

## Advanced Programming Techniques Sheet 0 — Warmup Exercises

This sheet is not mandatory. It is only a preparation for the programming project later in the semester. There is no submission, however, we strongly recommend you work on all these exercises.

### Environment

Please be aware that the computer exercises of AdvPT take place in the CIP-Pools with Linux machines. You can also bring your own laptops, but our support focuses on the provided CIP systems. You can use them remotely with ssh. If you have never worked with the Linux terminal, we recommend going through some tutorials first.

Furthermore, we expect you to know essentials like the difference between stack and heap or the use of pointers. We also recommend you to learn about Git, Make, and CMake. These tools are invaluable for C++ development. If you never worked with C/C++ we recommend watching [The Structure of a Program](#) and [Pointers and Memory](#).

Here are some links regarding the mentioned topics. Feel free to explore these subjects on your own with your favorite search engine.

- [Linux Tutorial](#)
- [Linux Terminal](#)
- [Stack vs Heap](#)
- [CMake](#)
- [Make Tutorial](#)
- [Valgrind](#)
- [gdb Tutorial](#)

### Part 1 — Writing First C++ Programs

a) **Range Sum** Write a program that queries the user for two numbers and sums the numbers in that range (including the first number, excluding the last number).

b) **Factorial** Write a program that prompts the user to enter a number and then calculates the approximate factorial of the given number as a double precision floating point number and writes it to the standard output. Verify your program at least against the following *test cases*:

$$\begin{aligned}0! &= 1.0 & ; & & 1! &= 1.0 & ; & & 6! &= 720.0 & ; & & 12! &= 479001600.0 \\13! &= 6227020800.0 & ; & & 21! &\approx 5.1091e19 \\35! &\approx 1.0333e40 & ; & & -1! &=?\end{aligned}$$

c) **Punctuation** Write a program that reads a line from standard input and prints the line to standard output but with all punctuation removed. The resulting program should be usable as a filter like this:

```
./punctuation < with_punct.txt > no_punct.txt
```

**Hint:** Have a look at the following STL Header: `<cctype>`

## Part 2 — Basic C++ Quizzes

Complete the following Studon tests under "Exercise Material -> StudOn Tests":

**a) Variables and Basic Types** Demonstrate your basic knowledge in C++ variables and basic data types by taking a quick StudOn Quiz ("Variables and Basic Types").

**b) Function overloading: Basics** Demonstrate your basic knowledge in the resolution of functions by taking a quick StudOn Quiz ("Function resolution - basics").

**c) Function overloading: Inheritance** Demonstrate your advanced knowledge in the resolution of functions by taking a quick StudOn Quiz ("Function resolution - classes and structs").

Notice that there are also two remaining StudOn tests requiring knowledge about C++ templates. These will be included in the next exercise sheet (Part 1).