**Rewards: 100, -1:**

**Small-Grid:**

Num generated: 208; num unique: 18

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,26197,3586,2915,20,18,9,13,15,9,12,14,12,11,12,13,13,10,12,9,9,23,12,14,10,12,9,10,11,11,12,10,12,19,9,15,16,10,12,10,13,9,13,12,13,12,10,11,11,13,9,12,12,14,9,12,12,9,10,14,9,15,12,11,9,13,10,13,11,11,13,10,12,13,11,16,17,17,9,13,13,13,11,13,10,12,15,10,11,10,9,10,13,15,11,9,9,14,12,9,11

Policy Iteration,15872,3022,1843,35,11,9,12,14,12,15,10,10,9,9,9,21,17,11,15,10,12,10,11,16,12,12,13,10,12,19,12,14,13,9,14,13,10,17,9,10,11,12,11,11,10,12,12,12,10,14,18,20,17,11,12,11,17,12,10,14,9,12,9,10,13,9,17,11,12,17,17,11,9,11,17,12,12,13,12,17,12,10,9,15,22,18,10,16,14,13,10,9,11,10,13,9,11,11,11,16

Q Learning,122,135,49,19,47,17,89,32,12,11,19,11,19,66,12,16,21,9,22,26,16,9,15,18,17,15,25,41,10,19,16,9,9,16,23,11,16,9,61,11,38,16,16,20,10,13,11,86,12,21,59,13,21,14,15,16,11,19,19,15,32,18,10,12,21,14,19,29,18,30,23,14,16,16,9,18,12,19,13,15,17,12,25,15,12,14,9,44,44,19,39,10,13,29,12,9,12,14,20,62

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,43,2,4,3,4,4,3,4,4,4,6,4,5,6,11,6,7,6,8,7,7,6,6,6,12,13,14,16,17,16,17,15,17,16,15,22,18,20,19,21,30,9,9,11,10,11,13,10,13,14,7,8,8,8,8,10,11,11,10,10,10,11,14,11,24,10,8,9,9,12,11,11,11,10,10,10,14,11,11,11,11,11,13,19,21,26,26,24,31,24,27,33,13,13,12,12,13,13,12,12

Policy Iteration,9,1,1,1,1,2,5,4,3,2,2,3,4,7,9,9,5,5,11,8,5,6,6,10,8,8,6,7,7,8,10,9,9,9,8,12,29,24,29,27,29,30,24,25,31,29,54,60,45,26,24,18,23,24,25,24,24,25,24,29,24,19,15,15,27,31,26,21,23,20,26,26,19,27,24,20,20,19,21,20,19,24,27,27,24,24,22,28,52,28,27,36,28,39,47,29,37,35,35,46

Q Learning,46,22,4,3,6,12,44,11,8,12,7,2,5,6,4,5,4,2,3,2,3,4,5,4,6,5,4,3,4,5,2,3,3,3,2,4,4,6,5,3,3,5,4,4,3,5,4,9,4,4,3,4,4,5,7,4,5,4,3,6,7,4,8,5,5,5,4,7,5,6,4,5,4,4,4,5,3,4,5,7,5,6,6,4,5,6,4,7,6,6,5,5,4,5,11,6,5,7,5,7

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,-26095.0,-3484.0,-2813.0,82.0,84.0,93.0,89.0,87.0,93.0,90.0,88.0,90.0,91.0,90.0,89.0,89.0,92.0,90.0,93.0,93.0,79.0,90.0,88.0,92.0,90.0,93.0,92.0,91.0,91.0,90.0,92.0,90.0,83.0,93.0,87.0,86.0,92.0,90.0,92.0,89.0,93.0,89.0,90.0,89.0,90.0,92.0,91.0,91.0,89.0,93.0,90.0,90.0,88.0,93.0,90.0,90.0,93.0,92.0,88.0,93.0,87.0,90.0,91.0,93.0,89.0,92.0,89.0,91.0,91.0,89.0,92.0,90.0,89.0,91.0,86.0,85.0,85.0,93.0,89.0,89.0,89.0,91.0,89.0,92.0,90.0,87.0,92.0,91.0,92.0,93.0,92.0,89.0,87.0,91.0,93.0,93.0,88.0,90.0,93.0,91.0

Policy Iteration Rewards,-15770.0,-2920.0,-1741.0,67.0,91.0,93.0,90.0,88.0,90.0,87.0,92.0,92.0,93.0,93.0,93.0,81.0,85.0,91.0,87.0,92.0,90.0,92.0,91.0,86.0,90.0,90.0,89.0,92.0,90.0,83.0,90.0,88.0,89.0,93.0,88.0,89.0,92.0,85.0,93.0,92.0,91.0,90.0,91.0,91.0,92.0,90.0,90.0,90.0,92.0,88.0,84.0,82.0,85.0,91.0,90.0,91.0,85.0,90.0,92.0,88.0,93.0,90.0,93.0,92.0,89.0,93.0,85.0,91.0,90.0,85.0,85.0,91.0,93.0,91.0,85.0,90.0,90.0,89.0,90.0,85.0,90.0,92.0,93.0,87.0,80.0,84.0,92.0,86.0,88.0,89.0,92.0,93.0,91.0,92.0,89.0,93.0,91.0,91.0,91.0,86.0

