

CS 121 – Homework #7 – Giving Directions – due Friday, April 12, 2019

In this assignment you will write a Python program that reads two street addresses from a file, and then gives directions on how to get from the first place to the second.

For this program, the setting is a city in which there are two kinds of roads: Streets that run east-west, and Avenues that run north-south. The streets are numbered from 1 in the south to 100 in the north. The avenues are numbered from 1 in the east to 100 in the west.

Along every street and avenue, there are 99 address numbers per block. Address numbers ending in 00 are not used. For example, along 24th Avenue between 4th Street and 5th Street, the possible address numbers are from 401 to 499, inclusive. Odd-numbered address are on the west side of avenues and on the south side of streets.

Ask the user to enter the name of the file that contains the input. If this input file does not exist, then the program should print an error message and halt. You may assume that the input file contains a statement beginning with “I want to go from” and then gives two addresses. See the example I/O below. Each address will have three attributes: an address number in the range [101..9999], a road number in the range [1..100], and a road type which will be either “Street” or “Avenue”.

The output from your program will be a short sequence of directions to travel from the first address to the second. Your program must suggest a way to arrive at the destination that is both the shortest route, and uses the fewest number of roads. In the example, the path suggested by the program uses two roads. An equally short path could have gone west on 16th Street and then north on 58th Avenue, but this would have used four roads instead of two. There may be situations in which there is not a unique shortest way that uses the fewest number of roads. So, in these cases your program should have some systematic method of choosing one path to present to the user.

Each direction printed by your program needs to give a direction (north, east, south or west) along a specific street or avenue. The number of this road should be printed as a cardinal number. In other words, don't print “st”, “nd”, “rd” or “th” to make it an ordinal number. The last part of the output should be a statement that says on which side of the road the destination lies: the left or right side. In the example below, we are travelling west to a destination on the south side of the street, so it must be on the left. Your output should look like the example below. Note the capitalization and punctuation.

Hint: After your program reads the two addresses, there are various cases that you need to consider when forming the route. For example, the two addresses could be on the same road, on perpendicular roads, or on parallel roads. Each case needs to be handled slightly differently.

The example I/O appears on the next page.

Example I/O:

What is the name of the input file? **input.txt**

Go north on 24 Avenue.

Go west on 20 Street.

6255 will be on your left.

Note: This output assumes that the text file input.txt looks like this:

I want to go from 439 24 Avenue to 6255 20 Street.