Module 2 Exercise Guide

Lab 2: Using Annotations

Advanced Java Programming

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Introduction

This lab is designed to give you an introduction to creating a Web application and incorporating some useful functionalities.

In this exercise, you will create a Spring Boot application without dependencies by doing the following:

- Create a Book class under com.example package with Id, Title, and Author attributes
- Add setters, getters, and constructors
- Use @Bean and @Component annotation to create a Book bean and execute display() method
- Add a package under src/java named org.learnquest
- Create a new class Laptop under org.learnquest with Id and Brand attributes
- Use @ComponentScan to scan to scan the package org.learnquest and create bean of Computer and print brand of Laptop

Exercise 1:

Part 1: Create a Maven Project and Import into Eclipse

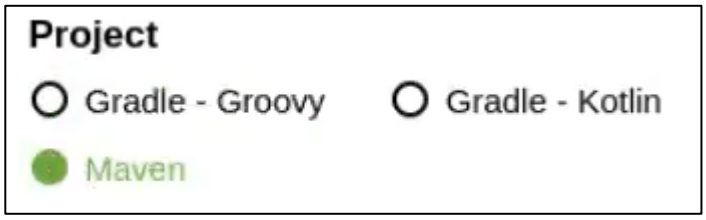
1. Open your lab.

2. On the desktop, double-click the **Firefox Web Browser** icon to open it.

3. When Firefox opens, type **https://start.spring.io/** in the URL and hit **Enter** to go to the Spring Initializr webpage.

4. Once the Spring Initializr page opens, edit the following properties:

   a. For Project, select **Maven**. These types are used to generate the project's package structure and naming conventions.



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b. Under Project Metadata, leave the default of **com.example** for Group.

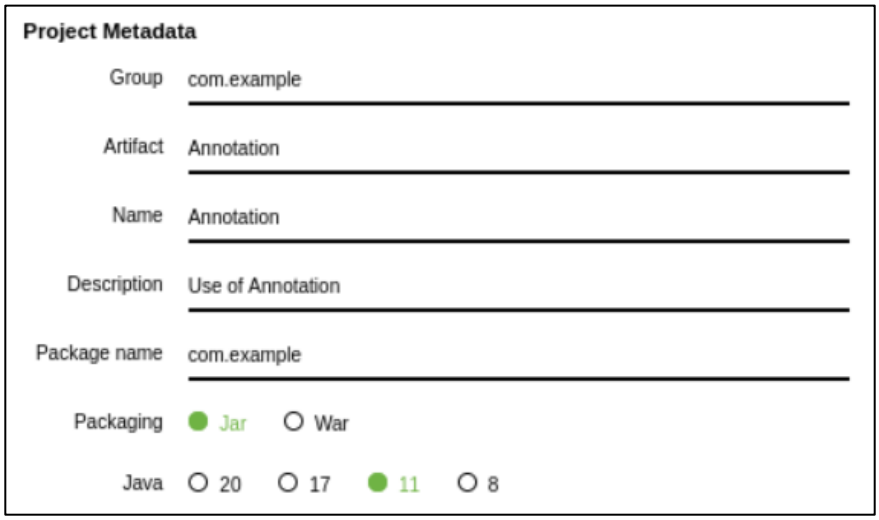
c. Change the Artifact name to **Annotation.** (Name will automatically default to this).

d. For Description, enter **Use of Annotation**.

e. For Package name, use **com.example**. (remove .annotation)

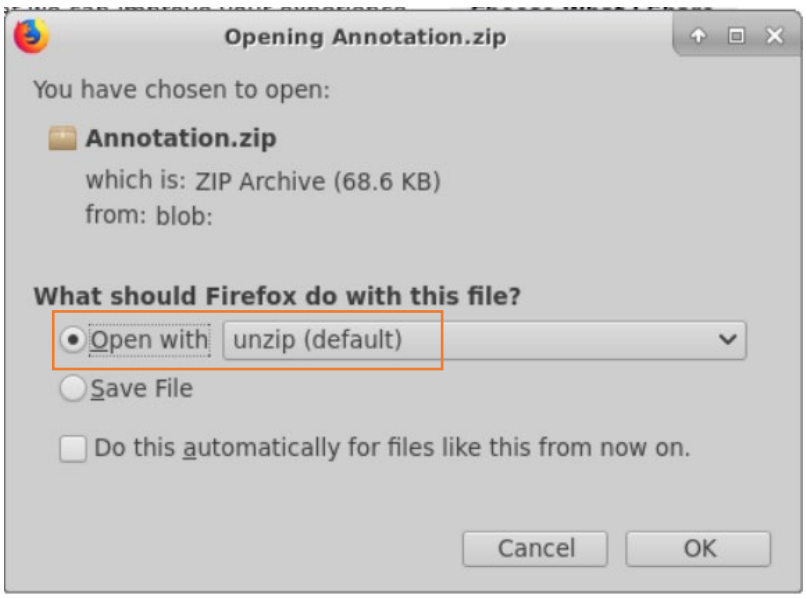
f. Select **Jar** file for Packaging.

g. Select Java version **11**.



5. Click **Generate** at the bottom of the screen. GENERATE CTRL + ⏎.

6. In the pop up box, leave the default of **Open with unzip (default)**, then click **OK**.



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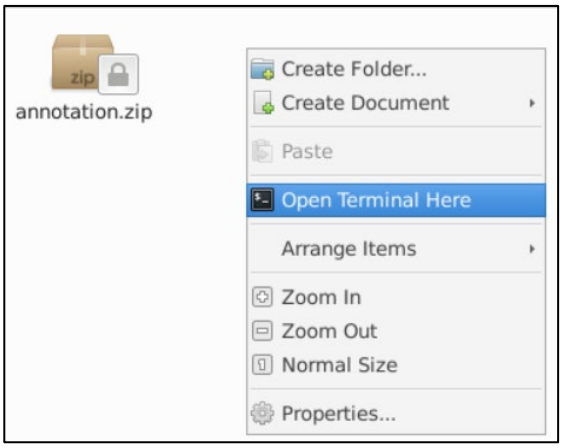
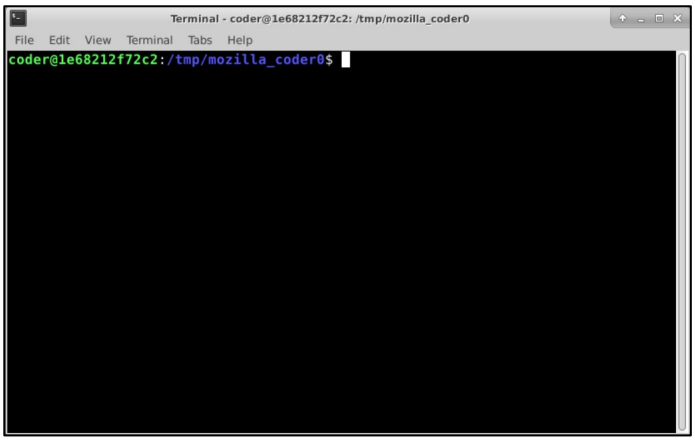
7. At the upper right of your window, click the **Downloads** icon. 
8. Click the **Annotation.zip** file folder icon at the right to open the file location.

