Creating Classes and Objects

Lab #2

COMP3021 2022 Spring

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- **Objectives of this lab**

  Learn How to Create a Class.

  Attributes, constructors, getters and setters, equals(), toString().

  Learn How to Inherit a Class

  Classes and subclasses

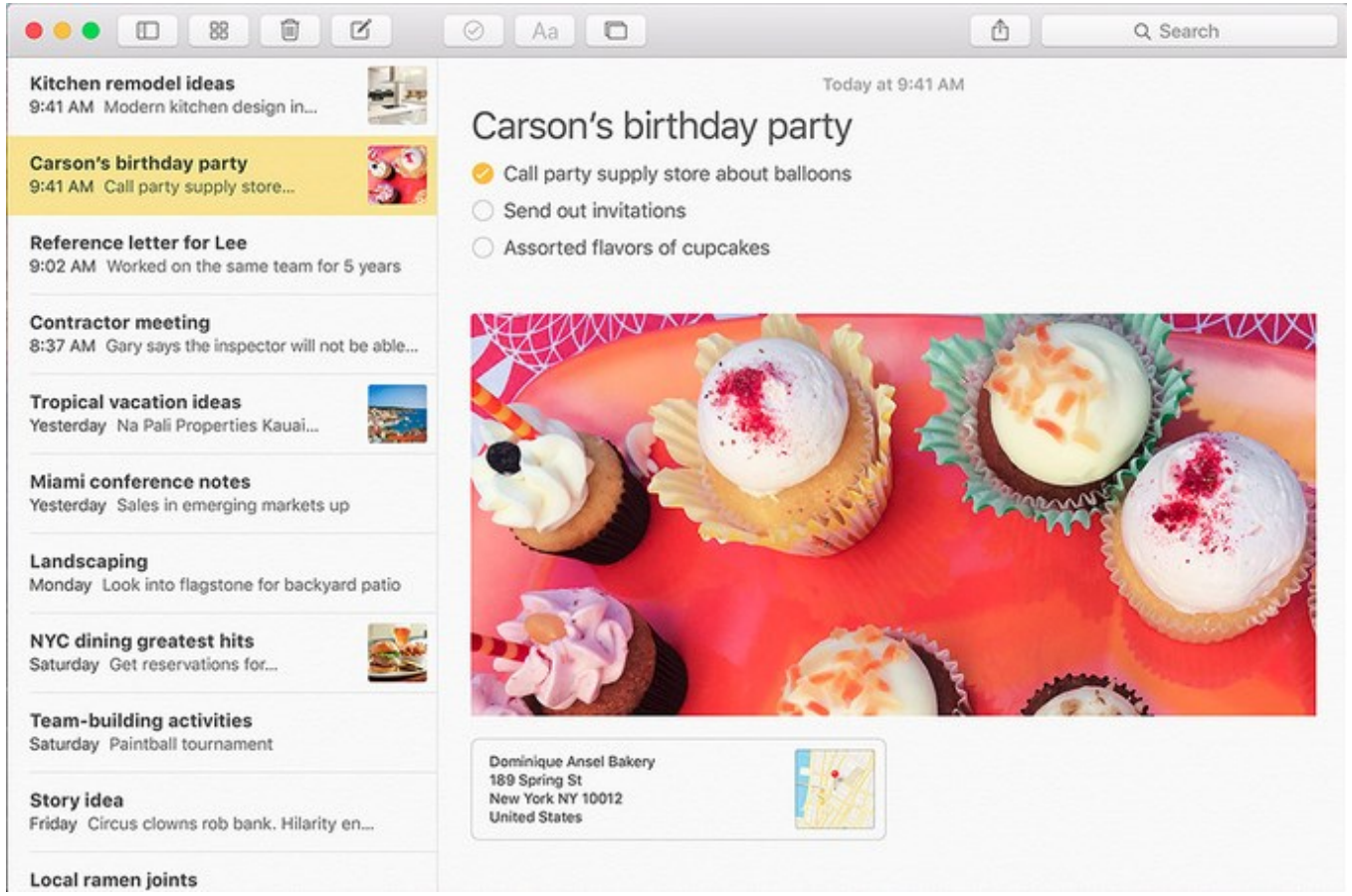
  `this` and `super`

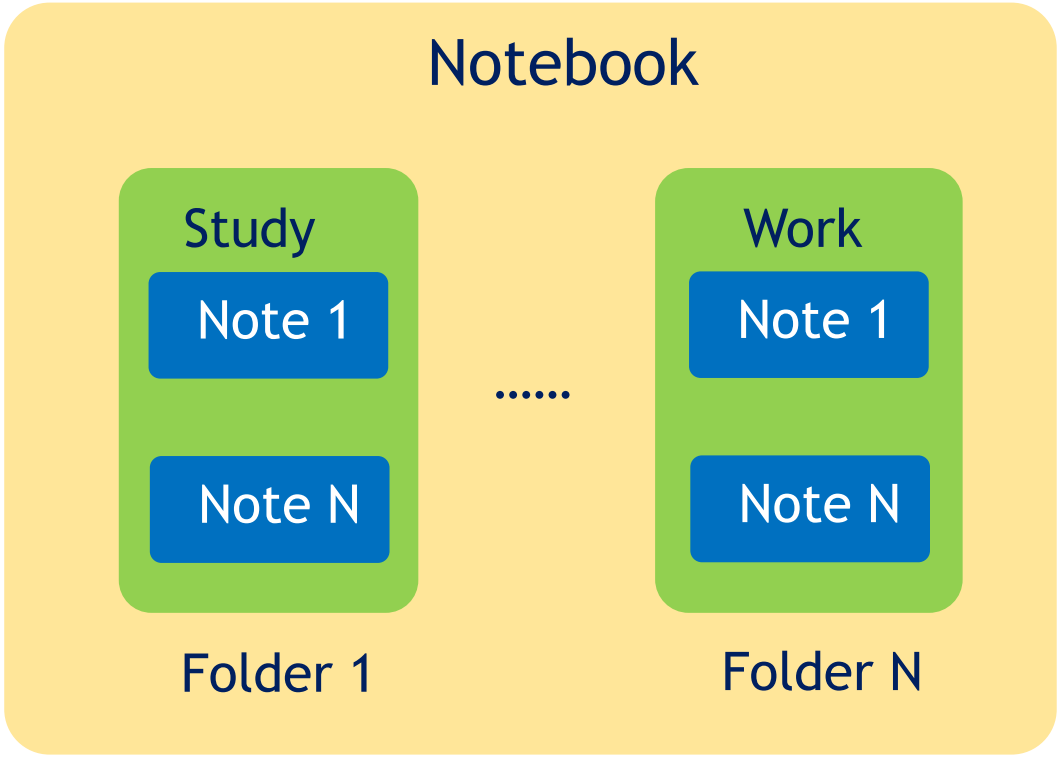
  Learn How to Create an Instance of a Class (Object)

  Creating new objects, comparing objects, call member functions

Lab Project's Introduction

- At the end of this course you will have implemented a **NoteBook** program in Java
- Implemented incrementally during the lab sessions





- Create, edit, store and delete notes
- Notes are grouped in folders
- Notes contain either text or images

LAB #2
Introduction

- **LAB #2 Overview**

  Task 1: Create five classes based on a given class diagram

  NoteBook, Folder, Note, TextNote, ImageNote

  Task 2: Implement some basic functionalities

  Insert a new note

  Task 3: Test your implementation and show the result to the TAs

Useful Java background

- **ArrayList**
  - A notebook may contains many folders, a folder may contains many notes
  - We use **java.util.ArrayList** to store these folders and notes
  - How to create an ArrayList object?

```
ArrayList<Folder> folders = new ArrayList<Folder>();

ArrayList<Note> notes = new ArrayList<Note>();
```

Types of the elements

  - How to add a new element in the list?

```
Folder f = new Folder(folderName);
folders.add(f);
```

Create a new Folder

Add the object f in folders

  - How to iterate over the elements of an ArrayList ?

```
for (Folder f : folders){
}
```

