ESC101 : Fundamental of Computing
Lab 5 for 5th September 2008

1. **Multiplying two long numbers correctly :** (marks = 10)
   We spent may lectures on types, expression of mixed types, their evaluation, range of various numeric types. One point which was emphasized multiple times in the lecture class was that a numeric type, say `long`, has a limit on the maximum value which it can store. So we have to be very careful when we perform an arithmetic operation on two variables of numeric types. For example, if we have one variable `x` of type `long` and another variable `y` of type `byte`, and we want to print the product of `x` and `y`, then the following code may give error if the product of these variables is beyond the range of `long`. (you may compile and execute it to convince yourself).

   ```
   long x = 9000000000000000000L; byte y = 125;
   long product = x*y;
   System.out.println(product);
   ```

   For your information, the largest positive value of `long` is 9223372036854775807. You have to write a program which prints the product of the two variables `x` and `y` of type `long` and `byte` respectively. Your program **must** work correctly for any positive values assigned to `x` and `y`.
   Hint : (one possible solution) use two `long` variables for storing *upper half* and *lower half* of `x`. In a similar way, keep two variables of type `long` for storing `product`. Now to compute `product`, you may think of simulating multiplication by addition - computing $x \times y$ is equivalent to computing the sum of the series $x + x + \ldots x$ with y terms in it. In order to take care of the situation where values that we compute is beyond the range of `long`, carefully use the fact that we are storing `x` as well as `product` using two long variables each.

2. **Printing numbers in words :** (marks=10)
   Write a program to assign a grade according to the marks received in an exam. So given a mark print the appropriate grade.
   More than 90 receives A grade
   More than 60 receives B grade
   More than 40 receives C grade
   More than 30 receives D grade
   Less than 30 receives Failed

   The variable `mark` will be of type `int`. Your program should work for all values of `mark` in the range [0,100].

Note : one mark should be deducted from each question if the code is not properly indented. The students are encouraged to write comments to improve the readability of the code. For the first question, only **4 marks** should be awarded if the logic is correct but the program does not work for some input. Furthermore, no marks should be given if the logic is also incorrect.