Part 1

1. Explain in your report why the first move of the agent for the example search problem from Figure 8 is to the east rather than the north given that the agent does not know initially which cells are blocked.

The agent doesn’t know which cells are blocked when it starts to find the path.

If it has full knowledge of the maze, then the best path is to the North and then go around

the obstacle.

Since the agent doesn’t know, it has four options South, West, North and East. The first

step in A\* will be towards the shortest unblocked path.

It cannot go South as E2 is the bottom cell.

The manhatten distance from the neighbors are:

From North (D2) 🡪 4

From West (E1) 🡪 4

From East (E3) 🡪 2 (shortest path)

So, the first move from E2 the agent will make is to the East.

1. This project argues that the agent is guaranteed to reach the target if it is not separated

from it by blocked cells. Give a convincing argument that the agent in finite gridworlds indeed either reaches the target or discovers that this is impossible

in finite time. Prove that the number of moves of the agent until it reaches the target

or discovers that this is impossible isbounded from above by the number of

unblocked cells squared.

The agent will reach the goal as the number of grids is finite.

In A\*, there is a close list, so once it is expanded it will never go back to the open list.

If a cell is reachable from the start, the agent will visit them in a finite number of steps unless it is surrounded by blocked cells.

The algorithm terminates when it reaches the goal or when all the cells are visited. So, the

algorithm is guaranteed to find a solution if it is not blocked.

The worst-case scenario would be if all the cells are unblocked, and the agent start from an unblocked cell and visit and expand all the other unblocked cells. By visiting every cell, it is guaranteed to find the target if it is possible.

If the number of unblocked cells is ‘n’ in a certain scenario:

In the worst case, A\* will expand all n nodes.

If A\* start search from every unblocked cell (n) and the agent visits every other unblocked cell from every starting position it will expand n nodes n times.

So, the upper limit on the moves by the agent is number of unblocked cells squared (n2)