
Java Methods

In this tutorial, we will learn about Java methods, how to define methods, and how to use methods in Java programs with the help of examples.

Java Methods

A method is a block of code that performs a specific task.

Suppose you need to create a program to create a circle and color it. You can create two methods to solve this problem:

- a method to draw the circle
- a method to color the circle

Dividing a complex problem into smaller chunks makes your program easy to understand and reusable.

In Java, there are two types of methods:

- **User-defined Methods**: We can create our own method based on our requirements.
- **Standard Library Methods**: These are built-in methods in Java that are available to use.

Let's first learn about user-defined methods.

Declaring a Java Method

The syntax to declare a method is:

```
returnType methodName() {

  // method body

}
```

Here,

- **returnType** - It specifies what type of value a method returns For example if a method has an `int` return type then it returns an integer value.

If the method does not return a value, its return type is `void`.

- **methodName** - It is an identifier that is used to refer to the particular method in a program.
- **method body** - It includes the programming statements that are used to perform some tasks. The method body is enclosed inside the curly braces `{ }`.

For example,

```
int addNumbers() {// code

}
```

In the above example, the name of the method is `adddNumbers()`. And, the return type is `int`. We will learn more about return types later in this tutorial.

This is the simple syntax of declaring a method. However, the complete syntax of declaring a method is

```
modifier static returnType nameOfMethod (parameter1, parameter2, ...) {

  // method body

}
```

Here,

- **modifier** - It defines access types whether the method is public, private, and so on. To learn more, visit Java Access Specifier.
- **static** - If we use the `static` keyword, it can be accessed without creating objects.

For example, the `sqrt()` method of standard Math class is static. Hence, we can directly call `Math.sqrt()` without creating an instance of `Math` class.

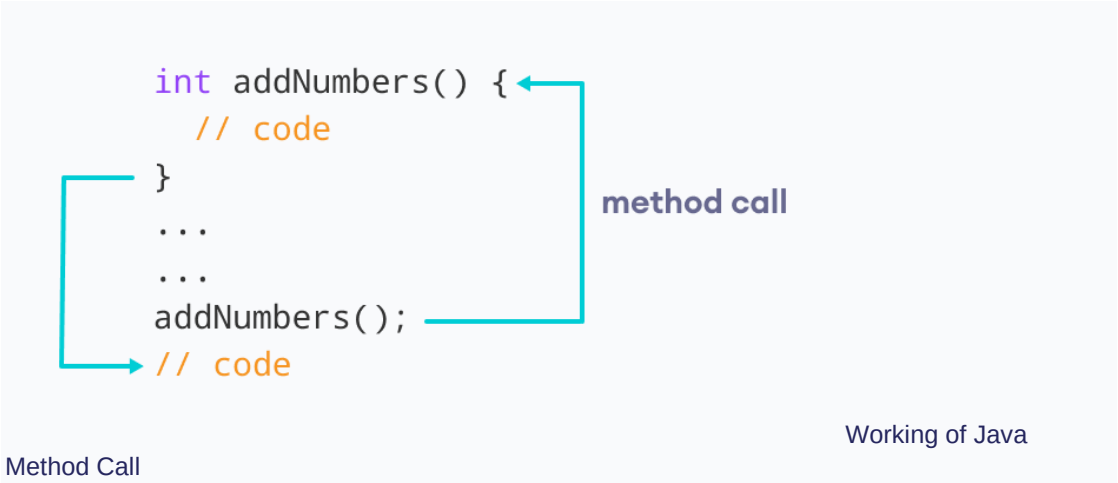
- **parameter1/parameter2** - These are values passed to a method. We can pass any number of arguments to a method.

Calling a Method in Java

In the above example, we have declared a method named `addNumbers()`. Now, to use the method, we need to call it.

Here's is how we can call the `addNumbers()` method.

```
// calls the method

addNumbers();
```



Working of Java Method Call

Example 1: Java Methods

```
class Main {


  // create a method
  public int addNumbers(int a, int b) {
    int sum = a + b;
    // return value
    return sum;
  }


  public static void main(String[] args) {


    int num1 = 25;
    int num2 = 15;
```

```
    // create an object of Main
    Main obj = new Main();
    // calling method
    int result = obj.addNumbers(num1, num2);
    System.out.println("Sum is: " + result);
  }
}
```

Output

```
Sum is: 40
```

In the above example, we have created a method named `addNumbers()`. The method takes two parameters `a` and `b`. Notice the line,

```
int result = obj.addNumbers(num1, num2);
```

Here, we have called the method by passing two arguments `num1` and `num2`. Since the method is returning some value, we have stored the value in the `result` variable.