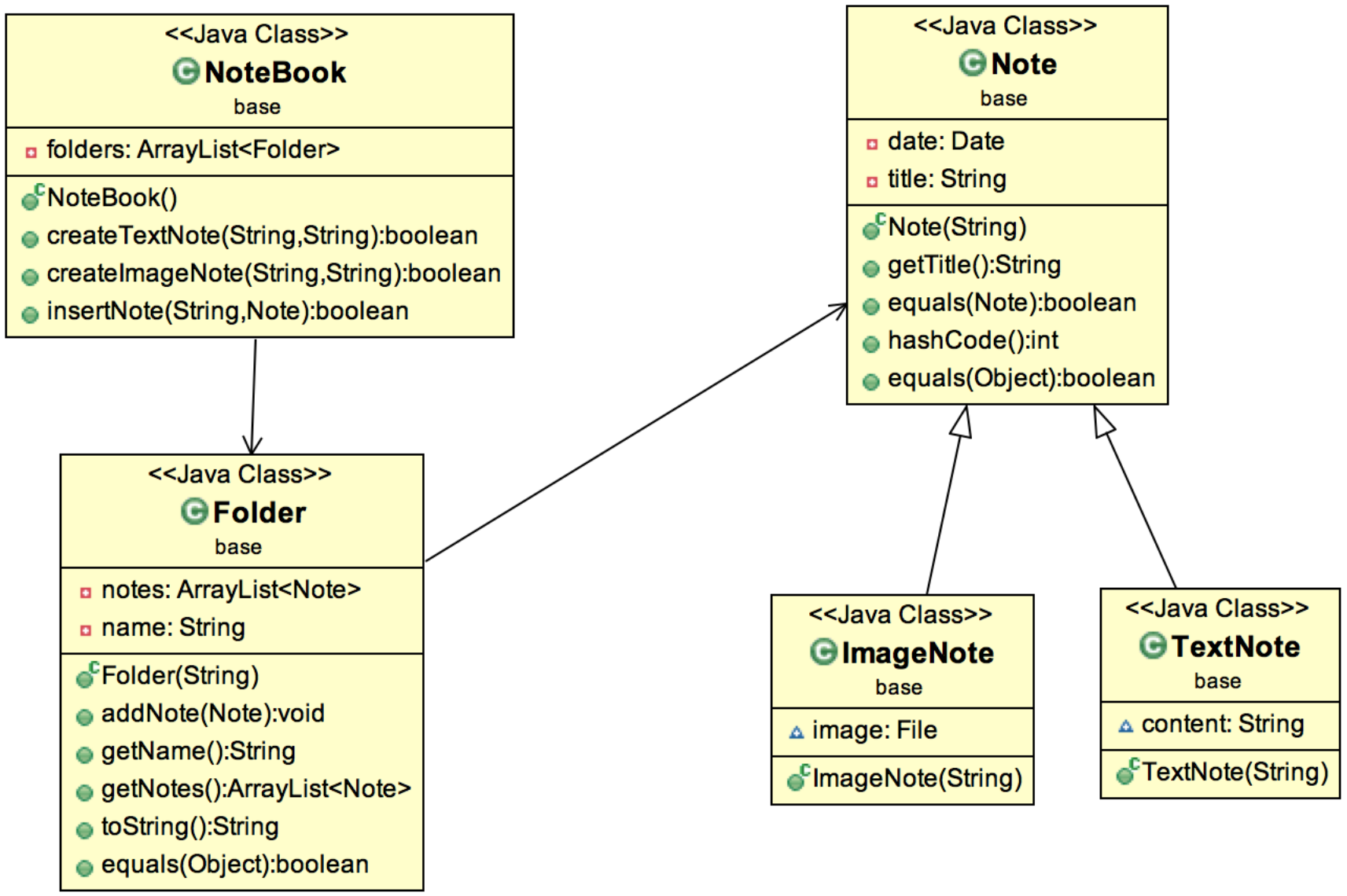
Useful Java background

- **Date**
  - We will record the creation date of a note
  - In Java, we use class **java.util.Date** to get this information
  - To get the current Date you can do as follows

```
Date date = new Date(System.currentTimeMillis());
```

