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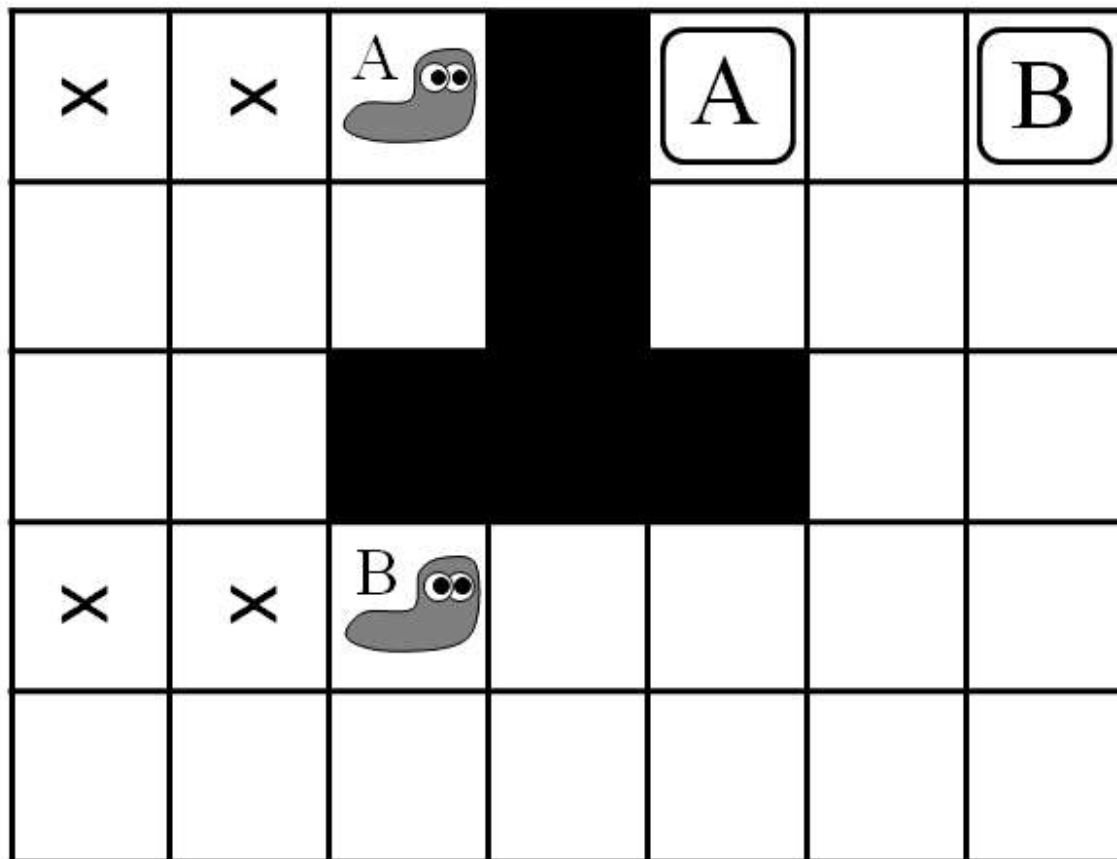
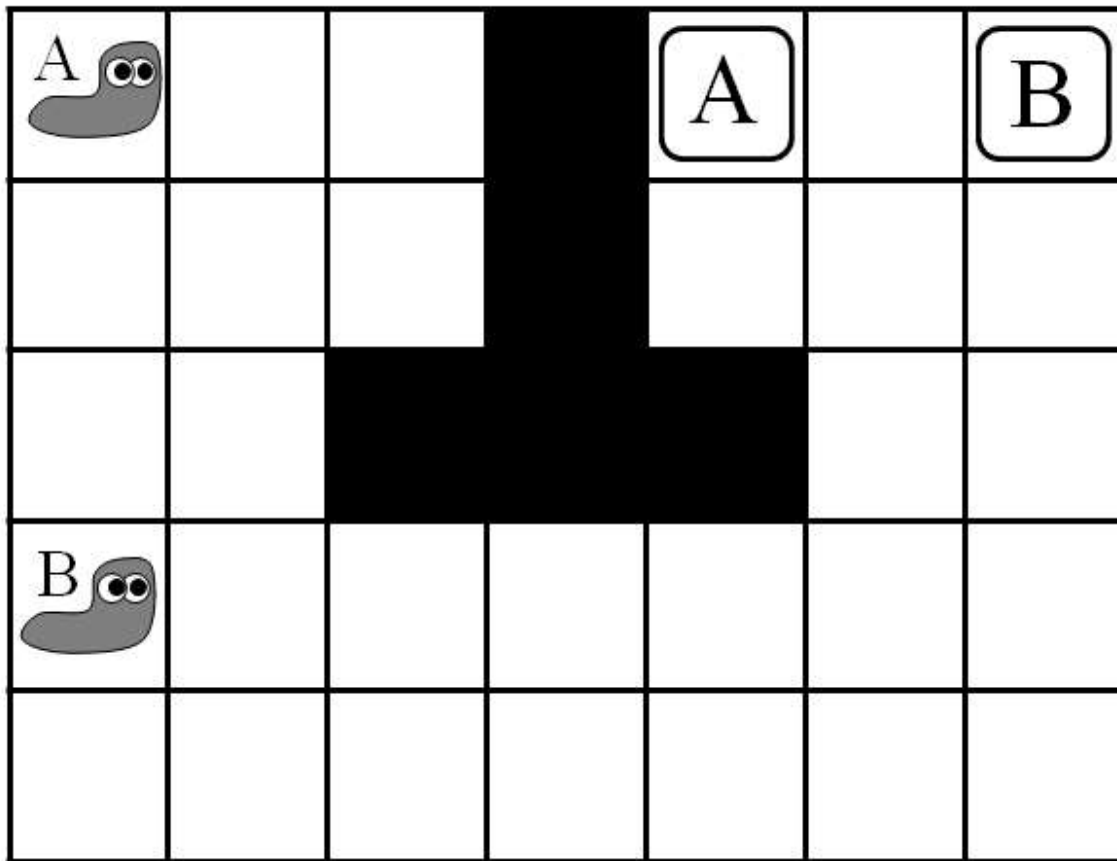
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## Q3: Search: Slugs

