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Java Foundations

4-2

The `import` Declaration and Packages

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Objectives

- This lesson covers the following objectives:
  - Access a class by using its fully qualified name
  - Describe the function of the `import` statement
  - Use the `import` statement to access a class in a package
  - Understand the purpose of an asterisk in an `import` statement
  - Identify packages that are automatically imported

Why Should You Reinvent the Wheel?

- Frequently, you may rewrite the same Java code for different programs
- As an alternative to rewriting the same code, you can use the Java-provided library, which organizes frequently used code
- This library is called the Java class library
- The Java class library documentation is available here:
  - https://docs.oracle.com/en/java/javase/17/docs/api/java.base/module-summary.html

Packages in the Java Class Library

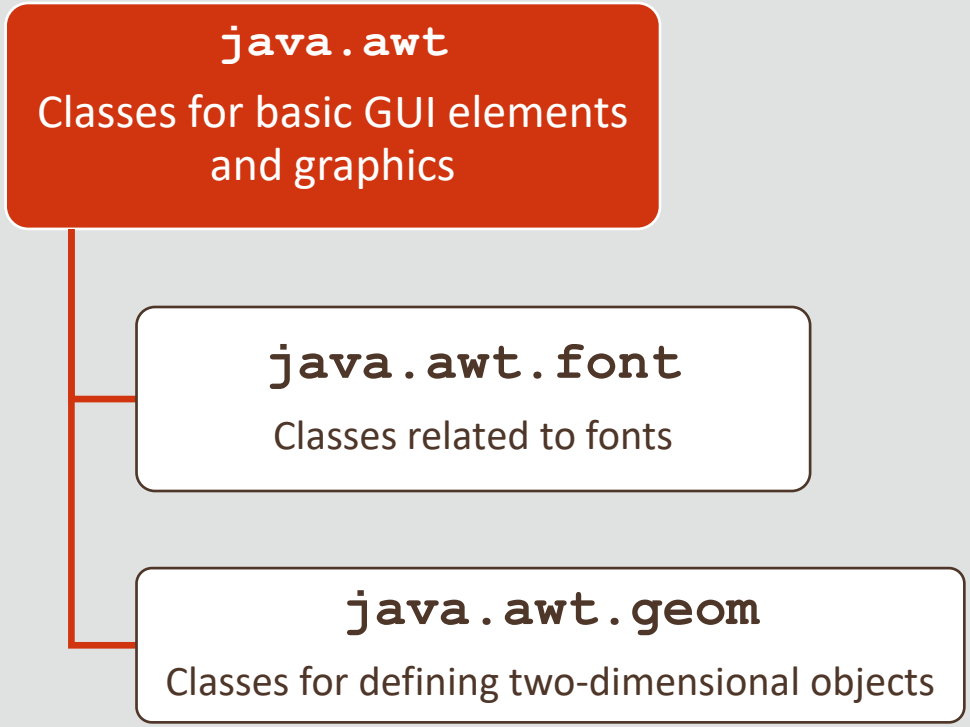
- The classes of the Java class library are organized into packages
- A package contains a group of related classes
- With a package, it becomes easier to locate the related classes

Packages in the Java Class Library

Package	Purpose
`java.lang`	Provides classes that are fundamental to the design of the Java language
`javax.swing`	Provides classes to build GUI components
`java.net`	Provides classes for networking applications
`java.time`	Provides classes for dates, times, instants, and durations