Q Learning Rewards,-20.0,-33.0,53.0,83.0,55.0,85.0,13.0,70.0,90.0,91.0,83.0,91.0,83.0,36.0,90.0,86.0,81.0,93.0,80.0,76.0,86.0,93.0,87.0,84.0,85.0,87.0,77.0,61.0,92.0,83.0,86.0,93.0,93.0,86.0,79.0,91.0,86.0,93.0,41.0,91.0,64.0,86.0,86.0,82.0,92.0,89.0,91.0,16.0,90.0,81.0,43.0,89.0,81.0,88.0,87.0,86.0,91.0,83.0,83.0,87.0,70.0,84.0,92.0,90.0,81.0,88.0,83.0,73.0,84.0,72.0,79.0,88.0,86.0,86.0,93.0,84.0,90.0,83.0,89.0,87.0,85.0,90.0,77.0,87.0,90.0,88.0,93.0,58.0,58.0,83.0,63.0,92.0,89.0,73.0,90.0,93.0,90.0,88.0,82.0,40.0

**Large-Grid:**

Num generated: 1520; num unique: 102

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,8130,7368,76,655,488,31,28,26,24,32,23,34,35,23,23,23,28,34,32,21,34,26,27,32,26,24,27,34,28,23,23,25,26,30,29,21,27,23,29,26,28,25,29,28,23,26,36,22,27,26,27,28,33,33,29,26,32,27,30,26,21,29,30,29,31,32,33,27,31,31,43,34,23,30,48,28,28,21,32,25,26,26,23,26,35,25,23,26,23,29,27,29,26,35,22,29,29,24,23,25

Policy Iteration,3608,4590,2038,327,930,274,573,369,36,32,30,30,25,29,30,25,27,35,36,22,23,23,30,21,30,26,32,29,23,30,21,23,23,28,25,32,26,26,24,30,25,27,27,24,21,36,29,31,23,23,33,27,27,27,29,25,25,33,31,38,32,23,21,30,23,32,24,24,33,35,26,24,30,22,25,25,28,33,31,23,27,25,23,24,34,27,33,23,22,29,28,26,26,30,22,25,23,27,37,26

Q Learning,666,63,267,260,223,193,119,305,185,191,296,164,188,113,137,161,80,118,128,106,109,80,47,34,87,62,48,86,143,129,54,140,41,51,156,103,95,328,40,27,36,29,33,59,30,95,92,35,142,45,26,55,108,28,145,68,40,33,122,57,33,56,129,113,53,43,89,36,76,51,72,60,22,81,57,53,31,37,44,51,77,92,37,41,44,83,54,72,62,76,55,143,103,36,48,60,38,107,49,29

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,210,10,29,20,41,57,28,30,25,37,38,54,43,36,24,71,38,107,90,63,58,57,32,37,32,34,40,42,39,39,39,39,43,66,89,94,69,72,61,61,66,64,65,68,75,71,89,73,80,146,171,147,61,62,87,67,74,82,90,85,77,76,78,79,80,79,86,89,88,85,87,91,88,95,98,94,94,93,98,99,97,113,123,130,123,127,113,109,106,110,114,106,110,120,112,113,126,132,136,132

Policy Iteration,18,10,8,17,19,21,41,31,22,35,29,30,39,58,72,76,80,95,51,59,57,51,49,54,55,61,59,63,68,86,97,117,146,96,117,110,95,101,108,97,94,109,124,97,103,99,104,108,115,116,163,113,112,119,148,123,127,122,151,152,174,176,160,148,138,142,156,152,148,150,153,155,158,177,158,169,170,165,170,175,178,178,177,186,179,194,185,190,192,197,206,193,194,204,204,206,245,265,237,216

Q Learning,35,17,24,33,45,19,15,10,15,22,13,13,11,10,11,11,12,9,11,13,11,12,13,11,13,17,13,23,25,13,14,15,13,14,15,15,17,17,15,14,14,14,14,21,17,19,15,15,16,17,17,16,19,16,20,20,21,22,23,17,17,16,20,26,23,24,21,39,32,23,27,21,23,26,25,21,20,25,23,21,21,26,20,26,27,23,23,29,20,23,29,27,26,21,26,24,23,29,23,26

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,-8028.0,-7266.0,26.0,-553.0,-386.0,71.0,74.0,76.0,78.0,70.0,79.0,68.0,67.0,79.0,79.0,79.0,74.0,68.0,70.0,81.0,68.0,76.0,75.0,70.0,76.0,78.0,75.0,68.0,74.0,79.0,79.0,77.0,76.0,72.0,73.0,81.0,75.0,79.0,73.0,76.0,74.0,77.0,73.0,74.0,79.0,76.0,66.0,80.0,75.0,76.0,75.0,74.0,69.0,69.0,73.0,76.0,70.0,75.0,72.0,76.0,81.0,73.0,72.0,73.0,71.0,70.0,69.0,75.0,71.0,71.0,59.0,68.0,79.0,72.0,54.0,74.0,74.0,81.0,70.0,77.0,76.0,76.0,79.0,76.0,67.0,77.0,79.0,76.0,79.0,73.0,75.0,73.0,76.0,67.0,80.0,73.0,73.0,78.0,79.0,77.0

