Lab 3: Coding and Testing a Complex Number ADT

At the completion of this lab you should be able to:

- Create Java packages and libraries
- Implement the complex number ADT as a Java Class.
- Create a class by first stubbing-in the methods.
- Test methods using the IntelliJ debugger.

Implementing the Complex Number ADT

We will implement the design of the Complex Number shown in Figure 1.

Part I. Open the README.md file in the project. Write the definition of ADT and save the file. (See note at the end of this document for more on using Markdown in IntelliJ.)

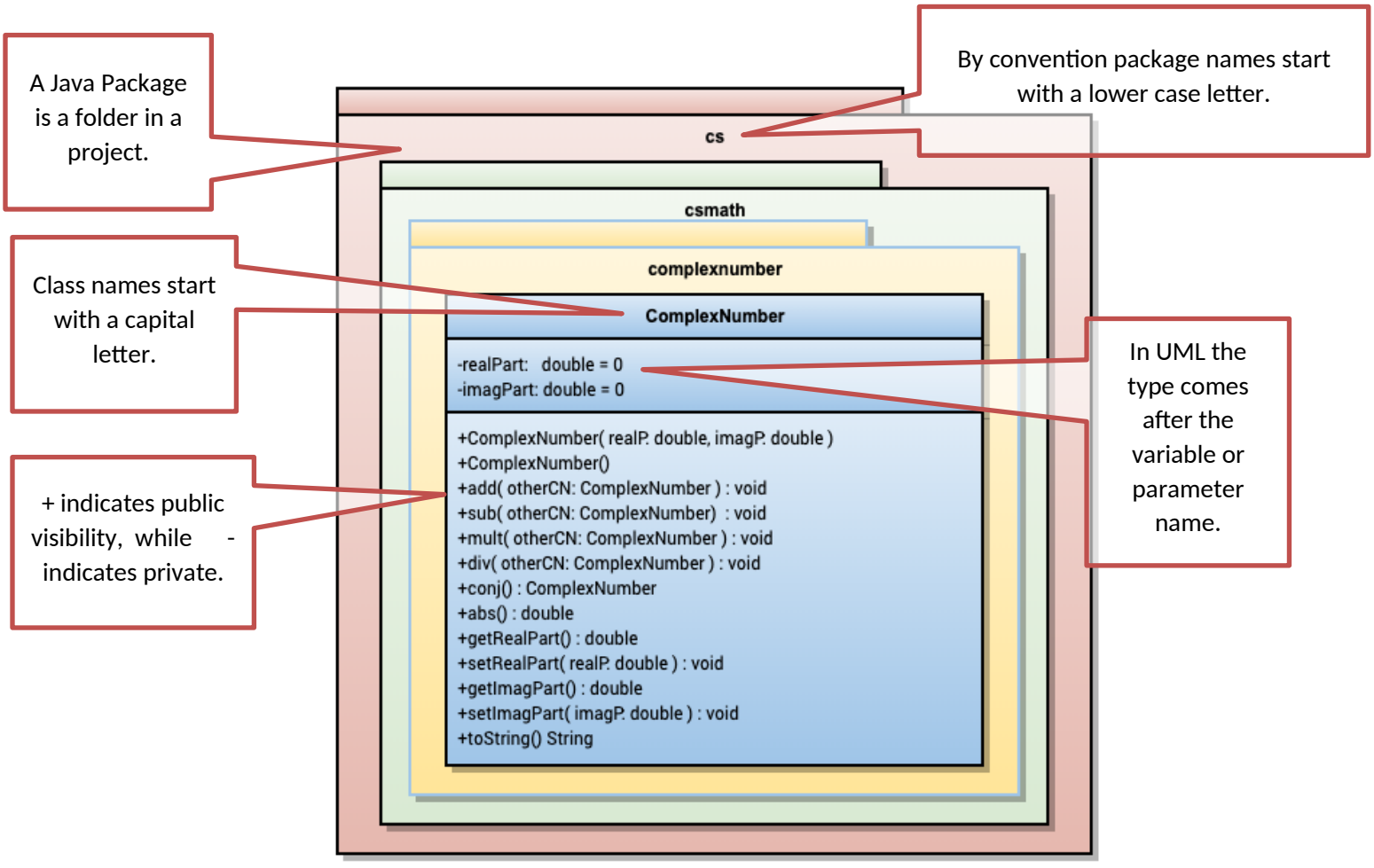


FIGURE 1: DESIGN OF COMPLEX NUMBER ADT

Definitions of the methods are given in the following table.

Operation	Description
add(otherCN): void	thisCN ⟵ thisCN + otherCN
sub(otherCN): void	thisCN ⟵ thisCN – otherCN
mult(otherCN): void	thisCN ⟵ thisCN * otherCN
div(otherCN): void	thisCN ⟵ thisCN / otherCN
conj(): ComplexMumber	returns the conjugate of thisCN
abs(): double	returns the magnitude of thisCN
ComplexNumber()	construct 0 + 0*i*
ComplexNumber(real, imag)	construct the complex number : real + imag*i*
getRealPart(): double	return the real part of the number
getImagPart(): double	return the imaginary part of the number
setRealPart(real): void	set the real part of the number to real
setImagPart(imag): void	set the imaginary part of the number to imag
toString()	ret ⟵ String representation of the number

Note that **ret** indicates the return value of the method. Descriptions of the numeric operations for complex variables may be found in the document *ComplexNumberADT.pdf*.