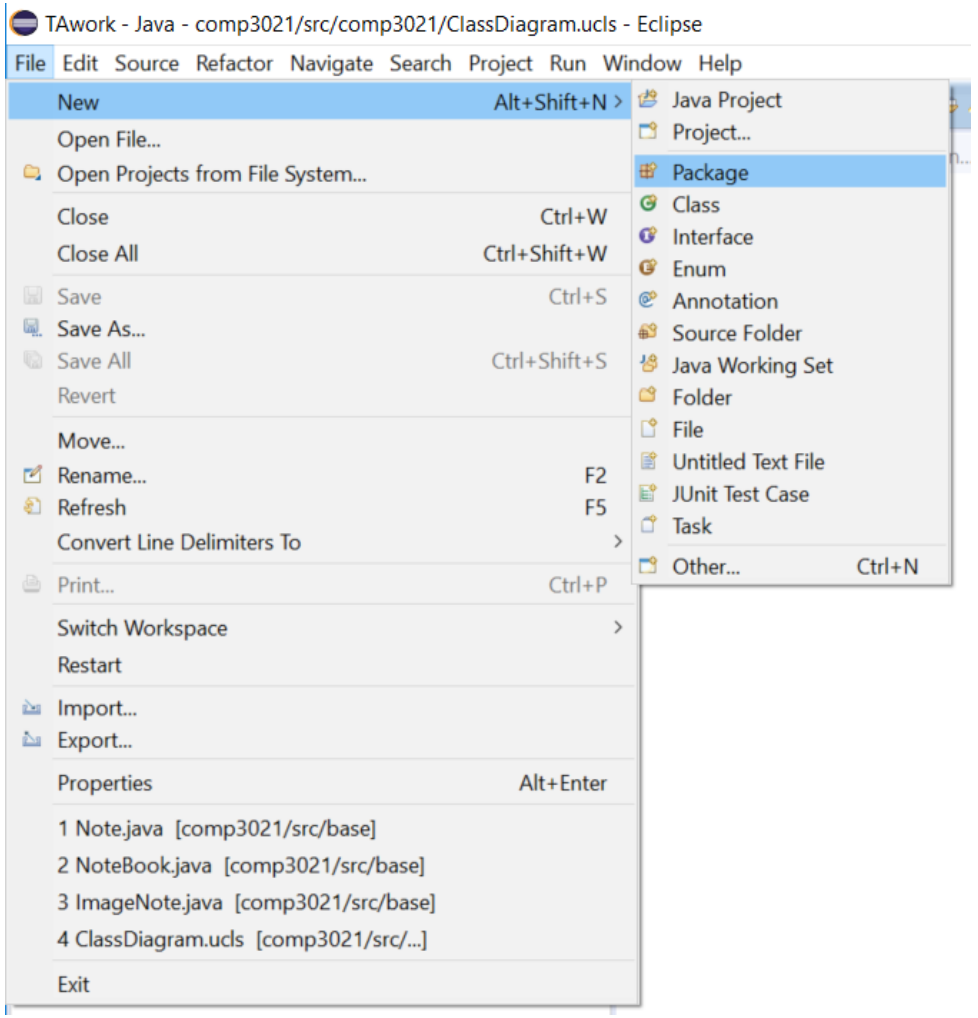
LAB #2
Instructions

Class Diagram



- **Create package “base”**

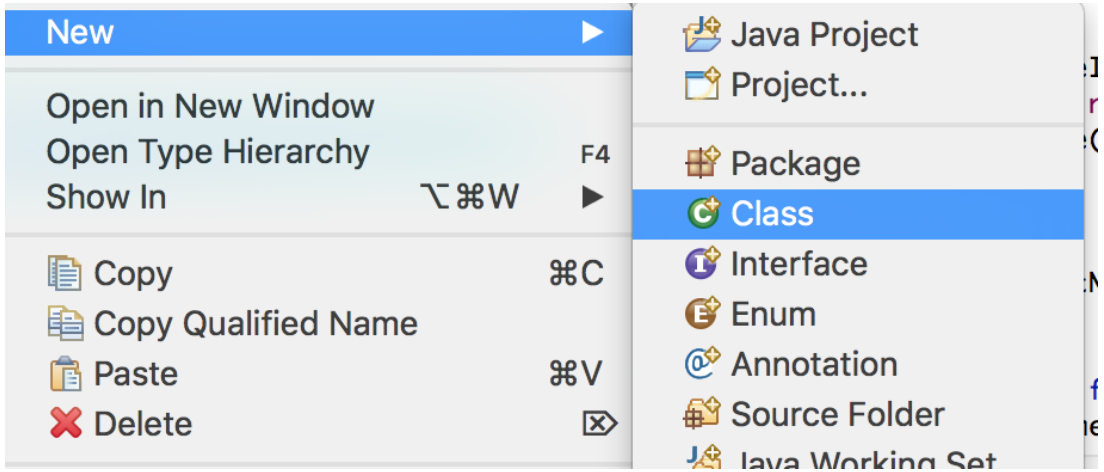
1. Open Eclipse (you can find it in C:\Eclipse)
2. Open the project *comp3021lab* that you created in lab1
3. Create a package named “base”

