```
Python: 3.8.8 (default, Feb 24 2021, 15:54:32) [MSC v.1928 64 bit (AMD64)]
scipy: 1.7.1
numpy: 1.19.2
pandas: 1.1.3
sklearn: 0.24.2
Hello World!
**************
Part-1-Monte Carlo First-visit
**************
**************
Epoch-0
**************
----N(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
----S(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
----V(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
```

```
**********
Epoch- 1
**********
----N(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 1.]
 [0. 0. 0. 0. 1.]
 [0. 0. 0. 0. 0.]]
----S(s)-----
[[ 0.     0.     0.     0.     0.   ]
 [ 0.     0.     0.     0.     0.   ]
 [ 0.     0.     0.     0.    -3.439]
 [ 0.     0.     0.     0.    -2.71 ]
 [ 0.     0.     0.     0.     0.   ]]
----V(s)-----
[[ 0.     0.     0.     0.     0.   ]
 [ 0.     0.     0.     0.     0.   ]
 [ 0.     0.     0.     0.    -3.439]
 [ 0.     0.     0.     0.    -2.71 ]
 [ 0.     0.     0.     0.     0.   ]]
--------------------
k, s, r, γ, and G(s)
--------------------
 k   s    r  gamma     gs
 1  14 -1.0    0.9 -3.439
 2  19 -1.0    0.9 -2.710
 3  14 -1.0    0.9 -1.900
 4  19 -1.0    0.9 -1.000
```

```
************
Epoch- 10
************
----N(s)-----
[[0. 3. 2. 2. 2.]
 [1. 4. 2. 2. 1.]
 [3. 4. 4. 3. 4.]
 [6. 7. 7. 7. 6.]
 [7. 8. 7. 6. 0.]]
----S(s)-----
[[  0.         -25.86691378 -16.8617797  -19.88017194 -19.88365232]
 [ -4.68559    -29.1047823  -17.17568919 -19.86695815  -9.85219117]
 [-26.06153239 -35.57811032 -38.45011872 -25.65774437 -33.17777933]
 [-48.1671129  -60.55801253 -51.05068336 -45.56650599 -34.32408668]
 [-56.41744164 -62.70029221 -52.19506334 -43.82763475   0.        ]]
----V(s)-----
[[ 0.         -8.62230459 -8.43088985 -9.94008597 -9.94182616]
 [-4.68559    -7.27619557 -8.58784459 -9.93347908 -9.85219117]
 [-8.68717746 -8.89452758 -9.61252968 -8.55258146 -8.29444483]
 [-8.02785215 -8.65114465 -7.29295477 -6.50950086 -5.72068111]
 [-8.05963452 -7.83753653 -7.45643762 -7.30460579  0.        ]]
--------------------
k, s, r, γ, and G(s)
--------------------
  k   s    r  gamma        gs
  1  22 -1.0    0.9 -9.015229
  2  21 -1.0    0.9 -8.905810
  3  20 -1.0    0.9 -8.784233
  4  15 -1.0    0.9 -8.649148
  5  15 -1.0    0.9 -8.499054
  6  16 -1.0    0.9 -8.332282
  7  15 -1.0    0.9 -8.146980
  8  16 -1.0    0.9 -7.941089
  9  17 -1.0    0.9 -7.712321
 10  18 -1.0    0.9 -7.458134
 11  23 -1.0    0.9 -7.175705
 12  23 -1.0    0.9 -6.861894
 13  18 -1.0    0.9 -6.513216
 14  23 -1.0    0.9 -6.125795
 15  22 -1.0    0.9 -5.695328
 16  17 -1.0    0.9 -5.217031
 17  22 -1.0    0.9 -4.685590
 18  23 -1.0    0.9 -4.095100
 19  18 -1.0    0.9 -3.439000
 20  23 -1.0    0.9 -2.710000
 21  23 -1.0    0.9 -1.900000
 22  23 -1.0    0.9 -1.000000
```

```
************
Epoch- 100
************
----N(s)-----
[[ 0. 42. 41. 44. 38.]
 [50. 59. 54. 46. 40.]
 [52. 60. 56. 51. 40.]
 [51. 56. 62. 55. 37.]
 [45. 52. 52. 52.  0.]]
