CIS*1500 W16 – Assignment #2

Due: Friday February 12, 3pm

Write complete C programs for each problem and submit them separately in the dropboxes for Assignment 2A and Assignment 2B respectively. **Make sure you submit the .c file, not the executable.** Your programs must compile successfully with the command:

gcc -Wall -std=c99 -lm your_file.c

For both questions, assume that only INTEGER values are entered as input.

(A) **[15 marks]** Is global warming real? To help answer this question, we want to study the trend of annual rainfall in various locations. The amount of annual rainfall is measured in centimetres (rounded to the nearest centimetre). However, the report will go directly to Barrack Obama, so the measurements need to be converted to inches (1cm = 0.3937 in).

Write a program that will read as input the measurements for the past 5 years (entered by user one at a time). It should then output the total rainfall back in inches rounded to one decimal place. Furthermore, the **average amount of rainfall** should be calculated for the 5 years (in inches) along with the **standard deviation**. Both values should be reported to two decimal places. Finally, if the amount of rainfall is either strictly increasing or strictly decreasing year over year, then report an additional message stating "Barrack - global warming is for real!".

To calculate the standard deviation, include **math.h** and use the formula:

$$\sqrt{\frac{1}{5}\Big((x_1 - avg)^2 + (x_2 - avg)^2 + (x_3 - avg)^2 + (x_4 - avg)^2 + (x_5 - avg)^2\Big)},$$

where x_1, x_2, x_3, x_4, x_5 are the 5 years of rainfall in inches, and avg is their average.

For example, if the rainfall for the past 5 years in Guelph was 790, 777, 772, 762, 749 respectively, then your program should output:

```
In 2011, there was 311.0 inches of rainfall.
In 2012, there was 305.9 inches of rainfall.
In 2013, there was 303.9 inches of rainfall.
In 2014, there was 300.0 inches of rainfall.
In 2015, there was 294.9 inches of rainfall.

The average rainfall was 303.15 inches, with standard deviation 5.45.
Barrack - global warming is for real!
```

(B) **[20 marks]** As you get older, it gets harder to do math in your head. But in your current job, you must routinely determine a persons age relative to the current date. To make your life easy you decide to write a C program that will take a persons birthday as input, and output back a sentence like the following:

You were born on Apr 4, 2000 and you are 15 years old.

The birthday should be entered as 3 separate fields (year, month, day), and the input must be checked for validity. The month should be input as an integer in the range 1..12, and then output back as its 3 character abbreviation. You may assume that the current day is hard-coded to Feb 12, 2016 (i.e., you do not prompt for the current date). If an invalid date has been entered you must produce the following output.

An invalid birthdate has been entered.

To simplify the checking, you may assume that every year divisible by 4 is a leap-year. The following are examples of invalid birth dates:

- ▷ `2000 2 30` (not 30 days in Feb)
- ▷ `1997 2 29` (not a leap year)
- ▷ `2016 2 17` (date in future)
- ▷ `2011 13 7` (13 is not a valid month)
- ▷ `2000 7 -2` (-2 is not a valid day)