Policy Iteration Rewards,-3506.0,-4488.0,-1936.0,-225.0,-828.0,-172.0,-471.0,-267.0,66.0,70.0,72.0,72.0,77.0,73.0,72.0,77.0,75.0,67.0,66.0,80.0,79.0,79.0,72.0,81.0,72.0,76.0,70.0,73.0,79.0,72.0,81.0,79.0,79.0,74.0,77.0,70.0,76.0,76.0,78.0,72.0,77.0,75.0,75.0,78.0,81.0,66.0,73.0,71.0,79.0,79.0,69.0,75.0,75.0,75.0,73.0,77.0,77.0,69.0,71.0,64.0,70.0,79.0,81.0,72.0,79.0,70.0,78.0,78.0,69.0,67.0,76.0,78.0,72.0,80.0,77.0,77.0,74.0,69.0,71.0,79.0,75.0,77.0,79.0,78.0,68.0,75.0,69.0,79.0,80.0,73.0,74.0,76.0,76.0,72.0,80.0,77.0,79.0,75.0,65.0,76.0

Q Learning Rewards,-564.0,39.0,-165.0,-158.0,-121.0,-91.0,-17.0,-203.0,-83.0,-89.0,-194.0,-62.0,-86.0,-11.0,-35.0,-59.0,22.0,-16.0,-26.0,-4.0,-7.0,22.0,55.0,68.0,15.0,40.0,54.0,16.0,-41.0,-27.0,48.0,-38.0,61.0,51.0,-54.0,-1.0,7.0,-226.0,62.0,75.0,66.0,73.0,69.0,43.0,72.0,7.0,10.0,67.0,-40.0,57.0,76.0,47.0,-6.0,74.0,-43.0,34.0,62.0,69.0,-20.0,45.0,69.0,46.0,-27.0,-11.0,49.0,59.0,13.0,66.0,26.0,51.0,30.0,42.0,80.0,21.0,45.0,49.0,71.0,65.0,58.0,51.0,25.0,10.0,65.0,61.0,58.0,19.0,48.0,30.0,40.0,26.0,47.0,-41.0,-1.0,66.0,54.0,42.0,64.0,-5.0,53.0,73.0

**Rewards: 10000, -1:**

**Small-Grid:**

Num generated: 208; num unique: 18

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,54368,1094,5144,261,14,15,13,11,9,10,14,12,13,12,15,9,10,15,10,13,14,11,11,12,16,13,11,9,11,10,11,12,10,14,15,10,11,11,12,11,9,10,16,11,15,13,9,14,11,10,12,16,11,12,17,14,13,14,11,13,12,9,14,9,15,10,9,10,15,14,9,13,12,9,10,12,9,10,9,11,10,12,9,11,9,12,12,10,17,10,11,11,10,9,9,13,13,24,11,11

Policy Iteration,5058,4223,12886,88,12,17,10,9,11,9,13,15,10,12,10,9,9,11,13,15,9,14,20,19,14,14,13,12,13,15,9,12,14,16,11,14,12,16,11,15,12,16,12,11,12,14,14,11,9,12,12,12,10,15,12,9,11,9,14,11,14,17,12,9,9,11,12,17,9,10,14,10,10,10,13,11,12,11,10,9,10,10,14,11,10,15,9,9,9,12,12,10,11,11,12,13,11,10,13,12

Q Learning,191,96,193,37,168,37,56,13,14,11,28,11,11,24,18,12,10,13,15,12,50,13,19,12,13,9,17,28,16,10,20,37,19,14,34,10,19,11,9,14,18,32,15,19,13,14,12,22,20,11,12,14,31,16,12,18,12,13,20,16,13,33,15,13,20,12,11,29,12,19,10,10,89,12,16,17,11,33,13,18,46,10,9,11,40,40,18,18,10,10,9,12,12,19,15,30,12,42,16,17

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,54,2,1,2,2,2,2,2,2,2,2,3,3,3,4,3,2,3,3,6,6,5,5,6,4,4,5,6,7,8,9,7,9,7,9,7,7,5,7,7,9,9,10,10,9,6,13,11,12,7,16,18,22,23,31,34,29,31,30,18,22,33,12,12,11,10,9,9,10,9,9,9,10,10,10,11,10,10,10,10,10,10,10,11,12,10,13,23,17,17,18,17,20,15,15,15,13,12,12,13

Policy Iteration,11,1,2,5,6,7,7,8,15,11,12,12,13,22,7,11,10,11,11,10,10,13,12,7,15,20,21,16,15,16,13,18,11,18,22,18,17,23,23,23,22,18,21,23,18,24,23,21,18,16,27,19,19,31,21,23,18,27,17,19,26,22,21,24,28,35,27,26,27,16,22,33,19,29,23,24,21,21,20,22,22,22,21,20,66,30,27,27,22,20,26,29,32,26,34,31,26,23,25,23