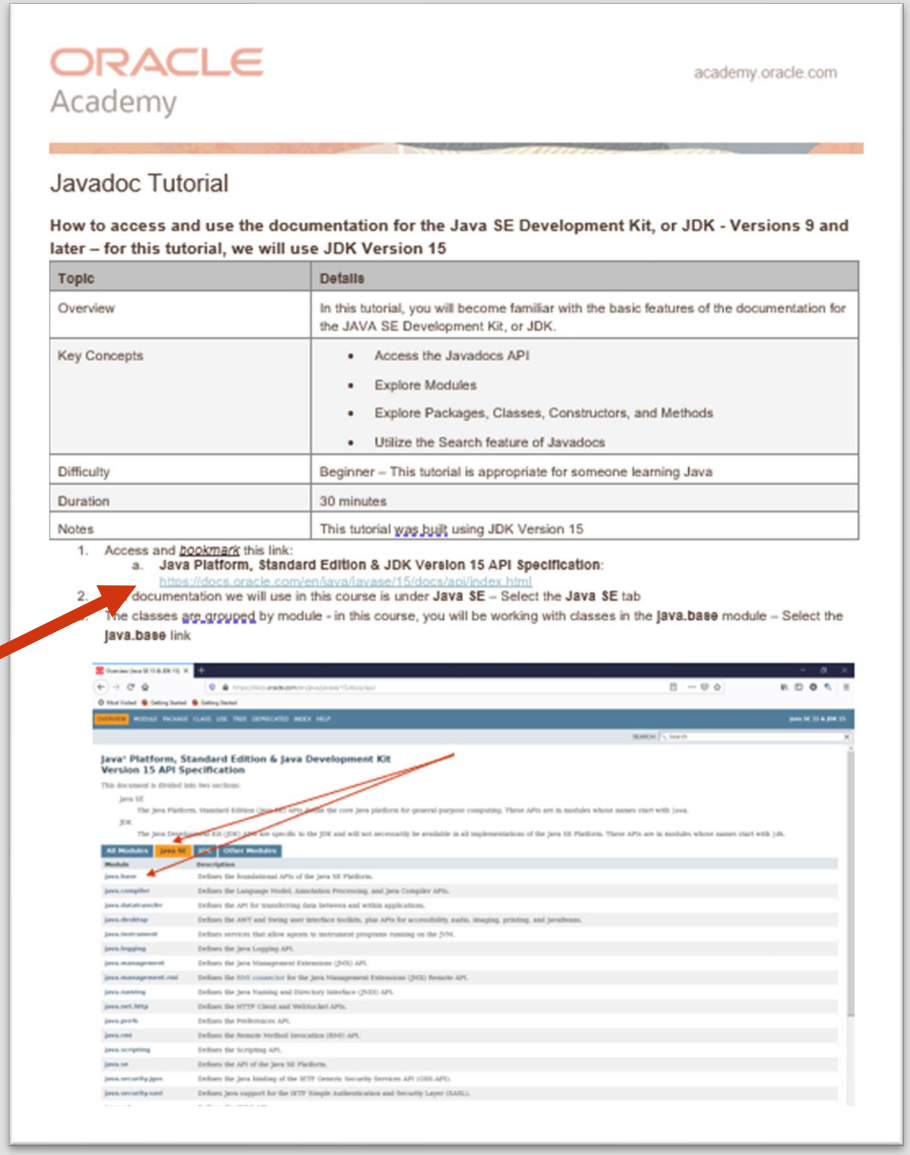
How Are the Packages Organized?

- The vast collection of classes are organized into a tree-like hierarchy, which allows packages to be divided into subpackages, like this:



Javadoc Tutorial

- From Oracle Academy Education Byte – Java – Hands on Lab:
  - Access and complete the Java API Documentation (Javadoc) Tutorial
  - https://docs.oracle.com/en/java/javase/15/docs/api/index.html



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Javadoc Tutorial

How to access and use the documentation for the Java SE Development Kit, or JDK - Versions 9 and later – for this tutorial, we will use JDK Version 15

Topic	Details
Overview	In this tutorial, you will become familiar with the basic features of the documentation for the JAVA SE Development Kit, or JDK.
Key Concepts	• Access the Javadocs API • Explore Modules • Explore Packages, Classes, Constructors, and Methods • Utilize the Search feature of Javadocs
Difficulty	Beginner – This tutorial is appropriate for someone learning Java
Duration	30 minutes
Notes	This tutorial was built using JDK Version 15

1. Access and bookmark this link:
   a. **Java Platform, Standard Edition & JDK Version 15 API Specification**:
      https://docs.oracle.com/en/java/javase/15/docs/api/index.html
2. The documentation we will use in this course is under **Java SE** – Select the **Java SE** tab
3. The classes are grouped by module - in this course, you will be working with classes in the **java.base** module – Select the **java.base** link

Using a Class from a Package

- To use a class from a package in your program, you need to specify its fully qualified name
- For example, to use the `Scanner` class to read a keyboard input, the fully qualified name for the `Scanner` class, which is defined in the `java.util` package, is:

```
java.util.Scanner
```

Package **Class Name**

Using the Fully Qualified Class Name

- As you can see, using the fully qualified name creates very long names for classes
- Long names reduce the readability of the code and also make coding difficult

