

Vaishnavi Patel

The python version I used is 3.7

Question 4: Thank you Vertex

Edge: 38	has neighboring nodes:	949	230
Edge: 39	has neighboring nodes:	867	519
Edge: 40	has neighboring nodes:	259	70
Edge: 41	has neighboring nodes:	927	96
Edge: 42	has neighboring nodes:	476	998
Edge: 43	has neighboring nodes:	840	84
Edge: 44	has neighboring nodes:	552	816
Edge: 45	has neighboring nodes:	727	929
Edge: 46	has neighboring nodes:	139	127
Edge: 47	has neighboring nodes:	117	629
Edge: 48	has neighboring nodes:	97	688
Edge: 49	has neighboring nodes:	552	625
Edge: 50	has neighboring nodes:	161	636
Edge: 51	has neighboring nodes:	967	759
Edge: 52	has neighboring nodes:	390	721
Edge: 53	has neighboring nodes:	800	620
Edge: 54	has neighboring nodes:	568	714
Edge: 55	has neighboring nodes:	796	987
Edge: 56	has neighboring nodes:	718	116
Edge: 57	has neighboring nodes:	817	962
Edge: 58	has neighboring nodes:	922	909
Edge: 59	has neighboring nodes:	405	838
Edge: 60	has neighboring nodes:	201	238
Edge: 61	has neighboring nodes:	924	666
Edge: 62	has neighboring nodes:	81	908
Edge: 63	has neighboring nodes:	386	128
Edge: 64	has neighboring nodes:	593	426
Edge: 65	has neighboring nodes:	606	855
Edge: 66	has neighboring nodes:	827	740
Edge: 67	has neighboring nodes:	725	692
Edge: 68	has neighboring nodes:	167	769
Edge: 69	has neighboring nodes:	497	788
Edge: 70	has neighboring nodes:	939	344
Edge: 71	has neighboring nodes:	710	584
Edge: 72	has neighboring nodes:	669	834
Edge: 73	has neighboring nodes:	581	844
Edge: 74	has neighboring nodes:	701	945
Edge: 75	has neighboring nodes:	743	208
Edge: 76	has neighboring nodes:	582	955
Edge: 77	has neighboring nodes:	375	897
Edge: 78	has neighboring nodes:	465	291
Edge: 79	has neighboring nodes:	124	623
Edge: 80	has neighboring nodes:	246	497
Edge: 81	has neighboring nodes:	172	533
Edge: 82	has neighboring nodes:	335	557
Edge: 83	has neighboring nodes:	317	601

Edge: 960	has neighboring nodes:	986	966
Edge: 961	has neighboring nodes:	999	961
Edge: 962	has neighboring nodes:	972	977
Edge: 963	has neighboring nodes:	988	991
Edge: 964	has neighboring nodes:	978	996
Edge: 965	has neighboring nodes:	978	973
Edge: 966	has neighboring nodes:	967	999
Edge: 967	has neighboring nodes:	996	985
Edge: 968	has neighboring nodes:	989	977
Edge: 969	has neighboring nodes:	969	972
Edge: 970	has neighboring nodes:	984	976
Edge: 971	has neighboring nodes:	981	993
Edge: 972	has neighboring nodes:	993	989
Edge: 973	has neighboring nodes:	991	990
Edge: 974	has neighboring nodes:	981	987
Edge: 975	has neighboring nodes:	984	981
Edge: 976	has neighboring nodes:	976	993
Edge: 977	has neighboring nodes:	994	996
Edge: 978	has neighboring nodes:	988	980
Edge: 979	has neighboring nodes:	987	979
Edge: 980	has neighboring nodes:	984	994
Edge: 981	has neighboring nodes:	981	997
Edge: 982	has neighboring nodes:	996	987
Edge: 983	has neighboring nodes:	998	991
Edge: 984	has neighboring nodes:	987	998
Edge: 985	has neighboring nodes:	985	992
Edge: 986	has neighboring nodes:	987	997
Edge: 987	has neighboring nodes:	995	997
Edge: 988	has neighboring nodes:	990	996
Edge: 989	has neighboring nodes:	989	997
Edge: 990	has neighboring nodes:	996	992
Edge: 991	has neighboring nodes:	998	993
Edge: 992	has neighboring nodes:	995	997
Edge: 993	has neighboring nodes:	997	999
Edge: 994	has neighboring nodes:	995	999
Edge: 995	has neighboring nodes:	996	998
Edge: 996	has neighboring nodes:	999	997
Edge: 997	has neighboring nodes:	997	998
Edge: 998	has neighboring nodes:	998	
Edge: 999	has neighboring nodes:	999	