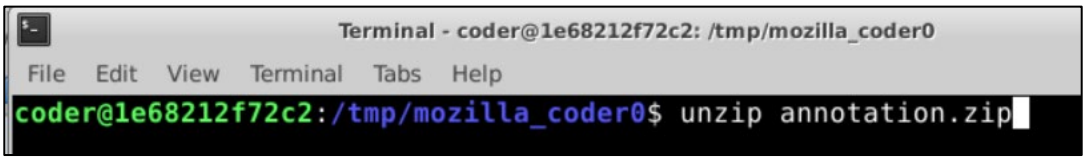
9. A window will open displaying the zip file. Right-click in the **white space** in the window and select **Open Terminal Here**.



10. A Terminal window will open.



11. In the Terminal, type in **unzip annotation.zip** and hit **Enter**.



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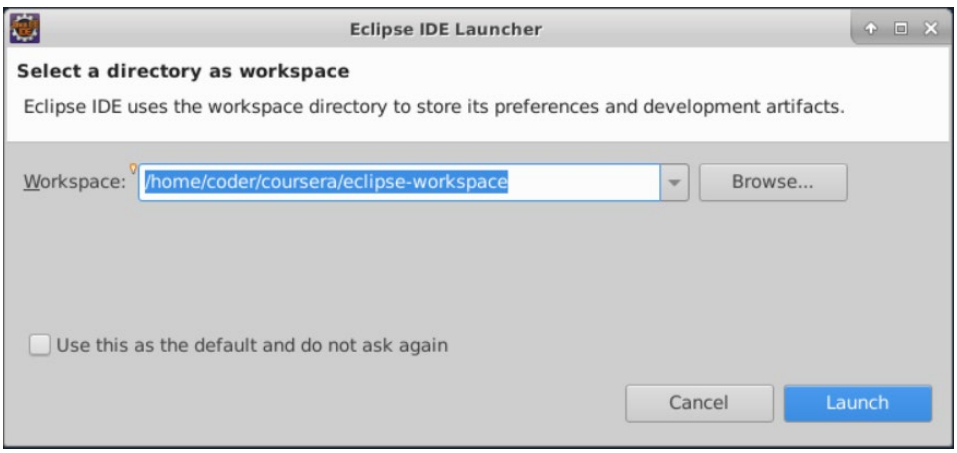
12. You will see that an Annotation folder appears in the location.

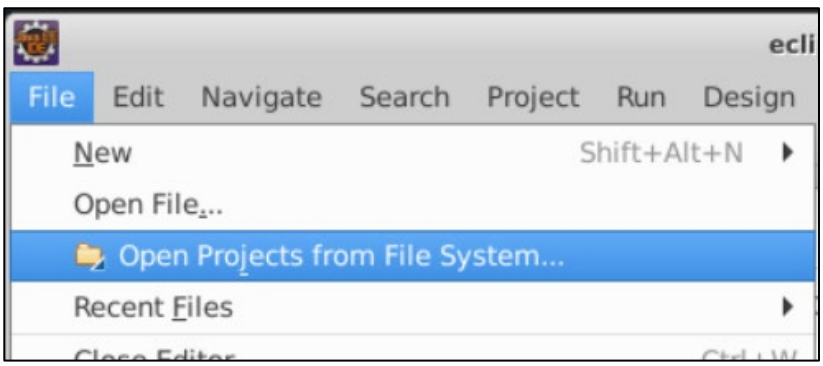
13. **Close** all open windows.

14. Now we need to import the project to our IDE in Eclipse as a Maven project. On the desktop, double-click the **Eclipse** icon to open Eclipse IDE.

15. In the Eclipse IDE Launcher window, click **Launch** to select the default workspace.



16. When Eclipse opens, click **File > Open Projects from File System...**



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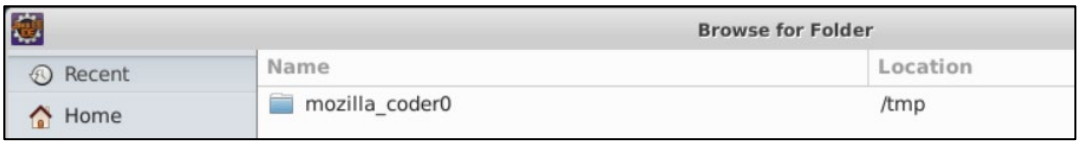
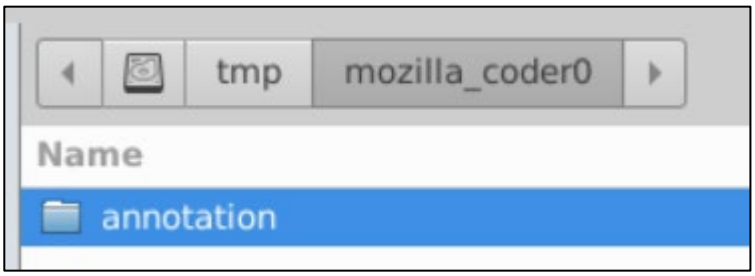
17. In the Import Projects window, click **Directory…** at the upper right. 

18. Double-click to open the **mozilla_coder0 folder**. (Note: if it isn't listed under Recent, navigate to Other Locations > Computer> tmp)

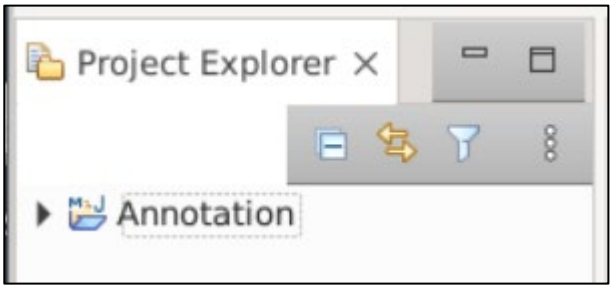


19. Select the **annotation** folder and click **Open**.



20. Click **Finish** in the Import window. 

21. Once the project is created, you'll see the Annotation project in the Project Explorer on the left side of the window.