Part II. Do the following steps using the notes found in the document *Implementing&TestingComplexNumberADT.pdf* as a guide. Perform these steps in the order listed.

1. Clone the CSLibrary GitHub repository created for the assignment.
2. Explore the package structure defined in the repository. Note that all code is in the src folder. The packages are nested folders inside the src folder as indicated in Figure 1.
3. Edit the ComplexNumber.java file in the complexnumber package.
4. Complete the implementation of the stub methods as illustrated in the class diagram and table above:
    - constructors, the getRealPart method and the getImagPart method.
    - instance methods add and mult.
    - instance methods conj and abs.
5. Ensure your code compiles. Test your new class using the IntelliJ debugger. In our next lab we will learn to create and execute test cases with Junit. Here are some values you can use to test your code. You should make up others your self.

    a) (2.0 + 3.1i) + (3.0 – 3.1i) = 5.0 + 0i

    b) (3.14 + 2.5i) + (0.0 + 0.0i) = 3.14 + 2.5i

    c) (2.1 + 3.1i) * (0.5 -0.5i) = 2.6 +0.5i

    d) (2.1 + 3.1i) * (0.0 + 0.0i) = 0.0 + 0.0i

    e) abs(1.0 + 0.0i) = 1

    f) abs(1.0 + 1.0i) = 1.414 (actually √2)

g) conj(2.1 + 3.2i) = 2.1 – 3.2i

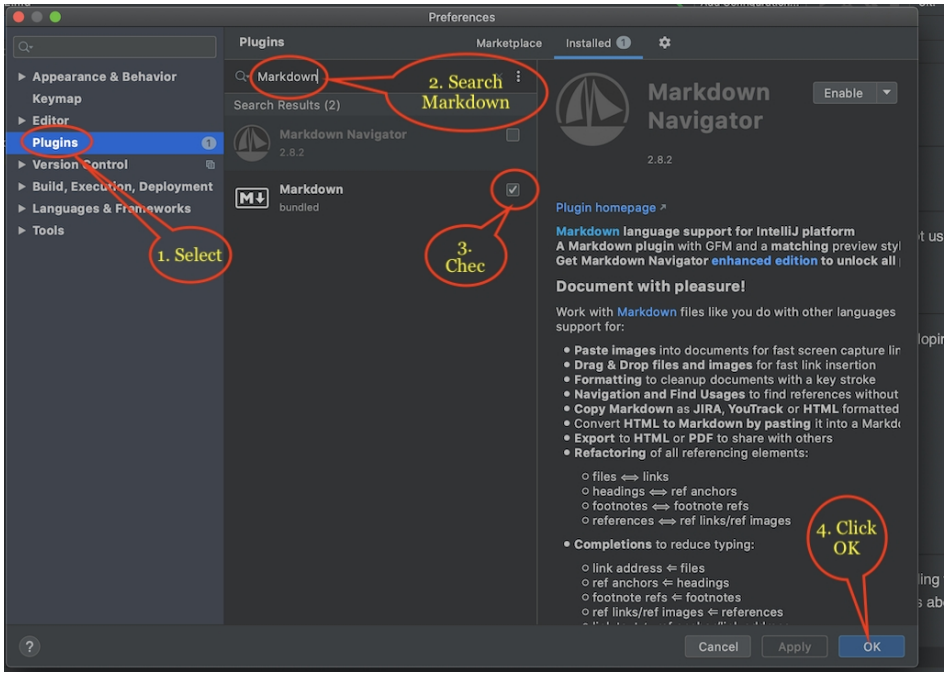
h) conj(2.1 -3.2i) = 2.1 + 3.2i

Finishing Up

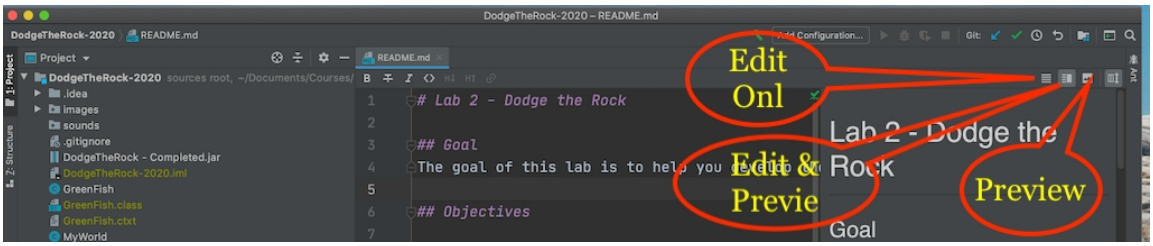
Commit your code with the comment "Lab complete" and push to the repository.

Editing and Viewing Markdown in IntelliJ

1. Enable Markdown in the IntelliJ Preferences for Editor.



2. Select Edit Mode to Edit or Preview Mode to See



3.

3. To add text as a paragraph, type in the editor on a blank line and end the paragraph with a return followed by a blank line.