*****mDFS*****

937,866,861,756,748,712,687,684,678,677,675,673,660,657,655,647,628,627,614,603,638,590,585,57
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9,417,416,573,414,410,408,404,403,451,398,397,774,392,389,388,387,385,380,377,650,690,373,372,
370,369,610,365,360,357,356,354,353,349,347,659,345,379,343,383,355,340,339,338,336,453,334,50
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505,757,775,300,299,798,815,402,431,641,599,617,649,297,296,483,293,290,382,289,287,286,284,28
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491,326,764,255,253,274,520,662,409,679,252,288,250,249,245,243,242,241,239,574,683,237,234,22
8,394,227,248,226,224,292,378,498,689,223,221,220,531,219,534,218,217,215,213,251,711,626,212,
211,546,477,210,419,209,244,715,204,203,202,400,583,200,316,199,197,196,194,193,551,667,700,76
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143,142,214,308,763,141,570,140,510,613,138,206,207,305,263,597,642,137,136,367,395,155,460,13
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602,765,588,119,424,736,118,523,115,572,785,114,384,113,695,878,111,563,110,107,129,229,697,10
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,797,302,332,645,93,165,449,254,92,91,90,374,89,457,88,231,260,87,776,86,535,787,887,415,85,28
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633,719,708,826,611,779,74,73,72,669,71,584,710,69,68,167,632,65,855,64,426,593,653,608,63,128
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701,885,17,216,624,788,832,841,852,16,66,827,839,15,43,84,281,455,539,671,740,805,829,836,863,
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717,12,501,11,205,350,450,800,399,406,694,668,771,744,749,768,790,893,445,571,825,877,437,777,
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112,470,862,902,959,681,698,848,909,926,950,954,957,930,961,916,958,927,982,734,860,943,920,96
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991,993,986,987,995,996,997,998,999,

*****Kahns:*****

```
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,618,622,624,647,649,656,662,664,668,677,678,680,689,697,726,734,746,800,812,870,21,479,128,760,305,134,371,131,535,
323,456,258,155,168,174,58,272,216,364,228,213,223,276,297,335,349,57,101,532,393,251,262,234,291,270,218,220,274,43
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3,856,853,924,836,625,807,822,929,833,788,827,741,904,638,847,782,803,819,661,919,849,834,881,724,787,806,765,872,88
3,776,828,813,766,899,945,642,796,808,891,939,852,838,900,651,887,907,835,862,790,906,915,898,931,844,936,874,910,86
7,911,878,882,823,905,735,903,928,901,748,858,840,884,908,820,943,917,895,880,948,923,949,837,933,861,885,922,935,92
5,896,932,952,954,886,875,951,913,934,947,912,967,963,892,918,944,959,961,937,926,982,995,938,968,
PS C:\Users\HP.LAPTOP-T27KQ4SL> █
```

