

Two classes were created:

- **Class Fraction** - allows a creation of a Fraction object, it has two private data members: numerator and denominator. Since mathematical operations on initial forms of fractions may require calculations of high values, *int* was used as a data type to enable a storage of values taking up to 4 bytes of memory space.
- **Class FractionList** – created to further encapsulate the code, it has one private data member, which is a vector of Fraction objects. This class was created, to simplify a main function (interface) and to allow more efficient management of multiple Fraction objects.

The "**Fraction.h**" file is a header file containing classes declarations with comments.

The "**Fraction.cpp**" file is the implementation of the classes' member functions. For the purpose of coursework, two classes are stored in one file, however it would be appropriate to store the two classes headers and their implementations separately as "Fraction(.h/.cpp)" and "FractionList(.h/.cpp)" files.

Constructors and destructors can be found on top of each class declaration. It was assumed these do not require commenting. They were set as defaults, wherever appropriate.

Class members were listed in the public, protected, private order as it is a common programming practice. For the same reason a file name, which was made constant was declared globally in main.cpp. Class data members were named starting with *m_*, since it is highly desired to clearly differentiate class data members from other variables. For other components a naming convention was as follows:

- Functions – starting and cont. with capital letter ie. MyFunction;
- Classes and Objects – starting with capital letters ie. Fraction, FractionList, Sum;
- Variables – starting with small letter, following words with capital ie. myVariable;
- Constants – all capital letters, words separated by underscore, ie FILE_NAME;

The creation of a Fraction with a denominator of zero was forbidden by using an `assert()` function. If the Fraction constructor, or a `m_denominator` setter is called with a zero as a parameter, the programme will abort its execution. A *try, throw, catch* exception error was also considered, however it would only display a warning message and not prevent a user from division by zero.

The "**main.cpp**":

1. An object of class FractionList is created to read and display all fractions from a "FractionList.txt" file.
2. To save a memory space, a List of fractions is reduced to the lowest terms. A sum of all Fractions stored in a List is calculated and displayed.
3. Lastly, a usage of overloaded operators is demonstrated by calculating $-F6 - ((F1 + F2) * F3 - F4) / F5$ and displaying the result on the screen. F1 to F6 are the first six fractions from the "FractionList.txt" file.

A potential issue, that may be encountered is overflow of data. As mentioned before, a declared 4 byte data types were sufficient for this application, however if work with more complex data is intended, a restriction on maximum input values should be put on. For this purpose an `assert()` could also be deployed if necessary.

The programme was developed for Object Oriented Engineering Computing Coursework purpose.

Number of Fractions read from a file: 8

Fraction 1 from the list:

Initial: $10/4$

Reduced Initial: $5/2$

Mixed: $2 \frac{1}{2}$

Real: 2.5

Fraction 2 from the list:

Initial: $20/3$

Reduced Initial: $20/3$

Mixed: $6 \frac{2}{3}$

Real: 6.66667

Fraction 3 from the list:

Initial: $-21/7$

Reduced Initial: $-3/1$

Mixed: -3

Real: -3

Fraction 4 from the list:

Initial: $-99/22$

Reduced Initial: $-9/2$

Mixed: $-4 \frac{1}{2}$

Real: -4.5

Fraction 5 from the list:

Initial: $32/4$

Reduced Initial: $8/1$

Mixed: 8

Real: 8

Fraction 6 from the list:

Initial: $-34/10$

Reduced Initial: $-17/5$

Mixed: $-3 \frac{2}{5}$

Real: -3.4

Fraction 7 from the list:

Initial: $4/6$

Reduced Initial: $2/3$

Mixed: $2/3$

Real: 0.66667

Fraction 8 from the list:

Initial: $5/3$

Reduced Initial: $5/3$

Mixed: $1 \frac{2}{3}$

Real: 1.66667

The total sum of all fractions from the list is:

Initial: $4644/540$

Reduced Initial: $43/5$

Mixed: $8 \frac{3}{5}$

Real: 8.6

The result of $-F6 - ((F1 + F2) * F3 - F4) / F5$ is:

Initial: $3012/480$

Reduced Initial: $251/40$

Mixed: $6 \frac{11}{40}$

Real: 6.275