----S(s)-----
[[   0.         -284.00335583 -368.41408628 -397.65967152 -349.34781476]
 [-325.281766   -448.95005323 -470.24359003 -427.88948052 -368.26285361]
 [-423.58261552 -496.11732819 -494.87250725 -428.78732442 -338.62596939]
 [-454.37215391 -493.84480726 -496.40759752 -397.09875781 -211.32431753]
 [-395.95374226 -447.71315184 -401.62231638 -283.94138884    0.        ]]
----V(s)-----
[[ 0.         -6.76198466 -8.98570942 -9.03771981 -9.19336355]
 [-6.50563532 -7.60932294 -8.70821463 -9.30194523 -9.20657134]
 [-8.14581953 -8.26862214 -8.83700906 -8.4075946  -8.46564923]
 [-8.90925792 -8.81865727 -8.00657415 -7.21997741 -5.71146804]
 [-8.79897205 -8.6098683  -7.72350608 -5.46041132  0.        ]]
--------------------
k, s, r, γ, and G(s)
--------------------
  k   s    r  gamma        gs
  1  22 -1.0    0.9 -8.649148
  2  22 -1.0    0.9 -8.499054
  3  21 -1.0    0.9 -8.332282
  4  20 -1.0    0.9 -8.146980
  5  21 -1.0    0.9 -7.941089
  6  22 -1.0    0.9 -7.712321
  7  21 -1.0    0.9 -7.458134
  8  21 -1.0    0.9 -7.175705
  9  22 -1.0    0.9 -6.861894
 10  22 -1.0    0.9 -6.513216
 11  23 -1.0    0.9 -6.125795
 12  18 -1.0    0.9 -5.695328
 13  17 -1.0    0.9 -5.217031
 14  18 -1.0    0.9 -4.685590
 15  13 -1.0    0.9 -4.095100
 16  12 -1.0    0.9 -3.439000
 17   7 -1.0    0.9 -2.710000
 18   6 -1.0    0.9 -1.900000
 19   1 -1.0    0.9 -1.000000
```

```
**********
Part-2-Monte Carlo Every-visit
**********
**********
Epoch-0
**********
----N(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
----S(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
----V(s)-----
[[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
```

```
************
Epoch- 1
************
----N(s)-----
[[0. 0. 0. 0. 0.]
 [2. 2. 0. 0. 0.]
 [3. 4. 0. 0. 0.]
 [0. 2. 1. 0. 0.]
 [0. 1. 3. 1. 0.]]
----S(s)-----
[[  0.          0.          0.          0.          0.        ]
 [-15.82485292 -12.98768915   0.          0.          0.        ]
 [-24.28946965 -28.06784406   0.          0.          0.        ]
 [  0.         -13.15811968  -2.71        0.          0.        ]
 [  0.          -4.68559     -9.4341     -1.          0.        ]]
----V(s)-----
[[ 0.          0.          0.          0.          0.        ]
 [-7.91242646 -6.49384457  0.          0.          0.        ]
 [-8.09648988 -7.01696102  0.          0.          0.        ]
 [ 0.         -6.57905984 -2.71        0.          0.        ]
 [ 0.         -4.68559    -3.1447     -1.          0.        ]]
--------------------
k, s, r, γ, and G(s)
--------------------
  k   s    r  gamma        gs
  1   5 -1.0    0.9 -8.649148
  2  10 -1.0    0.9 -8.499054
  3  10 -1.0    0.9 -8.332282
  4  11 -1.0    0.9 -8.146980
  5  16 -1.0    0.9 -7.941089
  6  11 -1.0    0.9 -7.712321
  7  10 -1.0    0.9 -7.458134
  8   5 -1.0    0.9 -7.175705
  9   6 -1.0    0.9 -6.861894
 10  11 -1.0    0.9 -6.513216
 11   6 -1.0    0.9 -6.125795
 12  11 -1.0    0.9 -5.695328
 13  16 -1.0    0.9 -5.217031
 14  21 -1.0    0.9 -4.685590
 15  22 -1.0    0.9 -4.095100
 16  22 -1.0    0.9 -3.439000
 17  17 -1.0    0.9 -2.710000
 18  22 -1.0    0.9 -1.900000
 19  23 -1.0    0.9 -1.000000
```

```
************
Epoch- 10
************
----N(s)-----
[[ 0.  9. 21. 12. 12.]
 [ 9. 16. 23. 16. 16.]
 [13. 17. 19. 15. 21.]
 [22. 27. 25. 19. 22.]
 [23. 35. 27. 19.  0.]]
