CSC 110 Programming Project 2

Windchill Calculator[i]

The wind makes us colder when it blows across the exposed area of our skin. It draws heat away from our bodies. When the wind speeds up, it draws more heat away, so your body cools faster than if it were a still day. A couple Antarctic explorers in the 40's (Siple and Passel) experimented with water bottles and different wind conditions. They formed the first formula to express windchill. There have been some changes in the formula over the years because windchill is a difficult measurement to express. How many factors should it take into account? the humidity? the person's size and weight? day or night? latitude?

The formulas you need

$$OldStyleWC = 0.081\left(3.71\sqrt{velocity} + 5.81 - 0.25\,velocity\right)(tempF - 91.4) + 91.4$$

$$NewStyleWC = 35.74 + 0.6215\,tempF - 35.75\,(velocity^{0.16}) + 0.4275\,tempF\;(velocity^{0.16})$$

where *velocity* is the wind speed in miles per hour and *tempF* is the Fahrenheit temperature.

- The first formula is to calculate the windchill according to an older formula, used up until 2001.
- The second formula calculates the windchill according to the current formula.

Your program should develop a table of windchills, based on the user's inputs of the temperature and the starting wind speed. The table should produce columns as seen below, for wind speed, the windchill according to the old formula, windchill according to the new formula and the difference between the two windchills. The table should be nicely labeled; the use of tab characters is encouraged. The table wind speed should start where the user says. Set the range to stop at 90 mph.

Sample Run:

```
Big Blue Wind Chill

Enter air temperature (F): 30
Enter starting wind speed (mph): 44

Temperature = 30.0 degrees F

Wind Speed      Old Formula     New Formula     Difference

   44            -5.0            12.0            -17.6
   49            -6.0            12.0            -17.4
   54            -6.0            11.0            -16.9
   59            -6.0            10.0            -16.2
   64            -6.0            10.0            -15.3
   69            -5.0            9.0             -14.2
   74            -4.0            9.0             -13.0
   79            -3.0            8.0             -11.5
   84            -2.0            8.0             -10.0
   89            -1.0            7.0             -8.3
```

Another Run:

```
Big Blue Wind Chill

Enter air temperature (F): 39.25
Enter starting wind speed (mph): 25

Temperature = 39.25 degrees F

Wind Speed      Old Formula     New Formula     Difference

   25            15.0            28.0            -13.5
   30            13.0            27.0            -14.7
   35            11.0            27.0            -15.5
   40            10.0            26.0            -15.9
   45            9.0             25.0            -16.0
   50            9.0             25.0            -15.8
   55            9.0             24.0            -15.4
   60            9.0             24.0            -14.8
   65            9.0             23.0            -14.0
   70            10.0            23.0            -13.0
   75            10.0            22.0            -11.9
   80            11.0            22.0            -10.7
   85            12.0            22.0            -9.4
```

Make sure you format the lines of the output as described above. Line breaks, spacing, spelling should be **exactly like** the sample runs.

Design

```
# Title Comment  - fill this in!
#  main function
    # Step 1. Display introductory message
    # (some of your design here)
    # loop for the range of windspeeds desired with step of 5
    #     Step N. calculate the windchill for the current windspeed using the
old formula
    #     (more design goes here)
    #     Step M. output to the shell the windspeed, the old windchill, the
new windchill and the difference
    #     (more design goes here)
```

and individually fill in the missing steps in the design. The N and M will depend on how many steps you put in the design. There should be at least 10 steps in the design.

There are some specifications that your program needs to meet.

- This program uses user inputs; you will have to prompt the user for them.
- You MUST use assignment statements to do your calculations, not calculating expressions in output statements.
- You MUST use at least one math library function. Yes, there is a way to write the equation without using math functions, but the specification is to use a math function.
- Note the types of data being output. Your program must match those.
- Note the decimal places shown. Use the round function as needed. The numbers from the formulas are rounded to 0 places; the difference is rounded to 1 place.
- Your code must include a title comment and code must be well documented using comments. And, you must use meaningful variable names.

Implement the design

Individually write a Python program to implement your design. Start with a copy of the Python file you have that has the design in it (possibly updated with improvements you came up with) and write your Python code between the commented lines of the design. Make sure you eliminate any syntax and logic errors. Verify that it does come out with the correct answers. **Your program must have a main function and call it to run the program.**

Submit your solution by attaching the source code (.py file).

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[i] Based on http://www.cs.uky.edu/~keen/EngageCSEdu/programs/1pgm.html from https://www.engage-csedu.org