1. Enter the score from the auto grader.

Q1: 3/3  
Q2: 3/3  
Q3: 3/3  
Q4: 3/3  
Q5: 3/3  
Q6: 3/3  
Q7: 5/4  
Q8: 3/3  
Total: 26/25

2. Describe briefly how you solved the problems.

Q1: Solved using a min priority queue and visited array. Positions are added to the priority queue with a negative priority so that when we pop off the queue we always retrieve the next deepest element. The priority is decreased for every level of deepness we search. A position is marked as visited once it is popped off the queue.  
Q2: Also solved using a priority queue except that this time the priority is increased for every level of deepness we go, so we check all positions at the same level first. Therefore, traversing in a breadth first manner.  
Q3: Also solved using a priority queue except that this time the priority is the cost of moving to the next position. Therefore, we always pop off the least costly position next.  
Q4: This was solved similarly to UCS but now the priority is the cost of moving to the next position plus the heuristic that is passed in. So the position with the least value of the sum of the cost and heuristic is searched next.  
Q5: Solved by keeping track of the corners visited for every path. Every time a corner was visited we remove it from the corners array. Once all corners have been visited then we return that it is a goal state.  
Q6: The corners heuristic I coded takes the minimum of the Manhattan distances of all the corners with respect to the current position. Pacman then moves to that corner and we repeat the process again until we reach a goal state.  
Q7: The food heuristic I coded goes through each pellet in the food grid and calculates the mazeDistance to that pellet from the current position. It returns the greatest distance found.  
Q8: For this question, I called my astar function to find the closest dot.

3. Paste the output from auto grader.

Starting on 9-18 at 16:50:51

Question q1

===========

\*\*\* PASS: test\_cases\q1\graph\_backtrack.test

\*\*\* solution: ['1:A->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

\*\*\* PASS: test\_cases\q1\graph\_bfs\_vs\_dfs.test

\*\*\* solution: ['0:A->B', '0:B->D', '0:D->G']

\*\*\* expanded\_states: ['A', 'B', 'D']

\*\*\* PASS: test\_cases\q1\graph\_infinite.test

\*\*\* solution: ['0:A->B', '1:B->C', '1:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

\*\*\* PASS: test\_cases\q1\graph\_manypaths.test

\*\*\* solution: ['0:A->B1', '0:B1->C', '0:C->D', '0:D->E1', '0:E1->F', '0:F->G']

\*\*\* expanded\_states: ['A', 'B1', 'C', 'D', 'E1', 'F']

\*\*\* PASS: test\_cases\q1\pacman\_1.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 246

\*\*\* nodes expanded: 269

### Question q1: 3/3 ###

Question q2

===========

\*\*\* PASS: test\_cases\q2\graph\_backtrack.test

\*\*\* solution: ['1:A->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C', 'D']

\*\*\* PASS: test\_cases\q2\graph\_bfs\_vs\_dfs.test

\*\*\* solution: ['1:A->G']

\*\*\* expanded\_states: ['A', 'B']

\*\*\* PASS: test\_cases\q2\graph\_infinite.test

\*\*\* solution: ['0:A->B', '1:B->C', '1:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

\*\*\* PASS: test\_cases\q2\graph\_manypaths.test

\*\*\* solution: ['1:A->C', '0:C->D', '1:D->F', '0:F->G']

\*\*\* expanded\_states: ['A', 'B1', 'C', 'B2', 'D', 'E1', 'F', 'E2']

\*\*\* PASS: test\_cases\q2\pacman\_1.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 68

\*\*\* nodes expanded: 269

### Question q2: 3/3 ###

Question q3

===========

\*\*\* PASS: test\_cases\q3\graph\_backtrack.test

\*\*\* solution: ['1:A->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C', 'D']

\*\*\* PASS: test\_cases\q3\graph\_bfs\_vs\_dfs.test

\*\*\* solution: ['1:A->G']

\*\*\* expanded\_states: ['A', 'B']

