understanding of Dijkstra's and A*; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed. <i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i></p> <p>Mark Band 1 – Low Level (1-3 marks) The candidate demonstrates a basic knowledge of Dijkstra's and A* with limited understanding shown; the material is basic and contains some inaccuracies. The candidates makes a limited attempt to apply acquired knowledge and</p>	<p>9</p> <p>AO1.1 (2) AO1.2 (2) AO2.1 (2) AO3.3 (3)</p>	<p>AO1: Knowledge and Understanding Indicative content</p> <ul style="list-style-type: none"> • Heuristic helps produce a solution in a faster time • A* uses estimated distance from final node • Dijkstra uses a weight/distance • A* chooses which path to take next based on lowest current distance travelled <p>AO2: Application</p> <ul style="list-style-type: none"> • Description of how A* will differ from Dijkstra, e.g. taking the shorter route A-B-E-I before exploring nodes from D and E • Description of the different number of comparisons that would be needed in this problem • A* doesn't need to find all possible solutions (saves time) <p>AO3: Evaluation Candidates will need to evaluate the benefits and drawbacks of each algorithm</p> <ul style="list-style-type: none"> • Small-scale problem • Quick to find a solution using either method • Difference in programming complexity is minimal • Don't know if this problem needs to scale • Most efficient route needed

**If you found this
useful, drop a follow
to help me out!**

THANK YOU!

GCST