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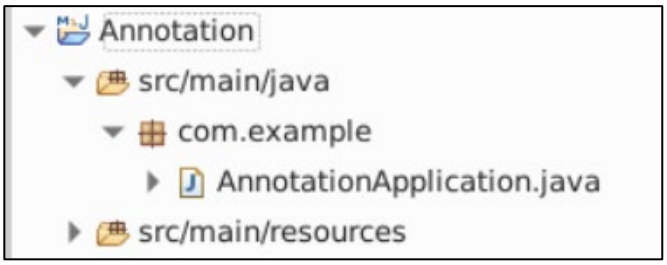
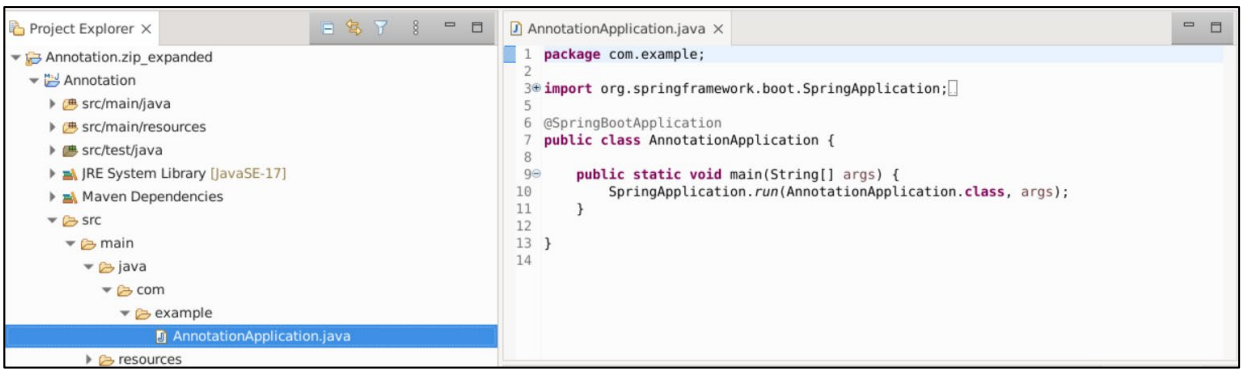
Part 2: Create a Web Application using JSP

1. Expand **Annotation**. Expand **src/main/java**. Then expand the **com.example** package.

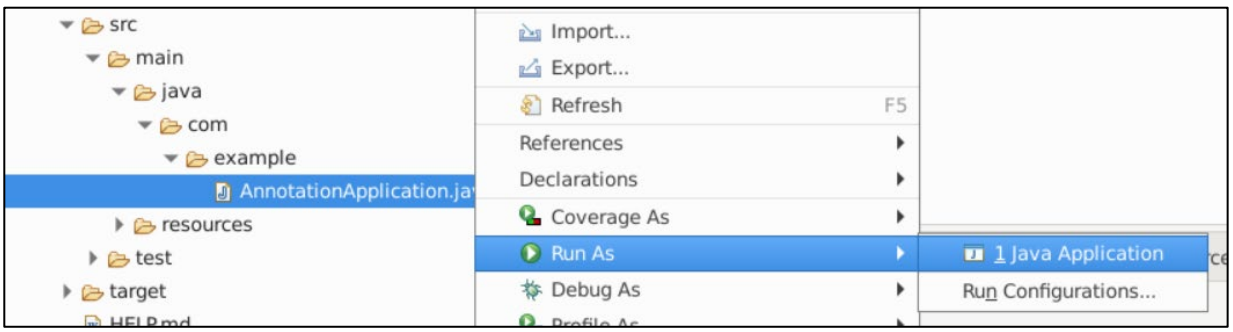


The **AnnotationApplication.java** file is your execution point, and the file that we will run several times throughout this lab.

2. Double-click the **AnnotationApplication.java** file to open it.



3. Right-click on the AnnotationApplication.java file and select **Run As > Java Application** to run your Spring Boot application. Eclipse will start the application and display the logs in the Run view.



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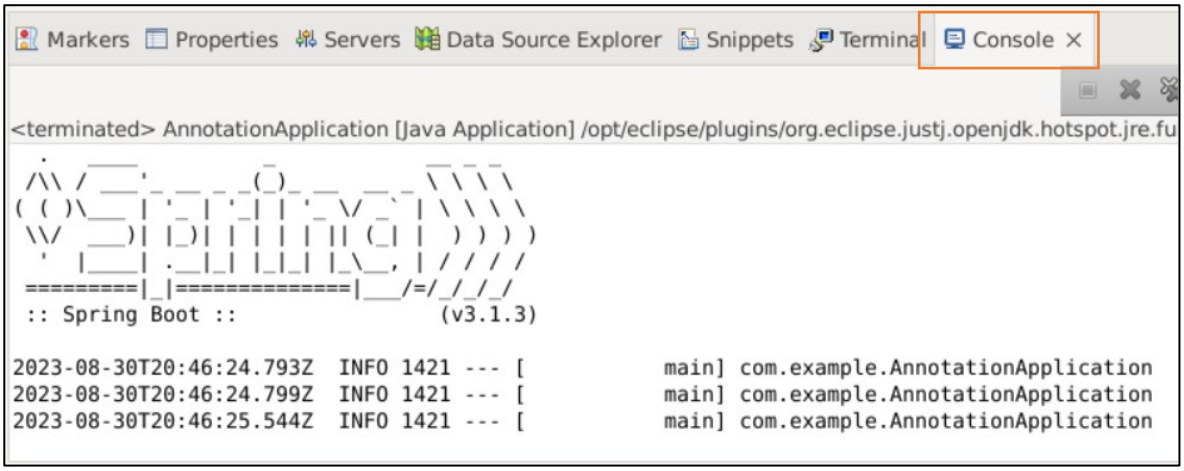
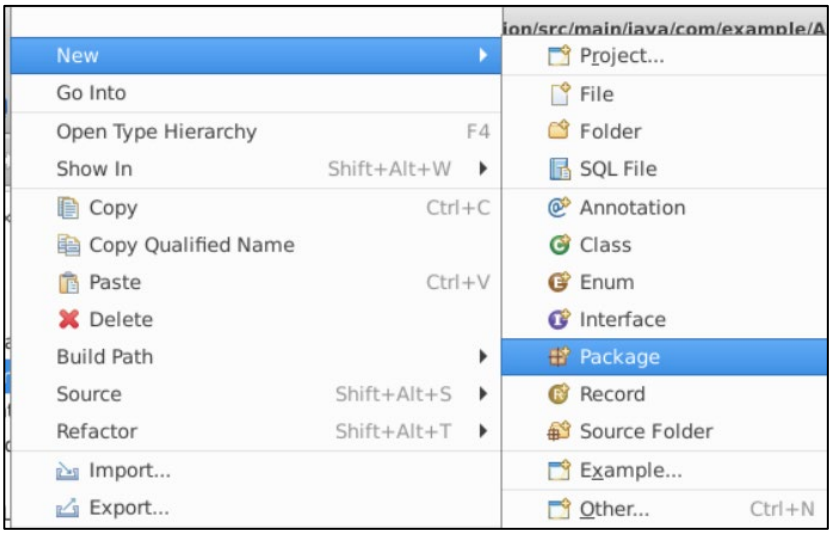
4. Resize the bottom pane (if necessary) and select the **Console** tab (if necessary) to see your application.

