Exercise 2.1

Set up an algorithm which converts a floating number in the decimal representation to a floating number in the binary representation. You may or may not use a scientific representation. Write thereafter a program which implements this algorithm following much of the same procedure outlined in program2.cpp or program2.f90 in chapter 2 of the lecture notes.

Exercise 2.2

2.2a) Make a program which sums

$$s_{\rm up} = \sum_{n=1}^{N} \frac{1}{n},$$

and

$$s_{\rm down} = \sum_{n=N}^{n=1} \frac{1}{n}.$$

The program should read N from screen and write the final output to screen.

2.2b) Compare $s_{\rm up}$ og $s_{\rm down}$ for different N using both single and double precision for N up to $N = 10^{10}$. Which of the above formula is the most realiable one? Try to give an explanation of possible differences. One possibility for guiding the eye is for example to make a log-log plot of the relative difference as a function of N in steps of 10^n with $n = 1, 2, \ldots, 10$. This means you need to compute $log_{10}(|(s_{\rm up}(N) - s_{\rm down}(N))/s_{\rm down}(N)|)$ as function of $log_{10}(N)$.