----S(s)-----
[[   0.          -86.48372279 -204.83556012 -113.8566085  -113.10119393]
 [ -58.82418968 -143.08672849 -224.11306074 -140.04717334 -133.699794  ]
 [-106.2428146  -146.75260422 -172.74177605 -117.45736786 -158.89090844]
 [-169.60686513 -228.71375759 -203.20604072 -130.21298626 -109.08293789]
 [-184.90913599 -275.59898401 -202.21742093 -111.82468726    0.        ]]
----V(s)-----
[[ 0.         -9.60930253 -9.75407429 -9.48805071 -9.42509949]
 [-6.53602108 -8.94292053 -9.74404612 -8.75294833 -8.35623712]
 [-8.1725242  -8.63250613 -9.09167242 -7.83049119 -7.56623374]
 [-7.70940296 -8.47087991 -8.12824163 -6.85331507 -4.95831536]
 [-8.03952765 -7.87425669 -7.48953411 -5.88550986  0.        ]]
--------------------
k, s, r, γ, and G(s)
--------------------
    k   s    r  gamma        gs
    1  23 -1.0    0.9 -9.999999
    2  23 -1.0    0.9 -9.999999
    3  22 -1.0    0.9 -9.999998
    4  22 -1.0    0.9 -9.999998
    5  23 -1.0    0.9 -9.999998
    6  22 -1.0    0.9 -9.999998
    7  17 -1.0    0.9 -9.999998
    8  12 -1.0    0.9 -9.999997
    9  11 -1.0    0.9 -9.999997
   10   6 -1.0    0.9 -9.999997
   11   1 -1.0    0.9 -9.999996
   12   2 -1.0    0.9 -9.999996
   13   1 -1.0    0.9 -9.999996
   14   6 -1.0    0.9 -9.999995
   15   7 -1.0    0.9 -9.999995
   16  12 -1.0    0.9 -9.999994
   17  11 -1.0    0.9 -9.999993
   18   6 -1.0    0.9 -9.999993
   19   5 -1.0    0.9 -9.999992
   20  10 -1.0    0.9 -9.999991
   21  10 -1.0    0.9 -9.999990
   22  15 -1.0    0.9 -9.999989
   23  16 -1.0    0.9 -9.999987
```

```
 24  11 -1.0    0.9 -9.999986
 25  12 -1.0    0.9 -9.999985
 26  13 -1.0    0.9 -9.999983
 27  18 -1.0    0.9 -9.999981
 28  23 -1.0    0.9 -9.999979
 29  23 -1.0    0.9 -9.999976
 30  18 -1.0    0.9 -9.999974
 31  19 -1.0    0.9 -9.999971
 32  14 -1.0    0.9 -9.999968
 33  14 -1.0    0.9 -9.999964
 34  19 -1.0    0.9 -9.999960
 35  14 -1.0    0.9 -9.999956
 36   9 -1.0    0.9 -9.999951
 37   4 -1.0    0.9 -9.999945
 38   4 -1.0    0.9 -9.999939
 39   3 -1.0    0.9 -9.999932
 40   3 -1.0    0.9 -9.999925
 41   2 -1.0    0.9 -9.999917
 42   3 -1.0    0.9 -9.999907
 43   3 -1.0    0.9 -9.999897
 44   2 -1.0    0.9 -9.999886
 45   2 -1.0    0.9 -9.999873
 46   7 -1.0    0.9 -9.999859
 47   6 -1.0    0.9 -9.999843
 48   5 -1.0    0.9 -9.999826
 49   6 -1.0    0.9 -9.999806
 50   5 -1.0    0.9 -9.999785
 51  10 -1.0    0.9 -9.999761
 52   5 -1.0    0.9 -9.999734
 53  10 -1.0    0.9 -9.999705
 54  11 -1.0    0.9 -9.999672
 55   6 -1.0    0.9 -9.999636
 56   7 -1.0    0.9 -9.999595
 57   8 -1.0    0.9 -9.999550
 58   7 -1.0    0.9 -9.999500
 59   2 -1.0    0.9 -9.999445
 60   7 -1.0    0.9 -9.999383
 61  12 -1.0    0.9 -9.999314
 62  11 -1.0    0.9 -9.999238
 63  10 -1.0    0.9 -9.999154
 64  10 -1.0    0.9 -9.999060
 65  11 -1.0    0.9 -9.998955
