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Introduction to Scripting Languages

All scripting languages are programming languages. The scripting language is basically a language where instructions are written for a run time environment. They do not require the compilation step and are rather interpreted. It brings new functions to applications and glue complex system together. A scripting language is a programming language designed for integrating and communicating with other programming languages.

Advantages of scripting languages:

- **Easy learning:** The user can learn to code in scripting languages quickly, not much knowledge of web technology is required.
- **Fast editing:** It is highly efficient with the limited number of data structures and variables to use.
- **Interactivity:** It helps in adding visualization interfaces and combinations in web pages. Modern web pages demand the use of scripting languages. To create enhanced web pages, fascinated visual description which includes background and foreground colors and so on.
- **Functionality:** There are different libraries which are part of different scripting languages. They help in creating new applications in web browsers and are different from normal programming languages.

There are two types of scripting language

Client-side scripting is performed to generate a code that can run on the client end (browser) without needing the server side processing. Basically, these types of scripts are placed inside an HTML document. The client-side scripting can be used to examine the user's form for the errors before submitting it and for changing the content according to the user input. As I mentioned before, the web requires three elements for its functioning which are, client, database and server.

Server-side scripting is a technique of programming for producing the code which can run software on the server side, in simple words any scripting or programming that can run on the web server is known as server-side scripting. The operations like customization of a website, dynamic change in the website content, response generation to the user's queries, accessing the database, and so on are performed at the server end.

BASIS FOR COMPARISON	SERVER-SIDE SCRIPTING	CLIENT-SIDE SCRIPTING
Basic	Works in the back end which could not be visible at the client end.	Works at the front end and script are visible among the users.
Processing	Requires server interaction.	Does not need interaction with the server.
Languages involved	PHP, ASP.net, Ruby on Rails, ColdFusion, Python, etcetera.	HTML, CSS, JavaScript, etc.
Affect	Could effectively customize the web pages and provide dynamic websites.	Can reduce the load to the server.
Security	Relatively secure.	Insecure

JavaScript Introduction

JavaScript is a cross-platform, object-oriented scripting language used to make webpages interactive (e.g., having complex animations, clickable buttons, popup menus, etc.). JavaScript contains a standard library of objects, such as Array, Date, and Math, and a core set of language elements such as operators, control structures, and statements.

JavaScript Can Change HTML Content

One of many JavaScript HTML methods is `getElementById()`.

The example below "finds" an HTML element (with id="demo"), and changes the element content (innerHTML) to "Hello JavaScript":

```
<html>
        <body>

                <h2>What Can JavaScript Do? </h2>

                <p id="demo">JavaScript can change HTML content. </p>

                <button type="button"
                onclick='document.getElementById("demo").innerHTML = "Hello
                JavaScript!"'>Click Me! </button>

        </body>
</html>
```

JavaScript Can Change HTML Styles (CSS)

Changing the style of an HTML element, is a variant of changing an HTML attribute:

```
<p id="demo">JavaScript can change the style of an HTML element.</p>

<button type="button"
onclick="document.getElementById('demo').style.fontSize='35px'">Click
Me!</button>
```

JavaScript Can Hide HTML Elements

Hiding HTML elements can be done by changing the `display` style:

```
<p id="demo">JavaScript can hide HTML elements.</p>

<button type="button"
onclick="document.getElementById('demo').style.display='none'">Click
Me!</button>
```

JavaScript Syntax

JavaScript syntax is the set of rules, how JavaScript programs are constructed:

```
// How to create variables:
var x;
let y;

// How to use variables:
x = 5;
y = 6;
let z = x + y;
```

JavaScript Values

The JavaScript syntax defines two types of values:

- Fixed values
- Variable values

Fixed values are called **Literals**.

Variable values are called **Variables**.

JavaScript Literals

The two most important syntax rules for fixed values are:

1. **Numbers** are written with or without decimals:

```
10.50

1001
```

2. **Strings** are text, written within double or single quotes:

```
"John Doe"

'John Doe'
```

JavaScript Where To

The <script> Tag

In HTML, JavaScript code is inserted between `<script>` and `</script>` tags.

```
<script>
document.getElementById("demo").innerHTML = "My First JavaScript";
</script>
```

JavaScript in <head> or <body>

You can place any number of scripts in an HTML document.

Scripts can be placed in the `<body>`, or in the `<head>` section of an HTML page, or in both.

```
<html>
        <head>
                <script>
                function myFunction() {
                  document.getElementById("demo").innerHTML = "Paragraph
                changed.";
                }
                </script>
        </head>
        <body>

                <h2>JavaScript in Head</h2>

                <p id="demo">A Paragraph.</p>

                <button type="button" onclick="myFunction()">Try it</button>

        </body>
</html>
```

Placing scripts at the bottom of the <body> element improves the display speed, because script interpretation slows down the display.

