CSCI 1300 CS1: Starting Computing
Instructor: Fleming, Fall 2018
Homework 1
Due: 6:00 pm, Sun, Sept. 9

(5 percentage bonus on the total score if submitted by Fri. Sep 7th)
(2 percentage bonus on the total score if submitted by Sat. Sep 8th)

Algorithm and Pseudocode

NOTE : Please make sure that what you submit it is not code in any language (cpp,python,etc), but that it follows pseudocode or algorithm rules.

For the following problems, write the algorithm using the building blocks discussed in the Representations document listed on Moodle for week one. In your algorithms, use indentation to show that a line in the algorithm is inside of a loop or a conditional.
For example:

```
if x equals y
    output(x)
```

The line ***output(x)*** only executes if ***x equals y*** is true and is therefore it is indented under the ***if*** statement.

Note: Example of a good pseudo code : here

How to Submit:

Your work should be typed. Submit your assignment as a PDF on Moodle under the **H1** link

Problems:

1. (15 points) The U.S. Census provides information about the current U.S. population as well as approximate rates of change. Using those rates and the current US population, write an algorithm to calculate the U.S. population in exactly one year (365 days). Your algorithm should output the result of your calculations.

   Three rates of change are provided:
   a. There is a birth every 8 seconds
   b. There is a death every 12 seconds
   c. There is a new immigrant every 27 seconds

   Current U.S. population: 328,441,687

2. (15 points) A day has 86,400 seconds (24*60*60). Given a number of seconds in the range of 0 to 1,000,000 seconds, output the time as days, hours, minutes, and seconds for a 24- hour clock. For example, 70,000 seconds is 0 days, 19 hours, 26 minutes, and 40 seconds. Your program should have user input that is the number of seconds to convert, and then use that number in your calculations. If your results are W, X, Y, and Z, then your output should be displayed as :

   The time is W days, X hours, Y minutes, and Z seconds

3. (10 points) In science, temperature is always described in Celsius, but in the U.S. we tend to use Fahrenheit temperatures. Write an algorithm to convert a given Fahrenheit temperature into Celsius. (Subtracting thirty-two from the Fahrenheit value and taking five ninths of that result will provide the Celsius value)

4. (10 points) Write an algorithm that asks a user to enter a number between 1 and 10. (This range includes the numbers 1 and 10.) When they enter the number, check that it is actually between 1 and 10. If it is not, ask them to enter a number again. Continue to ask until they enter a valid number. Once their number is valid, output the number.

5. (25 points) In text-based choose your own adventure games, the game player is presented with choices throughout the game and then the game responds based on the user's choice.

   Write the algorithm to choose your own superhero adventure game where the user has three choices:

a. Fight the villain
b. Save the citizen
c. Return to secret base

The game should repeatedly ask the user which of the three options they want to do until the user says “Return to secret base”. When “Return to secret base” is selected, the loop should exit, which effectively ends the game.

If the user selects “Fight the villain”, the algorithm should output “You win!”. If “Save the citizen” is selected, the algorithm should output “You saved the citizen”. If “Return to secret base” is selected, the algorithm should output “Who will save the world?”.

You can set up your algorithm to check for the user’s input in any way you like. Checking for the actual words, such as “Save the citizen” is one option. If you want to assign a number to each option and check for the number, that also works.

6.A. (15 points) A bank account starts out with $10,000. Interest is compounded monthly at 6 percent per year (0.5 percent per month). Every month, $500 is withdrawn to meet college expenses. Write an algorithm to find how many years does it take for the account to deplete.
Hint : Create a table with money that is getting compounded and the money that is withdrawn and calculate by hand the what happens in the first 5 months. Then use the pattern to help you figure out the algorithm.

6.B. (10 points) Make changes to the algorithm to ask the user to input the values for principal, rate and monthly expenditure. Is there a scenario where the algorithm will not terminate (maybe enter an infinite loop)? If so, make changes to the algorithm so that it always terminates.