Grids and Movement

Standard difficulty · 20 questions · 40 marks · Time: 37 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A robot facing North turns right 90°. It now faces:

(a) South **(b)** North **(c)** West **(d)** East

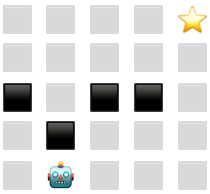
2. A robot is on a 5 × 5 grid. Cells are named (column, row), with (1, 1) at the bottom left. It starts at (5, 1) facing North. F = move forward one cell, L = turn left 90°, R = turn right 90° (turning stays in the same cell). It follows: F L F L F. In which cell does it stop? Give (column, row).

(a) (4, 1) **(b)** (5, 1) **(c)** (1, 4) **(d)** (4, 2)

3. A robot is on a 5 × 5 grid. Cells are named (column, row), with (1, 1) at the bottom left. It starts at (5, 3) facing North. F = move forward one cell, L = turn left 90°, R = turn right 90° (turning stays in the same cell). It follows: F F L L F L R. Which way is it facing at the end?

(a) East **(b)** North **(c)** South **(d)** West

4.



The robot moves one square at a time up, down, left or right (not diagonally), and cannot enter a black square. What is the fewest number of moves to reach the star ?

(a) 7 **(b)** 8 **(c)** 6 **(d)** 9

5. On a street grid you walk from corner (0, 0) to corner (3, 5), moving only right (east) or up (north), one block at a time. How many different shortest routes are there?

(a) 57 **(b)** 56 **(c)** 15 **(d)** 8

6. On a grid of streets, a delivery robot goes 8 steps East, then 6 steps West, then 8 steps South, then 7 steps West, then 5 steps North. It can only move North, South, East or West. What is the fewest number of steps to get back to the start?

(a) 10 **(b)** 34 **(c)** 8 **(d)** 2

7. On a 6 × 6 grid with no walls, a robot moves one cell at a time across or up and down (never diagonally). What is the fewest number of moves from (6, 6) to (5, 3)?

(a) 5 **(b)** 3 **(c)** 4 **(d)** 6

8. A robot on a 5 × 5 grid starts at (4, 2) facing East (cells are (column, row), (1, 1) at the bottom left). F = forward one cell, L and R = turn 90° left or right. Which commands take it to (4, 3)?

(a) R F R F F F **(b)** R R R R F F **(c)** R F R R F F **(d)** R F R R R F

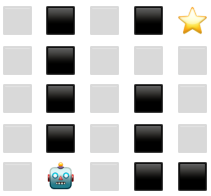
Section B — Short answer — 8 × 2 = 16 marks

9. What does the command F mean for a grid robot, and what do L and R mean?

10. A robot is on a 5 × 5 grid. Cells are named (column, row), with (1, 1) at the bottom left. It starts at (4, 1) facing North. F = move forward one cell, L = turn left 90°, R = turn right 90° (turning stays in the same cell). It follows: F F F F. In which cell does it stop? Give (column, row).

11. A robot is on a 5 × 5 grid. Cells are named (column, row), with (1, 1) at the bottom left. It starts at (5, 5) facing East. F = move forward one cell, L = turn left 90°, R = turn right 90° (turning stays in the same cell). It follows: R F L R F F. Which way is it facing at the end?

12.



The robot moves one square at a time up, down, left or right (not diagonally), and cannot enter a black square . What is the fewest number of moves to reach the star ?

13. On a street grid you walk from corner (0, 0) to corner (3, 4), moving only right (east) or up (north), one block at a time. The corner (1, 2) is closed for repairs. How many different shortest routes are there?

14. On a grid of streets, a delivery robot goes 8 steps West, then 2 steps South, then 1 step East. It can only move North, South, East or West. What is the fewest number of steps to get back to the start?

15. On a 6 × 6 grid with no walls, a robot moves one cell at a time across or up and down (never diagonally). What is the fewest number of moves from (4, 6) to (3, 4)?

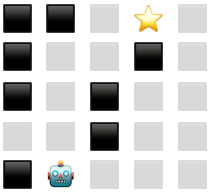
16. A child faces East and turns 90° clockwise, then 90° clockwise, then 45° anticlockwise. Which way is the child facing now?

Section C — Word problems — 4 × 4 = 16 marks

17. A robot starts at (1, 1) facing North on a 5 × 5 grid. Commands: F F R F F L F. (a) Write its cell after each move. (b) Where does it stop? (c) Which way does it face?

18. A robot is on a 5 × 5 grid. Cells are named (column, row), with (1, 1) at the bottom left. It starts at (5, 3) facing South. F = move forward one cell, L = turn left 90°, R = turn right 90° (turning stays in the same cell). It follows: R F F F F L F. (a) In which cell does it stop? Give (column, row). (b) Which way is it facing at the end?

19.



The robot moves one square at a time up, down, left or right (not diagonally), and cannot enter a black square . What is the fewest number of moves to reach the star ?

20. (a) On a street grid you walk from corner (0, 0) to corner (3, 4), moving only right (east) or up (north), one block at a time. How many different shortest routes are there?
(b) On a grid of streets, a delivery robot goes 7 steps West, then 6 steps North, then 7 steps South, then 1 step South, then 1 step West. It can only move North, South, East or West. What is the fewest number of steps to get back to the start?

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Answer key

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Q	Answer	Working
1	**(d) East**	—
2	**(a) (4, 1)**	track the cell and the facing after each command; it ends facing South
3	**(c) South**	1 right and 3 left quarter-turns from North
4	**(a) 7**	count outwards from the robot, one ring of squares at a time, until the star is reached
5	**(b) 56**	write at each corner the number of ways to reach it: the corner to its left plus the corner below
6	**(c) 8**	it ends 5 West and 3 South of the start
7	**(c) 4**	1 across + 3 up or down
8	**(c) R F R R F F**	trace each set of commands; only one ends at the goal
9	**F moves forward one cell in the direction it faces; L and R turn it 90° left or right without moving.**	—
10	**(4, 5)**	track the cell and the facing after each command; it ends facing North
11	**South**	2 right and 1 left quarter-turns from East
12	**7**	count outwards from the robot, one ring of squares at a time, until the star is reached
13	**17**	write at each corner the number of ways to reach it: the corner to its left plus the corner below; the closed corner gets 0
14	**9**	it ends 7 West and 2 South of the start
15	**3**	1 across + 2 up or down
16	**South-West**	net turn = 135° clockwise from East
17	**(a) (1, 2), (1, 3), turn, (2, 3), (3, 3), turn, (3, 4). (b) (3, 4). (c) North.**	—
18	**(a) (1, 2); (b) South**	track the cell and the facing after each command
19	**6**	count outwards from the robot, one ring of squares at a time, until the star is reached
20	**(a) 35; (b) 10**	(a) write at each corner the number of ways to reach it: the corner to its left plus the corner below; (b) it ends 8 West and 2 South of the start