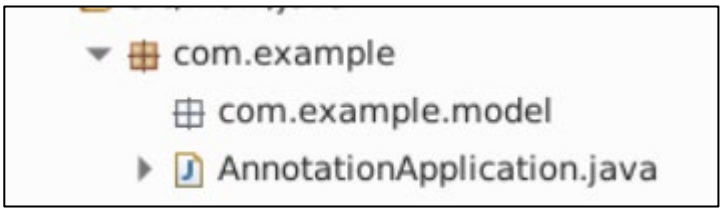


5. Now we will make some changes and add some packages and classes. In your Project Explorer pane, right-click the **com.example** package and select **New > Package** from the menu.



6. In the New Java Package Window, name the package **com.example.model** and click **Finish**.

7. Eclipse will create the model package within the com.example package.



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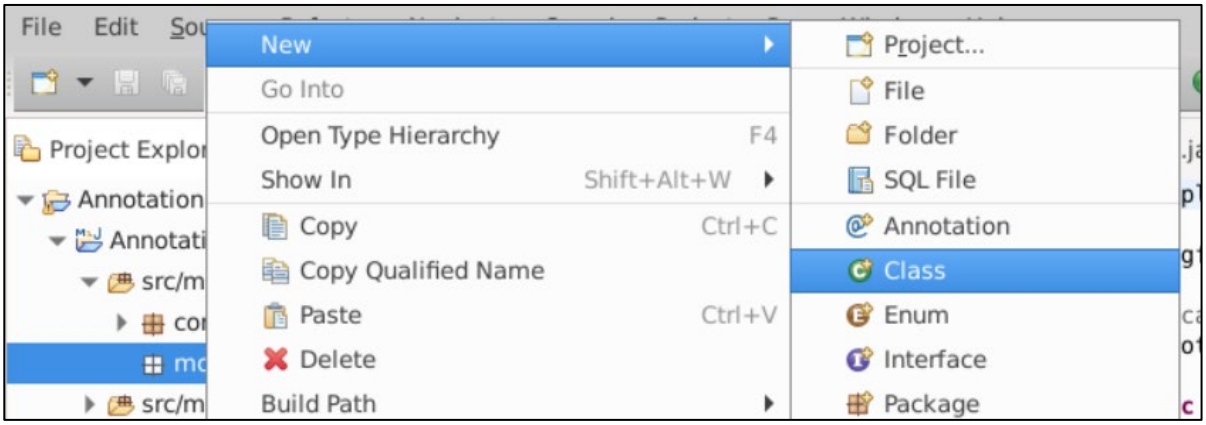
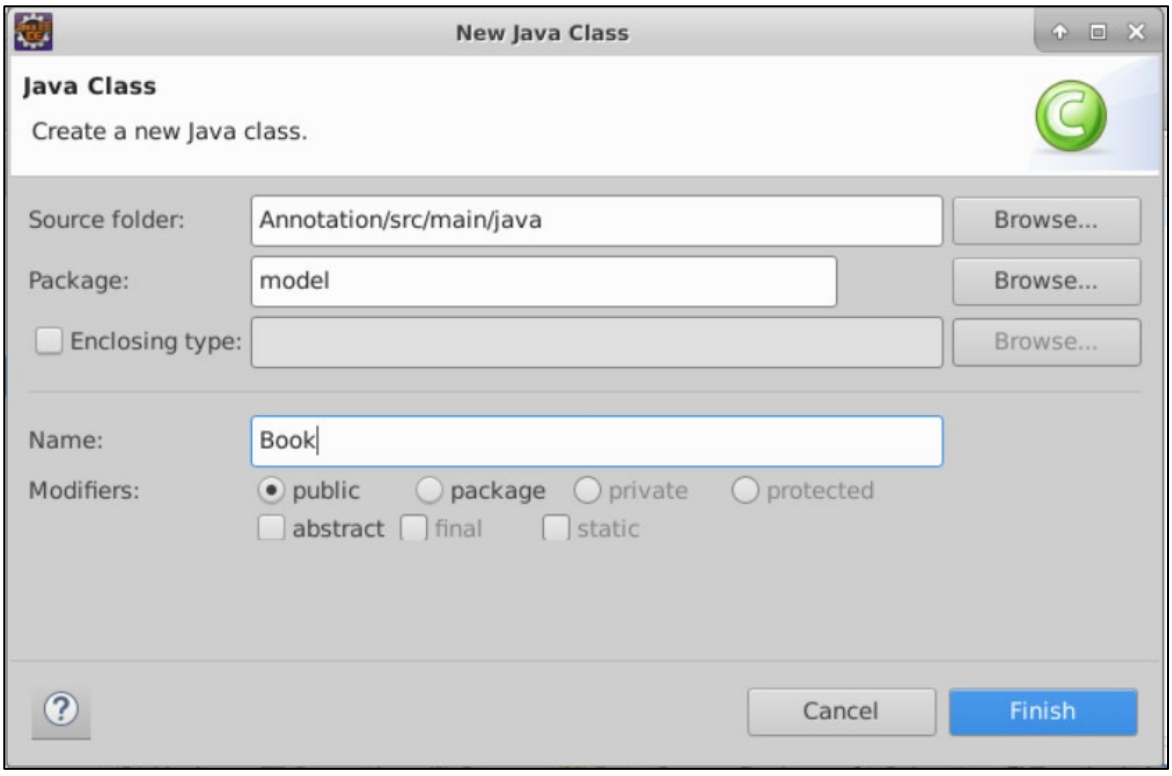
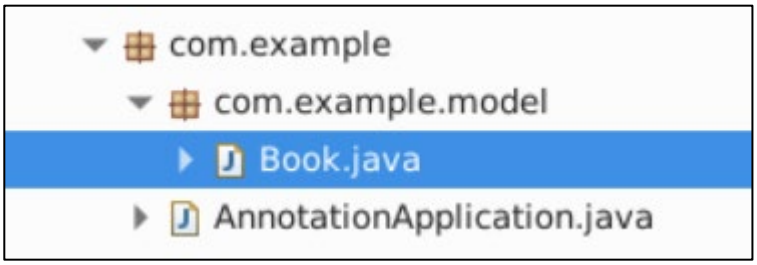
8. Right-click on your new **model** package and select **New > Class**.