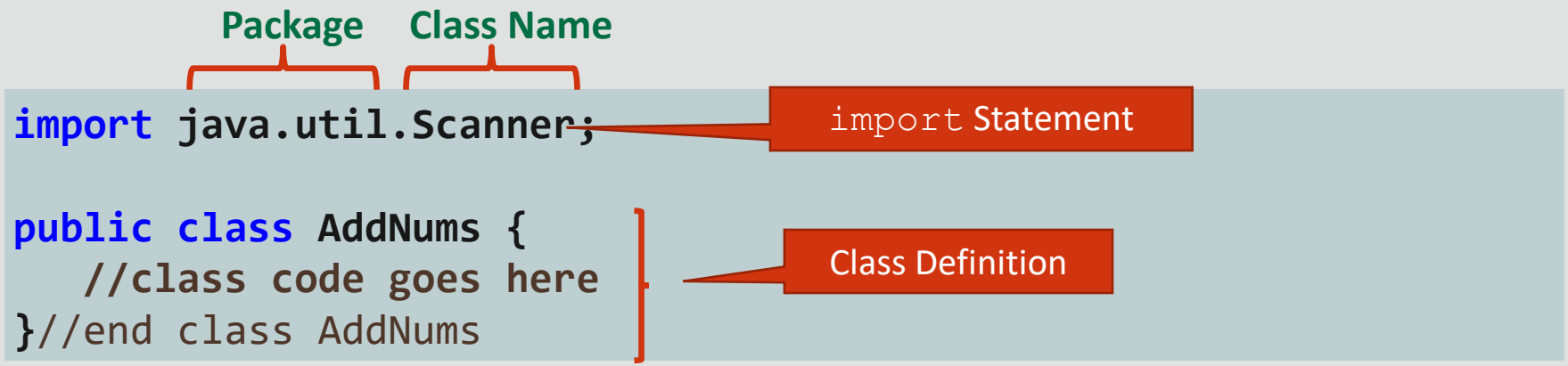
```
public static void main(String[] args) {   Fully Qualified Class Name
    int num;
    java.util.Scanner keyboard =  new java.util.Scanner(System.in);
    System.out.print("Enter a number");
    num = keyboard.nextInt();
    System.out.print("The number you entered is" + num);
}//end method main
```

Is There an Alternative to the Fully Qualified Name?

- Suppose that you have a friend whose name is Santi Inez Luis Vidal
  - How tedious is it to call him by his full name every time?
  - If you could simply refer to him as “Santi,” it would be so much more convenient
- Similarly, accessing Java classes by using fully qualified names is equally tedious in your programs
- Let’s see if there’s a way to specify only the name of the class instead of its fully qualified name

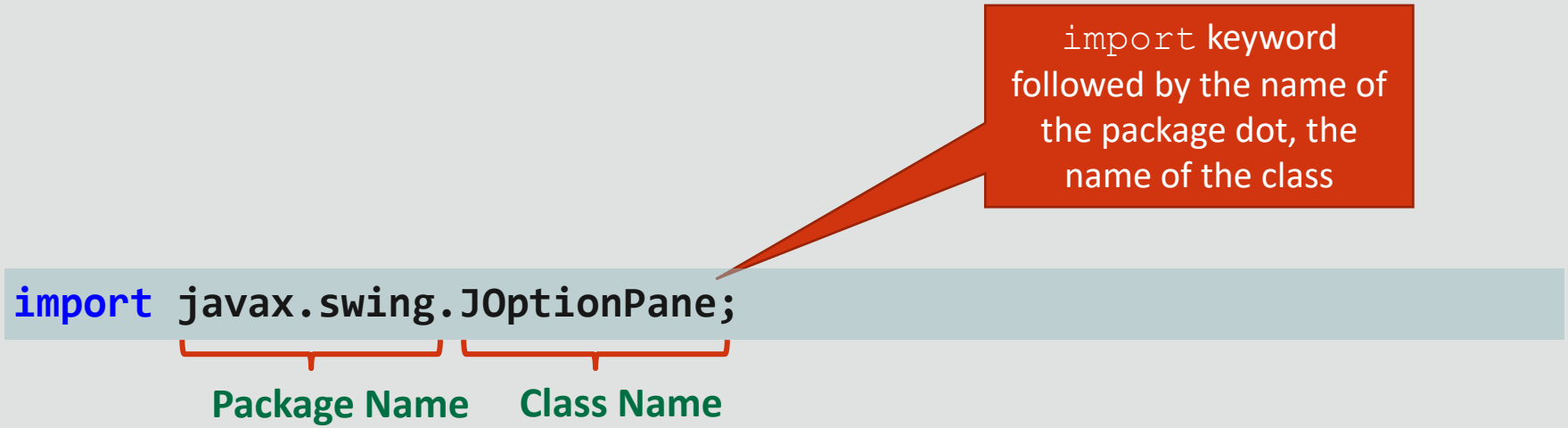
Using the `import` Statement

- You can avoid the fully qualified class name by using the `import` statement
- You place the `import` statement above your class definition. It looks like this:
  - **`import package.className`**
  - Example:



How Do You Import a Single Class?