> **Note**: The method is not static. Hence, we are calling the method using the object of the class.

Java Method Return Type

A Java method may or may not return a value to the function call. We use the **return statement** to return any value. For example,

```
int addNumbers() {
...return sum;
}
```

Here, we are returning the variable `sum`. Since the return type of the function is `int`. The sum variable should be of `int` type. Otherwise, it will generate an error.

Example 2: Method Return Type

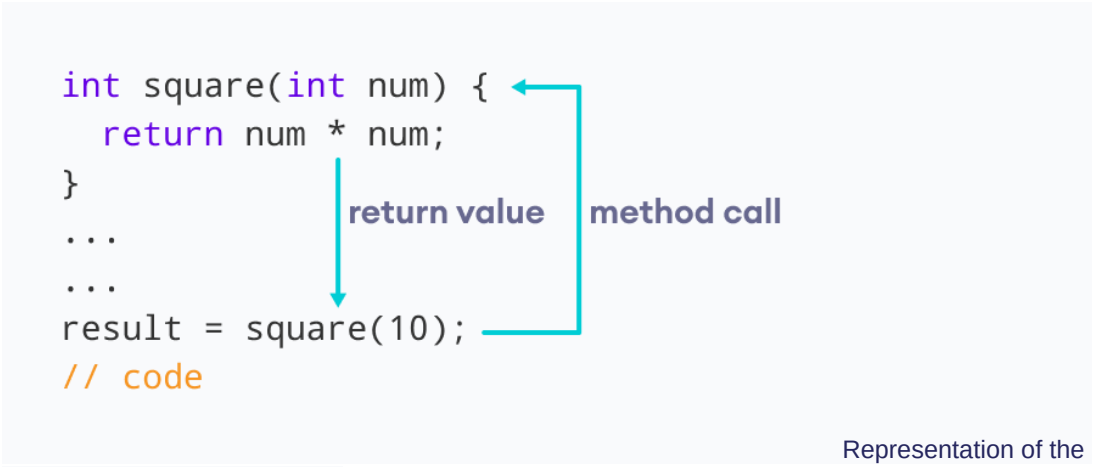
```
class Main {

// create a method

  public static int square(int num) {


    // return statement

    return num * num;

  }


  public static void main(String[] args) {

    int result;


    // call the method

    // store returned value to result

    result = square(10);


    System.out.println("Squared value of 10 is: " + result);

  }

}
```

Output:

```
Squared value of 10 is: 100
```

In the above program, we have created a method named `square()`. The method takes a number as its parameter and returns the square of the number.

Here, we have mentioned the return type of the method as `int`. Hence, the method should always return an integer value.



Representation of the Java method returning a value

Note: If the method does not return any value, we use the void keyword as the return type of the method. For example,

```
public void square(int a) {

  int square = a * a;

  System.out.println("Square is: " + a);

}
```

Method Parameters in Java

A method parameter is a value accepted by the method. As mentioned earlier, a method can also have any number of parameters. For example,

```
// method with two parametersint addNumbers(int a, int b) {

  // code

}

// method with no parameterint addNumbers(){

  // code

}
```

If a method is created with parameters, we need to pass the corresponding values while calling the method. For example,

---

```
// calling the method with two parameters

addNumbers(25, 15);

// calling the method with no parameters

addNumbers()
```

Example 3: Method Parameters

```
class Main {


  // method with no parameter
  public void display1() {
    System.out.println("Method without parameter");
  }


  // method with single parameter
  public void display2(int a) {
    System.out.println("Method with a single parameter: " + a);
  }


  public static void main(String[] args) {


    // create an object of Main
    Main obj = new Main();


    // calling method with no parameter
    obj.display1();


    // calling method with the single parameter
    obj.display2(24);
  }
```

```
}
```

Output

```
Method without parameter

Method with a single parameter: 24
```

Here, the parameter of the method is `int`. Hence, if we pass any other data type instead of `int`, the compiler will throw an error. It is because Java is a strongly typed language.

Note: The argument `24` passed to the `display2()` method during the method call is called the actual argument.

The parameter `num` accepted by the method definition is known as a formal argument. We need to specify the type of formal arguments. And, the type of actual arguments and formal arguments should always match.

Standard Library Methods

The standard library methods are built-in methods in Java that are readily available for use. These standard libraries come along with the Java Class Library (JCL) in a Java archive (*.jar) file with JVM and JRE.

For example,

- `print()` is a method of `java.io.PrintSteam`. The `print("...")` method prints the string inside quotation marks.
- `sqrt()` is a method of `Math` class. It returns the square root of a number.