9. Enter **Book** as the class name. Click **Finish**.



10. Eclipse will generate the new Java class named **Book.java** in the model package.



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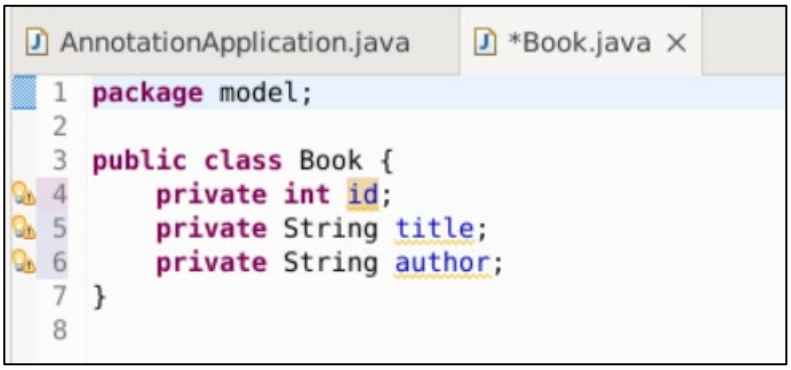
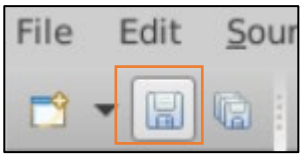
11. The Book.java file should be open in your middle pane. (If not, double-click it in the Project Explorer pane to open it) In the Book.java file, declare the private attributes ID, title, and author by adding the following code beginning on line 4:

```
private int id;
private String title;
private String author;
```

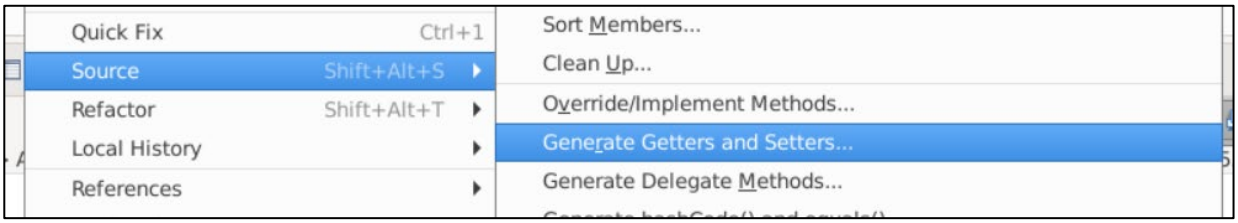


12. Click the **Save** icon in the ribbon.

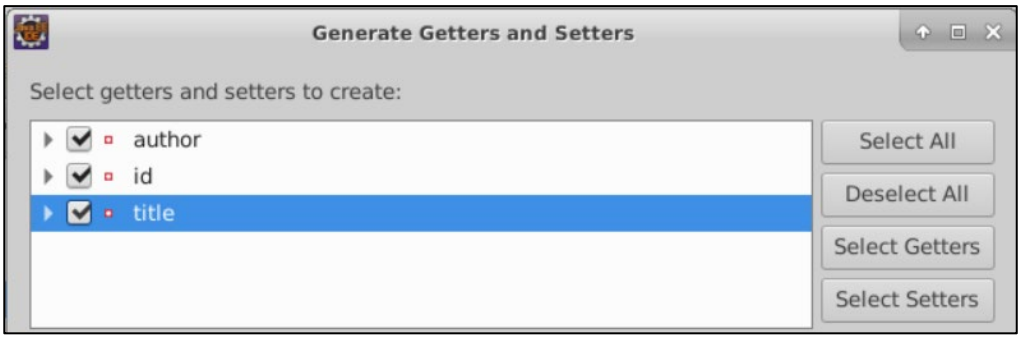


13. Hit **Enter** a few times after line 6 (author;) to go to line 8 (but before the closing bracket).

14. **Right-click** on the blank line and select **Source > Generate Getters and Setters...**



15. Check the **Select All** button to select author, id, and title, then click **Generate**.



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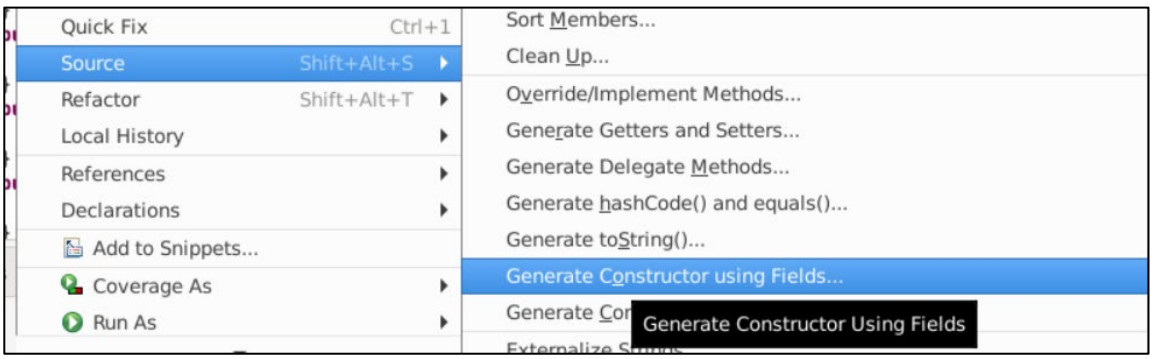
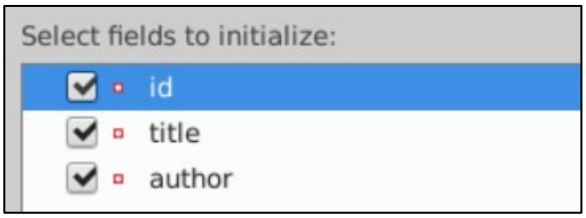
16. Now you should see all the Getters and Setters listed in your code.

```java
package com.example.model;

public class Book {
    private int id;
    private String title;
    private String author;
    public int getId() {
        return id;
    }
    public void setId(int id) {
        this.id = id;
    }
    public String getTitle() {
        return title;
    }
    public void setTitle(String title) {
        this.title = title;
    }
    public String getAuthor() {
        return author;
    }
    public void setAuthor(String author) {
        this.author = author;
    }

    
}
```

17. Now we will add the Constructor. Right-click on a blank line (before the last closing bracket) and select **Source > Generate Constructor using Fields...**



18. Ensure all of the fields are selected and click **Generate**.



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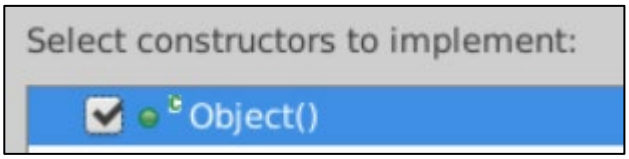
19. The Constructor has been added:

```
10    public Book(int id, String title, String author) {
11        super();
12        this.id = id;
13        this.title = title;
14        this.author = author;
15    }
```

20. Let's add a Constructor without any parameters. Right-click the blank line before the last closing bracket and select **Source > Generate Constructors from Superclass...**

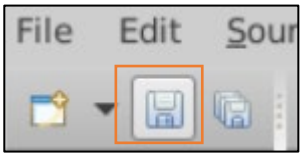
21. Ensure **Object** is selected and click **Generate**.