Q Learning,36,4,6,2,5,13,33,15,5,5,4,1,3,4,3,4,5,6,13,4,5,3,8,3,4,8,3,6,2,3,3,2,4,2,3,3,3,4,2,2,3,3,4,3,3,3,4,3,6,4,3,3,5,3,3,3,3,4,4,3,3,3,3,4,4,3,3,4,3,4,4,4,5,3,5,5,4,8,5,5,5,5,5,5,9,7,5,4,5,5,4,5,4,5,5,5,5,5,5,6

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,-44366.0,8908.0,4858.0,9741.0,9988.0,9987.0,9989.0,9991.0,9993.0,9992.0,9988.0,9990.0,9989.0,9990.0,9987.0,9993.0,9992.0,9987.0,9992.0,9989.0,9988.0,9991.0,9991.0,9990.0,9986.0,9989.0,9991.0,9993.0,9991.0,9992.0,9991.0,9990.0,9992.0,9988.0,9987.0,9992.0,9991.0,9991.0,9990.0,9991.0,9993.0,9992.0,9986.0,9991.0,9987.0,9989.0,9993.0,9988.0,9991.0,9992.0,9990.0,9986.0,9991.0,9990.0,9985.0,9988.0,9989.0,9988.0,9991.0,9989.0,9990.0,9993.0,9988.0,9993.0,9987.0,9992.0,9993.0,9992.0,9987.0,9988.0,9993.0,9989.0,9990.0,9993.0,9992.0,9990.0,9993.0,9992.0,9993.0,9991.0,9992.0,9990.0,9993.0,9991.0,9993.0,9990.0,9990.0,9992.0,9985.0,9992.0,9991.0,9991.0,9992.0,9993.0,9993.0,9989.0,9989.0,9978.0,9991.0,9991.0

Policy Iteration Rewards,4944.0,5779.0,-2884.0,9914.0,9990.0,9985.0,9992.0,9993.0,9991.0,9993.0,9989.0,9987.0,9992.0,9990.0,9992.0,9993.0,9993.0,9991.0,9989.0,9987.0,9993.0,9988.0,9982.0,9983.0,9988.0,9988.0,9989.0,9990.0,9989.0,9987.0,9993.0,9990.0,9988.0,9986.0,9991.0,9988.0,9990.0,9986.0,9991.0,9987.0,9990.0,9986.0,9990.0,9991.0,9990.0,9988.0,9988.0,9991.0,9993.0,9990.0,9990.0,9990.0,9992.0,9987.0,9990.0,9993.0,9991.0,9993.0,9988.0,9991.0,9988.0,9985.0,9990.0,9993.0,9993.0,9991.0,9990.0,9985.0,9993.0,9992.0,9988.0,9992.0,9992.0,9992.0,9989.0,9991.0,9990.0,9991.0,9992.0,9993.0,9992.0,9992.0,9988.0,9991.0,9992.0,9987.0,9993.0,9993.0,9993.0,9990.0,9990.0,9992.0,9991.0,9991.0,9990.0,9989.0,9991.0,9992.0,9989.0,9990.0

Q Learning Rewards,9811.0,9906.0,9809.0,9965.0,9834.0,9965.0,9946.0,9989.0,9988.0,9991.0,9974.0,9991.0,9991.0,9978.0,9984.0,9990.0,9992.0,9989.0,9987.0,9990.0,9952.0,9989.0,9983.0,9990.0,9989.0,9993.0,9985.0,9974.0,9986.0,9992.0,9982.0,9965.0,9983.0,9988.0,9968.0,9992.0,9983.0,9991.0,9993.0,9988.0,9984.0,9970.0,9987.0,9983.0,9989.0,9988.0,9990.0,9980.0,9982.0,9991.0,9990.0,9988.0,9971.0,9986.0,9990.0,9984.0,9990.0,9989.0,9982.0,9986.0,9989.0,9969.0,9987.0,9989.0,9982.0,9990.0,9991.0,9973.0,9990.0,9983.0,9992.0,9992.0,9913.0,9990.0,9986.0,9985.0,9991.0,9969.0,9989.0,9984.0,9956.0,9992.0,9993.0,9991.0,9962.0,9962.0,9984.0,9984.0,9992.0,9992.0,9993.0,9990.0,9990.0,9983.0,9987.0,9972.0,9990.0,9960.0,9986.0,9985.0

**Large-Grid:**

Num generated: 1520; num unique: 102

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,7560,5459,139,148,46,32,24,30,25,26,29,30,24,27,24,29,25,28,39,25,28,41,21,22,23,25,30,24,31,23,45,24,31,35,40,28,24,36,21,22,24,35,29,30,32,22,30,27,24,21,27,28,31,26,24,37,27,30,23,27,30,30,29,23,25,24,27,29,23,25,33,25,28,21,23,23,41,31,35,23,29,28,34,28,27,34,27,28,37,26,23,21,36,27,24,29,27,25,37,28