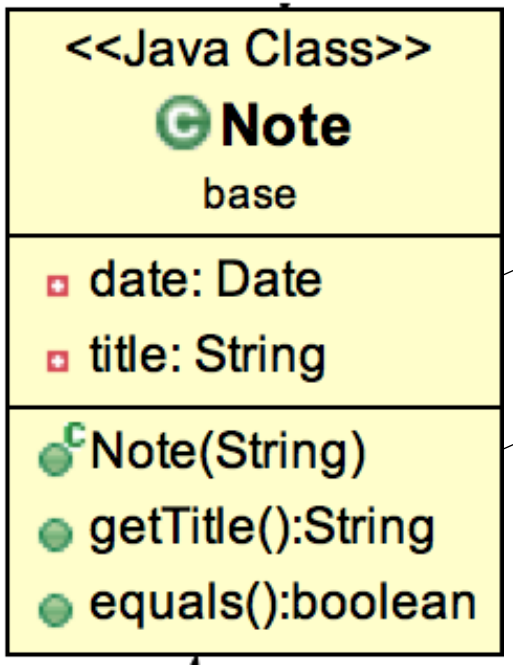


- **Create class Note**

1. Create class Note inside package base

2. Right click on package base
   new -> Class





Two private class fields

Constructor takes as argument the String title

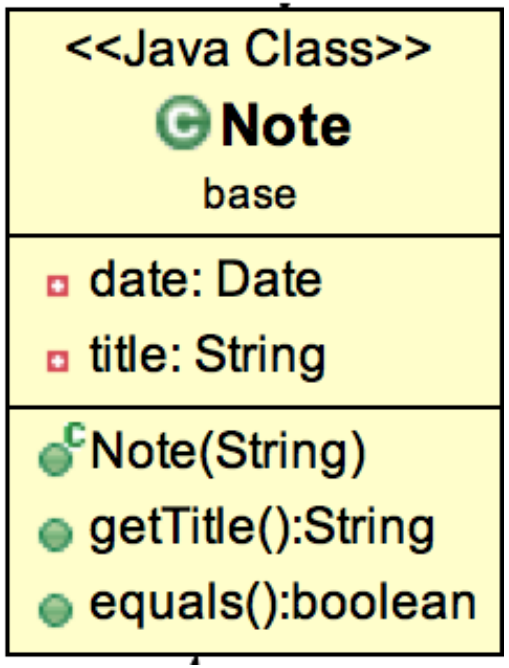
```
public class Note {

    [redacted]Date date;
    private String [redacted]

    public Note(String title){
            this.[redacted]
            date = new [redacted]
    }
```

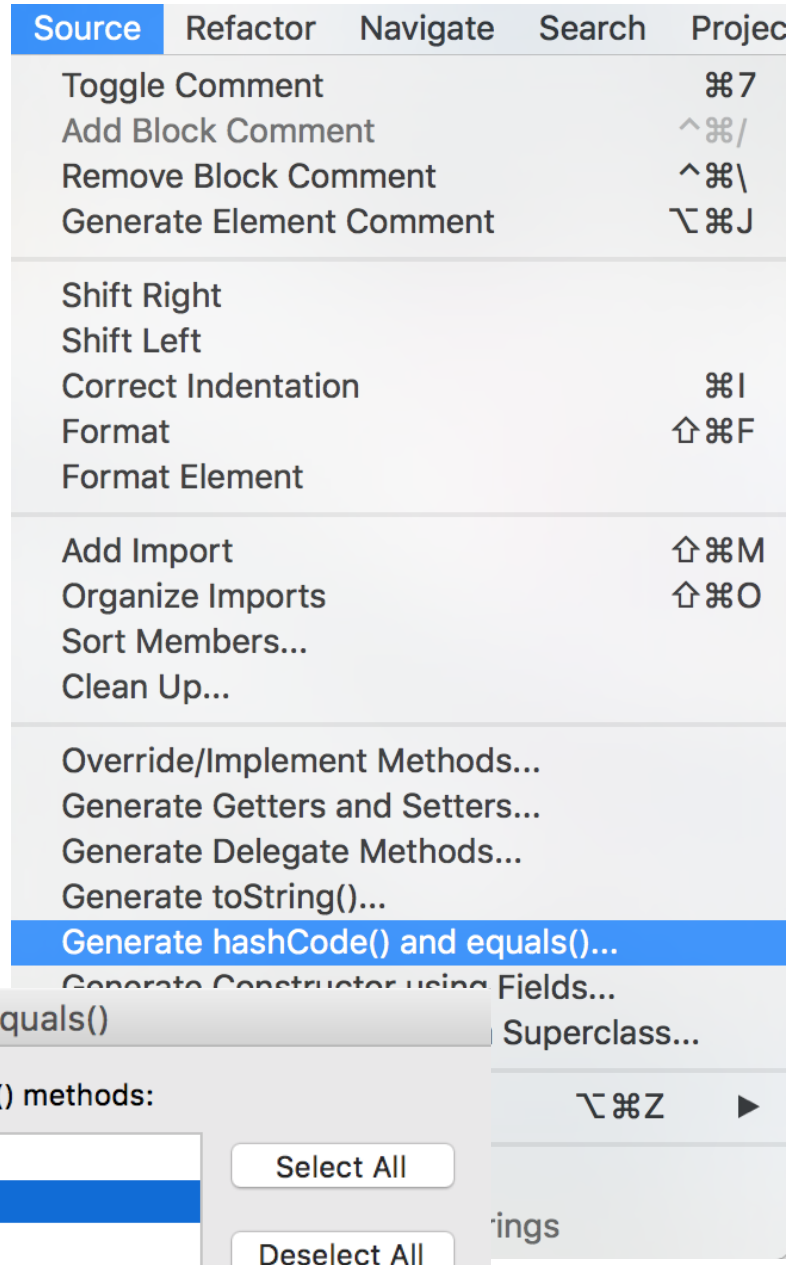
Create all attributes, constructors and member functions as described in the class diagram.

