JAVA SYLLABUS

What is Java?

Java is a popular programming language, created in 1995.

It is owned by Oracle, and more than **3 billion** devices run Java.

It is used for:

- Mobile applications (specially Android apps)
- Desktop applications
- Web applications
- Web servers and application servers
- Games
- Database connection
- And much, much more!

Why Use Java?

- Java works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc.)
- It is one of the most popular programming language in the world
- It is easy to learn and simple to use
- It is open-source and free
- It is secure, fast and powerful
- It has a huge community support (tens of millions of developers)
- Java is an object oriented language which gives a clear structure to programs and allows code to be reused, lowering development costs
- As Java is close to C++ and C#, it makes it easy for programmers to switch to Java or vice versa.

Java Install

- Some PCs might have Java already installed.
- To check if you have Java installed on a Windows PC, search in the start bar for Java or type the following in Command Prompt (cmd.exe):

```
C:\Users\Your Name>java -version
```

- If Java is installed, you will see something like this (depending on version):

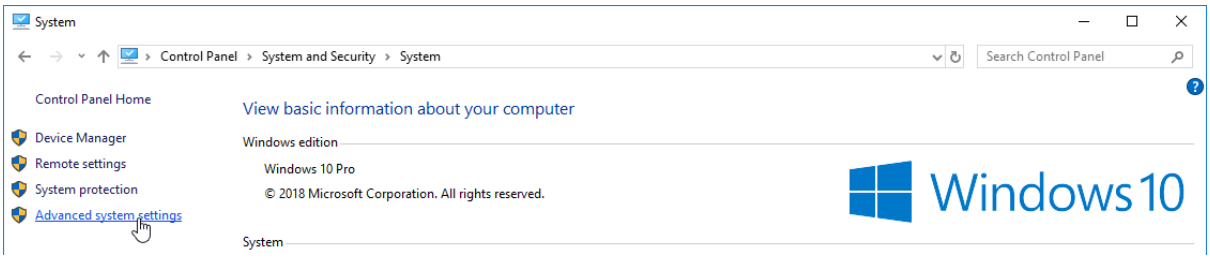
```
java version "11.0.1" 2018-10-16 LTS
Java(TM) SE Runtime Environment 18.9 (build 11.0.1+13-LTS)
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.1+13-LTS, mixed mode)
```

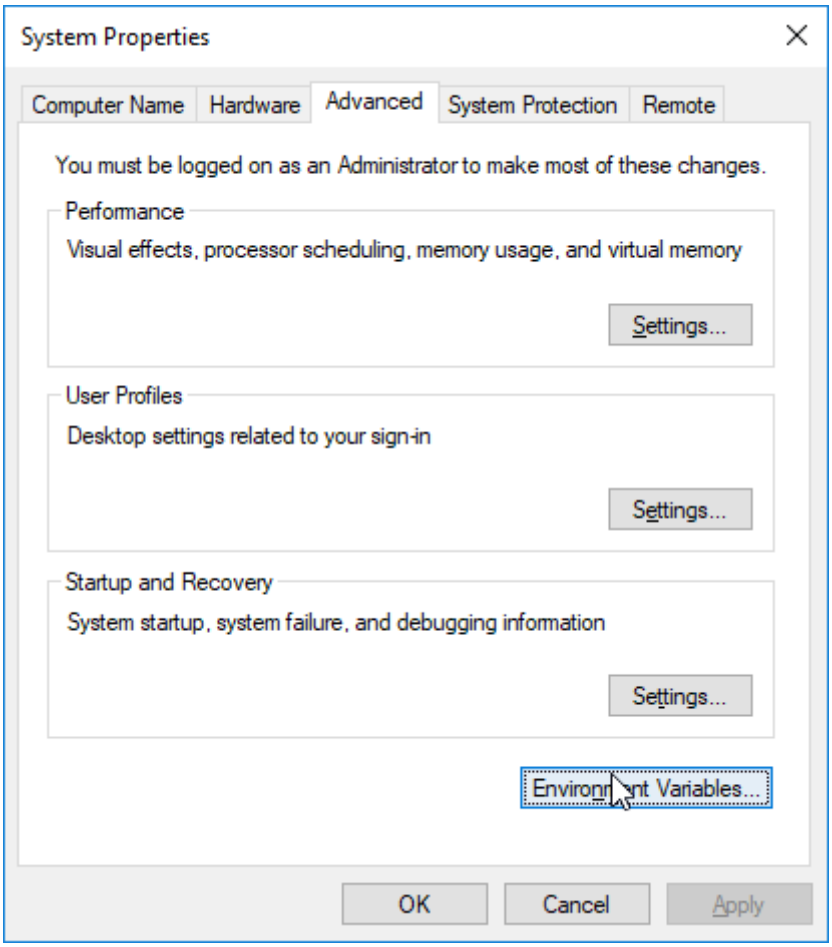
- If you do not have Java installed on your computer, you can download it for free from oracle.com.

