Problem Sheet 1

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Q. 1 Consider the following programme which takes two integers as input and prints the sum of all integers between them

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// A sample program to illustrate some basic features of C++.
// It adds all integers between two given integers and
// outputs the sum to the screen.

#include <iostream> // include standard library for I/O
using namespace std;
int main (int argc, char *argv[])
{
  int n, m; // declare n and m to be integers
  cout << "Enter two integers: "; // output to screen
  cin >> n >> m; // input will be assigned to n,m

  if(n>m){ //if n is bigger than m,swap them
    int temp = n; // declare temp and initialize it
    n = m; // assign value of m to n
    m = temp; // assign value of temp to m
    }
  double sum = 0.0; // sum has double precision

  // a loop, i changes from n to m with increment 1 each time
  for (int i = n; i <= m; i++) { // <=: less than or equal to
    sum += i; // sum += i means sum = sum + i;
  }
  cout << "Sum of integers from " << n << " to " << m
  << " is: " << sum << endl; // output sum to screen

  return 0; // end of the programme
}
```

(a) Run the above programme: give 1000 and 1 as the input.

(b) Modify the programme to compute the sum of squares of all integers between two given integers, i.e. find the sum $n^2 + (n+1)^2 + \ldots + m^2$ for two given integers n and m with

$n < m$. You may have to declare sum to double or long double in order to incorporate large values of n and m. Compute the sum: $1^2 + 2^2 + \cdots + 5000^2$ in two ways: first, by declaring sum as int and second, as long double. What do you observe?

(c) Modify this programme to calculate:

$$\sin(1.1) + \sin(1.3) + \sin(1.5) + \ldots + \sin(9.9)$$
$$e^{1.1} + e^{1.2} + e^{1.3} + \ldots + e^{15.5}$$

You need to include the header <math.h>

(d) Modify suitably the above code to compute $n!$ for a given n. You may change sum to, say, fact. How do you initialise fact? Change the types of fact as above and evaluate $13!$, $20!$ and $40!$.