Policy Iteration,7695,1914,2402,1037,135,43,79,25,23,30,44,26,26,29,24,35,30,30,28,26,32,29,26,23,28,24,30,26,33,28,29,32,25,26,43,29,30,31,32,25,28,23,30,34,23,27,26,25,27,26,24,29,23,27,22,23,31,30,25,23,31,27,28,26,35,28,29,31,24,28,39,31,24,24,25,22,23,26,33,29,29,25,35,26,33,35,26,36,28,26,28,33,26,25,33,26,22,26,28,30

Q Learning,888,486,204,268,351,88,196,589,241,95,155,257,106,66,43,71,172,98,188,96,36,67,31,82,73,84,74,51,104,39,139,158,42,43,185,133,32,77,70,41,42,38,62,54,36,73,33,49,43,45,109,60,61,53,102,55,41,58,40,65,106,156,74,44,70,68,33,25,90,29,204,44,241,35,54,159,36,45,42,109,41,74,24,37,82,152,141,39,41,54,59,39,36,30,68,33,82,65,40,26

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,129,61,10,15,14,21,43,46,46,51,19,17,19,21,27,28,23,35,44,58,84,71,218,83,36,38,40,47,53,53,49,46,41,52,66,93,107,69,50,47,49,58,57,62,61,65,67,62,62,98,142,149,137,65,76,74,75,75,80,81,74,77,77,81,75,83,81,86,87,86,87,91,89,92,96,93,91,99,98,96,101,99,99,105,105,105,108,107,108,140,136,115,127,124,121,119,124,117,130,117

Policy Iteration,86,7,8,10,19,17,22,33,30,27,25,28,33,38,33,36,37,45,45,45,48,54,53,56,58,85,68,65,77,82,77,81,70,87,85,78,80,85,85,82,88,94,92,95,104,111,132,114,110,106,114,118,119,112,132,124,134,135,150,146,147,154,135,145,139,145,146,146,152,150,158,160,163,158,164,159,165,188,196,171,175,176,194,180,192,184,204,182,191,197,202,198,216,215,201,206,206,209,211,220

Q Learning,74,60,14,27,13,25,18,21,14,16,19,19,16,15,12,15,18,14,26,10,11,12,11,13,15,13,13,13,12,13,15,13,14,16,18,15,16,17,13,15,16,17,15,16,20,18,17,17,16,17,16,17,18,21,17,16,18,17,18,20,19,17,18,21,20,24,21,25,19,20,19,22,24,26,23,22,24,20,23,26,22,23,25,24,22,22,22,23,26,23,24,29,24,22,24,25,24,23,35,26

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,2442.0,4543.0,9863.0,9854.0,9956.0,9970.0,9978.0,9972.0,9977.0,9976.0,9973.0,9972.0,9978.0,9975.0,9978.0,9973.0,9977.0,9974.0,9963.0,9977.0,9974.0,9961.0,9981.0,9980.0,9979.0,9977.0,9972.0,9978.0,9971.0,9979.0,9957.0,9978.0,9971.0,9967.0,9962.0,9974.0,9978.0,9966.0,9981.0,9980.0,9978.0,9967.0,9973.0,9972.0,9970.0,9980.0,9972.0,9975.0,9978.0,9981.0,9975.0,9974.0,9971.0,9976.0,9978.0,9965.0,9975.0,9972.0,9979.0,9975.0,9972.0,9972.0,9973.0,9979.0,9977.0,9978.0,9975.0,9973.0,9979.0,9977.0,9969.0,9977.0,9974.0,9981.0,9979.0,9979.0,9961.0,9971.0,9967.0,9979.0,9973.0,9974.0,9968.0,9974.0,9975.0,9968.0,9975.0,9974.0,9965.0,9976.0,9979.0,9981.0,9966.0,9975.0,9978.0,9973.0,9975.0,9977.0,9965.0,9974.0

Policy Iteration Rewards,2307.0,8088.0,7600.0,8965.0,9867.0,9959.0,9923.0,9977.0,9979.0,9972.0,9958.0,9976.0,9976.0,9973.0,9978.0,9967.0,9972.0,9972.0,9974.0,9976.0,9970.0,9973.0,9976.0,9979.0,9974.0,9978.0,9972.0,9976.0,9969.0,9974.0,9973.0,9970.0,9977.0,9976.0,9959.0,9973.0,9972.0,9971.0,9970.0,9977.0,9974.0,9979.0,9972.0,9968.0,9979.0,9975.0,9976.0,9977.0,9975.0,9976.0,9978.0,9973.0,9979.0,9975.0,9980.0,9979.0,9971.0,9972.0,9977.0,9979.0,9971.0,9975.0,9974.0,9976.0,9967.0,9974.0,9973.0,9971.0,9978.0,9974.0,9963.0,9971.0,9978.0,9978.0,9977.0,9980.0,9979.0,9976.0,9969.0,9973.0,9973.0,9977.0,9967.0,9976.0,9969.0,9967.0,9976.0,9966.0,9974.0,9976.0,9974.0,9969.0,9976.0,9977.0,9969.0,9976.0,9980.0,9976.0,9974.0,9972.0