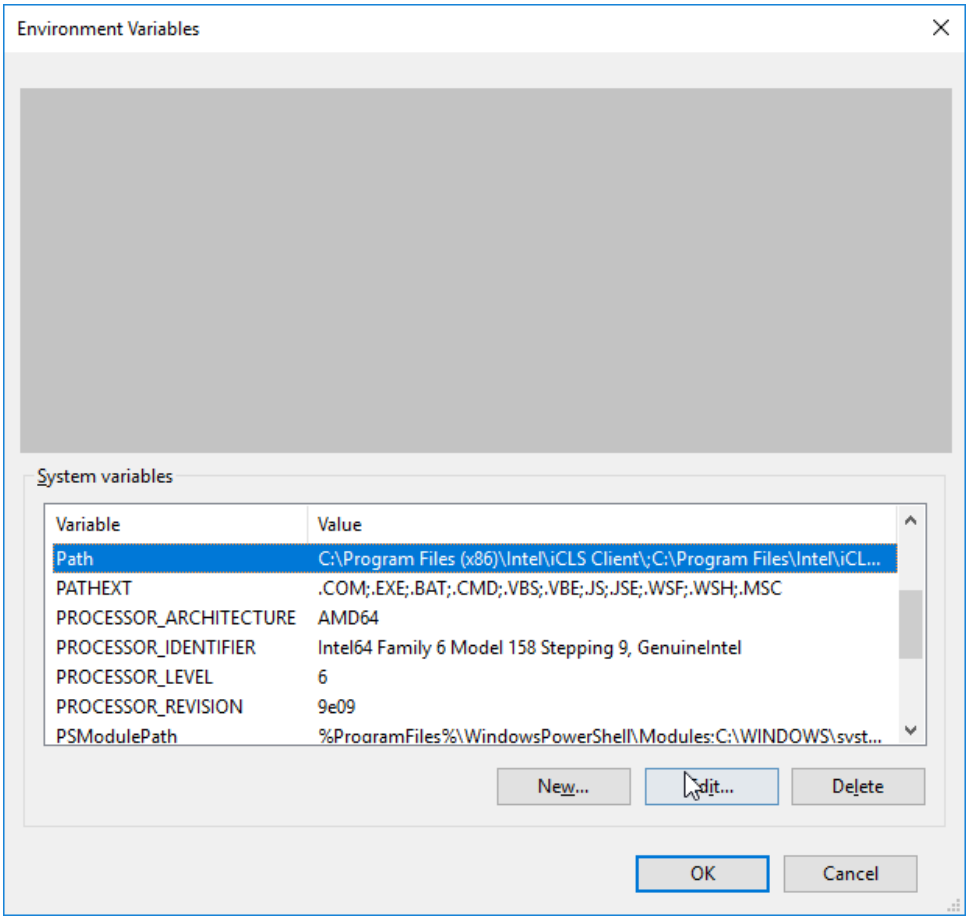
Setup for Windows

To install Java on Windows:

1. Go to "System Properties" (Can be found on Control Panel > System and Security > System > Advanced System Settings)
2. Click on the "Environment variables" button under the "Advanced" tab
3. Then, select the "Path" variable in System variables and click on the "Edit" button
4. Click on the "New" button and add the path where Java is installed, followed by **\bin**. By default, Java is installed in C:\Program Files\Java\jdk-11.0.1 (If nothing else was specified when you installed it). In that case, You will have to add a new path with: **C:\Program Files\Java\jdk-11.0.1\bin**
   Then, click "OK", and save the settings
5. At last, open Command Prompt (cmd.exe) and type **java -version** to see if Java is running on your machine






Environment Variables
System variables
Variable
Value
Path
C:\Program Files (x86)\Intel\iCLS Client\;C:\Program Files\Intel\iCL...
PATHEXT
.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE
AMD64
PROCESSOR_IDENTIFIER
Intel64 Family 6 Model 158 Stepping 9, GenuineIntel
PROCESSOR_LEVEL
6
PROCESSOR_REVISION
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PSModulePath
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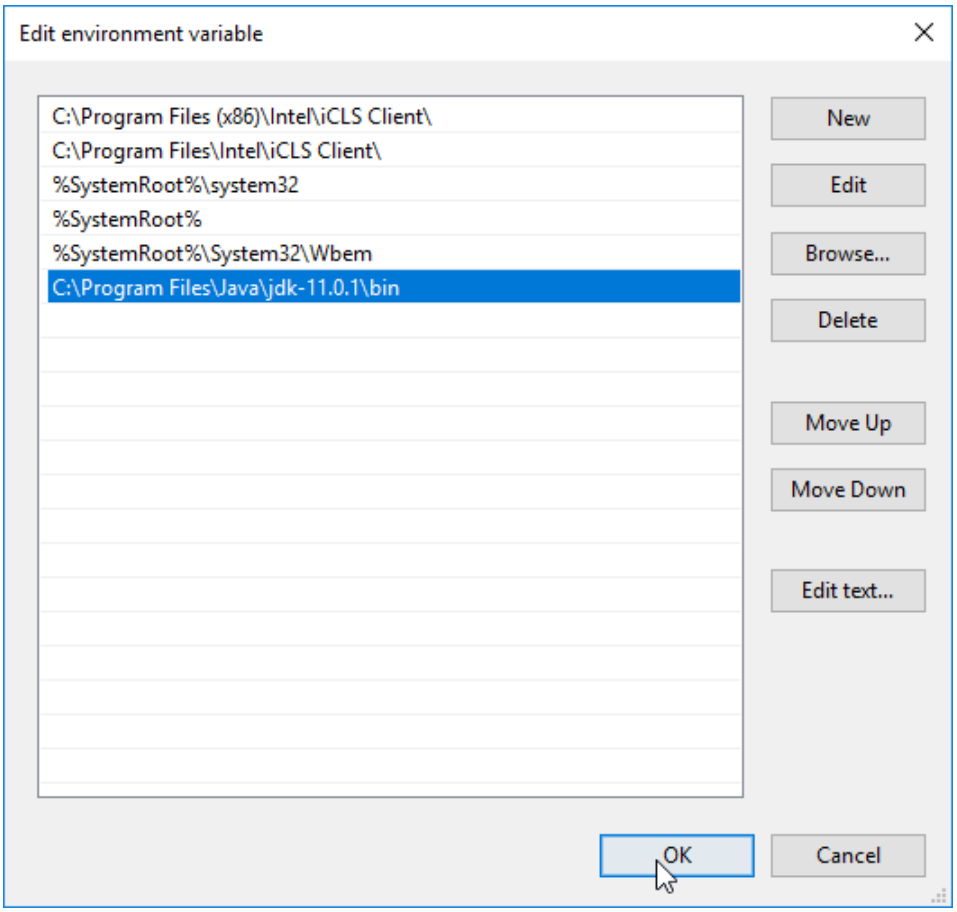
New...
Edit...
Delete
OK
Cancel


