

CS11 Programming Assignment # 7 due Thursday 18 Nov. 1999

Giving Directions

In this assignment you will write a C++ program that reads two street addresses from a file, and then gives directions on how to get from the first place to the second. The purpose of this assignment is to gain experience creating a small object-oriented program in C++. You will also make use of strings and file I/O.

Background Information

For this program, the setting is a city in which there are two kinds of roads: Streets that run east and west, and Avenues that run north and 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 addresses 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 example on other side). Each address will have 3 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".

Your program must be organized into three files like the example object-oriented programs we went over in lecture. You should design and implement an *address* class. Its three data attributes were described in the previous paragraph. You should write three constructors for this class. In particular, the initial-value constructor should *only* take a single string parameter. The main program should not depend on the existence of certain class attributes. You should also write some generalized member functions to facilitate the writing of the main program. The main program should just be a driver program for the class, delegating most of the work to the class member functions.

The output from your program will be a short sequence of directions to get from the first address to the second. Your program must suggest a way to get to the destination that is both the shortest way, and uses the fewest number of roads. In the example given on the reverse side, 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 4 roads rather than 2. 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 a systematic method of arbitrarily 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, we are travelling west to a destination that is on the south side of the road, so it must be on the left.

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.