

Create a project called lab5 (if using Visual Studio), and a source file called lab5.cpp.

Your group will define a class called ComplexNumber that is an abstract data type for a complex number. Include all of the following member or friend functions in your ComplexNumber class:

- a default constructor and a value constructor that do the “reasonable” things;
- mutator and accessor member functions that work on the real and imaginary parts of the complex number;
- an overloaded version of the insertion operator << (written as a non-member friend function) that writes the complex number given as the right-hand operand of the insertion operator to the output stream given as the left-hand operand of the insertion operator, and representing the complex number as “a+bi” (where a is the value of the real part, and b is the value of the imaginary part) – e.g., 1.2+3.4i;
- overloaded versions of the binary operators +, -, *, and / (written as member functions), that implement the corresponding operations for complex numbers as described in https://en.wikipedia.org/wiki/Complex_number#Elementary_operations; and
- an overloaded version of the unary operator ! that implements the “complex conjugate” operation as described in the Wikipedia entry linked above.

Write a driver program in the main function that will fully test your class. Your main function should also create and output (using two separate for loops) a vector of 10 complex numbers that are initialized as $n+(2n)i$, where n is an index ranging from 0 to 9. Your first for loop should use an integer loop variable to index the vector. Your second for loop should use an iterator to access the variable elements in sequence.

The output of your program should look something like this:

Value of c1 (default constructor):

c1.Re() == 0, c1.Im() == 0

Value of c2 (value constructor):

c2.Re() == 1, c2.Im() == 2

c2 + c3 (1+2i + 3+4i) == 4+6i

c2 - c3 (1+2i - 3+4i) == -2+-2i

c2 * c3 (1+2i * 3+4i) == -5+10i

c2 / c3 (1+2i / 3+4i) == 0.44+0.08i

(c2/c3) + (c2*c3) == -4.56+10.08i

Conjugate of c2 (1+2i) == 1+-2i

Vector output using indexed for-loop:

0+0i

1+2i

2+4i

3+6i

4+8i

5+10i

6+12i

7+14i

8+16i

9+18i

Vector output using an iterator in for-loop:

0+0i

1+2i

2+4i

3+6i

4+8i

5+10i

6+12i

7+14i

8+16i

9+18i

When finished, one member of your group should turn in your lab5.cpp file on Blackboard.