Q Learning Rewards,9114.0,9516.0,9798.0,9734.0,9651.0,9914.0,9806.0,9413.0,9761.0,9907.0,9847.0,9745.0,9896.0,9936.0,9959.0,9931.0,9830.0,9904.0,9814.0,9906.0,9966.0,9935.0,9971.0,9920.0,9929.0,9918.0,9928.0,9951.0,9898.0,9963.0,9863.0,9844.0,9960.0,9959.0,9817.0,9869.0,9970.0,9925.0,9932.0,9961.0,9960.0,9964.0,9940.0,9948.0,9966.0,9929.0,9969.0,9953.0,9959.0,9957.0,9893.0,9942.0,9941.0,9949.0,9900.0,9947.0,9961.0,9944.0,9962.0,9937.0,9896.0,9846.0,9928.0,9958.0,9932.0,9934.0,9969.0,9977.0,9912.0,9973.0,9798.0,9958.0,9761.0,9967.0,9948.0,9843.0,9966.0,9957.0,9960.0,9893.0,9961.0,9928.0,9978.0,9965.0,9920.0,9850.0,9861.0,9963.0,9961.0,9948.0,9943.0,9963.0,9966.0,9972.0,9934.0,9969.0,9920.0,9937.0,9962.0,9976.0

**Rewards: -2, -1:**

**Small-Grid:**

Num generated: 208; num unique: 18

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,10753,286254,30012,2700,5341,19452,15,9181,11,12,12,10,13,9,15,9,12,9,13,11,10,12,13,9,11,13,11,10,13,11,13,9,12,9,12,16,9,13,15,14,9,11,17,16,19,14,10,11,16,11,14,12,11,16,11,10,10,9,12,9,17,9,10,13,9,9,11,12,13,29,11,9,10,12,15,11,15,11,11,9,9,10,10,17,10,15,9,9,16,13,11,11,11,10,22,10,14,17,13,11

Policy Iteration,63748,3850,8937,3942,13631,14530,923,1102,159,13,9,13,22,18,11,10,16,9,19,10,12,11,12,9,9,13,25,10,9,19,12,10,14,13,10,9,9,19,11,10,12,14,10,10,11,10,9,9,11,11,10,12,12,10,12,18,14,16,13,12,10,10,10,12,9,14,11,11,10,12,12,10,12,9,10,10,12,11,13,16,10,10,11,14,9,11,13,10,14,9,9,12,15,11,9,15,12,12,10,12

Q Learning,149,33,45,34,26,9,55,43,39,23,11,13,18,83,54,11,20,23,15,43,10,80,9,9,11,34,40,12,14,18,11,15,10,15,13,17,11,17,73,27,12,36,12,15,12,17,18,12,77,21,11,14,64,18,10,18,17,11,18,12,12,24,60,22,24,22,11,38,20,9,29,15,22,51,19,11,19,18,41,12,16,12,9,12,9,16,14,9,14,24,63,12,11,52,15,42,17,20,10,17

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,47,2,1,2,1,2,1,1,1,1,2,2,1,2,3,3,2,2,3,2,4,3,4,9,7,8,7,5,5,5,5,4,4,4,4,5,5,5,5,6,5,6,5,5,5,6,6,6,6,10,9,9,9,10,11,14,13,11,11,9,9,8,8,9,8,9,11,12,14,14,10,14,15,9,9,9,10,10,11,10,10,11,10,11,10,11,11,12,11,11,11,11,13,13,12,12,12,13,12,12

Policy Iteration,12,1,1,2,2,3,2,2,2,2,3,3,3,4,4,7,4,5,7,6,5,5,6,9,10,7,7,7,7,7,8,8,9,8,8,9,9,9,9,9,9,11,10,11,11,10,23,20,22,15,19,21,22,17,15,13,13,13,14,16,14,14,15,15,16,15,17,25,16,18,17,17,17,17,18,19,20,18,19,19,19,22,20,21,34,21,19,24,20,22,23,22,24,22,23,21,25,24,28,25

Q Learning,13,4,8,9,17,28,8,10,11,7,6,6,9,6,2,4,5,5,3,6,4,4,6,4,3,3,3,3,3,3,3,3,3,3,3,5,3,3,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,5,4,4,5,4,9,4,4,4,4,5,6,4,5,6,5,5,4,6,5,5,5,5,5,5,6,6,6,5,6,7,5,5,7,6,5,6,7,6,6,7,6,6,6,12,6

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,-10753.0,-286254.0,-30012.0,-2700.0,-5341.0,-19452.0,-15.0,-9181.0,-11.0,-12.0,-12.0,-10.0,-13.0,-9.0,-15.0,-9.0,-12.0,-9.0,-13.0,-11.0,-10.0,-12.0,-13.0,-9.0,-11.0,-13.0,-11.0,-10.0,-13.0,-11.0,-13.0,-9.0,-12.0,-9.0,-12.0,-16.0,-9.0,-13.0,-15.0,-14.0,-9.0,-11.0,-17.0,-16.0,-19.0,-14.0,-10.0,-11.0,-16.0,-11.0,-14.0,-12.0,-11.0,-16.0,-11.0,-10.0,-10.0,-9.0,-12.0,-9.0,-17.0,-9.0,-10.0,-13.0,-9.0,-9.0,-11.0,-12.0,-13.0,-29.0,-11.0,-9.0,-10.0,-12.0,-15.0,-11.0,-15.0,-11.0,-11.0,-9.0,-9.0,-10.0,-10.0,-17.0,-10.0,-15.0,-9.0,-9.0,-16.0,-13.0,-11.0,-11.0,-11.0,-10.0,-22.0,-10.0,-14.0,-17.0,-13.0,-11.0

