Climate Classification

In this assignment you will write a C++ program that reads monthly average temperature and precipitation data from a file, and then gives the climate classification for this particular place. The purpose of this assignment is to become acquainted to using arrays (of numbers) and further practice with file I/O.

First, ask the user to enter the name of the input file. If the input file does not exist, inform the user, and ask for the file name again. The input file will contain 3 lines. The first line will be the name of a city. The second line will contain twelve numbers representing the average temperature (in degrees Fahrenheit) of the months from January to December. The third line, also containing 12 numbers, represents the precipitation (in inches) of each of the months.

The output from your program will go to the screen. Inform the user of the average annual temperature of the city (counting each month equally), and the total annual precipitation. In addition, your program will determine what type of climate the city has, based on the criteria listed below. There are 14 possible cases:

1. *Tropical wet*: the average temperature for the coldest month is at least 64.4, and the driest month has at least 2.4 inches of precipitation.
2. *Tropical wet and dry*: like tropical wet, but the driest month has less than 2.4 inches of precipitation.
3. *Hot desert*: the coldest month is 32 degrees or warmer, and the annual precipitation is less than one-fifth the value of the temperature.
4. *Cold desert*: like the hot desert, but the coldest month is less than 32 degrees.
5. *Hot steppe*: like the hot desert, but the annual precipitation is at least one-fifth but less than one-third the value of the temperature.
6. *Cold steppe*: like the hot steppe, but the coldest month is less than 32 degrees.
7. *Subtropical*: the warmest month is at least 71.6 degrees, and the coldest month is at least 32 degrees but less than 64.4 degrees.
8. *Temperate*: like subtropical, but the warmest month is less than 71.6 degrees.
9. *Humid continental*: like subtropical, but the coldest month is less than 32 degrees.
10. *Cool continental*: The warmest month is less than 71.6 degrees and at least 4 months have an average temperature of at least 50, and the coldest month is less than 32.
11. *Subarctic*: Like cool continental, but only 1-3 months have an average temperature at least 50.
12. *Tundra*: The warmest month is at least 32 but less than 50.
13. *Icecap*: The warmest month is less than 32.
14. *Unclassified*: The climate data do not fit into any of the above categories.

In cases 7-11, your program should also comment on whether the city has a dry summer or dry winter. If it has neither, then the program doesn't need to state this. A *dry summer* means that the driest month has less than 1.2 inches of precipitation, and there is at least 3 times as much precipitation in the wettest month of winter than in the driest

month of summer. A *dry winter* means that at least 10 times as much precipitation falls in the wettest month of sunmmer than the driest month of winter.

For the purposes of the above definitions of dry summer and winter, you may assume that if July is warmer than January, then "summer" refers to the half-year from May through October and the winter half is November through April. If January is warmer than July, then these roles of summer and winter months are reversed.

You can find actual climate data on the Web at http://www.worldclimate.com. You can create example input files based on the data given there.

Note: In the example that follows, it appears that the temperatures are all integers, but your program should assume that they may be floating-point numbers. I suggest that you use arrays of double for both the temperature and precipitation. Also, do not assume that the name of the city is a single word.

Example I/O:

```
What is the name of the input file?  toronto.txt

The average temperature of Toronto is 45.2 degrees.
Toronto has 31.4 inches of precipitation annually.
Toronto has a cool continental climate.
```

Note – this output assumes that the text file toronto.txt looks like this:

```
Toronto
22  21  30  42  54  64  69  67  60  49  37  27
2.8 2.4 2.4 2.3 2.8 2.7 2.8 2.8 2.7 2.6 2.6 2.5
```