

BiL 102 – Computer Programming

HW 05

Last Submission Date: April 3, 2013 – 14:00

So far we covered 2 representation methods to represent a real number:

- Floating-point representation
- Rational number representation (representing with 2 integers – “a” and “b” - as a/b)

In this homework, you will implement a new representation using 3 integers “s”, “i” and “f” to represent the sign, integer and the fractional parts respectively such that:

$$\begin{aligned}s &\in \{-1, 1\}, \\ 0 &\leq i \leq 9999 \text{ and} \\ 0 &\leq f \leq 9999\end{aligned}$$

124,4578	→	s=1, i=124,	f=4578
-4579. 24	→	s=-1, i=4579,	f=2400
1.002	→	s=1, i=1,	f=20
-0.0001	→	s=-1, i=0,	f=1
19	→	s=1, i=19,	f=0
5.2526887	→	s=1, i=5,	f=2527
15000	→	s=1, i=5000,	f=0

You will write the following functions in this representation **without using any floating-point variables unless implicitly expressed in function definition below**:

Casting:

- A function to cast from double to 3 integer representation returning resulting number (3 variables) as output parameters an overflow flag (0: normal, 1:overflow) as the return value
- A function to cast from 3 integer representation to double (returning an error flag as the return value)

Basic operations:

- A function to add 2 variables: takes 2 numbers (6 variables), returns the sum of them as output parameters (3 integers) and an overflow flag (1 in the case of an overflow and 0 otherwise) as the return value.
- A function to subtract a variable from another, having similar prototype with the adding function
- A function to multiply 2 variables, having similar prototype with the adding function
- A function to divide a variable by another variable, having similar prototype with the adding function

I/O:

Define an enumeration “operator_t” to represent the mathematical operators

- A function to get a mathematical operation with its operands which will return 2 real numbers (in 3 integer representation) and the operator(enumaration) as output

parameters and an error flag as the return value. The user will enter the operation as one compound phrase without space and press enter (certainly %lf not permitted).

e.g. 150.78+22<enter>

- A function to get a math operation from file similarly (adding a FILE* to the argument list – file will be opened by the caller function)
- A function to print a real number given in 3 integer representation to the console.
- A function to print a real number given in 3 integer representation to a text file (given as FILE*).

Test:

- Write a function to calculate π with the following formula using real numbers in the 3 integer representation only which:
 - takes the number of terms from the user,
 - compares the result with a precise value of π ,
 - returns the calculated value and the error.

$$\pi = 3 + \frac{4}{2 \times 3 \times 4} - \frac{4}{4 \times 5 \times 6} + \frac{4}{6 \times 7 \times 8} - \frac{4}{8 \times 9 \times 10} + \dots$$

- Write a function to calculate π with the above formula using double numbers which:
 - takes the number of terms from the user,
 - compares the result with a precise value of π ,
 - returns the calculated value and the error.

General:

1. Obey honor code principles.
2. Obey coding convention.
3. Your submission should include the following file only
HW05_<student_name>_<studentSurname>_<student number>.c
4. Deliver the printout of your code **until the last submission date**.
5. Do not use non-English characters in any part of your homework (in body, **file name**, etc.).