Details of function "`equals()`"

This function is designed for comparing whether two Note objects are the same

In this lab, two notes are the same if their titles are the same.





- **Create class TextNote and ImageNote**

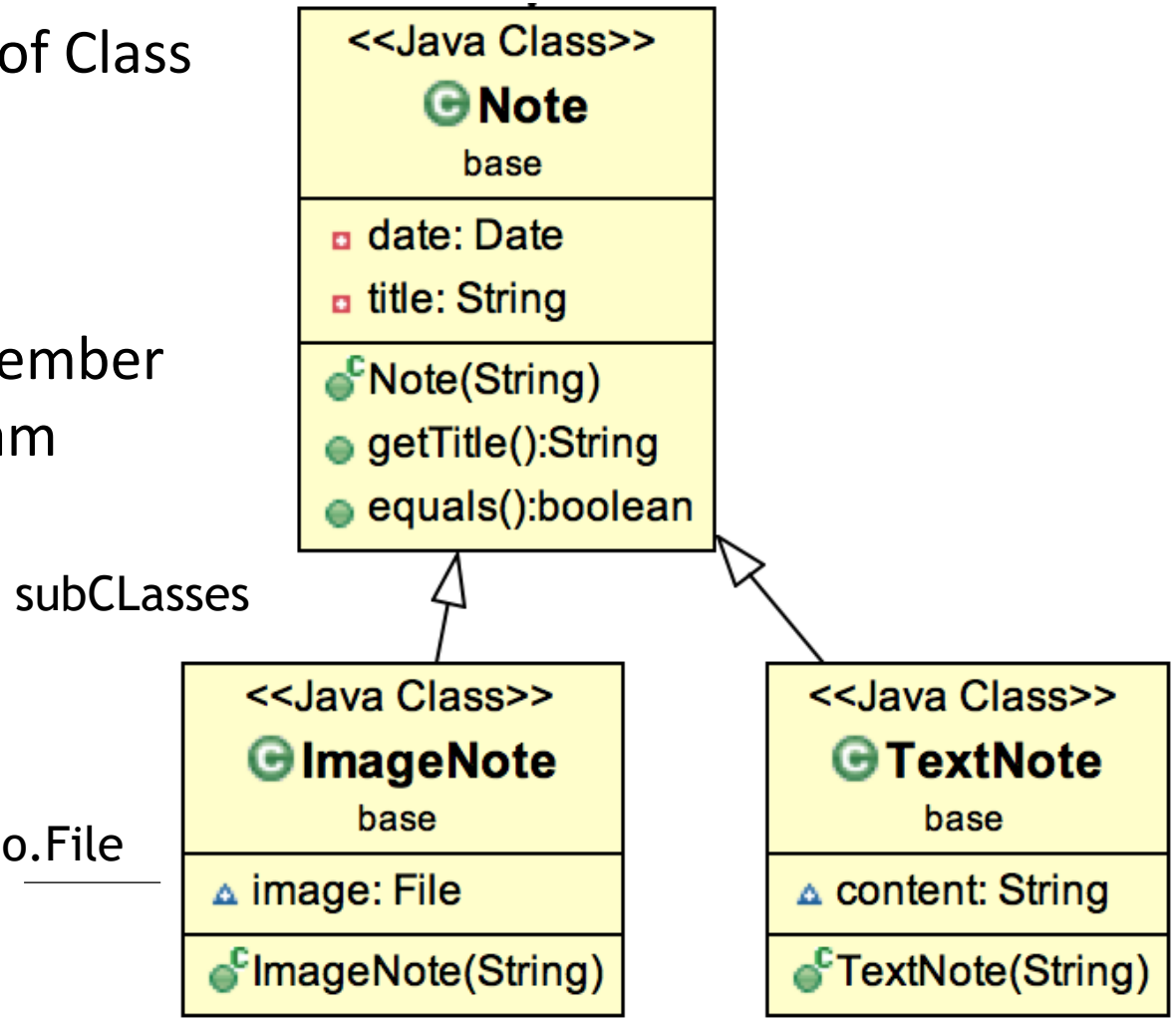
1. ImageNote and TextNote are subclasses of Class Note

```
public class ImageNote extends Note {
```