Edit environment variable
C:\Program Files (x86)\Intel\iCLS Client\
C:\Program Files\Intel\iCLS Client\
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
C:\Program Files\Java\jdk-11.0.1\bin
New
Edit
Browse...
Delete
Move Up
Move Down
Edit text...
OK
Cancel

Write the following in the command line (cmd.exe):

```
C:\Users\Your Name>java -version
```

If Java was successfully installed, you will see something like this (depending on version):

```
java version "11.0.1" 2018-10-16 LTS
Java(TM) SE Runtime Environment 18.9 (build 11.0.1+13-LTS)
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.1+13-LTS, mixed mode)
```

Java Topics

Java Syntax	Java Methods	Java OOP	Java File Handling
Java Comments	Java Method Parameters	Java Classes/Objects	Java Files
Java Variables	Java Method Overloading	Java Class Attributes	Java Create/Write Files
Java Data Types		Java Class Methods	Java Read Files
Java Type Casting		Java Constructors	Java Delete Files
Java Operators		Java Modifiers	
Java Strings		Java Encapsulation	
Java Math		Java Packages / API	
Java Booleans		Java Inheritance	
Java If...Else		Java Polymorphism	
Java Switch		Java Inner Classes	
Java While Loop		Java Abstraction	
Java For Loop		Java Interface	
Java Break/Continue		Java Enums	
Java Arrays		Java User Input	
		Java Date	
		Java ArrayList	
		Java HashMap	
		Java Wrapper Classes	
		Java Exceptions	

JAVA Syntax

Example:

```
public class MyClass {
  public static void main(String[] args) {
    System.out.println("Hello World");
  }
}
```

Example explained

Every line of code that runs in Java must be inside a `class`. In our example, we named the class **MyClass**. A class should always start with an uppercase first letter.

Note: Java is case-sensitive: "MyClass" and "myclass" has different meaning.

The name of the java file **must match** the class name. When saving the file, save it using the class name and add ".java" to the end of the filename. To run the example above on your computer, make sure that Java is properly installed. The output should be:

```
Hello World
```

The main Method

The `main()` method is required and you will see it in every Java program:

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

Any code inside the `main()` method will be executed. You don't have to understand the keywords before and after main.

For now, just remember that every Java program has a `class` name which must match the filename, and that every program must contain the `main()` method.

System.out.println()

Inside the `main()` method, we can use the `println()` method to print a line of text to the screen:

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

  System.out.println("Hello World");

}
```

Variables and Types

Although Java is object oriented, not all types are objects. It is built on top of basic variable types called primitives.

Here is a list of all primitives in Java:

- `byte` (number, 1 byte)
- `short` (number, 2 bytes)
- `int` (number, 4 bytes)
- `long` (number, 8 bytes)
- `float` (float number, 4 bytes)

- `double` (float number, 8 bytes)
- `char` (a character, 2 bytes)
- `boolean` (true or false, 1 byte)
- Java is a strong typed language, which means variables need to be defined before we use them.

Numbers

- To declare and assign a number use the following syntax:

```
int myNumber;
myNumber = 5;
```

- Or you can combine them:

```
int myNumber = 5;
```

- To define a double floating point number, use the following syntax:

```
double d = 4.5;
d = 3.0;
```

- If you want to use float, you will have to cast:

```
float f = (float) 4.5;
```

Conditionals

Java uses boolean variables to evaluate conditions. The boolean values `true` and `false` are returned when an expression is compared or evaluated. For example:

```
int a = 4;
boolean b = a == 4;

if (b) {
    System.out.println("It's true!");
}
```

Of course we don't normally assign a conditional expression to a boolean. Normally, we just use the short version:

```
int a = 4;

if (a == 4) {
    System.out.println("Ohhh! So a is 4!");
}
```

Java Operators

Operators are used to perform operations on variables and values.

In the example below, we use the `+` **operator** to add together two values:

Example

```
int x = 100 + 50;
```

Although the `+` operator is often used to add together two values, like in the example above, it can also be used to add together a variable and a value, or a variable and another variable:

Example

```
int sum1 = 100 + 50;         // 150 (100 + 50)

int sum2 = sum1 + 250;       // 400 (150 + 250)

int sum3 = sum2 + sum2;      // 800 (400 + 400)
```

Java Strings

Strings are used for storing text.

A `String` variable contains a collection of characters surrounded by double quotes:

Example

Create a variable of type `String` and assign it a value:

```
String greeting = "Hello";
```

String Concatenation

The `+` operator can be used between strings to combine them. This is called **concatenation**:

Example

