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//File: HW04_1.cpp
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//Date: 2/18/2020
//Compiler used: MS Visual Studio 2017
//Purposes: program 1: take a user inputted hex value and
//           convert to decimal equivalent
//           program 2: find the distance between two points on earth
#include <iostream>
#include <math.h>
using namespace std;

#define prog 2
#if prog== 1

int main()
{
    char hexVal = 0;
    int decVal = 0;
    bool valid = true;
    cout << "Enter a Hexadecimal charecter 0-9 or A-F or a-f:";
    cin >> hexVal;

    if (isdigit(hexVal))
        decVal = hexVal - 48;
    //65 = A, 70=F in ascii.
    else if (64 < int(toupper(hexVal)) && int(toupper(hexVal)) < 71)
        // 54 is a magic number conversion factor between ascii and hex
        // EX: F = 70, 70-55 = 15
        decVal = int( toupper(hexVal) ) - 55;
    else
        valid = false;

    if (valid)
        cout << "Decimal Equivalent: " << decVal;
    else
        cout << "Invalid input!";

    return 0;
}

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Enter a Hexadecimal charecter 0-9 or A-F or a-f:0
Decimal Equivalent: 0

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Enter a Hexadecimal charecter 0-9 or A-F or a-f:5
Decimal Equivalent: 5

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Enter a Hexadecimal charecter 0-9 or A-F or a-f:9
Decimal Equivalent: 9

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Enter a Hexadecimal charecter 0-9 or A-F or a-f:a
Decimal Equivalent: 10

Enter a Hexadecimal charecter 0-9 or A-F or a-f:A
Decimal Equivalent: 10

Enter a Hexadecimal charecter 0-9 or A-F or a-f:f
Decimal Equivalent: 15

Enter a Hexadecimal charecter 0-9 or A-F or a-f:F
Decimal Equivalent: 15

Enter a Hexadecimal charecter 0-9 or A-F or a-f:d
Decimal Equivalent: 13

Enter a Hexadecimal charecter 0-9 or A-F or a-f:C
Decimal Equivalent: 12

Enter a Hexadecimal charecter 0-9 or A-F or a-f:G
Invalid input!

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#elif prog == 2
int main()
{

    double point0[2] = {0.0, 0.0};
    double point1[2] = {0.0, 0.0};
    const double EARTH_RADIUS = 6378.1;
    const double PI = 3.141592653589793238462643383279;
    const double DEGREES_TO_RADIANS = PI/180.0;
    double distance = 0.0;

    cout << "Enter point 1 (latitude, longitude) in degrees: ";
    cin >> point0[0] >> point0[1];
    cout << "Enter point 2 (latitude, longitude) in degrees: ";
    cin >> point1[0] >> point1[1];

    point0[0] *= DEGREES_TO_RADIANS;
    point0[1] *= DEGREES_TO_RADIANS;
    point1[0] *= DEGREES_TO_RADIANS;
    point1[1] *= DEGREES_TO_RADIANS;

    distance = EARTH_RADIUS * acos(
        sin(point0[0]) * sin(point1[0]) +
        cos(point0[0]) * cos(point1[0]) *
        cos(point0[1] - point1[1]) );

    cout << "The distance between the two points is " << distance << " km";
    return 0;
}
```

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}
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#endif
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Enter point 1 (latitude, longitude) in degrees: 39.55 -116.25
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Enter point 2 (latitude, longitude) in degrees: 41.5 87.37
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The distance between the two points is 10703.7 km
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