- You can import a single class or an entire package
- To import a single class into your program, you write an `import` statement like this:



`javax.swing` Package

- Java has an extensive library for constructing GUIs
- This library, called `swing`, can be imported into your program to give you access to Java's GUI functionality
- The `swing` library is in the `javax.swing` package

Accessing a Class from the `swing` Package

- The `swing` package has a `JOptionPane` class
- This class creates a pop-up window that can be used to display strings of text to the user
- To use the `JOptionPane` class, you must first `import` it into your class:

```
import javax.swing.JOptionPane;

public class Welcome {
   //class code to go here
}//end class Welcome
```

`import` statement that imports a single class, `JOptionPane`, from the `swing` package

Importing the `JOptionPane` Class

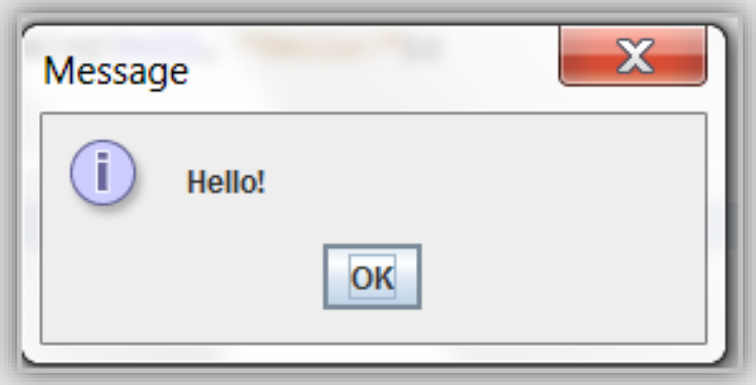
- You can then use `JOptionPane` to display text by calling the `showMessageDialog` method inside the `JOptionPane` class

```
import javax.swing.JOptionPane;

public class Welcome {

    public static void main(String[] args) {
        JOptionPane.showMessageDialog(null, "Hello!");
    }//end method main
}//end class Welcome
```

Output Looks Like This!



How Do You Import All Classes in a Package?

- You can import all classes in a particular package by using the * wildcard character in the `import` statement

How Do You Import All Classes in a Package?

- Let's say you want to extend the previous example by creating an instance of the `JFrame` class and add its reference to `JOptionPane`, like this:

```
import javax.swing.JOptionPane;
import javax.swing.JFrame;

public class Welcome {

    public static void main(String[] args) {
        JFrame frame = new JFrame();
        JOptionPane.showMessageDialog(frame, "Hello!");
    }//end method main
}//end class Welcome
```

Importing 2 classes from the `swing` package

Accessing All Classes from the `swing` Package

- As you access more classes from the `swing` package in your program, the number of `import` statements also increases

Accessing All Classes from the `swing` Package

- To avoid this, you can import all classes from the `swing` package by using the * wildcard character in the `import` statement, like this:

```
import javax.swing.*;

public class Welcome {
   public static void main(String[] args) {
      JFrame frame = new JFrame();
      JOptionPane.showMessageDialog(frame, "Hello!");
   }//end method main
}//end class Welcome
```

Replace all `import` statements of the previous example with one `import` statement

Including Multiple `import` Statements

- You can include multiple `import` statements in a Java program to access classes in the same package or in different packages
- For example:

```
import java.util.Date;
import java.util.Calendar;
import javax.swing.*;

public class DisplayDate {
   //class definition here
}//end class DisplayDate
```

Importing classes from the same package

Importing classes from different packages

Identify Packages That Are Automatically Imported

- So far, you have used `System.out.println()` to print text to the console

```
public class DisplayOutput {

    public static void main(String[] args) {
        System.out.println("Hello, how are you today?");
    }//end method main
}//end class DisplayOutput
```

- However, you didn't import a package for using this method in your program
- So how does Java know what to do when you call it?

`java.lang` Package

- If you look at the Java library, you'll see that the `System` class is organized in the `java.lang` package
- By default, the `java.lang` package is automatically imported into all Java programs

Exercise 1

- Create a new project and add the `AddImport.java` file to the project
- Examine `AddImport.java`
  - Perform the following:
  - Replace the fully qualified name to access the `JLabel` component with an `import` statement
  - To `import` classes from the `util` package, replace multiple `import` statements with a single `import` statement

Summary

- In this lesson, you should have learned how to:
  - Access a class by using its fully qualified name
  - Describe the function of the `import` statement
  - Use the `import` statement to access a class in a package
  - Understand the purpose of an asterisk in an `import` statement
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