```
String firstName = "John";

String lastName = "Doe";

System.out.println(firstName + " " + lastName);
```

Math.max(*x*,*y*)

The `Math.max(x,y)` method can be used to find the highest value of *x* and *y*:

Example

```
Math.max(5, 10);
```

Java Booleans

Very often, in programming, you will need a data type that can only have one of two values, like:

- YES / NO
- ON / OFF
- TRUE / FALSE

For this, Java has a `boolean` data type, which can take the values `true` or `false`.

Boolean Values

A boolean type is declared with the `boolean` keyword and can only take the values `true` or `false`:

Example

```
boolean isJavaFun = true;

boolean isFishTasty = false;

System.out.println(isJavaFun);     // Outputs true

System.out.println(isFishTasty);   // Outputs false
```

Boolean Expression

A **Boolean expression** is a Java expression that returns a Boolean value: `true` or `false`.

You can use a comparison operator, such as the **greater than** (`>`) operator to find out if an expression (or a variable) is true:

Example

```
int x = 10;

int y = 9;

System.out.println(x > y); // returns true, because 10 is higher than 9
```

Java Conditions and If Statements

Java supports the usual logical conditions from mathematics:

- Less than: `a < b`
- Less than or equal to: `a <= b`
- Greater than: `a > b`
- Greater than or equal to: `a >= b`
- Equal to `a == b`
- Not Equal to: `a != b`

You can use these conditions to perform different actions for different decisions.

Java has the following conditional statements:

- Use `if` to specify a block of code to be executed, if a specified condition is true
- Use `else` to specify a block of code to be executed, if the same condition is false
- Use `else if` to specify a new condition to test, if the first condition is false
- Use `switch` to specify many alternative blocks of code to be executed

The if Statement

Use the `if` statement to specify a block of Java code to be executed if a condition is `true`.

Syntax

```
if (condition) {

  // block of code to be executed if the condition is true

}
```

Note that `if` is in lowercase letters. Uppercase letters (If or IF) will generate an error.

In the example below, we test two values to find out if 20 is greater than 18. If the condition is `true`, print some text:

Example

```
if (20 > 18) {

  System.out.println("20 is greater than 18");

}
```

The else Statement

Use the `else` statement to specify a block of code to be executed if the condition is `false`.

Syntax

```
if (condition) {
```

```
  // block of code to be executed if the condition is true
} else {
  // block of code to be executed if the condition is false
}
```

Example

```
int time = 20;
if (time < 18) {
  System.out.println("Good day.");
} else {
  System.out.println("Good evening.");
}
// Outputs "Good evening."
```

The else if Statement

Use the `else if` statement to specify a new condition if the first condition is `false`.

Syntax

```
if (condition1) {
  // block of code to be executed if condition1 is true
} else if (condition2) {
  // block of code to be executed if the condition1 is false and condition2 is true
} else {
  // block of code to be executed if the condition1 is false and condition2 is false
}
```

Example

```
int time = 22;
if (time < 10) {
  System.out.println("Good morning.");
} else if (time < 20) {
  System.out.println("Good day.");
```

```
} else {
  System.out.println("Good evening.");
}
// Outputs "Good evening."
```

Example explained

In the example above, time (22) is greater than 10, so the **first condition** is `false`. The next condition, in the `else if` statement, is also `false`, so we move on to the `else` condition since **condition1** and **condition2** is both `false` - and print to the screen "Good evening".

However, if the time was 14, our program would print "Good day."

Java Switch Statements

Use the `switch` statement to select one of many code blocks to be executed.

Syntax

```
switch(expression) {
  case x:
    // code block
    break;
  case y:
    // code block
    break;
  default:
    // code block
}
```

This is how it works:

- The `switch` expression is evaluated once.
- The value of the expression is compared with the values of each `case`.
- If there is a match, the associated block of code is executed.
- The `break` and `default` keywords are optional.

The example below uses the weekday number to calculate the weekday name:

Example

```
int day = 4;
switch (day) {
  case 1:
    System.out.println("Monday");
    break;
  case 2:
    System.out.println("Tuesday");
    break;
  case 3:
    System.out.println("Wednesday");
    break;
  case 4:
    System.out.println("Thursday");
    break;
  case 5:
    System.out.println("Friday");
    break;
  case 6:
    System.out.println("Saturday");
    break;
  case 7:
    System.out.println("Sunday");
    break;
}
// Outputs "Thursday" (day 4)
```

Loops

Loops can execute a block of code as long as a specified condition is reached.

Loops are handy because they save time, reduce errors, and they make code more readable.

Java While Loop

The `while` loop loops through a block of code as long as a specified condition is `true`:

Syntax

```
while (condition) {
  // code block to be executed
}
```

In the example below, the code in the loop will run, over and over again, as long as a variable (i) is less than 5:

Example

```
int i = 0;
while (i < 5) {
  System.out.println(i);
  i++;
}
```

Java For Loop

When you know exactly how many times you want to loop through a block of code, use the `for` loop instead of a `while` loop:

Syntax

```
for (statement 1; statement 2; statement 3) {
  // code block to be executed
 }
```

Statement 1 is executed (one time) before the execution of the code block.

Statement 2 defines the condition for executing the code block.

Statement 3 is executed (every time) after the code block has been executed.

The example below will print the numbers 0 to 4:

Example

