P3: Into the imaginary realm
https://www.w3schools.com/cpp/cpp_classes.asp

Complex Number Class - 13/02/21

1) Design a class to represent the complex number with appropriate constructors. Your constructor should be overloaded appropriately with the correct overloading method. Implement your operators as member functions in your class.

To make my constructor I declared a function, with no type, that would then read in type of two floats. This was overloaded so that it would set the real and imaginary variables of the class to the values it read in.

```
class complex
{
public:
    complex(float re, float im)
    {
        real = re;
        imaginary = im;
    }
    float Re(void)
    {
        return real;
    }
    float Im(void)
    {
        return imaginary;
    }
    float mod(void)
    {
        return sqrt(pow(real, 2) + pow(imaginary, 2));
    }

private:
    float real;
    float imaginary;
};
```

2) Design appropriate overloading schemes for out-of-class overloading support for basic build-in operators.

I decided which operators I wanted to create overloading schemes for, namely the arithmetic and the comparative operators, and then overloaded them so that they would perform the operation on the class and return the appropriate value.

```
    complex operator+(complex &a) const
    {
        return complex(real + a.real, imaginary + a.imaginary);
    }
    complex operator-(complex &a) const
    complex operator*(complex &a) const
    complex operator/(complex &a) const

    void operator+=(complex &a)
    {
        real += a.real;
        imaginary += a.imaginary;
    }
    void operator-=(complex &a)
    void operator*=(complex &a)
    void operator/=(complex &a)

    bool operator==(complex &a) const
    {
        if ((real == a.real) && (imaginary == a.imaginary))
        {
            return 1;
        }
        else
        {
            return 0;
        }
    }
bool operator!=(complex &a) const
```

Impedance of circuits - 16/02/21

3) How do you find the real part of impedance in an RLC circuit?

$$Z = R + jX$$
$$\Re Z = R$$

4) How do you calculate the imaginary part of the impedance of an RLC circuit?

$$Z = R + jX$$
$$\Im Z = X$$
$$\Im Z = X_L - X_C$$
$$\Im Z = \omega L - \frac{1}{\omega C}$$

5) Write a simple function that takes in the total series resistance, capacitance, inductance and frequency of a series RLC circuit and convert it into impedance.

```
float RLC(float resistance, float inductance, float capacitance, float freq)
{
    float omega = 2 * M_PI * freq;

    float XL = omega * inductance;
    float XC = 1 / (omega * capacitance);

    return sqrt(pow(resistance, 2) + pow(XL - XC, 2));
}
```

6) Why is impedance important in a circuit?

Impedance is important in the calculator of the response of the circuit as ohm's law describes the voltage as:

$$V = IZ$$

And so to calculate the current of the RLC circuit it will be :

$$I = \frac{V}{Z}$$