ESC101 : Fundamental of Computing
Lab 6 for 11th September 2008

From this lab onwards, you will have to write JAVA programs which receive input from command-line (terminal). This was demonstrated during the lecture of 8th September.

1. **Divisor summatory function :** (marks=10)
   A *divisor function* is an arithmetical function related to the divisors of an integer. It is defined as the number of divisors of an integer. e.g. Divisor function of 12, $\sigma_0(12) = 6$, since the divisors of 12 are: $1, 2, 3, 4, 6, 12$. (For more about *divisor function*, visit `http://en.wikipedia.org/wiki/Divisor_function`)

   The *Divisor summatory function* of n is defined as the sum of the divisor function of the first n positive integers. It is given by the following formula:

   $$D(n) = \sum_{k=1}^{n} \sigma_0(k)$$

   e.g.

   $$\begin{aligned} D(6) &= \sigma_0(1) + \sigma_0(2) + \sigma_0(3) + \sigma_0(4) + \sigma_0(5) + \sigma_0(6) \\ &= 1 + 2 + 2 + 3 + 2 + 4 \\ &= 14 \end{aligned}$$

   Write a JAVA program to find $D(n)$ for any positive integer n passed as a command line argument.

   Your program should implement and use the following function:

   `(int) divisorFunction (int k)`: Returns $\sigma_0(k)$.

2. **Area of a triangle using Taylor's series formula for sine :** (marks=10)
   In mathematics, the *Taylor series* is a representation of a function as an infinite sum of terms. The *Taylor series* is a representation of *sine* function is given by

   $$sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} \cdots$$

   where x is in *radians*.

   Design the following function:

   `(double) sin (double x)`: Takes x in radians and returns $sin(x)$.

   Optional: For implementing the *sin* function, you have a choice of using the following functions, which would enhance the readability of the code, but decrease the speed of the program:

   `(double) power (double x, int k)`: Returns x^k.
   `(int) factorial (int n)`: Returns $n!$.

   Using the function sin as described above, write a program which, given two sides of a triangle and the angle between them, computes the area of the triangle. You have to give input through terminal with first two values for the two sides of the triangle and the third input for the angle in radian.