```
for (int i = 0; i < 5; i++) {
```

```
  System.out.println(i);
}
```

Example explained

Statement 1 sets a variable before the loop starts (int i = 0).

Statement 2 defines the condition for the loop to run (i must be less than 5). If the condition is true, the loop will start over again, if it is false, the loop will end.

Statement 3 increases a value (i++) each time the code block in the loop has been executed.

Java Break

The `break` statement can also be used to jump out of a **loop**.

This example jumps out of the loop when i is equal to 4:

Example

```
for (int i = 0; i < 10; i++) {
  if (i == 4) {
    break;
  }
  System.out.println(i);
}
```

Java Continue

The `continue` statement breaks one iteration (in the loop), if a specified condition occurs, and continues with the next iteration in the loop.

This example skips the value of 4:

Example

```
for (int i = 0; i < 10; i++) {
  if (i == 4) {
    continue;
  }
  System.out.println(i);
```

```
}
```

Java Arrays

Arrays are used to store multiple values in a single variable, instead of declaring separate variables for each value.

To declare an array, define the variable type with **square brackets**:

```
String[] cars;
```

We have now declared a variable that holds an array of strings. To insert values to it, we can use an array literal - place the values in a comma-separated list, inside curly braces:

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};
```

To create an array of integers, you could write:

```
int[] myNum = {10, 20, 30, 40};
```

Access the Elements of an Array

You access an array element by referring to the index number.

This statement accesses the value of the first element in cars:

Example

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

System.out.println(cars[0]);

// Outputs Volvo
```

Change an Array Element

To change the value of a specific element, refer to the index number:

Example

```
cars[0] = "Opel";
```

Example

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

cars[0] = "Opel";

System.out.println(cars[0]);
```

```
// Now outputs Opel instead of Volvo
```

Array Length

To find out how many elements an array has, use the `length` property:

Example

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

System.out.println(cars.length);

// Outputs 4
```

Loop Through an Array

You can loop through the array elements with the `for` loop, and use the `length` property to specify how many times the loop should run.

The following example outputs all elements in the **cars** array:

Example

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

for (int i = 0; i < cars.length; i++) {

  System.out.println(cars[i]);

}
```

Loop Through an Array with For-Each

There is also a "**for-each**" loop, which is used exclusively to loop through elements in arrays:

Syntax

```
for (type variable : arrayname) {

  ...

}
```

The following example outputs all elements in the **cars** array, using a "**for-each**" loop:

Example

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

for (String i : cars) {
```

```
  System.out.println(i);

}
```

The example above can be read like this: **for each** `String` element (called **i** - as in **i**ndex) in **cars**, print out the value of **i**.

If you compare the `for` loop and **for-each** loop, you will see that the **for-each** method is easier to write, it does not require a counter (using the length property), and it is more readable.

Multidimensional Arrays

A multidimensional array is an array containing one or more arrays.

To create a two-dimensional array, add each array within its own set of **curly braces**:

Example

```
int[][] myNumbers = { {1, 2, 3, 4}, {5, 6, 7} };
```

myNumbers is now an array with two arrays as its elements.

To access the elements of the **myNumbers** array, specify two indexes: one for the array, and one for the element inside that array. This example accesses the third element (2) in the second array (1) of myNumbers:

Example

```
int[][] myNumbers = { {1, 2, 3, 4}, {5, 6, 7} };

int x = myNumbers[1][2];

System.out.println(x); // Outputs 7
```

We can also use a `for loop` inside another `for loop` to get the elements of a two-dimensional array (we still have to point to the two indexes):

Example

```
public class MyClass {

  public static void main(String[] args) {

    int[][] myNumbers = { {1, 2, 3, 4}, {5, 6, 7} };

    for (int i = 0; i < myNumbers.length; ++i) {

      for(int j = 0; j < myNumbers[i].length; ++j) {

        System.out.println(myNumbers[i][j]);
```

```
      }
    }

  }

}
```

Java Methods

A **method** is a block of code which only runs when it is called.

You can pass data, known as parameters, into a method.

Methods are used to perform certain actions, and they are also known as **functions**.

Why use methods? To reuse code: define the code once, and use it many times.

Create a Method

A method must be declared within a class. It is defined with the name of the method, followed by parentheses **()**. Java provides some pre-defined methods, such as `System.out.println()`, but you can also create your own methods to perform certain actions:

Example

Create a method inside MyClass:

```
public class MyClass {

  static void myMethod() {

    // code to be executed

  }

}
```

Example Explained

- `myMethod()` is the name of the method
- `static` means that the method belongs to the MyClass class and not an object of the MyClass class. You will learn more about objects and how to access methods through objects later in this tutorial.
- `void` means that this method does not have a return value.

Call a Method

To call a method in Java, write the method's name followed by two parentheses **()** and a semicolon**;**

In the following example, `myMethod()` is used to print a text (the action), when it is called:

Example

Inside `main`, call the `myMethod()` method:

```
public class MyClass {
  static void myMethod() {
    System.out.println("I just got executed!");
  }

  public static void main(String[] args) {
    myMethod();
  }
}

// Outputs "I just got executed!"
```

A method can also be called multiple times:

Example

```
public class MyClass {
  static void myMethod() {
    System.out.println("I just got executed!");
  }

  public static void main(String[] args) {
    myMethod();
    myMethod();
    myMethod();
  }
}

// I just got executed!
```

```
// I just got executed!