I node you want me:

```
----- 0 -----  
edge : 1 : weight : 10 :  
edge : 2 : weight : 1 :  
edge : 3 : weight : 2 :  
edge : 4 : weight : 8 :  
edge : 5 : weight : 3 :  
edge : 6 : weight : 9 :  
edge : 7 : weight : 8 :  
edge : 8 : weight : 10 :  
edge : 9 : weight : 9 :  
edge : 10 : weight : 2 :
```

```
----- 1 -----  
edge : 0 : weight : 9 :  
edge : 2 : weight : 7 :  
edge : 3 : weight : 10 :  
edge : 4 : weight : 5 :  
edge : 5 : weight : 4 :  
edge : 6 : weight : 10 :  
edge : 7 : weight : 10 :  
edge : 8 : weight : 8 :  
edge : 9 : weight : 6 :  
edge : 10 : weight : 4 :
```

```
----- 2 -----  
edge : 0 : weight : 9 :  
edge : 1 : weight : 10 :  
edge : 3 : weight : 5 :  
edge : 4 : weight : 7 :  
edge : 5 : weight : 8 :  
edge : 6 : weight : 8 :  
edge : 7 : weight : 1 :  
edge : 8 : weight : 7 :  
edge : 9 : weight : 8 :  
edge : 10 : weight : 5 :
```

```
----- 3 -----  
edge : 0 : weight : 4 :  
edge : 1 : weight : 10 :  
edge : 2 : weight : 9 :  
edge : 4 : weight : 6 :  
edge : 5 : weight : 9 :
```

```
edge : 9 : weight : 1 :  
edge : 10 : weight : 5 :  
----- 4 -----  
edge : 0 : weight : 10 :  
edge : 1 : weight : 7 :  
edge : 2 : weight : 3 :  
edge : 3 : weight : 3 :  
edge : 5 : weight : 3 :  
edge : 6 : weight : 9 :  
edge : 7 : weight : 8 :  
edge : 8 : weight : 1 :  
edge : 9 : weight : 10 :  
edge : 10 : weight : 5 :  
----- 5 -----  
edge : 0 : weight : 2 :  
edge : 1 : weight : 5 :  
edge : 2 : weight : 7 :  
edge : 3 : weight : 8 :  
edge : 4 : weight : 8 :  
edge : 6 : weight : 6 :  
edge : 7 : weight : 4 :  
edge : 8 : weight : 10 :  
edge : 9 : weight : 1 :  
edge : 10 : weight : 9 :  
----- 6 -----  
edge : 0 : weight : 9 :  
edge : 1 : weight : 5 :  
edge : 2 : weight : 6 :  
edge : 3 : weight : 9 :  
edge : 4 : weight : 10 :  
edge : 5 : weight : 3 :  
edge : 7 : weight : 4 :  
edge : 8 : weight : 10 :  
edge : 9 : weight : 5 :  
edge : 10 : weight : 10 :  
----- 7 -----  
edge : 0 : weight : 4 :  
edge : 1 : weight : 3 :  
edge : 2 : weight : 10 :  
edge : 3 : weight : 4 :  
edge : 4 : weight : 6 :
```

```
edge : 7 : weight : 3 :  
edge : 9 : weight : 10 :  
edge : 10 : weight : 2 :
```

----- 9 -----

```
edge : 0 : weight : 3 :  
edge : 1 : weight : 8 :  
edge : 2 : weight : 4 :  
edge : 3 : weight : 5 :  
edge : 4 : weight : 3 :  
edge : 5 : weight : 5 :  
edge : 6 : weight : 6 :  
edge : 7 : weight : 6 :  
edge : 8 : weight : 8 :  
edge : 10 : weight : 4 :
```

----- 10 -----

```
edge : 0 : weight : 10 :  
edge : 1 : weight : 10 :  
edge : 2 : weight : 10 :  
edge : 3 : weight : 1 :  
edge : 4 : weight : 9 :  
edge : 5 : weight : 5 :  
edge : 6 : weight : 5 :  
edge : 7 : weight : 7 :  
edge : 8 : weight : 1 :  
edge : 9 : weight : 4 :
```

The finalized length: 11

*****DIJKSTRAS ALGORITHM FOR RANDOM GRAPH*****

```
Node: 0 : Distance: 0  
Node: 1 : Distance: 5  
Node: 2 : Distance: 1  
Node: 3 : Distance: 2  
Node: 4 : Distance: 4  
Node: 5 : Distance: 3  
Node: 6 : Distance: 4  
Node: 7 : Distance: 2  
Node: 8 : Distance: 3  
Node: 9 : Distance: 3  
Node: 10 : Distance: 2
```