22. The constructor has been added to your code.

```
public Book() {
    super();
    // TODO Auto-generated constructor stub
}
```

23. Click the **Save** icon in the ribbon.



24. Annotate the Book class with @Component by adding `@Component` before the public class (top of the document).

```
1  package com.example.model;
2  @Component
3  public class Book {
4      private int id;
```

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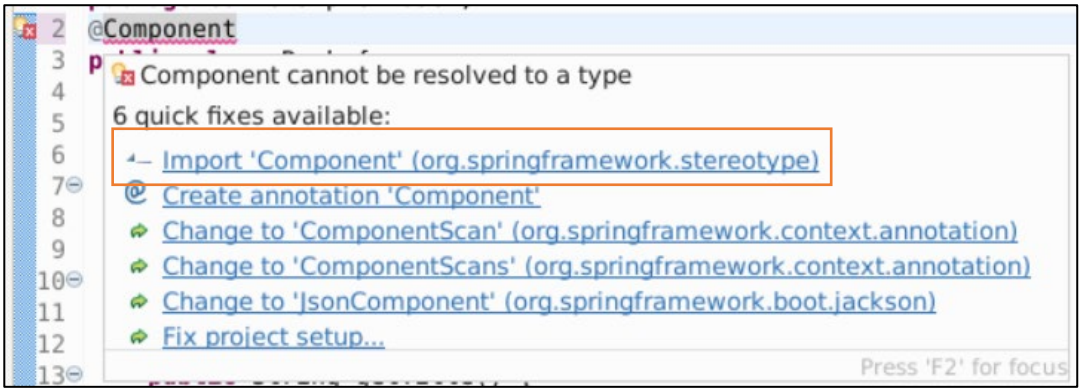
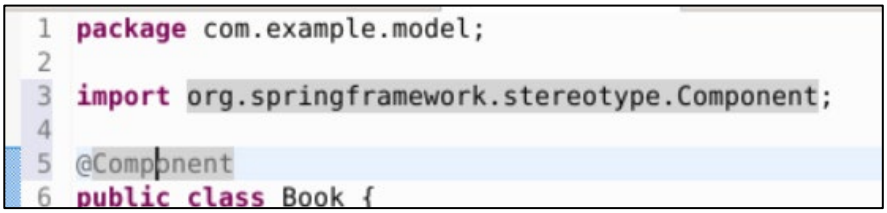
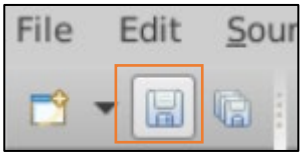
25. Note that you get an error! Hover your mouse over @Component until a tip box appears. In the tip box, select **Import 'Component' (org.springframework.stereotype)**.



26. The code will update and add the import line automatically.



27. Click the **Save** icon in the ribbon.



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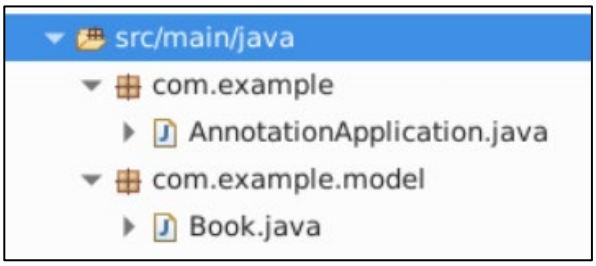
Part 3: Adding Objects, Beans, and Classes

1. In the **Project Explorer** view, right click **src/main/java** and select **Refresh** to update the structure. Expand the two packages.



2. Go back to your **AnnotationApplication.java** class file. (From the Project Explorer pane or the tab at the top.)

3. Modify the code on line 10 to add ApplicationContext before the existing SpringApplication code so it reads as follows:

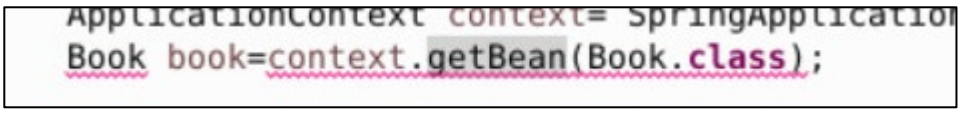
```
ApplicationContext context= SpringApplication.run(Annotatio…
```

4. An error will appear. Hover over `ApplicationContext` and select **Import 'ApplicationContext' (org.springframework.context)**.

5. Move to the end of the line of code and hit enter to add a new line before the closing bracket.

6. Now we will create an Object of Book and use the get Bean method to retrieve it:

```
Book book=context.getBean(Book.class);
```



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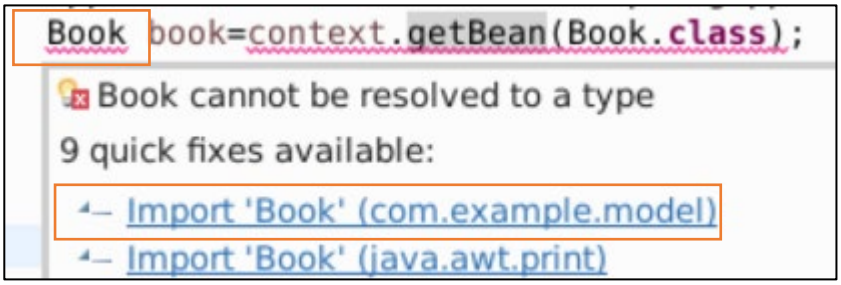
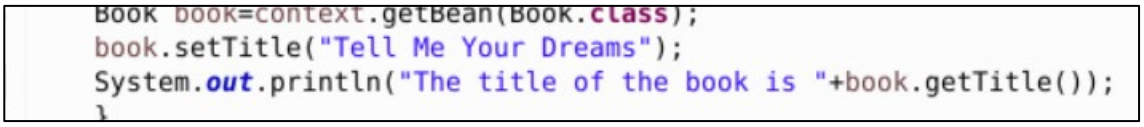
7. Hover over **Book** and select **Import 'Book' (com.example.model)**.