// I just got executed!
```

Java Method Parameters

Information can be passed to methods as parameter. Parameters act as variables inside the method.

Parameters are specified after the method name, inside the parentheses. You can add as many parameters as you want, just separate them with a comma.

The following example has a method that takes a `String` called **fname** as parameter. When the method is called, we pass along a first name, which is used inside the method to print the full name:

Example

```
public class MyClass {
  static void myMethod(String fname) {
    System.out.println(fname + " Refsnes");
  }

  public static void main(String[] args) {
    myMethod("Liam");
    myMethod("Jenny");
    myMethod("Anja");
  }
}
// Liam Refsnes
// Jenny Refsnes
// Anja Refsnes
```

Multiple Parameters

You can have as many parameters as you like:

Example

```
public class MyClass {
```

```
  static void myMethod(String fname, int age) {
    System.out.println(fname + " is " + age);
  }

  public static void main(String[] args) {
    myMethod("Liam", 5);
    myMethod("Jenny", 8);
    myMethod("Anja", 31);
  }
}

// Liam is 5
// Jenny is 8
// Anja is 31
```

Return Values

The `void` keyword, used in the examples above, indicates that the method should not return a value. If you want the method to return a value, you can use a primitive data type (such as `int`, `char`, etc.) instead of `void`, and use the `return` keyword inside the method:

Example

```
public class MyClass {
  static int myMethod(int x) {
    return 5 + x;
  }

  public static void main(String[] args) {
    System.out.println(myMethod(3));
  }
}
// Outputs 8 (5 + 3)
```

This example returns the sum of a method's **two parameters**:

Example

```
public class MyClass {
  static int myMethod(int x, int y) {
    return x + y;
  }

  public static void main(String[] args) {
    System.out.println(myMethod(5, 3));
  }
}
// Outputs 8 (5 + 3)
```

You can also store the result in a variable (recommended, as it is easier to read and maintain):

Example

```
public class MyClass {
  static int myMethod(int x, int y) {
    return x + y;
  }

  public static void main(String[] args) {
    int z = myMethod(5, 3);
    System.out.println(z);
  }
}
// Outputs 8 (5 + 3)
```

A Method with If...Else

It is common to use `if...else` statements inside methods:

Example

```
public class MyClass {


  // Create a checkAge() method with an integer variable called age
  static void checkAge(int age) {


    // If age is less than 18, print "access denied"
    if (age < 18) {
      System.out.println("Access denied - You are not old enough!");


    // If age is greater than 18, print "access granted"
    } else {
      System.out.println("Access granted - You are old enough!");
    }


  }


  public static void main(String[] args) {
    checkAge(20); // Call the checkAge method and pass along an age of 20
  }
}


// Outputs "Access granted - You are old enough!"
```

Method Overloading

With **method overloading**, multiple methods can have the same name with different parameters:

Example

```
int myMethod(int x)

float myMethod(float x)
```

```
double myMethod(double x, double y)
```

Consider the following example, which have two methods that add numbers of different type:

Example

```
static int plusMethodInt(int x, int y) {
  return x + y;
}

static double plusMethodDouble(double x, double y) {
  return x + y;
}

public static void main(String[] args) {
  int myNum1 = plusMethodInt(8, 5);
  double myNum2 = plusMethodDouble(4.3, 6.26);
  System.out.println("int: " + myNum1);
  System.out.println("double: " + myNum2);
}
```

Instead of defining two methods that should do the same thing, it is better to overload one.

In the example below, we overload the `plusMethod` method to work for both `int` and `double`:

Example

```
static int plusMethod(int x, int y) {
  return x + y;
}

static double plusMethod(double x, double y) {
  return x + y;
}

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

```
  int myNum1 = plusMethod(8, 5);

  double myNum2 = plusMethod(4.3, 6.26);

  System.out.println("int: " + myNum1);

  System.out.println("double: " + myNum2);

}
```

Java OOP

OOP stands for **Object-Oriented Programming**.

Procedural programming is about writing procedures or methods that perform operations on the data, while object-oriented programming is about creating objects that contain both data and methods.

Object-oriented programming has several advantages over procedural programming:

- OOP is faster and easier to execute
- OOP provides a clear structure for the programs
- OOP helps to keep the Java code DRY "Don't Repeat Yourself", and makes the code easier to maintain, modify and debug
- OOP makes it possible to create full reusable applications with less code and shorter development time

Java Classes/Objects

Java is an object-oriented programming language.

Everything in Java is associated with classes and objects, along with its attributes and methods. For example: in real life, a car is an object. The car has **attributes**, such as weight and color, and **methods**, such as drive and brake.

A Class is like an object constructor, or a "blueprint" for creating objects.

Create a Class

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

MyClass.java

Create a class named "`MyClass`" with a variable x:

```
public class MyClass {

  int x = 5;

}
```

Create an Object

In Java, an object is created from a class. We have already created the class named `MyClass`, so now we can use this to create objects.