*****LINKED LIST*****

----- 0 -----

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

Node: 9 : Distance: 3
Node: 10 : Distance: 2

*****LINKED LIST*****

```
----- 0 -----  
edge : 1 : weight : 1 :  
----- 1 -----  
edge : 2 : weight : 1 :  
----- 2 -----  
edge : 3 : weight : 1 :  
----- 3 -----  
edge : 4 : weight : 1 :  
----- 4 -----  
edge : 5 : weight : 1 :  
----- 5 -----  
edge : 6 : weight : 1 :  
----- 6 -----  
edge : 7 : weight : 1 :  
----- 7 -----  
edge : 8 : weight : 1 :  
----- 8 -----  
edge : 9 : weight : 1 :  
----- 9 -----  
edge : 10 : weight : 1 :  
----- 10 -----
```

The finalized length: 11

*****DIJKSTRAS FOR LINKED LIST*****

Node: 0 : Distance: 0
Node: 1 : Distance: 1
Node: 2 : Distance: 2
Node: 3 : Distance: 3
Node: 4 : Distance: 4
Node: 5 : Distance: 5
Node: 6 : Distance: 6
Node: 7 : Distance: 7
Node: 8 : Distance: 8
Node: 9 : Distance: 9
Node: 10 : Distance: 10

PS C:\Users\HP.LAPTOP-T27KQ4SL>

PROBLEMS	OUTPUT	DEBUG CONSOLE	TERMINAL
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Node: 9974	:	Distance: 9974	
Node: 9975	:	Distance: 9975	
Node: 9976	:	Distance: 9976	
Node: 9977	:	Distance: 9977	
Node: 9978	:	Distance: 9978	
Node: 9979	:	Distance: 9979	
Node: 9980	:	Distance: 9980	
Node: 9981	:	Distance: 9981	
Node: 9982	:	Distance: 9982	
Node: 9983	:	Distance: 9983	
Node: 9984	:	Distance: 9984	
Node: 9969	:	Distance: 9969	
Node: 9970	:	Distance: 9970	
Node: 9971	:	Distance: 9971	
Node: 9972	:	Distance: 9972	
Node: 9973	:	Distance: 9973	
Node: 9974	:	Distance: 9974	
Node: 9975	:	Distance: 9975	
Node: 9976	:	Distance: 9976	
Node: 9977	:	Distance: 9977	
Node: 9978	:	Distance: 9978	
Node: 9979	:	Distance: 9979	
Node: 9980	:	Distance: 9980	
Node: 9981	:	Distance: 9981	
Node: 9982	:	Distance: 9982	
Node: 9983	:	Distance: 9983	
Node: 9984	:	Distance: 9984	
Node: 9985	:	Distance: 9985	
Node: 9986	:	Distance: 9986	
Node: 9987	:	Distance: 9987	
Node: 9988	:	Distance: 9988	
Node: 9989	:	Distance: 9989	
Node: 9990	:	Distance: 9990	
Node: 9991	:	Distance: 9991	
Node: 9992	:	Distance: 9992	
Node: 9993	:	Distance: 9993	
Node: 9994	:	Distance: 9994	
Node: 9995	:	Distance: 9995	
Node: 9996	:	Distance: 9996	
Node: 9997	:	Distance: 9997	
Node: 9998	:	Distance: 9998	
Node: 9999	:	Distance: 9999	
10000			