 66  16 -1.0    0.9 -9.998839
 67  11 -1.0    0.9 -9.998710
 68  16 -1.0    0.9 -9.998567
 69  11 -1.0    0.9 -9.998407
```

```
 70  12 -1.0    0.9 -9.998230
 71  17 -1.0    0.9 -9.998034
 72  22 -1.0    0.9 -9.997815
 73  17 -1.0    0.9 -9.997573
 74  12 -1.0    0.9 -9.997303
 75   7 -1.0    0.9 -9.997003
 76   2 -1.0    0.9 -9.996670
 77   3 -1.0    0.9 -9.996300
 78   2 -1.0    0.9 -9.995889
 79   3 -1.0    0.9 -9.995432
 80   2 -1.0    0.9 -9.994925
 81   7 -1.0    0.9 -9.994361
 82   2 -1.0    0.9 -9.993734
 83   7 -1.0    0.9 -9.993038
 84   8 -1.0    0.9 -9.992264
 85   3 -1.0    0.9 -9.991405
 86   2 -1.0    0.9 -9.990450
 87   7 -1.0    0.9 -9.989389
 88   8 -1.0    0.9 -9.988210
 89   9 -1.0    0.9 -9.986900
 90   4 -1.0    0.9 -9.985444
 91   4 -1.0    0.9 -9.983827
 92   4 -1.0    0.9 -9.982030
 93   9 -1.0    0.9 -9.980033
 94   4 -1.0    0.9 -9.977815
 95   9 -1.0    0.9 -9.975350
 96   8 -1.0    0.9 -9.972611
 97  13 -1.0    0.9 -9.969567
 98  12 -1.0    0.9 -9.966186
 99  11 -1.0    0.9 -9.962429
100   6 -1.0    0.9 -9.958254
101   7 -1.0    0.9 -9.953616
102   6 -1.0    0.9 -9.948462
103   1 -1.0    0.9 -9.942736
104   6 -1.0    0.9 -9.936373
105   7 -1.0    0.9 -9.929303
106   6 -1.0    0.9 -9.921448
107   1 -1.0    0.9 -9.912720
108   6 -1.0    0.9 -9.903023
109   7 -1.0    0.9 -9.892247
110   2 -1.0    0.9 -9.880275
111   2 -1.0    0.9 -9.866972
112   7 -1.0    0.9 -9.852191
113   8 -1.0    0.9 -9.835768
114   7 -1.0    0.9 -9.817520
115   2 -1.0    0.9 -9.797244
116   2 -1.0    0.9 -9.774716
```

```
117   7 -1.0    0.9 -9.749684
118  12 -1.0    0.9 -9.721872
119  17 -1.0    0.9 -9.690968
120  16 -1.0    0.9 -9.656632
121  15 -1.0    0.9 -9.618480
122  16 -1.0    0.9 -9.576088
123  21 -1.0    0.9 -9.528987
124  21 -1.0    0.9 -9.476652
125  21 -1.0    0.9 -9.418503
126  16 -1.0    0.9 -9.353892
127  17 -1.0    0.9 -9.282102
128  18 -1.0    0.9 -9.202336
129  17 -1.0    0.9 -9.113706
130  18 -1.0    0.9 -9.015229
131  19 -1.0    0.9 -8.905810
132  14 -1.0    0.9 -8.784233
133   9 -1.0    0.9 -8.649148
134   8 -1.0    0.9 -8.499054
135   7 -1.0    0.9 -8.332282
136  12 -1.0    0.9 -8.146980
137  11 -1.0    0.9 -7.941089
138  16 -1.0    0.9 -7.712321
139  17 -1.0    0.9 -7.458134
140  16 -1.0    0.9 -7.175705
141  15 -1.0    0.9 -6.861894
142  15 -1.0    0.9 -6.513216
143  15 -1.0    0.9 -6.125795
144  20 -1.0    0.9 -5.695328
145  21 -1.0    0.9 -5.217031
146  20 -1.0    0.9 -4.685590
147  15 -1.0    0.9 -4.095100
148  16 -1.0    0.9 -3.439000
149  21 -1.0    0.9 -2.710000
150  22 -1.0    0.9 -1.900000
151  23 -1.0    0.9 -1.000000
```

```
************
Epoch- 100
************
----N(s)-----
[[  0. 129. 188. 171. 169.]
 [105. 160. 188. 176. 183.]
 [168. 188. 182. 172. 163.]
 [186. 206. 198. 173. 131.]
 [200. 215. 176.  89.   0.]]