To create an object of `MyClass`, specify the class name, followed by the object name, and use the keyword `new`:

Example

Create an object called "`myObj`" and print the value of x:

```
public class MyClass {
  int x = 5;

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

Multiple Objects

You can create multiple objects of one class:

Example

Create two objects of `MyClass`:

```
public class MyClass {
  int x = 5;

  public static void main(String[] args) {
    MyClass myObj1 = new MyClass();  // Object 1
    MyClass myObj2 = new MyClass();  // Object 2
    System.out.println(myObj1.x);
    System.out.println(myObj2.x);
  }
```

```
}
```

Using Multiple Classes

You can also create an object of a class and access it in another class. This is often used for better organization of classes (one class has all the attributes and methods, while the other class holds the `main()` method (code to be executed)).

Remember that the name of the java file should match the class name. In this example, we have created two files in the same directory/folder:

- MyClass.java
- OtherClass.java

MyClass.java

```
public class MyClass {

  int x = 5;

}
```

OtherClass.java

```
class OtherClass {

  public static void main(String[] args) {

    MyClass myObj = new MyClass();

    System.out.println(myObj.x);

  }

}
```

When both files have been compiled:

```
C:\Users\Your Name>javac MyClass.java
C:\Users\Your Name>javac OtherClass.java
```

Run the OtherClass.java file:

```
C:\Users\Your Name>java OtherClass
```

And the output will be:

```
5
```

Java Class Attributes

we used the term "variable" for `x` in the example (as shown below). It is actually an **attribute** of the class. Or you could say that class attributes are variables within a class:

Example

Create a class called "`MyClass`" with two attributes: `x` and `y`:

```
public class MyClass {
  int x = 5;
  int y = 3;
}
```

Java Class Methods

Example

Create a method named `myMethod()` in MyClass:

```
public class MyClass {
  static void myMethod() {
    System.out.println("Hello World!");
  }
}
```

`myMethod()` prints a text (the action), when it is **called**. To call a method, write the method's name followed by two parentheses **()** and a semicolon**;**

Example

Inside `main`, call `myMethod()`:

```
public class MyClass {
  static void myMethod() {
    System.out.println("Hello World!");
  }

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

```
// Outputs "Hello World!"
```

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
```

Encapsulation

The meaning of **Encapsulation**, is to make sure that "sensitive" data is hidden from users. To achieve this, you must:

- declare class variables/attributes as `private`
- provide public **get** and **set** methods to access and update the value of a `private` variable

Get and Set

`private` variables can only be accessed within the same class (an outside class has no access to it). However, it is possible to access them if we provide public **get** and **set** methods.

The `get` method returns the variable value, and the `set` method sets the value.

Syntax for both is that they start with either `get` or `set`, followed by the name of the variable, with the first letter in upper case:

Example

```
public class Person {
  private String name; // private = restricted access


  // Getter
  public String getName() {
    return name;
  }


  // Setter
  public void setName(String newName) {
    this.name = newName;
  }
}
```

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

```
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);
  }
}
```

Java Polymorphism

Polymorphism means "many forms", and it occurs when we have many classes that are related to each other by inheritance.

Inheritance lets us inherit attributes and methods from another class. **Polymorphism** uses those methods to perform different tasks. This allows us to perform a single action in different ways.

For example, think of a superclass called `Animal` that has a method called `animalSound()`. Subclasses of Animals could be Pigs, Cats, Dogs, Birds - And they also have their own implementation of an animal sound (the pig oinks, and the cat meows, etc.):

Example

```
class Animal {
  public void animalSound() {
    System.out.println("The animal makes a sound");
  }
}

class Pig extends Animal {
  public void animalSound() {
    System.out.println("The pig says: wee wee");
  }
}

class Dog extends Animal {
  public void animalSound() {
    System.out.println("The dog says: bow wow");
  }
}
```

Java Inner Classes

In Java, it is also possible to nest classes (a class within a class). The purpose of nested classes is to group classes that belong together, which makes your code more readable and maintainable.

To access the inner class, create an object of the outer class, and then create an object of the inner class:

Example

```
class OuterClass {
  int x = 10;

  class InnerClass {
    int y = 5;
```

```
  }
}


public class MyMainClass {
  public static void main(String[] args) {
    OuterClass myOuter = new OuterClass();
    OuterClass.InnerClass myInner = myOuter.new InnerClass();
    System.out.println(myInner.y + myOuter.x);
  }
}


// Outputs 15 (5 + 10)
```

Java Abstract Classes and Methods

Data **abstraction** is the process of hiding certain details and showing only essential information to the user.
Abstraction can be achieved with either **abstract classes** or **interfaces**.

The `abstract` keyword is a non-access modifier, used for classes and methods:

- **Abstract class:** is a restricted class that cannot be used to create objects (to access it, it must be inherited from another class).
- **Abstract method:** can only be used in an abstract class, and it does not have a body. The body is provided by the subclass (inherited from).

An abstract class can have both abstract and regular methods:

```
abstract class Animal {
  public abstract void animalSound();
  public void sleep() {
    System.out.println("Zzz");
  }
}
```

Java Interface

Another way to achieve abstraction in Java, is with interfaces.

An `interface` is a completely "**abstract class**" that is used to group related methods with empty bodies:

Example

```
// interface

interface Animal {

  public void animalSound(); // interface method (does not have a body)

  public void run(); // interface method (does not have a body)

}
```

Java User Input

The `Scanner` class is used to get user input, and it is found in 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 Strings:

Example

```
import java.util.Scanner;  // Import the Scanner class


class MyClass {

  public static void main(String[] args) {

    Scanner myObj = new Scanner(System.in);  // Create a Scanner object

    System.out.println("Enter username");


    String userName = myObj.nextLine();  // Read user input

    System.out.println("Username is: " + userName);  // Output user input

  }

}
```

Display Current Date

To display the current date, import the `java.time.LocalDate` class, and use its `now()` method:

Example