Question: Wish upon a star

```
GRID[ 90 , 89 ] = 8990
GRID[ 91 , 89 ] = 8991
GRID[ 92 , 89 ] = 8992
GRID[ 93 , 89 ] = 8993
GRID[ 94 , 89 ] = 8994
GRID[ 95 , 89 ] = 8995
GRID[ 96 , 89 ] = 8996
GRID[ 97 , 89 ] = 8997
GRID[ 98 , 89 ] = 8998
GRID[ 99 , 89 ] = 8999
GRID[ 0 , 90 ] = 9000
GRID[ 1 , 90 ] = 9001
GRID[ 2 , 90 ] = 9002
GRID[ 3 , 90 ] = 9003
GRID[ 4 , 90 ] = 9004
GRID[ 5 , 90 ] = 9005
GRID[ 6 , 90 ] = 9006
GRID[ 7 , 90 ] = 9007
GRID[ 8 , 90 ] = 9008
GRID[ 9 , 90 ] = 9009
GRID[ 10 , 90 ] = 9010
GRID[ 11 , 90 ] = 9011
GRID[ 12 , 90 ] = 9012
GRID[ 13 , 90 ] = 9013
GRID[ 14 , 90 ] = 9014
GRID[ 15 , 90 ] = 9015
GRID[ 16 , 90 ] = 9016
GRID[ 17 , 90 ] = 9017
GRID[ 18 , 90 ] = 9018
GRID[ 19 , 90 ] = 9019
GRID[ 20 , 90 ] = 9020
GRID[ 21 , 90 ] = 9021
GRID[ 22 , 90 ] = 9022
GRID[ 23 , 90 ] = 9023
GRID[ 24 , 90 ] = 9024
GRID[ 25 , 90 ] = 9025
GRID[ 26 , 90 ] = 9026
GRID[ 27 , 90 ] = 9027
GRID[ 28 , 90 ] = 9028
GRID[ 29 , 90 ] = 9029
GRID[ 30 , 90 ] = 9030
GRID[ 31 , 90 ] = 9031
GRID[ 32 , 90 ] = 9032
GRID[ 33 , 90 ] = 9033
GRID[ 34 , 90 ] = 9034
GRID[ 35 , 90 ] = 9035
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GRID[ 44 , 94 ] = 9444
GRID[ 45 , 94 ] = 9445
GRID[ 46 , 94 ] = 9446
GRID[ 47 , 94 ] = 9447
GRID[ 48 , 94 ] = 9448
GRID[ 49 , 94 ] = 9449
GRID[ 50 , 94 ] = 9450
GRID[ 51 , 94 ] = 9451
GRID[ 52 , 94 ] = 9452
GRID[ 53 , 94 ] = 9453
GRID[ 54 , 94 ] = 9454
GRID[ 55 , 94 ] = 9455
GRID[ 56 , 94 ] = 9456
GRID[ 57 , 94 ] = 9457
GRID[ 58 , 94 ] = 9458
GRID[ 59 , 94 ] = 9459
GRID[ 60 , 94 ] = 9460
GRID[ 61 , 94 ] = 9461
GRID[ 62 , 94 ] = 9462
GRID[ 63 , 94 ] = 9463
GRID[ 64 , 94 ] = 9464
GRID[ 65 , 94 ] = 9465
GRID[ 66 , 94 ] = 9466
GRID[ 67 , 94 ] = 9467
GRID[ 68 , 94 ] = 9468
GRID[ 69 , 94 ] = 9469
GRID[ 70 , 94 ] = 9470
GRID[ 71 , 94 ] = 9471
GRID[ 72 , 94 ] = 9472
GRID[ 73 , 94 ] = 9473
GRID[ 74 , 94 ] = 9474
GRID[ 75 , 94 ] = 9475
GRID[ 76 , 94 ] = 9476
GRID[ 77 , 94 ] = 9477
GRID[ 78 , 94 ] = 9478
GRID[ 79 , 94 ] = 9479
GRID[ 80 , 94 ] = 9480
GRID[ 81 , 94 ] = 9481
GRID[ 82 , 94 ] = 9482
GRID[ 83 , 94 ] = 9483
GRID[ 84 , 94 ] = 9484
GRID[ 85 , 94 ] = 9485
GRID[ 86 , 94 ] = 9486
