CS101 Practice Problems

1 Variables, Expressions and if else statement

1. Input 5 integers, and display the second largest number.

2. Input a 4-digit integer, and display the sum of all its digits.

3. Input a 4-digit integer and check if it's divisible by 2,3,4 and 12. Use the standard techniques that inspect digits.

2 while do, or do while

1. Solve problem 1.1 with the help of iteration.

2. Write a program which reads an integer into variable n, and computes the sum $\sum\limits_{i=1}^{n} i$.

3. Write a program which reads an integer and finds its factorial.

4. Input an integer n, compute the sum of its digits

5. Fibonacci numbers are the numbers in the following integer sequence: 0,1,1,2,3,5,8,13,21 ... By definition, the first two fibonacci numbers are 0 and 1, and each subsequent number is the sum of the previous two numbers. Write a program to compute n^{th} number in this series given n.

6. Input an integer x and print the digits of x in the reverse order.

7. Modify the above program to compute an integer y such that y is produced by reversing x. For example, if x is 6787, y is 7876, and if x is 80, y is 8.

8. Write a program which reads an integer n, and finds the value of π using Madhava-Leibniz series truncated to n terms:

$$\sum_{i=0}^{n} \frac{(-1)^i}{2i+1} = \frac{\pi}{4}$$

9. Write a program that accepts x, and a number n and computes sin(x) using the sine series up to first n terms. The series is:
   $sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ...$

10. Write a program which reads an integer n, and finds its square root based on the Babylonian iterative method outlined below.

    (a) First ask the user to make an initial guess say x0.

    (b) Your program computes the next guess as the average of *previous guess* and the value $\frac{n}{previous\ guess}$. This new guess and its square are displayed to the user.

    (c) Repeat step (b) till the user is unsatisfied with the answer.

11. Write a program which reads an integer n, and finds the value of constant e using the following series truncated to n terms:

$$\frac{1}{e} = 1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + ...$$

12. Write a program that prints the calendar of a month, given the total number of days and the first day (0:Monday..6:Sunday) of that month.

    Say, the No. of days is 31 and the first day is Tuesday, then the output looks like what's given below.

```
M    T    W    T    F    S    S

     1    2    3    4    5    6
7    8    9    10   11   12   13
14   15   16   17   18   19   20
21   22   23   24   25   26   27
28   29   30   31
```

3 Fix bugs in these Programs

1. This is a program that tries to find out how many times A[0] repeats in an array of 5 integers. Something wrong here.. fix it

   You can download this code from
   $http://www.cse.iitb.ac.in/~rkj/cs101/bug1.cpp$

   ```cpp
   #include <iostream>
   using namespace std;

   int main() {

   int A[5];
   int i, count;

    cout << "Input 5 integers:\n";
    i=0;
    count = 1;
    while (i<5) { cin >> A[i]; i++;}

    i=1;
    while (i<5) {
           if (A[i]==A[0])
                   count=count+1;
           i++;
    }
    cout << A[0] << " repeats " << count << " times\n";

   }
   ```

2. The following program is an intermediate version of solution to problem 2.8. There is a problem in the program. Find it.

   You can download this code from
   $http://www.cse.iitb.ac.in/~rkj/cs101/bug2.cpp$

   ```cpp
   #include <iostream>
   using namespace std;
   ```

```cpp
int main () {
int n,i;
float sum1,sum2,sum;
   sum1=0;
   sum2=0;
   sum=0;

   cout << "How many terms?";
   cin >> n;
   i=0;
   while((i<=n) && (i%2==0)){
      sum1 = sum1 + (1/(float)(2*i+1.0));
      i++;
   }
   while((i<=n) && (i%2==1)){
      sum2 = sum2 - (1/(float)(2*i+1.0));
      i++;
   }
   sum= sum1+ sum2;
   cout << "The value Of Pi is" << 4*sum << endl;
   return(0);
}
```