2. Create all attributes, constructors and member functions as described in the class diagram

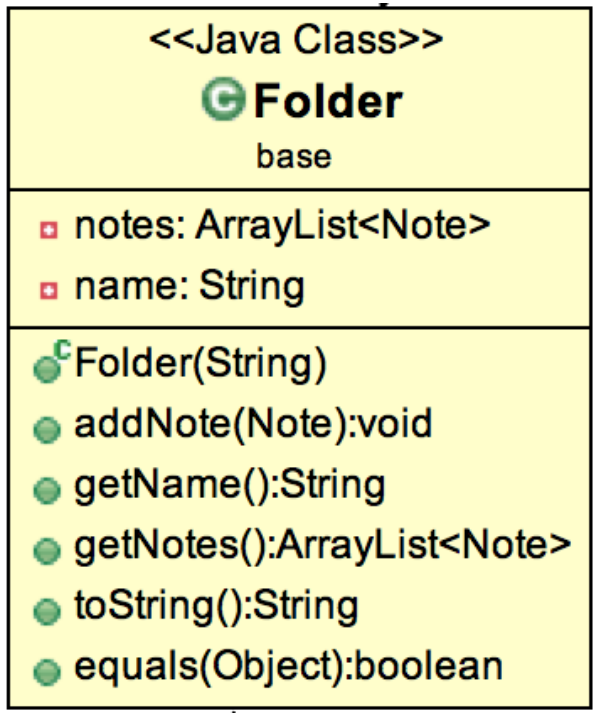
Use super() to initialize the parent class' attributes.

```
public ImageNote(String title){
        super(
}
```



- **Create class Folder**

1. Create class Folder inside package base
2. Create all attributes, constructors and member functions as described in the class diagram




```
package base;

import java.util

public class Folder {

    private ArrayList<Note> notes;
    private

    public Folder(String name) {

                notes = new
    }

    public void addNote
                notes.add(
    }

    public                 e(){
                return
    }

    public ArrayList      getN

    }
}
```

- **Class Folder**

1. Details of function "`equals()`"

   Two folders are equal if they have the same name

2. Details of function "`toString()`"

   This function is designed for printing out the information of a Folder.

   Output format:

```
<Folder Name> : <Number of Text Notes> : <Number of Image Notes>
```

```
@Override
public String toString() {
        int nText = 0;
        int nImage = 0;

        // TODO
        return name + ":" + nText + ":" + nImage;
}
```

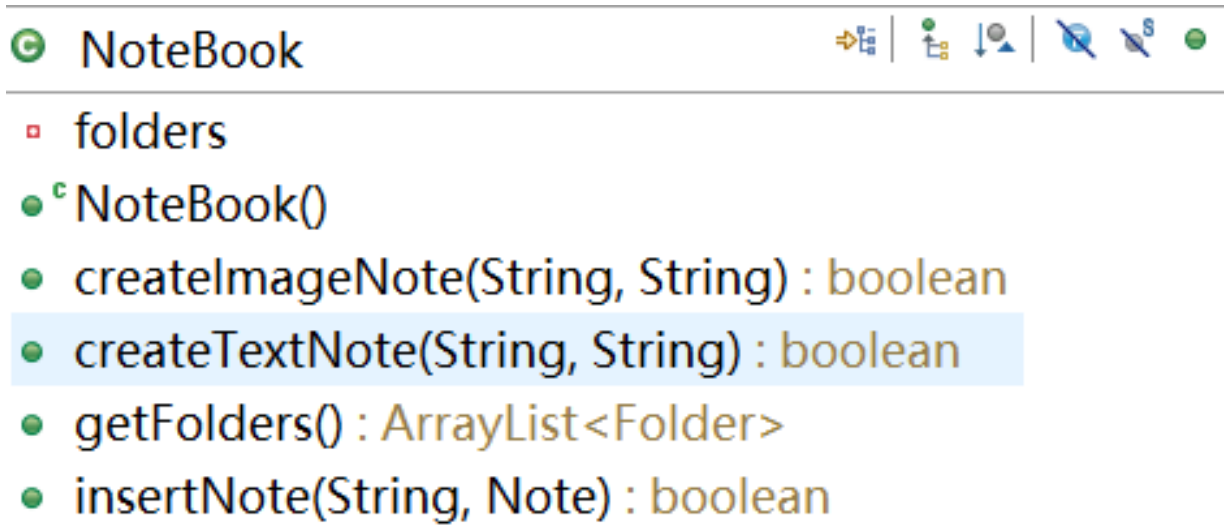
Scan the elements of the list "notes"