----S(s)-----
[[    0.          -776.29475637 -1518.98495194 -1480.00191104
  -1521.27045624]
 [ -539.01251302 -1186.32317573 -1560.54169955 -1522.39119899
  -1624.53807921]
 [-1364.25193342 -1575.94357938 -1527.38281833 -1426.27669105
  -1324.93912258]
 [-1680.7950002  -1865.5093745  -1655.26520571 -1238.36262623
   -839.10079886]
 [-1862.66020989 -1912.11698855 -1410.20432953  -502.54182568
      0.        ]]
----V(s)-----
[[ 0.         -6.01778881 -8.07970719 -8.65498194 -9.00160033]
 [-5.1334525  -7.41451985 -8.30075372 -8.64994999 -8.87725726]
 [-8.12054722 -8.38267861 -8.39221329 -8.29230634 -8.12846087]
 [-9.03653226 -9.05587075 -8.35992528 -7.15816547 -6.40534961]
 [-9.31330105 -8.89356739 -8.0125246  -5.64653737  0.        ]]
--------------------
k, s, r, γ, and G(s)
--------------------
  k   s    r  gamma        gs
  1  13 -1.0    0.9 -6.861894
  2  18 -1.0    0.9 -6.513216
  3  23 -1.0    0.9 -6.125795
  4  18 -1.0    0.9 -5.695328
  5  13 -1.0    0.9 -5.217031
  6   8 -1.0    0.9 -4.685590
  7   7 -1.0    0.9 -4.095100
  8   2 -1.0    0.9 -3.439000
  9   2 -1.0    0.9 -2.710000
 10   2 -1.0    0.9 -1.900000
 11   1 -1.0    0.9 -1.000000
```

```
*************
Part-3-Q-Learning
*************
Q-Learning Rewards Matrix (R)
-----------------------------
     0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23   24
0   100   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
1   100  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
2    -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
3    -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
4    -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
5   100  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
6    -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
7    -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
8    -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
9    -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1   -1
10   -1  -1  -1  -1  -1   0  -1  -1  -1  -1   0  -1  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1   -1
11   -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1   -1
12   -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1   -1
13   -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1   -1
14   -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1   -1
15   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1   -1
16   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1   -1
17   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1   -1
18   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0   -1
19   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  100
20   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1   -1
21   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1   -1
22   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0   -1
23   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  100
24   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  100
```

```
Q-Learning Value Matrix (Q)
---------------------------
Initial values
--------------
    0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
5   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
7   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
8   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
9   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
10  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
11  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
12  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
13  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
14  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
15  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
16  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
17  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
18  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
19  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
20  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
21  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
22  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
23  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
24  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

```
Iteration: 1
---------------
    0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
5   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
7   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
8   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
9   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
10  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
11  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
12  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
13  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
14  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
15  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
16  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
17  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
18  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
19  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
20  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
21  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
22  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
23  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 100
24  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

```
Iteration: 10
---------------
     0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
0    0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1  100   0  81   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
2    0  90   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
3    0   0  81   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
4    0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
5  100   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
6    0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
7    0   0   0   0   0   0   0   0  64   0   0   0  64   0   0   0   0   0   0   0   0   0   0   0   0
8    0   0   0   0   0   0   0  57   0   0   0   0   0  72   0   0   0   0   0   0   0   0   0   0   0
9    0   0   0   0   0   0   0   0  51   0   0   0   0   0  81   0   0   0   0   0   0   0   0   0   0
10   0   0   0   0   0   0   0   0   0   0   0  57   0   0   0   0   0   0   0   0   0   0   0   0   0
11   0   0   0   0   0   0   0   0   0   0   0   0  64   0   0   0  64   0   0   0   0   0   0   0   0
12   0   0   0   0   0   0   0  57   0   0   0  57   0   0   0   0   0  72   0   0   0   0   0   0   0
13   0   0   0   0   0   0   0   0  51   0   0   0  64   0  81   0   0   0  81   0   0   0   0   0   0
14   0   0   0   0   0   0   0   0   0  72   0   0   0   0   0   0   0   0   0  90   0   0   0   0   0
15   0   0   0   0   0   0   0   0   0   0  51   0   0   0   0   0   0   0   0   0   0   0   0   0   0
16   0   0   0   0   0   0   0   0   0   0   0  57   0   0   0   0   0  72   0   0   0  72   0   0   0
17   0   0   0   0   0   0   0   0   0   0   0   0  64   0   0   0  64   0  81   0   0   0  81   0   0
18   0   0   0   0   0   0   0   0   0   0   0   0   0  72   0   0   0  72   0  90   0   0   0  90   0
19   0   0   0   0   0   0   0   0   0   0   0   0   0   0  81   0   0   0  81   0   0   0   0   0 100
20   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0  72   0   0   0
21   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0  51   0   0   0  64   0  81   0   0
22   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0  72   0   0   0  72   0  90   0
23   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0  81   0   0   0  81   0 100
24   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

```
Iteration: 500
---------------
     0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24
0   605  505    0    0    0  505    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
