Exercise 1 – Hello world

1. Write a simple Fortran program, which prints a message on the screen (e.g., “Hello world”).

   - Save the file with the ending `.f90`.
   - Compile the program with `gfortran program.f90`. If you want to name your program, use the option `-o`, e.g., `gfortran -o hello program.f90`.
   - Run the program with `./a.out` or (if you named it hello) `./hello`.

2. Write a Fortran program, which reads a positive integer and calculates its factorial. The program should:

   - Ask for a positive integer.
   - Check whether the number is positive and, if not, print an error message.
   - Calculate the factorial ($N!$) and print the result on the screen:

$$N! = 1 \cdot 2 \cdot 3 \cdot ... \cdot N \tag{1}$$

3. Write a Fortran program, which calculates the mean and standard deviation of a series of (real) numbers. The program should:

   - Ask, how many numbers the user wants to enter.
   - Read in the numbers one after the other.
   - Continuously calculate the sum and sum of squares (no arrays yet).
   - Compute the mean ($\bar{x}$) and standard deviation (σ) from the sum and sum of squares:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \tag{2}$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} x_i^2 - \left(\frac{1}{n} \sum_{i=1}^{n} x_i \right)^2} \tag{3}$$

   To test the program, you can run it with the file `numbers.txt` as follows:
   `./a.out < numbers.txt`

   This should give `5.46790028` for the mean and `3.48388124` for the standard deviation.

Deadline: Please hand in your solutions (`.f90` files) by **Tuesday, 12 March 2023, 23:59**.