Policy Iteration Rewards,-63748.0,-3850.0,-8937.0,-3942.0,-13631.0,-14530.0,-923.0,-1102.0,-159.0,-13.0,-9.0,-13.0,-22.0,-18.0,-11.0,-10.0,-16.0,-9.0,-19.0,-10.0,-12.0,-11.0,-12.0,-9.0,-9.0,-13.0,-25.0,-10.0,-9.0,-19.0,-12.0,-10.0,-14.0,-13.0,-10.0,-9.0,-9.0,-19.0,-11.0,-10.0,-12.0,-14.0,-10.0,-10.0,-11.0,-10.0,-9.0,-9.0,-11.0,-11.0,-10.0,-12.0,-12.0,-10.0,-12.0,-18.0,-14.0,-16.0,-13.0,-12.0,-10.0,-10.0,-10.0,-12.0,-9.0,-14.0,-11.0,-11.0,-10.0,-12.0,-12.0,-10.0,-12.0,-9.0,-10.0,-10.0,-12.0,-11.0,-13.0,-16.0,-10.0,-10.0,-11.0,-14.0,-9.0,-11.0,-13.0,-10.0,-14.0,-9.0,-9.0,-12.0,-15.0,-11.0,-9.0,-15.0,-12.0,-12.0,-10.0,-12.0

Q Learning Rewards,-149.0,-33.0,-45.0,-34.0,-26.0,-9.0,-55.0,-43.0,-39.0,-23.0,-11.0,-13.0,-18.0,-83.0,-54.0,-11.0,-20.0,-23.0,-15.0,-43.0,-10.0,-80.0,-9.0,-9.0,-11.0,-34.0,-40.0,-12.0,-14.0,-18.0,-11.0,-15.0,-10.0,-15.0,-13.0,-17.0,-11.0,-17.0,-73.0,-27.0,-12.0,-36.0,-12.0,-15.0,-12.0,-17.0,-18.0,-12.0,-77.0,-21.0,-11.0,-14.0,-64.0,-18.0,-10.0,-18.0,-17.0,-11.0,-18.0,-12.0,-12.0,-24.0,-60.0,-22.0,-24.0,-22.0,-11.0,-38.0,-20.0,-9.0,-29.0,-15.0,-22.0,-51.0,-19.0,-11.0,-19.0,-18.0,-41.0,-12.0,-16.0,-12.0,-9.0,-12.0,-9.0,-16.0,-14.0,-9.0,-14.0,-24.0,-63.0,-12.0,-11.0,-52.0,-15.0,-42.0,-17.0,-20.0,-10.0,-17.0

**Large-Grid:**

Num generated: 1520; num unique: 102

//Aggregate Analysis//

The data below shows the number of steps/actions the agent required to reach

the terminal state given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,27561,1099,3236,28265,1026,16857,12273,67876,9996,2295,30431,3806,7997,2481,692,797,2040,184,756,173,213,63,23,24,26,29,25,21,25,33,23,24,28,30,35,21,23,30,29,30,27,33,25,25,29,26,27,25,29,27,26,24,23,23,22,30,26,29,26,23,25,23,23,22,29,36,23,31,25,25,26,27,28,33,23,30,29,24,28,22,22,33,30,24,24,31,28,27,24,28,26,25,31,27,28,22,21,21,30,24

Policy Iteration,6587,61476,3020,373,3261,5810,1751,181,1064,580,2200,416,262,134,118,100,93,124,167,48,31,28,37,24,26,25,24,28,26,25,26,23,36,32,24,29,26,35,27,35,21,22,25,21,27,27,25,23,28,33,30,22,25,29,29,34,29,29,28,33,24,25,30,22,33,33,33,26,30,29,27,24,32,30,36,32,29,26,28,23,34,22,36,23,34,27,52,30,27,28,33,26,31,24,26,26,27,25,23,26

Q Learning,567,191,587,423,219,528,414,240,264,218,192,176,140,419,131,183,411,137,58,74,84,63,93,143,102,181,69,120,50,162,59,57,287,166,74,34,111,60,121,186,179,42,32,97,142,55,63,41,105,38,182,61,73,87,52,70,95,83,72,62,52,51,85,36,113,113,82,53,36,41,135,112,39,86,62,80,24,39,173,45,59,38,48,25,59,49,50,50,34,37,54,95,84,29,29,68,49,24,46,45

The data below shows the number of milliseconds the algorithm required to generate

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration,148,9,5,15,7,10,11,13,16,19,131,15,16,21,25,20,25,22,25,25,30,32,37,31,35,34,37,35,41,38,45,55,44,41,50,45,46,48,48,51,52,55,53,67,89,65,62,62,64,63,73,69,64,71,84,72,74,83,89,76,84,74,93,92,82,93,106,96,132,134,96,90,92,94,95,99,97,94,97,108,98,99,100,102,121,107,106,111,110,111,114,110,115,116,115,119,118,121,126,117

