Quiz7:

Name: Zian Wang

(The result of the test case is in the second and the third page.)

Program Description:

I use a class which is written myself, to define the link list used in the program. The class's name is link_list and I put it together with the Quiz7.java. It is singly linked list. The structure of the link list is as follows:

This figure of link list stands for there is path from 1 to 2, and its length is stored in the weight of the node 1.

Also,there is a path from 1 to 3, and its length is stored in the weight of node 2

There will be an array of link_list, named adjacency_list[], to store the adjacency matrix, and every link_list stores all the paths from one vertex. For example, adjacency_list[x] stands for all the paths starts from vertex x. So the length of the adjacency_list[] is the number of the vertexes in the graph.

Every link list has several nodes, every node has 3 members:
The 1st member: "vertex" stands for the vertex of the node.
The 2nd member: "weight" stands for the weight of the path between the first node's vertex and the vertex of the next node, for example: in the link list starts with vertex 0, weight1 stands for length from 0 to 2, weight2 stands for length from 0 to 3, length n stands for length from 0 to n+1.
The 3rd member: "next" is a pointer points to the next node of the current node.

Because we need to use link list instead of two-dimension array, we defined a function to get the length of the path between two nodes by reading the array of link lists:
int getLength(int startNode, int target, link_list[] V).
Input: the index of the start vertex, the index of the end vertex, and the array of the link lists: V.
Output: the length of the path between the start node and the end node.
By using this function and the link list, we can replace the two-dimension array. For example: adjacency[a][b] = getLength(a, b, adjacency_list).

Test Case:

```
"C:\Program Files\Java\jdk-15.0.2\bin\
Prim with link list for adjacency:
Node:       Node:       Distance:
0           5           237
5           42          88
42          39          120
42          96          175
0           78          272
39          17          283
17          16          183
5           80          409
17          47          453
47          98          258
98          55          84
39          40          923
40          36          272
36          37          250
37          38          263
38          43          252
43          97          273
40          27          370
27          28          317
28          23          45
23          9           357
9           10          361
10          82          338
10          25          359
25          90          362
43          72          518
```

```
72          64          504
10          31          558
31          92          337
31          30          436
82          69          565
23          24          593
24          89          268
24          29          352
29          15          259
15          85          199
29          46          308
15          75          585
75          33          380
33          77          385
75          101         475
33          32          503
32          19          93
19          18          406
32          93          417
37          95          656
36          94          806
72          100         880
9           11          906
18          41          942
41          60          400
41          12          937
```

```
12          4           89
4           34          411
12          53          612
53          74          134
74          73          152
73          8           120
8           7           153
53          35          199
35          51          46
35          88          128
88          22          143
22          49          146
49          44          142
44          45          234
8           81          236
22          50          346
44          48          422
73          67          557
67          14          150
14          13          134
13          83          125
13          52          129
14          66          153
52          87          158
87          21          162
21          20          129
20          86          80
13          84          164
20          58          204
```

```
58          68          140
21          56          277
52          54          280
20          71          352
58          57          670
4           3           1140
53          26          1370
26          91          432
64          59          1400
59          99          955
59          65          993
34          76          1978
65          1           2461
1           2           600
2           79          133
79          6           510
6           61          424
61          63          866
63          62          147
18          70          2466
TotalDistance is: 44424

Process finished with exit code 0
```