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Java Fundamentals Part 3

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1. Java Constructors

A constructor in Java is a **special method** that is used to initialize objects. The constructor is called when an object of a class is created. It can be used to set initial values for object attributes:

Example

Create a constructor:

```
// Create a MyClass class
public class MyClass {
  int x;  // Create a class attribute

  // Create a class constructor for the MyClass class
  public MyClass() {
    x = 5;  // Set the initial value for the class attribute x
  }

  public static void main(String[] args) {
    MyClass myObj = new MyClass(); // Create an object of class MyClass (This will call the constructor)
    System.out.println(myObj.x); // Print the value of x
  }
}

// Outputs 5
```

1.1. Constructor Parameters

Constructors can also take parameters, which is used to initialize attributes.

The following example adds an `int y` parameter to the constructor. Inside the constructor we set x to y (x=y). When we call the constructor, we pass a parameter to the constructor (5), which will set the value of x to 5:

Example

```
public class MyClass {
  int x;

  public MyClass(int y) {
    x = y;
  }

  public static void main(String[] args) {
    MyClass myObj = new MyClass(5);
    System.out.println(myObj.x);
  }
}

// Outputs 5
```

You can have as many parameters as you want:

Example

Java Constructors

```
public class Car {
  int modelYear;
  String modelName;

  public Car(int year, String name) {
    modelYear = year;
    modelName = name;
  }

  public static void main(String[] args) {
    Car myCar = new Car(1969, "Mustang");
    System.out.println(myCar.modelYear + " " + myCar.modelName);
  }
}

// Outputs 1969 Mustang
```

2. Java Inheritance

2.1. Java Inheritance (Subclass and Superclass)

In Java, it is possible to inherit attributes and methods from one class to another. We group the "inheritance concept" into two categories:

- **subclass** (child) - the class that inherits from another class
- **superclass** (parent) - the class being inherited from

To inherit from a class, use the `extends` keyword.

In the example below, the `Car` class (subclass) inherits the attributes and methods from the `Vehicle` class (superclass):

Example

Java Inheritance

```java
class Vehicle {
  protected String brand = "Ford";        // Vehicle attribute
  public void honk() {                    // Vehicle method
    System.out.println("Tuut, tuut!");
  }
}

class Car extends Vehicle {
  private String modelName = "Mustang";    // Car attribute
  public static void main(String[] args) {

    // Create a myCar object
    Car myCar = new Car();

    // Call the honk() method (from the Vehicle class) on the myCar object
    myCar.honk();

    // Display the value of the brand attribute (from the Vehicle class) and the value of the modelName from the Car class
    System.out.println(myCar.brand + " " + myCar.modelName);
  }
}
```

We set the **brand** attribute in **Vehicle** to a `protected` access modifier. If it was set to `private`, the Car class would not be able to access it.

2.2. The final Keyword

If you don’t want other classes to inherit from a class, use the `final` keyword:

If you try to access a `final` class, Java will generate an error:

```
final class Vehicle {
  ...
}

class Car extends Vehicle {
  ...
}
```

The output will be something like this:

```
Car.java:8: error: cannot inherit from final Vehicleclass Car extends Vehicle {        ^1 error)
```

3. Java Packages / API

A package in Java is used to group related classes. Think of it as **a folder in a file directory**. We use packages to avoid name conflicts, and to write a better maintainable code. Packages are divided into two categories:

- Built-in Packages (packages from the Java API)
- User-defined Packages (create your own packages)

3.1. Built-in Packages

The Java API is a library of prewritten classes, that are free to use, included in the Java Development Environment.

The library contains components for managing input, database programming, and much much more. The complete list can be found at Oracles website: https://docs.oracle.com/javase/8/docs/api/.

The library is divided into **packages** and **classes**. Meaning you can either import a single class (along with its methods and attributes), or a whole package that contain all the classes that belong to the specified package.

To use a class or a package from the library, you need to use the `import` keyword:

```
import package.name.Class;   // Import a single class
import package.name.*;   // Import the whole package
```

3.1.1. Import a Class

If you find a class you want to use, for example, the `Scanner` class, **which is used to get user input**, write the following code:

Example

```
import java.util.Scanner;
```

In the example above, `java.util` is a package, while `Scanner` is a class of the `java.util` package.

To use the `Scanner` class, create an object of the class and use any of the available methods found in the `Scanner` class documentation. In our example, we will use the `nextLine()` method, which is used to read a complete line:

Example

Using the Scanner class to get user input:

```
import java.util.Scanner;

class MyClass {
  public static void main(String[] args) {
    Scanner myObj = new Scanner(System.in);
    System.out.println("Enter username");

    String userName = myObj.nextLine();
    System.out.println("Username is: " + userName);
  }
}
```

3.1.2. Import a Package

There are many packages to choose from. In the previous example, we used the Scanner class from the java.util package. This package also contains date and time facilities, random-number generator and other utility classes.

To import a whole package, end the sentence with an asterisk sign (*). The following example will import ALL the classes in the java.util package:

Example

```
import java.util.*;
```

3.2. User-defined Packages

To create your own package, you need to understand that Java uses a file system directory to store them. Just like folders on your computer:

Example

```
└── root
  └── mypack
    └── MyPackageClass.java
```

To create a package, use the `package` keyword:

MyPackageClass.java

```java
package mypack;
class MyPackageClass {
  public static void main(String[] args) {
    System.out.println("This is my package!");
  }
}
```

Save the file as **MyPackageClass.java**, and compile it:

```
javac MyPackageClass.java
```

Then compile the package:

```
javac -d . MyPackageClass.java
```

Java Packages / API

When we compiled the package in the example above, a new folder was created, called “mypack”.

To run the **MyPackageClass.java** file, write the following:

```
java mypack.MyPackageClass
```

The output will be:

```
This is my package!
```

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Thank you

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