ENGR 102 - Lab Assignment #11B

Spring 2019

You are to write the following program as described below. For all programs, include comments in your code that describe the purpose of individual blocks. Remember the appropriate header information.

For each program, you should write a function and have the program 'test' the function. For example, you might include several function calls and display the results, or create a program where a user can enter values and see the results. You may feel free to make multiple functions within any of these programs.

Program 1: Profit Prophets

☑ *Create and use functions in Python*

Imagine you have three parallel lists of the same length: one with the names of several production facilities, another with the annual cost to operate each of those facilities, and a third with the value of the products produced at each facility. Return the name and net profitability (profitability is the value of what is produced minus the cost to operate) of the least profitable facility.

Program 2: Again

☑ *Create and use functions in Python*

Write a function that takes in a list and returns the minimum, mean and maximum values from the list. You may use the min, mean, and/or max built-in functions to do so.

Program 3: Perfect Numbers

☑ *Create and use functions in Python*

A *perfect number* is a positive integer >1 that is equal to the sum of its proper divisors. The smallest perfect number is 6 since the sum of the proper divisors for 6 (1, 2, and 3) equals 6. The integer 28 is also a perfect number since the divisors for 28 are 1, 2, 4, 7, and 14 and the sum of these numbers equals 28.

Write a function that takes as input a positive integer ≥ 1, then determines the proper divisors of that integer, sums these divisors, and returns a True value if the number is a perfect number or a False value if it is not.

Assume that the program that calls this function verifies that the input is a positive integer ≥ 1.

Recall that "The **proper divisors** of a positive integer N are those numbers, other than N itself, that divide N without remainder. For N > 1 they will always include 1, but for N == 1 there are no **proper divisors**. The **proper divisors** of 6 are 1, 2, and 3. The **proper divisors** of 100 are 1, 2, 4, 5, 10, 20, 25, and 50."

Program 4: Keanu Reeves Starring in "Average Velocity"

☑ *Use basic engineering equations and write a Python program to perform the calculations.*
☑ *Create and use functions in Python*

Write a function that takes in two parallel lists: a list of times (in increasing order), and a list of distance traveled by that point in time. The function should return a new list giving the average velocity between consecutive time measurements. *(Note: the new list should have length one less than the original lists.)*