\*\*\* PASS: test\_cases\q3\graph\_infinite.test

\*\*\* solution: ['0:A->B', '1:B->C', '1:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

\*\*\* PASS: test\_cases\q3\graph\_manypaths.test

\*\*\* solution: ['1:A->C', '0:C->D', '1:D->F', '0:F->G']

\*\*\* expanded\_states: ['A', 'B1', 'C', 'B2', 'D', 'E1', 'F', 'E2']

\*\*\* PASS: test\_cases\q3\ucs\_0\_graph.test

\*\*\* solution: ['Right', 'Down', 'Down']

\*\*\* expanded\_states: ['A', 'B', 'D', 'C', 'G']

\*\*\* PASS: test\_cases\q3\ucs\_1\_problemC.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 68

\*\*\* nodes expanded: 269

\*\*\* PASS: test\_cases\q3\ucs\_2\_problemE.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 74

\*\*\* nodes expanded: 260

\*\*\* PASS: test\_cases\q3\ucs\_3\_problemW.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 152

\*\*\* nodes expanded: 173

\*\*\* PASS: test\_cases\q3\ucs\_4\_testSearch.test

\*\*\* pacman layout: testSearch

\*\*\* solution length: 7

\*\*\* nodes expanded: 14

\*\*\* PASS: test\_cases\q3\ucs\_5\_goalAtDequeue.test

\*\*\* solution: ['1:A->B', '0:B->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

### Question q3: 3/3 ###

Question q4

===========

\*\*\* PASS: test\_cases\q4\astar\_0.test

\*\*\* solution: ['Right', 'Down', 'Down']

\*\*\* expanded\_states: ['A', 'B', 'D', 'C', 'G']

\*\*\* PASS: test\_cases\q4\astar\_1\_graph\_heuristic.test

\*\*\* solution: ['0', '0', '2']

\*\*\* expanded\_states: ['S', 'A', 'D', 'C']

\*\*\* PASS: test\_cases\q4\astar\_2\_manhattan.test

\*\*\* pacman layout: mediumMaze

\*\*\* solution length: 68

\*\*\* nodes expanded: 221

\*\*\* PASS: test\_cases\q4\astar\_3\_goalAtDequeue.test

\*\*\* solution: ['1:A->B', '0:B->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C']

\*\*\* PASS: test\_cases\q4\graph\_backtrack.test

\*\*\* solution: ['1:A->C', '0:C->G']

\*\*\* expanded\_states: ['A', 'B', 'C', 'D']

\*\*\* PASS: test\_cases\q4\graph\_manypaths.test

\*\*\* solution: ['1:A->C', '0:C->D', '1:D->F', '0:F->G']

\*\*\* expanded\_states: ['A', 'B1', 'C', 'B2', 'D', 'E1', 'F', 'E2']

### Question q4: 3/3 ###

Question q5

===========

\*\*\* PASS: test\_cases\q5\corner\_tiny\_corner.test

\*\*\* pacman layout: tinyCorner

\*\*\* solution length: 28

### Question q5: 3/3 ###

Question q6

===========

\*\*\* PASS: heuristic value less than true cost at start state

\*\*\* PASS: heuristic value less than true cost at start state

\*\*\* PASS: heuristic value less than true cost at start state

path: ['North', 'East', 'East', 'East', 'East', 'North', 'North', 'West', 'West', 'West', 'West', 'Nort h', 'North', 'North', 'North', 'North', 'North', 'North', 'North', 'West', 'West', 'West', 'West', 'Sou th', 'South', 'East', 'East', 'East', 'East', 'South', 'South', 'South', 'South', 'South', 'South', 'We st', 'West', 'South', 'South', 'South', 'West', 'West', 'East', 'East', 'North', 'North', 'North', 'Eas t', 'East', 'East', 'East', 'East', 'East', 'East', 'East', 'South', 'South', 'East', 'East', 'East', ' East', 'East', 'North', 'North', 'East', 'East', 'North', 'North', 'East', 'East', 'North', 'North', 'E ast', 'East', 'East', 'East', 'South', 'South', 'South', 'South', 'East', 'East', 'North', 'North', 'Ea st', 'East', 'South', 'South', 'South', 'South', 'South', 'North', 'North', 'North', 'North', 'North', 'North', 'North', 'West', 'West', 'North', 'North', 'East', 'East', 'North', 'North']

