Problem 1	Automatic Homework	8 Points

Program Name: homework.cpp   Input File: homework.dat

You are given a homework assignment to find the two U.S. state capitals that are closest by road mileage. To help in this task, your teacher gives you an atlas. To complete your assignment, you must tally the mileage along the roads between each pair of points. You quickly realize that exhaustively testing the distances between all capitals will be enormously difficult, requiring you to check 1225 (= 49 + 48 + 47 + ... + 3 + 2 + 1) paths. Therefore, you need to find another method for getting the correct answer.

You realize you can eliminate candidate distances between any two capitals if the Euclidean distance between them is greater than the best road distance you have found so far. Clearly, Hawaii and Alaska are not needed for this exercise. You also decide that some of the state capitals in the West are too remote to be viable candidates. Therefore, the input may not include all 48 continental state capitals.

The atlas has a 30-inch wide by 20-inch tall map of the "Lower 48" states. The map is drawn from a view of the spherical globe centered over Kansas, which reduces the distortion caused by projection of a 3-dimensional globe onto a 2-dimensional piece of paper. Since you are only attempting to find candidate pairs, you may ignore any remaining distortion. Given the (X, Y) coordinates in inches, and that one inch on the map is equal to 150 miles, write a program that prints the sorted top five candidates for closest capital pairs with the distance between each pair. Later, to complete your assignment, you will only need to compute the road distances between those candidates.

Input
Input to your program will consist of between 5 and 48 lines, each of which will contain a single state capital. The format for the lines of input is as follows:

STATE CITY X.X Y.Y

Where STATE is the name of a state; CITY is the capital of STATE; X.X is the X coordinate to 0.1 inches of accuracy, and Y.Y is the Y coordinate to 0.1 inches of accuracy. STATE and CITY will contain the underscore character ("_") in the place of a blank space, so there is no whitespace within STATE or CITY. You know that $(0.0 \le X \le 30.0)$ and $(0.0 \le Y \le 20.0)$. Although your program does not know exactly which corner of the map is the origin, it is the same for all measurements.

The input will include exactly one space between STATE and CITY, between CITY and X.X, and between X.X and Y.Y. There will be no leading, trailing, or extraneous embedded spaces on any input line nor will there be any leading zeroes in any input line unless needed as a digit before the decimal point. No state capital is listed twice.

Output
Your program should print the top five candidate pairs of state capitols (one per line of output) sorted from closest together to farthest apart. The format for each output line is as follows:

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CITY1, STATE1 to CITY2, STATE2 distance is M.M
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Where STATE1 and CITY1 are the STATE and CITY of the first capital under consideration and STATE2 and CITY2 are the second capital under consideration. The first capital printed is the one that appears earlier in the input file. M.M is the distance in miles (left justified with no leading zeroes) between the two capitals to an accuracy of 0.1 miles.

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PROBLEM 1 CONTINUED

Example: Input File
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Louisiana Baton_Rouge 12.3 10.7
Mississippi Jackson 12.6 9.9
Texas Austin 9.7 10.8
Florida Tallahassee 15.2 10.7
Alabama Montgomery 14.3 10.1
South_Carolina Columbia 16.2 9.0
Georgia Atlanta 14.8 9.4
Tennessee Nashville 13.7 8.3
North_Carolina Raleigh 16.8 8.1
```
Output to screen
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Baton_Rouge, Louisiana to Jackson, Mississippi distance is 128.2
Montgomery, Alabama to Atlanta, Georgia distance is 129.0
Columbia, South_Carolina to Raleigh, North_Carolina distance is 162.2
Tallahassee, Florida to Montgomery, Alabama distance is 162.2
Tallahassee, Florida to Atlanta, Georgia distance is 204.0
```