ESC101 : Fundamental of Computing

Lab 4 for 18th August 2008

1. **Finding the value of PI :**
   Write a JAVA program to find the approximate value of `pi` using the infinite series:

$$\pi = 4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots\right)$$

   Print a table showing the value of `pi` approximated by computing one term of the series, by computing two terms, by computing three terms and so on upto 10 terms.

   Programming hint: Declare a double variable `pi` and initialize it to 0. Using a `for` loop, add/subtract each of the terms in the series to the variabe `pi`.

2. **Unique Prime Factorization Theorem:**
   In number theory, the *Fundamental Theorem of Arithmetic* states that every natural number greater than 1 can be written as a unique product of prime numbers. e.g. 360 can be written as $2^3 \times 3^2 \times 5^1$.

   Write a JAVA program to find the prime factors of a given number with the number of times each prime factor occurs in the factorization.

   e.g. For the input number 360, the output should be: $[2, 3], [3, 2], [5, 1]$

   Don't check whether any of the divisors is prime.

   Programming hint: Declare a variable `num` of type `int` and initialize it with the input value. For the example above, `num =` 360 is divisible by 2. So 2 is a prime factor of 360. Now set `num =` 180(360/2). Again check whether `num`(180) is divisible by 2 or not. Continue doing this until the `num` is not divisible by 2. Repeat the procedure for $3, 4, 5, \ldots$ until `num` becomes 1.