Math 3300 - Homework 2

1. Create a **program** which reads from a file named "investments.txt" which contains a single line consisting of a first name, a last name, and an initial investment amount (a double). Your program should create a file named "interest.txt" which contains the first name, last name, and the amount of money the person has after 1 year, 5 years, 10 years, and 20 years if the interest is compounded annually with an interest rate of 4%. (A formula for this quantity is: $P * (1.04)^t$ where t is in years and P is the amount initially invested)

2. Determine the truth value of the following statements (assume $a = 5$, $b = 2$, and $c = 4$). Remember that C++ interprets a non-zero number as TRUE and zero as FALSE. ! stands for NOT, && stands for AND, and || stands for OR.

   (a) $b > c$

   (b) $a! = b + c$

   (c) $a\%b == a\%c$

   (d) $!(a * b)$

   (e) $!(c\%b)$

   (f) $c\%b * a\&\&a\%c * b$

   (g) $c\%b * a||a\%c * b$

3. Write a **program** that asks the user to enter 2 integers. If the first number entered is the greatest, the program should output: **"The first number entered is greater."** If the second number entered is the greatest, the program should output: **"The second number entered is greater."** If the two numbers are equal, the program should output: **"The numbers are equal."**

4. Create a **program** which allows the user to convert between degrees Celsius and degrees Fahrenheit, or vice versa. The user will enter a number corresponding to the temperature, and a letter corresponding to whether the temperature entered is in Fahrenheit or Celsius (say 'F' or 'C'). Do this first using only **if-else** statements. Do it again using a **switch** statement. The necessary formula is: $F = \frac{9}{5}C + 32$. (Verify that 68 degrees Fahrenheit is 20 degrees Celsius)

5. 2 double numbers a and b have been entered. Create a **switch** statement appropriate for the following menu:

   Choose an option:
   Enter A to calculate the maximum of the 2 numbers
   Enter B to calculate the minimum of the 2 numbers
   Enter C to calculate the average of the 2 numbers
   Enter D to calculate the distance between the 2 numbers (i.e. —a-b—)
   Your switch statement should perform any calculations and output an appropriate response.

6. Create a **while** loop that will display:

    (a) The first 10 terms of the sequence: 3, 6, 9, 12, ...

    (b) The first 15 terms of the sequence: 2, 4, 8, 16, ...

    (c) The first 20 terms of the sequence: 100, 100, 99, 97, 94, 90, ... (how many are being subtracted to go from one term to the next?)

    (d) The first 25 terms of the sequence: 1, 1, 2, 3, 5, ... (each term is the sum of the 2 previous terms)

7. Without using your compiler, figure out the final value of the variable a after each of the following loops completes:

    (a) **int i=1, a=10;**
    while(i< 30)
    {
        i*=2;
        $a--;$
    }

    (b) **int a=15;**
    for(int i =1;i*a> 10;i++)
        $a-=2;$

    (c) **for(int i=1, a=0; i<6; i++)**
        for(int j=4; j>0; j--)
            a++;

    (d) **int a=0, i=2;**
    while(i<10)
    {
        while(a<=0)
        {
          a=i-a;
        }
        a=-a;
        i=abs(a);
    }

8. Using that $\pi = 4(1 - 1/3 + 1/5 - 1/7 + 1/9 + \cdots)$, write a **program** which will calculate the sum of this first n terms of the series (the user will enter a value for n). Experiment with your program and try to answer the following questions: For which value of n do you get $3.14\ldots$ for the first time? Although you got $3.14\ldots$ for the previous value of n, you should notice that because of the oscillating nature of the series, you will get some other value in the next couple terms. For which value of n will you always get $3.14\ldots$ for each subsequent term?

9. Create a **program** which calculates and displays the average of any number of real numbers. Do this by asking the user how many numbers he or she plans on entering,

then use a loop to repeatedly ask the user to enter a number (you will need to keep track of the sum of the numbers as they are entered).

10. Create a **function** whose input is an integer, which returns the "reverse" of that integer (e.g. 416 would become 614). This can be done with a loop. Here's the algorithm:

$$416 \% 10 = 6 \;\; \text{and} \;\; 416/10 = 41 \;\; \text{and} \;\; 0 * 10 + 6 = 6$$

$$41 \% 10 = 1 \;\; \text{and} \;\; 41/10 = 4 \;\; \text{and} \;\; 6 * 10 + 1 = 61$$

$$4 \% 10 = 4 \;\; \text{and} \;\; 4/10 = 0 \;\; \text{and} \;\; 61 * 10 + 4 = 614$$

Hint: Do a couple more examples by hand until you can decide exactly how to set up the loop.