CS520 Assignment III
Due: March 27

Implement a Map Problem State. The state should require the specification of a map, a start location, and a goal location. You can compute the straight-line heuristic by storing the coordinates for each node. The distance between two points can be computed with the formula:

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

You may use the Romania map as an example. But the idea is that the approach be general enough that the Romania map may be replaced with any other map.

It is up to you to determine how to represent maps (links between nodes, distances between nodes) and how to store the coordinates.

Use the provided search code to solve the problem using search. You also need to write the code to eliminate repeated states. You are to do the following

1. Solve the problem using breadth-first search.
2. Try to solve the problem using depth-first search.
3. Solve the problem using iterative deepening.
4. Solve the problem using A* search.

You should hand in the code that you wrote (not the search code provided) and also sample output. Be certain to write code that prints out the solution path.

All of the search code is available on the web page for the course. You may download all of the files individually or you can download all of the files as a tar file. You will then need to store the file `classes.tar` in a directory and then execute the command:

```
tar -xvf classes.tar
```

For the map of Romania example, you will need to enter the distance and connectivity information. The following info needs to be incorporated.

```
A --> (Z=75, S=140, T=118),
B --> (U=85, P=101, G=90, F=211),
C --> (D=120, R=146, P=138),
D --> (M=75),
E --> (H=86),
F --> (S=99),
H --> (U=98),
I --> (V=92, N=87),
L --> (T=111, M=70),
O --> (Z=71, S=151),
P --> (R=97),
R  --> (S=80),
U --> (V=142)))
```

For the map of Romania example, the following coordinates work:

```
A=( 91, 492),    B=(400, 327),    C=(253, 288),   D=(165, 299),
E=(562, 293),    F=(305, 449),    G=(375, 270),   H=(534, 350),
I=(473, 506),    L=(165, 379),    M=(168, 339),   N=(406, 537),
O=(131, 571),    P=(320, 368),    R=(233, 410),   S=(207, 457),
T=( 94, 410),    U=(456, 350),    V=(509, 444),   Z=(108, 531))
```