Programming Projects

Since you will use the previous formula, the gravitational force will be in dynes. One dyne equals a

\[ \text{g} \cdot \text{cm/sec}^2 \]

You should use a globally defined constant for the universal gravitational constant. Embed your function definition in a complete program that computes the gravitational force between two objects given suitable inputs. Your program should allow the user to repeat this calculation as often as the user wishes.

5. Write a program that asks for the user’s height, weight, and age, and then computes clothing sizes according to the following formulas.

- Hat size = weight in pounds divided by height in inches and all that multiplied by 2.9.
- Jacket size (chest in inches) = height times weight divided by 288 and then adjusted by adding one-eighth of an inch for each 10 years over age 30. (Note that the adjustment only takes place after a full 10 years. So, there is no adjustment for ages 30 through 39, but one-eighth of an inch is added for age 40.)
- Waist in inches = weight divided by 5.7 and then adjusted by adding one-tenth of an inch for each 2 years over age 28. (Note that the adjustment only takes place after a full 2 years. So, there is no adjustment for age 29, but one-tenth of an inch is added for age 30.)

Use functions for each calculation. Your program should allow the user to repeat this calculation as often as he or she wishes.

6. Write a function that computes the average and standard deviation of four scores. The standard deviation is defined to be the square root of the average of the four values: \( (s_i - \bar{a})^2 \), where \( \bar{a} \) is the average of the four scores \( s_1, s_2, s_3, \) and \( s_4 \). The function will have six parameters and will call two other functions. Embed the function in a program that allows you to test the function again and again until you tell the program you are finished.

7. In cold weather, meteorologists report an index called the wind chill factor, which takes into account the wind speed and the temperature. The index provides a measure of the chilling effect of wind at a given air temperature. Wind chill may be approximated by the following formula,

\[ W = 33 - \frac{(10\sqrt{v} - v + 10.5)(33 - t)}{23.1} \]

where

\[ v = \text{wind speed in m/sec} \]
\[ t = \text{temperature in degrees Celsius: } t \leq 10 \]
\[ W = \text{wind chill index (in degrees Celsius)} \]

Write a function that returns the wind chill index. Your code should ensure that the restriction on the temperature is not violated. Look up some weather reports in back issues of a newspaper in your library and compare the wind chill index you calculate with the result reported in the newspaper.