Here's a working example:

Example 4: Java Standard Library Method

```
public class Main {

  public static void main(String[] args) {



    // using the sqrt() method

    System.out.print("Square root of 4 is: " + Math.sqrt(4));
```

```
  }
}
```

Output:

```
Square root of 4 is: 2.0
```

To learn more about standard library methods, visit Java Library Methods.

What are the advantages of using methods?

1. The main advantage is **code reusability**. We can write a method once, and use it multiple times. We do not have to rewrite the entire code each time. Think of it as, "write once, reuse multiple times".

Example 5: Java Method for Code Reusability

```
public class Main {


  // method defined
  private static int getSquare(int x){
    return x * x;
  }


  public static void main(String[] args) {
    for (int i = 1; i <= 5; i++) {


      // method call
      int result = getSquare(i);
      System.out.println("Square of " + i + " is: " + result);
    }
  }
}
```

Output:

```
Square of 1 is: 1

Square of 2 is: 4

Square of 3 is: 9

Square of 4 is: 16

Square of 5 is: 25
```

In the above program, we have created the method named `getSquare()` to calculate the square of a number. Here, the method is used to calculate the square of numbers less than **6**.

Hence, the same method is used again and again.

2. Methods make code more **readable and easier** to debug. Here, the `getSquare()` method keeps the code to compute the square in a block. Hence, makes it more readable.

ava Method Overloading

In this article, you'll learn about method overloading and how you can achieve it in Java with the help of examples.

In Java, two or more methods may have the same name if they differ in parameters (different number of parameters, different types of parameters, or both). These methods are called overloaded methods and this feature is called method overloading. For example:

```
void func() { ... }

void func(int a) { ... }

float func(double a) { ... }

float func(int a, float b) { ... }
```

Here, the `func()` method is overloaded. These methods have the same name but accept different arguments.

> **Note**: The return types of the above methods are not the same. It is because method overloading is not associated with return types. Overloaded methods may have the same or different return types, but they must differ in parameters.

Why method overloading?

Suppose, you have to perform the addition of given numbers but there can be any number of arguments (let's say either 2 or 3 arguments for simplicity).

In order to accomplish the task, you can create two methods `sum2num(int, int)` and `sum3num(int, int, int)` for two and three parameters respectively. However, other programmers, as well as you in the future may get confused as the behavior of both methods are the same but they differ by name.

The better way to accomplish this task is by overloading methods. And, depending upon the argument passed, one of the overloaded methods is called. This helps to increase the readability of the program.

How to perform method overloading in Java?

Here are different ways to perform method overloading:

1. Overloading by changing the number of arguments

```
class MethodOverloading {

    private static void display(int a){

        System.out.println("Arguments: " + a);

    }


    private static void display(int a, int b){

        System.out.println("Arguments: " + a + " and " + b);

    }
```

```
    public static void main(String[] args) {

        display(1);

        display(1, 4);

    }

}
```

Output:

```
Arguments: 1

Arguments: 1 and 4
```

2. By changing the data type of parameters

```
class MethodOverloading {



    // this method accepts int

    private static void display(int a){

        System.out.println("Got Integer data.");

    }



    // this method  accepts String object

    private static void display(String a){

        System.out.println("Got String object.");

    }



    public static void main(String[] args) {

        display(1);

        display("Hello");

    }

}
```

Output:

```
Got Integer data.
```

```
Got String object.
```

Here, both overloaded methods accept one argument. However, one accepts the argument of type `int` whereas other accepts `String` object.

Let's look at a real-world example:

```
class HelperService {


    private String formatNumber(int value) {

        return String.format("%d", value);

    }


    private String formatNumber(double value) {

        return String.format("%.3f", value);

    }


    private String formatNumber(String value) {

        return String.format("%.2f", Double.parseDouble(value));

    }


    public static void main(String[] args) {

        HelperService hs = new HelperService();

        System.out.println(hs.formatNumber(500));

        System.out.println(hs.formatNumber(89.9934));

        System.out.println(hs.formatNumber("550"));

    }
}
```

When you run the program, the output will be:

```
500
```

```
89.993

550.00
```

> **Note**: In Java, you can also overload constructors in a similar way like methods.

Recommended Reading: Java Constructor Overloading

Important Points

- Two or more methods can have the same name inside the same class if they accept different arguments. This feature is known as method overloading.
- Method overloading is achieved by either:
  - changing the number of arguments.
  - or changing the data type of arguments.
- It is not method overloading if we only change the return type of methods. There must be differences in the number of parameters.