path length: 106

\*\*\* PASS: Heuristic resulted in expansion of 692 nodes

### Question q6: 3/3 ###

Question q7

===========

\*\*\* PASS: test\_cases\q7\food\_heuristic\_1.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_10.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_11.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_12.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_13.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_14.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_15.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_16.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_17.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_2.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_3.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_4.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_5.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_6.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_7.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_8.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_9.test

\*\*\* PASS: test\_cases\q7\food\_heuristic\_grade\_tricky.test

\*\*\* expanded nodes: 4137

\*\*\* thresholds: [15000, 12000, 9000, 7000]

### Question q7: 5/4 ###

Question q8

===========

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_1.test

\*\*\* pacman layout: Test 1

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_10.test

\*\*\* pacman layout: Test 10

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_11.test

\*\*\* pacman layout: Test 11

\*\*\* solution length: 2

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_12.test

\*\*\* pacman layout: Test 12

\*\*\* solution length: 3

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_13.test

\*\*\* pacman layout: Test 13

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_2.test

\*\*\* pacman layout: Test 2

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_3.test

\*\*\* pacman layout: Test 3

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_4.test

\*\*\* pacman layout: Test 4

\*\*\* solution length: 3

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_5.test

\*\*\* pacman layout: Test 5

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_6.test

\*\*\* pacman layout: Test 6

\*\*\* solution length: 2

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_7.test

\*\*\* pacman layout: Test 7

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_8.test

\*\*\* pacman layout: Test 8

\*\*\* solution length: 1

[SearchAgent] using function depthFirstSearch

[SearchAgent] using problem type PositionSearchProblem

\*\*\* PASS: test\_cases\q8\closest\_dot\_9.test

\*\*\* pacman layout: Test 9

\*\*\* solution length: 1

### Question q8: 3/3 ###

Finished at 16:51:08

Provisional grades

==================

Question q1: 3/3

Question q2: 3/3

Question q3: 3/3

Question q4: 3/3

Question q5: 3/3

Question q6: 3/3

Question q7: 5/4

Question q8: 3/3

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Total: 26/25

Your grades are NOT yet registered. To register your grades, make sure

to follow your instructor's guidelines to receive credit on your project.

4. Paste the git log.

$ git log

commit b4b1e93cc3e840e2d2bdc340c03daf530590c044

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Tue Sep 18 16:45:52 2018 -0400

added solution for eating all the dots and suboptimal search

commit 5baa1fe814bd62f3db8f624331d420c7459dad43

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Fri Sep 14 21:33:37 2018 -0400

added solution for corners problem

commit d7559b1d514468297e88d733204922af465d4309

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Sun Sep 9 21:03:03 2018 -0400

fixed solutions to pass test cases...

commit ff8bbdc43404d588214b90498903735077d82701

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Sun Sep 9 15:28:49 2018 -0400

added astar solution

commit 3f5867bff10eb781cc947f2c5c22a6ddae846f95

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Sat Sep 8 13:52:23 2018 -0400

added solution for ucs

commit e7f559be41fd9e5f4207718063a114a7a13aec5a

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Fri Sep 7 18:01:47 2018 -0400

added solution for bfs (\*•̀ᴗ•*́*\*)و ̑̑

commit d2b78c4bf34a0f0eb271fc20e33eabbe7815f053

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Thu Sep 6 21:44:35 2018 -0400

added solution for dfs

commit e40226c8928813b1335538d12f86828300aeccea

Author: Rebeca Amaya <rebeca\_amaya@bellsouth.net>

Date: Mon Sep 3 20:49:27 2018 -0400

initial commit ⌒°(❛ᴗ❛)°⌒