```
import java.time.LocalDate; // import the LocalDate class


public class MyClass {

  public static void main(String[] args) {

    LocalDate myObj = LocalDate.now(); // Create a date object

    System.out.println(myObj); // Display the current date

  }

}
```

Java ArrayList

The `ArrayList` class is a resizable array, which can be found in the `java.util` package.

The difference between a built-in array and an `ArrayList` in Java, is that the size of an array cannot be modified (if you want to add or remove elements to/from an array, you have to create a new one). While elements can be added and removed from an `ArrayList` whenever you want. The syntax is also slightly different:

Example

Create an `ArrayList` object called **cars** that will store strings:

```
import java.util.ArrayList; // import the ArrayList class


ArrayList<String> cars = new ArrayList<String>(); // Create an ArrayList object
```

Java try and catch

The `try` statement allows you to define a block of code to be tested for errors while it is being executed.

The `catch` statement allows you to define a block of code to be executed, if an error occurs in the try block.

The `try` and `catch` keywords come in pairs:

Syntax

```
try {

  //  Block of code to try
```

```
}
catch(Exception e) {
  //  Block of code to handle errors
}
```

Java File Handling

The `File` class from the `java.io` package, allows us to work with files.

To use the `File` class, create an object of the class, and specify the filename or directory name:

Example

```
import java.io.File;  // Import the File class


File myObj = new File("filename.txt"); // Specify the filename
```

Create a File

To create a file in Java, you can use the `createNewFile()` method. This method returns a boolean value: `true` if the file was successfully created, and `false` if the file already exists. Note that the method is enclosed in a `try...catch` block. This is necessary because it throws an `IOException` if an error occurs (if the file cannot be created for some reason):

Example

```
import java.io.File;  // Import the File class
import java.io.IOException;  // Import the IOException class to handle errors


public class CreateFile {
  public static void main(String[] args) {
    try {
      File myObj = new File("filename.txt");
      if (myObj.createNewFile()) {
        System.out.println("File created: " + myObj.getName());
      } else {
        System.out.println("File already exists.");
```

```
      }
    } catch (IOException e) {
      System.out.println("An error occurred.");
      e.printStackTrace();
    }
  }
}
```

The output will be:

```
File created: filename.txt
```

Write To a File

In the following example, we use the `FileWriter` class together with its `write()` method to write some text to the file we created in the example above. Note that when you are done writing to the file, you should close it with the `close()` method:

Example

```
import java.io.FileWriter;   // Import the FileWriter class
import java.io.IOException;  // Import the IOException class to handle errors


public class WriteToFile {
  public static void main(String[] args) {
    try {
      FileWriter myWriter = new FileWriter("filename.txt");
      myWriter.write("Files in Java might be tricky, but it is fun enough!");
      myWriter.close();
      System.out.println("Successfully wrote to the file.");
    } catch (IOException e) {
      System.out.println("An error occurred.");
      e.printStackTrace();
    }
  }
}
```

The output will be:

```
Successfully wrote to the file.
```

Read a File

you learned how to create and write to a file.

In the following example, we use the `Scanner` class to read the contents of the text file we created above:

Example

```
import java.io.File;  // Import the File class
import java.io.FileNotFoundException;  // Import this class to handle errors
import java.util.Scanner; // Import the Scanner class to read text files

public class ReadFile {
  public static void main(String[] args) {
    try {
      File myObj = new File("filename.txt");
      Scanner myReader = new Scanner(myObj);
      while (myReader.hasNextLine()) {
        String data = myReader.nextLine();
        System.out.println(data);
      }
      myReader.close();
    } catch (FileNotFoundException e) {
      System.out.println("An error occurred.");
      e.printStackTrace();
    }
  }
}
```

The output will be:

```
Files in Java might be tricky, but it is fun enough!
```

Get File Information

To get more information about a file, use any of the `File` methods:

Example

```
import java.io.File;  // Import the File class



public class GetFileInfo {
  public static void main(String[] args) {

    File myObj = new File("filename.txt");

    if (myObj.exists()) {

      System.out.println("File name: " + myObj.getName());

      System.out.println("Absolute path: " + myObj.getAbsolutePath());

      System.out.println("Writeable: " + myObj.canWrite());

      System.out.println("Readable " + myObj.canRead());

      System.out.println("File size in bytes " + myObj.length());

    } else {

      System.out.println("The file does not exist.");

    }

  }

}
```

The output will be:

```
File name: filename.txt
Absolute path: C:\Users\MyName\filename.txt
Writeable: true
Readable: true
File size in bytes: 0
```

Delete a File

To delete a file in Java, use the `delete()` method:

Example

```
import java.io.File;  // Import the File class
```

```
public class DeleteFile {
  public static void main(String[] args) {
    File myObj = new File("filename.txt");
    if (myObj.delete()) {
      System.out.println("Deleted the file: " + myObj.getName());
    } else {
      System.out.println("Failed to delete the file.");
    }
  }
}
```

The output will be:

```
Deleted the file: filename.txt
```

Add Two Numbers

Learn how to add two numbers in Java:

Example

```
int x = 5;
int y = 6;
int sum = x + y;
System.out.println(sum); // Print the sum of x + y
```

Add Two Numbers with User Input

Learn how to add two numbers with user input:

Example

```
import java.util.Scanner; // Import the Scanner class


class MyClass {
  public static void main(String[] args) {
    int x, y, sum;
```

```
    Scanner myObj = new Scanner(System.in); // Create a Scanner object

    System.out.println("Type a number:");

    x = myObj.nextInt(); // Read user input


    System.out.println("Type another number:");

    y = myObj.nextInt(); // Read user input


    sum = x + y;  // Calculate the sum of x + y

    System.out.println("Sum is: " + sum); // Print the sum

  }

}
```

Example of Tool