Computing and Statistical Data Analysis
Problem sheet 2
Due Monday 26 October, 2008.

Remember to write your name, College and degree programme (e.g., PhD, MSci or MSc) on your coursework.

Coding style counts. Remember to use meaningful names for variables and indent properly; I suggest two spaces per indentation. Please do not go past 80 characters per line or else the code becomes difficult to read when printed (in C++ you can always break a line wherever you like).

Avoid unnecessarily complicated code. Highest marks go to a simple, elegant, robust solution. If you choose to do something complicated (e.g., fancy error checking), then the complexity should buy meaningful additional functionality or robustness.

1 Write a program that computes a table of values of n, $\sqrt{n}$ and $\ln n$ for $n = 1, 2, \ldots n_{\max}$, where the value $n_{\max}$ is set by the user through a `cin` statement. Using the techniques shown in the lecture, display the result on the monitor formatted such that the value of n appears as an integer in a column with 5 spaces, and the values of $\sqrt{n}$ and $\ln n$ appears as decimal values with 12 total spaces and five places to the right of the decimal point.

Using the Unix $>$ operator, redirect the output to be captured into a file. (Here this is a bit awkward because of the `cin` statement. For this part of the exercise either comment out the `cin` statement and set $n_{\max}$ inside the program, or just try typing in the answer to the `cin` statement anyway, even though you won't be prompted to do so by the program.)

2 Modify your program from Exercise 1 to include a column for $n!$. Write a separate function called, e.g., `factorial` to implement this function. Write the function definition and its prototype in separate files, e.g., `factorial.cc` and `factorial.h`.

3 Overload the `factorial` function so that it can take arguments of type `int` or `double`. (Always return `double`.) Take reasonable action if, e.g., the argument is negative, non-integer valued, etc. Illustrate the use of the function in a simple test program.

4 Write a function `swap(x,y)` of return type `void` which takes two `int` arguments passed by reference, such that the values of `x` and `y` are swapped after calling the function. Write a short test program which calls `swap` to test and illustrate its use.

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