Policy Iteration,12,8,8,11,13,14,18,21,20,25,27,30,31,31,36,39,43,42,42,43,48,51,50,59,59,60,61,66,66,73,70,87,73,76,87,83,81,86,86,88,90,93,101,92,97,104,113,104,117,108,122,112,121,120,130,123,124,131,143,150,157,150,139,142,142,177,144,147,150,152,157,160,177,170,172,167,174,182,184,177,175,181,188,181,183,187,188,192,193,197,217,200,196,207,204,207,208,213,220,220

Q Learning,23,7,29,30,33,28,38,15,13,17,20,19,21,13,15,14,16,14,15,14,22,19,17,17,16,16,21,17,18,20,16,20,21,22,18,19,21,24,19,21,22,23,25,23,25,24,25,22,24,24,24,22,23,26,23,22,24,26,29,24,28,24,24,23,28,25,26,25,27,25,27,29,26,29,27,26,28,27,26,30,28,27,31,28,28,27,27,30,31,28,34,29,29,28,29,30,30,29,30,29

The data below shows the total reward gained for

the optimal policy given the number of iterations the algorithm was run.

Iterations,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100

Value Iteration Rewards,-27561.0,-1099.0,-3236.0,-28265.0,-1026.0,-16857.0,-12273.0,-67876.0,-9996.0,-2295.0,-30431.0,-3806.0,-7997.0,-2481.0,-692.0,-797.0,-2040.0,-184.0,-756.0,-173.0,-213.0,-63.0,-23.0,-24.0,-26.0,-29.0,-25.0,-21.0,-25.0,-33.0,-23.0,-24.0,-28.0,-30.0,-35.0,-21.0,-23.0,-30.0,-29.0,-30.0,-27.0,-33.0,-25.0,-25.0,-29.0,-26.0,-27.0,-25.0,-29.0,-27.0,-26.0,-24.0,-23.0,-23.0,-22.0,-30.0,-26.0,-29.0,-26.0,-23.0,-25.0,-23.0,-23.0,-22.0,-29.0,-36.0,-23.0,-31.0,-25.0,-25.0,-26.0,-27.0,-28.0,-33.0,-23.0,-30.0,-29.0,-24.0,-28.0,-22.0,-22.0,-33.0,-30.0,-24.0,-24.0,-31.0,-28.0,-27.0,-24.0,-28.0,-26.0,-25.0,-31.0,-27.0,-28.0,-22.0,-21.0,-21.0,-30.0,-24.0

Policy Iteration Rewards,-6587.0,-61476.0,-3020.0,-373.0,-3261.0,-5810.0,-1751.0,-181.0,-1064.0,-580.0,-2200.0,-416.0,-262.0,-134.0,-118.0,-100.0,-93.0,-124.0,-167.0,-48.0,-31.0,-28.0,-37.0,-24.0,-26.0,-25.0,-24.0,-28.0,-26.0,-25.0,-26.0,-23.0,-36.0,-32.0,-24.0,-29.0,-26.0,-35.0,-27.0,-35.0,-21.0,-22.0,-25.0,-21.0,-27.0,-27.0,-25.0,-23.0,-28.0,-33.0,-30.0,-22.0,-25.0,-29.0,-29.0,-34.0,-29.0,-29.0,-28.0,-33.0,-24.0,-25.0,-30.0,-22.0,-33.0,-33.0,-33.0,-26.0,-30.0,-29.0,-27.0,-24.0,-32.0,-30.0,-36.0,-32.0,-29.0,-26.0,-28.0,-23.0,-34.0,-22.0,-36.0,-23.0,-34.0,-27.0,-52.0,-30.0,-27.0,-28.0,-33.0,-26.0,-31.0,-24.0,-26.0,-26.0,-27.0,-25.0,-23.0,-26.0

Q Learning Rewards,-567.0,-191.0,-587.0,-423.0,-219.0,-528.0,-414.0,-240.0,-264.0,-218.0,-192.0,-176.0,-140.0,-419.0,-131.0,-183.0,-411.0,-137.0,-58.0,-74.0,-84.0,-63.0,-93.0,-143.0,-102.0,-181.0,-69.0,-120.0,-50.0,-162.0,-59.0,-57.0,-287.0,-166.0,-74.0,-34.0,-111.0,-60.0,-121.0,-186.0,-179.0,-42.0,-32.0,-97.0,-142.0,-55.0,-63.0,-41.0,-105.0,-38.0,-182.0,-61.0,-73.0,-87.0,-52.0,-70.0,-95.0,-83.0,-72.0,-62.0,-52.0,-51.0,-85.0,-36.0,-113.0,-113.0,-82.0,-53.0,-36.0,-41.0,-135.0,-112.0,-39.0,-86.0,-62.0,-80.0,-24.0,-39.0,-173.0,-45.0,-59.0,-38.0,-48.0,-25.0,-59.0,-49.0,-50.0,-50.0,-34.0,-37.0,-54.0,-95.0,-84.0,-29.0,-29.0,-68.0,-49.0,-24.0,-46.0,-45.0