Use *instanceof* to determine an object belongs to which class.

```
if (note instanceof TextNote)
```

- **Create class NoteBook**

1. Create class NoteBook inside package base
2. Create all attributes, constructors and member functions as described in the class diagram



- **Create class NoteBook**

```
public class NoteBook {

        private

        public NoteBook() {

        }

public boolean createTextNote(String folderName, String title) {
                TextNote note = new TextNote(      );
                return insertNote(folderName,
        }

public boolean createImageNote(String folderName, String title) {
                ImageNote note =
                return insertNote


        }
public ArrayList<Folder> getFolders() {

}
```

Create an instance of TextNote or ImageNote.

Call member function `insertNote()` to insert the note to the corresponding folders.

Details of function "`insertNote(String folderName,Note note)`"

This function is designed to insert a note to a folder with name folderName

Step 1:

Check if an object Folder with name folderName already exists in the NoteBook

If **yes**, get the object Folder with name **`folderName`**

If **not**, create a new object Folder using the folder name specified, and add it to the Notebook (inside ArrayList folders)

Step 2:

Check if among the notes contained in the folder there is one with the same title of the Note in input.

If **yes**, output an error message and return false

```
System.out.println("Creating note " + note.getTitle() + " under folder " + folderName + " failed");
```

If **not**, we add the note in input to the folder and return true

For Step 2 use the equals methods that we created

- **Class NoteBook**

Hints of a possible implementation of the method

```
public boolean insertNote(String folderName, Note note) {

                    Folder f = null;
                    for (Folder f1 : folders) {
                    [redacted]                    [redacted]
                    }

                    if (f == null) {
                       [redacted]
                }

                    for (Note n : f.getNotes()) {

        TODO
                    }

    TODO
```

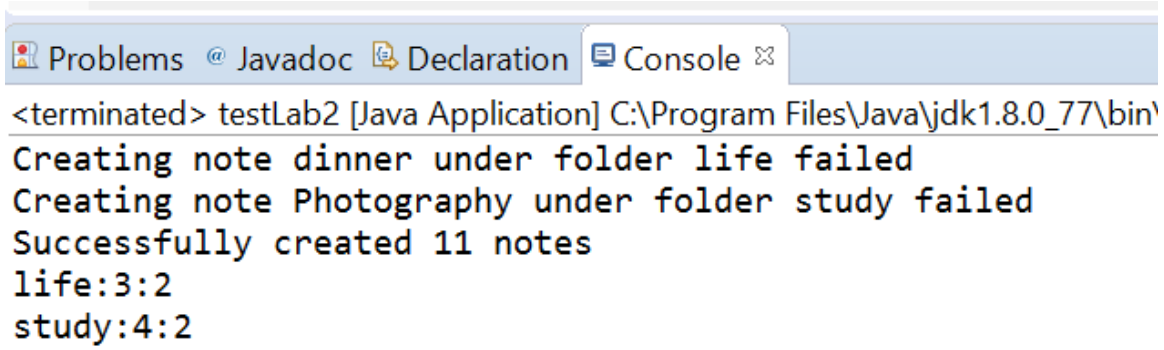
- **Test your code**

1. Download the `TestLab2.java` class from the course website https://course.cse.ust.hk/comp3021/labs/lab2/`TestLab2.java`

2. Copy and paste the java source file in the package ”base”

3. Run the main function of this class and show your results to TAs.

Sample Output:



END OF LAB #2

Don’t forget to commit and push your code.