1   644    0  521    0    0    0  521    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
2     0  579    0  468    0    0    0  468    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
3     0    0  521    0  421    0    0    0  421    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
4     0    0    0  468    0    0    0    0    0  386    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
5   644    0    0    0    0    0  521    0    0    0  521    0    0    0    0    0    0    0    0    0    0    0    0    0    0
6     0  579    0    0    0  579    0  468    0    0    0  468    0    0    0    0    0    0    0    0    0    0    0    0    0
7     0    0  521    0    0    0  521    0  421    0    0    0  421    0    0    0    0    0    0    0    0    0    0    0    0
8     0    0    0  468    0    0    0  468    0  386    0    0    0  386    0    0    0    0    0    0    0    0    0    0    0
9     0    0    0    0  421    0    0    0  421    0    0    0    0    0  429    0    0    0    0    0    0    0    0    0    0
10    0    0    0    0    0  579    0    0    0    0    0  468    0    0    0  468    0    0    0    0    0    0    0    0    0
11    0    0    0    0    0    0  521    0    0    0  521    0  421    0    0    0  421    0    0    0    0    0    0    0    0
12    0    0    0    0    0    0    0  468    0    0    0  468    0  386    0    0    0  386    0    0    0    0    0    0    0
13    0    0    0    0    0    0    0    0  421    0    0    0  421    0  429    0    0    0  429    0    0    0    0    0    0
14    0    0    0    0    0    0    0    0    0  386    0    0    0  386    0    0    0    0    0  477    0    0    0    0    0
15    0    0    0    0    0    0    0    0    0    0  521    0    0    0    0    0  421    0    0    0  421    0    0    0    0
16    0    0    0    0    0    0    0    0    0    0    0  468    0    0    0  468    0  386    0    0    0  386    0    0    0
17    0    0    0    0    0    0    0    0    0    0    0    0  421    0    0    0  421    0  429    0    0    0  429    0    0
18    0    0    0    0    0    0    0    0    0    0    0    0    0  386    0    0    0  386    0  477    0    0    0  477    0
19    0    0    0    0    0    0    0    0    0    0    0    0    0    0  429    0    0    0  429    0    0    0    0    0  577
20    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0  468    0    0    0    0    0  386    0    0    0
21    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0  421    0    0    0  421    0  429    0    0
22    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0  386    0    0    0  386    0  477    0
23    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0  429    0    0    0  429    0  531
24    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0  477    0    0    0  477  531
```

```
*************
Part-4-SARSA
*************
Q-Learning Rewards Matrix (R)
------------------------------
     0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23   24
0   100   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
1   100  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
2    -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
3    -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
4    -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
5   100  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
6    -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
7    -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
8    -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
9    -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
10   -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1  -1
11   -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1  -1
12   -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1  -1
13   -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1  -1
14   -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1
15   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1
16   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1  -1
17   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1  -1
18   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1  -1   0  -1
19   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1  -1  -1  -1  -1 100
20   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1  -1  -1   0  -1  -1  -1
21   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1  -1
22   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1   0  -1
23   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0  -1 100
24   -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1  -1   0  -1  -1  -1   0 100
```

```
Q-Learning Value Matrix (Q)
---------------------------
Initial values
--------------
    0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
5   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
7   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
8   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
9   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
10  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
11  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
12  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
13  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
14  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
15  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
16  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
17  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
18  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
19  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
20  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
21  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
22  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
23  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
24  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

```
Iteration: 1
--------------
    0   1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
1   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
5   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
7   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
8   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
9   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
10  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
11  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
12  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
13  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
14  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
15  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
16  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
17  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
18  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
19  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
20  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
21  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
22  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
23  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 100
24  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

Iteration: 10

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Iteration: 100

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	249	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	224	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	303	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	272	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	330	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	249	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	241	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	367	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	330	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	277	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	308	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	408
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	343