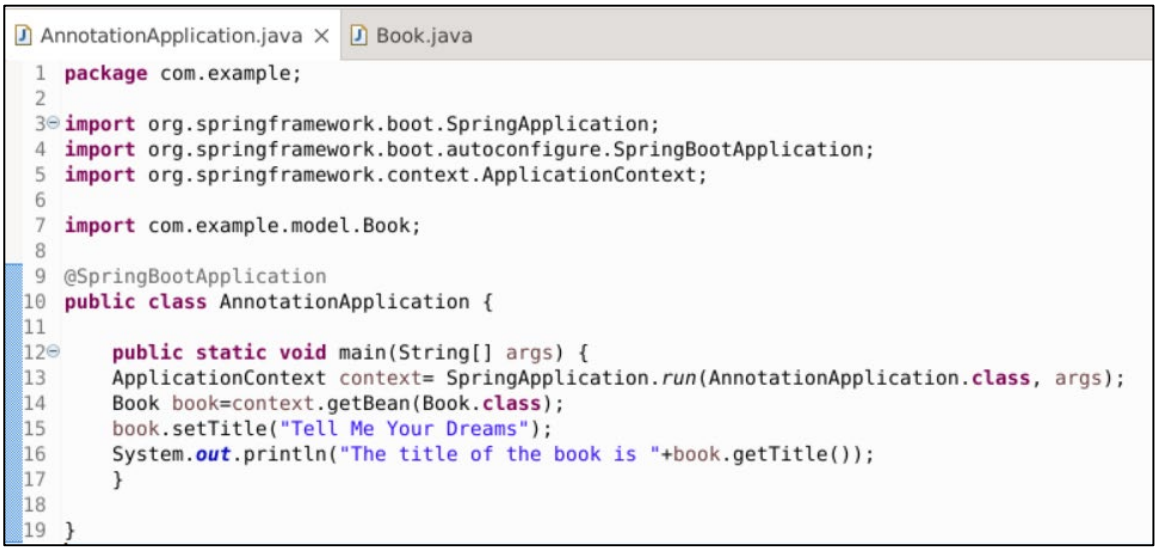
8. Now let's set the book title. Hit **Enter** at the end of the previous line to add a blank line. Type the following code to set the title of the book and display it:

```
book.setTitle("Tell Me Your Dreams");
System.out.println("The title of the book is "+book.getTitle());
```



9. In the ribbon, click **Save All**. 

10. Your full AnnotationApplication.java code should look like the following:



11. Right-click on your **AnnotationApplication.java** file in your Project Explorer pane and select **Run As > Java Application**.

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12. Expand your console pane at the bottom of the window and view the results. You will see that the title of the book is displayed:

```
4 import org.springframework.boot.autoconfigure.SpringBootApplication;
5 import org.springframework.context.ApplicationContext;

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<terminated> AnnotationApplication [Java Application] /opt/eclipse/plugins/org.eclipse.justj.openjdk.hotspot.jre.full.li

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 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v3.1.3)

2023-09-04T22:07:23.926Z  INFO 39478 --- [           main] com.example.AnnotationApplication
2023-09-04T22:07:23.931Z  INFO 39478 --- [           main] com.example.AnnotationApplication
2023-09-04T22:07:24.522Z  INFO 39478 --- [           main] com.example.AnnotationApplication
The title of the book is Tell Me Your Dreams
```

Exercise 2:

Part 1: Create a Package and use AppConfig file

1. In the Project Explorer, right click your **com.example** package and select **New > Class**.

2. Name it **AppConfig** and click **Finish**. It will open in your window.

```
AnnotationApplication.java   Book.java   AppConfig.java ×
1 package com.example;
2
3 public class AppConfig {
4
5 }
6
```

3. Go to the blank line 2 and hit **Enter**. Type in @Configuration, hit **Enter** to add a blank line, then hover over @Configuration and select **Import 'Configuration' (org.springframework.context.annotation)**.

```
3 @Configuration
4 p
5
6 }
7
  Configuration cannot be resolved to a type
  10 quick fixes available:
    Import 'Configuration' (org.springframework.context.annotation)
    Create annotation 'Configuration'
```

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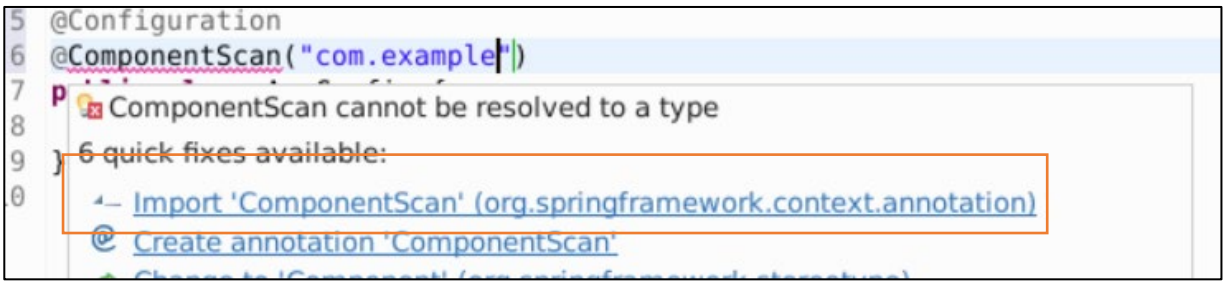
4. The import code is automatically added for you on line 3.

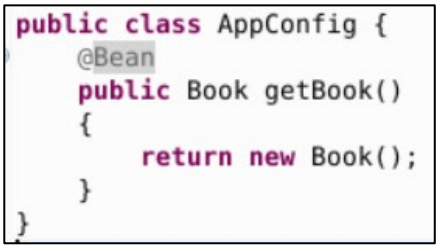
5. On the next line, type `@ComponentScan("com.example")`. Hover over **ComponentScan** and select **Import 'ComponentScan' (org.springframework.context.annotation)**.



6. Next, we will create a Bean for Book, however, because we already have one in our Book.java file, we need to comment that one out first. Go to your **Book.java** file and comment out the @Component line:

7. Swap back to your **AppConfig.java** file to add the bean there as follows (on line 9):

```
@Bean
public Book getBook()
{
      return new Book();
}
```



8. Hover over **@Bean** and select **Import 'Bean' (org.springframework.context.annotation)**, then hover over **Book** on line 11 and select **Import 'Book' (com.example.model)**.

