**Visual Basic Programming Tasks**

**Problem Brief**

1. Write a program that allows the user to enter a fraction. Choose whether or not you want them to enter the parts of the fraction (numerator and denominator) in one line (eg 1/2 for half) or if you want to do it separately.

 Your program should calculate and output this fraction in its simplest form. For example, the fraction 2/4 is written as 1/2 in its simplest form. 12/18 is 2/3.

Here is some pseudocode for doing this.

Set **numerator** variable to what the user enters

Set **denominator** variable to what the user enters

Set variable **a** to numerator

Set variable **b** to denominator

Do

 If a>b Then

 Set a to a-b

 End if

 If b>a Then

 Set b to b-a

 End if

until a=b

Set **hcf** variable to a

 numerator = numerator / hcf

 denominator = denominator / hcf

 Output “{0}/{1}”,numerator, denominator

2. Improve your program by making it possible to enter fractions where the numerator is larger than the denominator. Your program should convert the input to a mixed number with the fraction part in its simplest form.

 For example, the user enters 48/14. Your program should realise that this is a number larger than 1 and work out that you have 3/6/14 (3 and 6 fourteenths). It should then simplify 6/14 to get 3/7. The final output would be **3 and 3/7**.

3. Write a new program that allows you to enter 2 fractions. The program should then allow you to choose whether to add, subtract, multiply or divide the fractions. Your program should return the answer as a fraction in its simplest form.

Write your program in the following stages. Test each stage and comment the code to explain what it does. Copy the code into a Word document using a heading and sentence to explain what the stage does. Include a screenshot to show what your program does.

**A Make the menu**

1. Simplify a fraction
2. Convert a fraction to mixed number form
3. Fraction addition
4. Fraction subtraction
5. Fraction multiplication
6. Fraction division
7. Quit

Use the example program to help you make the menu. At this stage, just display the heading of the option that the user chose.

**B Simplifying a fraction**

To simplify a fraction, first find the highest common factor of the numerator and denominator. Divide them both by the HCF and you have a simplified numerator and denominator.

**C Mixed Number Form**

When a fraction has a numerator larger than the denominator, we convert it to mixed number form.

For example $\frac{3}{2}=1\frac{1}{2}$

Instead of having two parts, our fraction will have 3 parts, **whole**, **numerator** and **denominator**. To work out the whole number part, divide the numerator by the denominator using the **integer division** operator. This tells us how many whole numbers we can get from the fraction. Make the numerator equal to the **remainder** (modulus) when the numerator is divided by the denominator. Simplify the fraction part (new numerator and denominator) and you have your answer to output to the user.

**D Fraction multiplication**

This is the easiest operation with fractions.

$$\frac{a}{b}×\frac{c}{d}=\frac{a×c}{b×d}$$

Simplify the result of this calculation and you have your answer to output to the user.

**E** **Fraction division**

Division is pretty easy too – you just invert the second fraction and multiply.

$$\frac{a}{b}÷\frac{c}{d}=\frac{a}{b}×\frac{d}{c}=\frac{a×d}{b×c}$$

Simplify the result of this calculation and you have your answer to output to the user.

**F** **Fraction addition**

You need a bit more for addition, but still quite easy…



Simplify the result of this calculation and you have your answer to output to the user.

**G Fraction Subtraction**

Use the same approach as for addition but subtract instead of add.

**H Whole Program**

Test your finished program and make sure you have fully commented your code. Copy the completed code to your Word document under a suitable heading. Include some screenshots to demonstrate that your program works.