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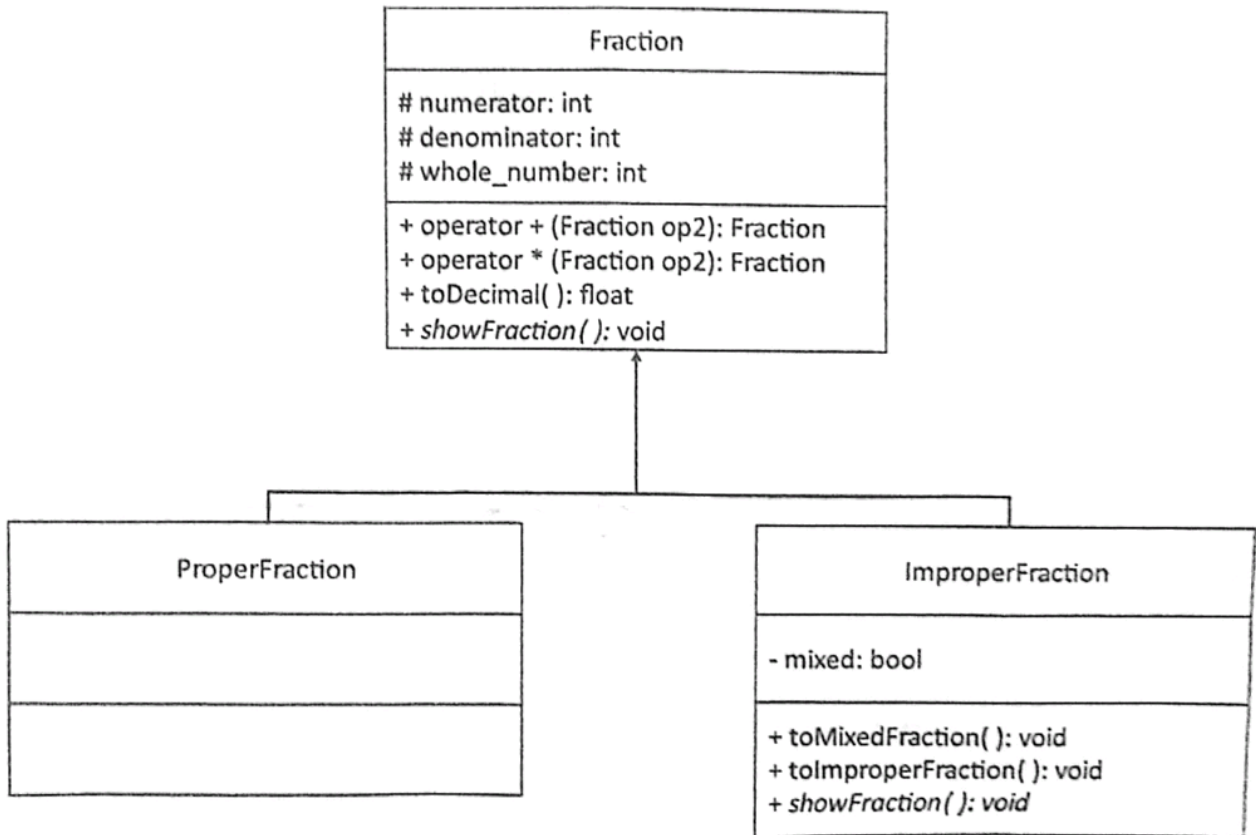
Question 1 (70 marks)

Read the entire question first before writing your program

Study the UML Class diagram below carefully.

The instructions will guide you on how to write the program

UML Class Diagram:



## Instructions:

- I. Create the classes as described by the UML Class diagram above in your source file.
  - a. The data members: **numerator**, **denominator**, and **whole\_number** store the respective parts of the fraction
  - b. The data member, **mixed** indicates whether the improper fraction is in the mixed-fraction format (*eg*:  $3\frac{1}{2}$ ) or the improper fraction format (*eg*:  $\frac{7}{2}$ )
  - c. The function **toDecimal ( )** should convert the fraction to its decimal form
  - d. The function **showFraction ( )** is a virtual function that displays the fraction in the ✓ form: **numerator/denominator**. In the **ImproperFraction** class, this function should be modified to include the **whole\_number** in the display.
  - e. The function **operator + ( )** should overload the arithmetic addition sign, to sum up two fractions
  - f. The function **operator \* ( )** should overload the arithmetic multiplication sign to multiply two fractions
  - g. The function **toMixedFraction( )** should convert the fraction from improper-fraction format (*eg*:  $\frac{7}{2}$ ) to mixed-fraction format (*eg*:  $3\frac{1}{2}$ )
  - h. The function **toImproperFraction( )** should convert the fraction from mixed-fraction format (*eg*:  $3\frac{1}{2}$ ) to improper-fraction format (*eg*:  $\frac{7}{2}$ )
- II. Write a program in your **main( )** that performs the following calculations with the classes created above:
  - a.  $\frac{1}{2} + \frac{1}{2}$
  - b.  $2\frac{3}{4} + \frac{5}{3}$
  - c.  $\frac{5}{3} * \frac{1}{2}$
  - d.  $2\frac{3}{4} * \frac{5}{3}$
  - e. Display all the results from a to d in fractional format
  - f. Convert  $\frac{1}{2}$  to decimal
  - g. Convert  $\frac{5}{3}$  to decimal

$$\begin{array}{r} \frac{1}{2} + \frac{5}{3} \\ \hline (3 \times 2) + 1 \\ \hline 2 \end{array}$$

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- h. Convert  $2\frac{3}{4}$  to decimal
- i. Display all the results from f to h in decimal format
- III. Comment your code appropriately
- IV. Hint: Mixed fractions should first be converted to improper fractions before performing arithmetic operations
- V. Note:
  - a. You are at liberty to add any suitable functions (including constructors, accessors, and mutators) to this program
  - b. You are at liberty to extend and improve the functionality of the application
  - c. Do **NOT** modify the class descriptions in the UML diagram
  - d. All codes should be written in the object-oriented paradigm using C++
  - e. Comment your index number at the beginning of your source file
  - f. Make appropriate member functions `const`
  - g. Debug your program well
  - h. Do not submit the codeblocks project file (.cbp) as this tends to corrupt during online submission. Only submit a C++ (.cpp) file.

*while cast < int 24000*

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