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9. Your final code for AppConfig.java should look like the following:

AnnotationApplication.java | Book.java | AppConfig.java ×

```java
package com.example;

import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.ComponentScan;
import org.springframework.context.annotation.Configuration;

import com.example.model.Book;

@Configuration
@ComponentScan("com.example")
public class AppConfig {
    @Bean
    public Book getBook()
    {
        return new Book();
    }
}
```

10. In the ribbon, click **Save All**. 

11. **Run** your AnnotationApplication.java file as a **Java Application.** You should get the exact same results, even though we commented out the @Component in the Book.java file. This is because we moved the Bean to the AppConfig.java file.

```
  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v3.1.3)

2023-09-04T22:37:35.827Z  INFO 50445 --- [
2023-09-04T22:37:35.832Z  INFO 50445 --- [
2023-09-04T22:37:36.511Z  INFO 50445 --- [
The title of the book is Tell Me Your Dreams
```

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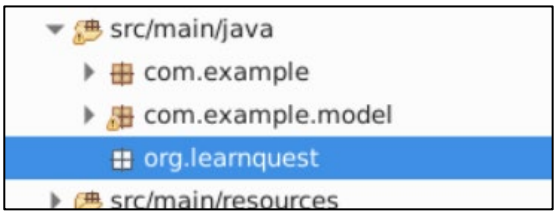
Part 2: Create a New Class and a Bean from It

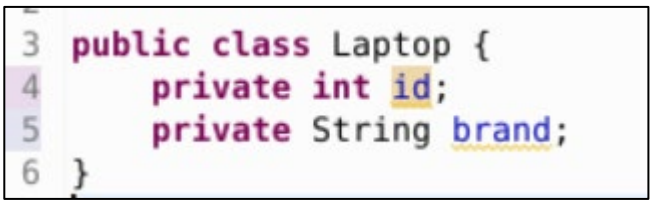
1. Create a new package under java named org.learnquest by right-clicking on **src/main/java > New > Package**. Name it **org.learnquest** and click **Finish**.



2. Right-click the new package, click **New > Class** and name it **Laptop**. Click **Finish**.

3. In the **Laptop.java** file, add attributes of **id** and **brand**:

```
private int id;
private String brand;
```

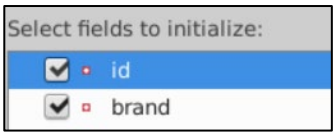


4. Next, we'll add setters, getters, and constructor as needed. Go to the end of the line and hit **Enter** to go to the next line. Right-click the blank line and select **Source > Generate Getters and Setters…**

5. Click **Select All** to select your fields, then click **Generate**. Your Getters and Setters are automatically added.

6. On the blank line, right-click, select **Source > Generate Constructor using Fields…**

7. Ensure the fields are selected and click **Generate**.



8. Right-click on the blank line and select **Source > Generate Constructors from Superclass…**

9. Ensure the Object is selected and click **Generate**. It is automatically added to the code.

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10. The Laptop.java code should look like the following:

```java
package org.learnquest;

public class Laptop {
    private int id;
    private String brand;
    public int getId() {
        return id;
    }
    public void setId(int id) {
        this.id = id;
    }
    public String getBrand() {
        return brand;
    }
    public void setBrand(String brand) {
        this.brand = brand;
    }
    public Laptop(int id, String brand) {
        super();
        this.id = id;
        this.brand = brand;
    }
    public Laptop() {
        super();
        // TODO Auto-generated constructor stub
    }

}
```

11. Go to your **AppConfig.java** class file to create a bean for Laptop class (after the bean for Book) as follows:

```
@Bean
public Laptop getComputer(){
     return new Laptop();
}
```

```java
@Configuration
@ComponentScan("com.example")
public class AppConfig {
    @Bean
    public Book getBook()
    {
        return new Book();
    }
    @Bean
    public Laptop getComputer() {
        return new Laptop();
    }
}
```

12. Hover over **Laptop** and import it to fix the errors.

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13. Go back to the top of the **AppConfig.java** file. We need to update it to scan the package org.learnquest. Hit **Enter** after the first Component Scan. Type the following code on the next line:

```
@ComponentScan("org.learnquest")
```

```
10 @Configuration
11 @ComponentScan("com.example")
12 @ComponentScan("org.learnquest")
13 public class AppConfig {
```

14. Your AppConfig.java file should look like the following:

```
1  package com.example;
2
3  import org.learnquest.Laptop;
4  import org.springframework.context.annotation.Bean;
5  import org.springframework.context.annotation.ComponentScan;
6  import org.springframework.context.annotation.Configuration;
7
8  import com.example.model.Book;
9
10 @Configuration
11 @ComponentScan("com.example")
12 @ComponentScan("org.learnquest")
13 public class AppConfig {
14     @Bean
15     public Book getBook()
16     {
17         return new Book();
18     }
19     @Bean
20     public Laptop getComputer()
21     {
22         return new Laptop();
23     }
24 }
```

15. Go to your **AnnotationApplication.java** file and edit the code to use the Laptop bean, and print the laptop. At the end of the System.out… line hit **Enter** twice, then type the following:

```
Laptop comp=context.getBean(Laptop.class);
comp.setBrand("Dell");
System.out.println("The brand of laptop is: "+comp.getBrand());
```

```
19         System.out.println("The title of your book is "+book.getTitle());
20
21         Laptop comp=context.getBean(Laptop.class);
22         comp.setBrand("Dell");
23         System.out.println("The brand name of laptop is: "+comp.getBrand());
24     }
25
26 }
```

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16. Your AnnotationApplication.java file should look like the following:

```java
package com.example;

import org.learnquest.Laptop;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;


import com.example.model.Book;

@SpringBootApplication

public class AnnotationsApplication {

    public static void main(String[] args) {
        ApplicationContext context= SpringApplication.run(AnnotationsApplication.class, args);
        Book book=context.getBean(Book.class);
        book.setTitle("Tell Me Your Dreams");
        System.out.println("The title of your book is "+book.getTitle());

        Laptop comp=context.getBean(Laptop.class);
        comp.setBrand("Dell");
        System.out.println("The brand of laptop is: "+comp.getBrand());
    }

}
```

17. In the ribbon, click **Save All.** 

18. In the Project Explorer pane, right-click **AnnotationApplication.java** and select **Run As > Java Application**.

19. View the results in the console. You should now see that the brand of laptop is printed along with the book title.

```
  .   ____          _            __ _ _
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( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::                (v3.1.3)

2023-09-05T15:19:29.147Z  INFO 42176 --- [
2023-09-05T15:19:29.152Z  INFO 42176 --- [
2023-09-05T15:19:29.751Z  INFO 42176 --- [
The title of your book is Tell Me Your Dreams
The brand of laptop is: Dell
```

**End of lab

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