GRID[ 87 , 94 ] = 9487
GRID[ 88 , 94 ] = 9488
GRID[ 89 , 94 ] = 9489
```

```
GRID[ 90 , 99 ] = 9990
GRID[ 91 , 99 ] = 9991
GRID[ 92 , 99 ] = 9992
GRID[ 93 , 99 ] = 9993
GRID[ 94 , 99 ] = 9994
GRID[ 95 , 99 ] = 9995
GRID[ 96 , 99 ] = 9996
GRID[ 97 , 99 ] = 9997
GRID[ 98 , 99 ] = 9998
GRID[ 99 , 99 ] = 9999
```

```
*****Astar on grid with 10000 [X,Y] matrix*****
```

```
Astar path:
```

```
[0 , 0] ~> [0 , 99] ~> [0 , 98] ~> [1 , 98] ~> [2 , 98]
~> [3 , 98] ~> [3 , 97] ~> [4 , 97] ~> [5 , 97]
~> [6 , 97] ~> [7 , 97] ~> [8 , 97] ~> [8 , 96]
~> [9 , 96] ~> [10 , 96] ~> [11 , 96] ~> [12 , 96]
~> [12 , 95] ~> [13 , 95] ~> [13 , 94] ~> [14 , 94]
~> [15 , 94] ~> [16 , 94] ~> [17 , 94] ~> [17 , 93]
~> [18 , 93] ~> [19 , 93] ~> [20 , 93] ~> [21 , 93]
~> [22 , 93] ~> [23 , 93] ~> [24 , 93] ~> [25 , 93]
~> [26 , 93] ~> [27 , 93] ~> [28 , 93] ~> [28 , 94]
~> [29 , 94] ~> [29 , 93] ~> [30 , 93] ~> [30 , 94]
~> [31 , 94] ~> [31 , 95] ~> [32 , 95] ~> [33 , 95]
~> [34 , 95] ~> [35 , 95] ~> [35 , 96] ~> [36 , 96]
~> [37 , 96] ~> [38 , 96] ~> [39 , 96] ~> [40 , 96]
~> [41 , 96] ~> [41 , 95] ~> [42 , 95] ~> [43 , 95]
~> [44 , 95] ~> [44 , 94] ~> [45 , 94] ~> [46 , 94]
~> [47 , 94] ~> [48 , 94] ~> [49 , 94] ~> [50 , 94]
~> [51 , 94] ~> [52 , 94] ~> [52 , 95] ~> [53 , 95]
~> [53 , 96] ~> [54 , 96] ~> [55 , 96] ~> [56 , 96]
~> [57 , 96] ~> [58 , 96] ~> [59 , 96] ~> [59 , 97]
~> [60 , 97] ~> [61 , 97] ~> [62 , 97] ~> [63 , 97]
~> [64 , 97] ~> [65 , 97] ~> [66 , 97] ~> [66 , 96]
~> [67 , 96] ~> [67 , 95] ~> [67 , 94] ~> [68 , 94]
~> [69 , 94] ~> [69 , 95] ~> [69 , 96] ~> [70 , 96]
~> [71 , 96] ~> [72 , 96] ~> [73 , 96] ~> [74 , 96]
~> [74 , 95] ~> [75 , 95] ~> [76 , 95] ~> [77 , 95]
~> [78 , 95] ~> [79 , 95] ~> [80 , 95] ~> [81 , 95]
~> [82 , 95] ~> [83 , 95] ~> [84 , 95] ~> [84 , 96]
~> [85 , 96] ~> [86 , 96] ~> [87 , 96] ~> [88 , 96]
~> [89 , 96] ~> [90 , 96] ~> [91 , 96] ~> [92 , 96]
~> [93 , 96] ~> [94 , 96] ~> [94 , 97] ~> [94 , 98]
~> [95 , 98] ~> [96 , 98] ~> [96 , 99] ~> [97 , 99]
~> [98 , 99] ~> [99 , 99]
```

```
Number of Nodes finalized in A Star: 127
```

```
PS C:\Users\HP.LAPTOP-T27KQ4SL> █
```