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**Part 1-Analysis**

**The problem is to calculate the distance between two cities by giving their longitude and latitude, cities’ names, latitudes, longitudes will be given from stdin.**

**Library:** iostream, cmath, string

We can computing the distance using some formula.

Assume the Earth is a perfect sphere.

**Formula:**

phi = 90 – latitude

theta = longitude

c = sin(phi1) \* sin(phi2) \* cos(theta1-theta2) +cos(phi1) \* cos(phi2)

d = R\*arccos(c)

R=6371km

**Part 2 - Code**

#include **<iostream>**#include **<string>**#include **<cmath>  
using namespace** std;  
  
**int** main() {  
 string city1,city2;  
 **double** pi=**M\_PI**;  
 **double** latitude1,latitude2,longitude1,longitude2,phi1,phi2,theta1,theta2;  
 cout<<**"The first city:"**;  
 getline(cin,city1);  
 cin>>latitude1>>longitude1;  
  
 cout<<**"The second city:"**;  
 cin.get();  
 getline(cin,city2);  
 cin>>latitude2>>longitude2;  
  
 phi1=(90-latitude1)\*pi/180;  
 phi2=(90-latitude2)\*pi/180;  
 theta1=longitude1\*pi/180;  
 theta2=longitude2\*pi/180;  
  
 **double** c=sin(phi1)\*sin(phi2)\*cos(theta1-theta2)+cos(phi1)\*cos(phi2);  
 **double** d=6371\*acos(c);  
 cout<<**"The distance between "**<<city1<<**" and "**<<city2<<**" is "**<<d<<**" km"**;  
 **return** 0;  
}

**Part 3 – Result & Verification**

**Test case #1**

**Input:**

Shenzhen

22.55 114.1

Beijing

39.9139 116.3917

**Output:**

The distance between Shenzhen and Beijing is 1942.84 km

**Test case#2**

**Input:**

New York, USA

40.7127 -74.0059

London, UK

51.5072 -0.1275

**Output:**

The distance between New York, USA and London, UK is 5570.25 km

**Test case#3**

**Input:**

Moscow, Russia

55.7500 37.6167

Rio de Janeiro, Brazil

-22.9083 -43.1964

**Output:**

The distance between Moscow, Russia and Rio de Janeiro, Brazil is 11545 km

**Part 4 – Difficulties & Solutions**

**Using cin to get whole string in a line which may include white space.**