### Problem 3: Search: Slugs

You are once again tasked with planning ways to get various creatures out of a maze. This time, it's slugs! As shown in the diagram below to the left, two slugs A and B want to exit a maze via their own personal exits. In each time step, both slugs move, though each can choose to either stay in place or move into an adjacent free square. The slugs cannot move into a square that the other slug is moving into. In addition, the slugs leave behind a sticky, poisonous substance and so they cannot move into any square that *either* slug has ever been in.

For example, for the situation shown in the diagram below to the left: if both slugs move right twice, the result is the situation shown in the diagram below to right, with the *X* squares unpassable to either slug. A slug can stay in the same square as long as it wants; it only leaves a trail when it moves.



You must pose a search problem that will get them to their exits in as few time steps as possible. You may assume that the board is of size  $N$  by  $M$ ; all answers should hold for a general instance of the maze, not simply the instance shown above. (You do not, however, need to generalize beyond two slugs.)

## Part 1

3/3 points (ungraded)

How many states are there in a minimal representation of the space?

☐  $2^{MN}$

☒  $2^{MN}(MN)^2$  ✓

☐  $(MN)^2$

☐  $2^{MN} + (MN)^2$

☐  $4MN$

☐  $4^{MN}$

☐  $(MN)^4$

Submit

✓ Correct (3/3 points)

## Part 2

2/2 points (ungraded)

Given that each of the two slugs has the actions (North, East, South, West, Stay) available, what is the branching factor?

☐ 5☐ 10☒ 25 ✓☐ 32

✓ Correct (2/2 points)

### Part 3

3/3 points (ungraded)

Which of the following is the *best* admissible heuristic for this problem?

☐ the number of free non-poisoned squares remaining on the grid☐ (maze distance of slug A to its exit + maze distance of slug B to its exit) / 2☐ min (maze distance of slug A to its exit, maze distance of slug B to its exit)☒ max (maze distance of slug A to its exit, maze distance of slug B to its exit) ✓

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✓ Correct (3/3 points)

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