External JavaScript

Scripts can also be placed in external files:

External file: myScript.js

```
function myFunction() {
  document.getElementById("demo").innerHTML = "Paragraph changed.";
}
```

External scripts are practical when the same code is used in many different web pages.

JavaScript files have the file extension **.js**.

To use an external script, put the name of the script file in the `src` (source) attribute of a `<script>` tag:

```
<html>
      <body>

            <h2>External JavaScript</h2>

            <p id="demo">A Paragraph.</p>

            <button type="button" onclick="myFunction()">Try it</button>

            <p>(myFunction is stored in an external file called "myScript.js")</p>

            <script src="myScript.js"></script>

      </body>
</html>
```

JavaScript Functions and Events

A JavaScript `function` is a block of JavaScript code, that can be executed when "called" for.

For example, a function can be called when an **event** occurs, like when the user clicks a button.

You will learn much more about functions and events in later chapters.

JavaScript Variables

Variables

Variables are containers for storing data (values).

In this example, `x`, `y`, and `z`, are variables, declared with the `var` keyword:

There are 3 ways to declare a JavaScript variable:

- Using `var`
- Using `let`
- Using `const`

You declare a JavaScript variable with the `var` keyword:

```
<body>

        <h2>JavaScript Variables</h2>

        <p>In this example, x, y, and z are variables.</p>

        <p id="demo"></p>

        <script>
        var x = 5;
        var y = 6;
        var z = x + y;
        document.getElementById("demo").innerHTML =
        "The value of z is: " + z;
        </script>

</body>
```

Much Like Algebra

In this example, `price1`, `price2`, and `total`, are variables:

Example

```
var price1 = 5;
var price2 = 6;
var total = price1 + price2;
```

JavaScript Identifiers

All JavaScript **variables** must be **identified** with **unique names**.

These unique names are called **identifiers**.

Identifiers can be short names (like x and y) or more descriptive names (age, sum, totalVolume).

The general rules for constructing names for variables (unique identifiers) are:

- Names can contain letters, digits, underscores, and dollar signs.
- Names must begin with a letter
- Names can also begin with $ and _
- Names are case sensitive (y and Y are different variables)
- Reserved words (like JavaScript keywords) cannot be used as names

JavaScript identifiers are case-sensitive.

JavaScript Reserved Words

In JavaScript you cannot use these reserved words as variables, labels, or function names:

abstract	arguments	await*	boolean
break	byte	case	catch
char	class*	const	continue
debugger	default	delete	do
double	else	enum*	eval
export*	extends*	false	final
finally	float	for	function
goto	if	implements	import*
in	instanceof	int	interface
let*	long	native	new
null	package	private	protected
public	return	short	static
super*	switch	synchronized	this
throw	throws	transient	true
try	typeof	var	void
volatile	while	with	yield

JavaScript Data Types

JavaScript variables can hold numbers like 100 and text values like "John Doe".

In programming, text values are called text strings.

JavaScript can handle many types of data, but for now, just think of numbers and strings.

Strings are written inside double or single quotes. Numbers are written without quotes.

If you put a number in quotes, it will be treated as a text string.

Example

```
var pi = 3.14;
var person = "John Doe";
var answer = 'Yes I am!';
```

Declaring (Creating) JavaScript Variables

Creating a variable in JavaScript is called "declaring" a variable.

You declare a JavaScript variable with the `var` keyword:

```
var carName;
```

After the declaration, the variable has no value (technically it has the value of `undefined`).

To **assign** a value to the variable, use the equal sign:

```
carName = "Volvo";
```

You can also assign a value to the variable when you declare it:

```
var carName = "Volvo";
```

One Statement, Many Variables

You can declare many variables in one statement.

Start the statement with `var` and separate the variables by **comma**:

```
var person = "John Doe", carName = "Volvo", price = 200;
```

Value = undefined

In computer programs, variables are often declared without a value. The value can be something that has to be calculated, or something that will be provided later, like user input.

A variable declared without a value will have the value `undefined`.

The variable carName will have the value `undefined` after the execution of this statement:

Example

```
var carName;
```

Re-Declaring JavaScript Variables

If you re-declare a JavaScript variable, it will not lose its value.

The variable `carName` will still have the value "Volvo" after the execution of these statements:

Example

```
var carName = "Volvo";
var carName;
```

JavaScript Let

The `let` keyword was introduced in ES6 (2015).

Variables defined with `let` cannot be Redeclared.

Variables defined with `let` must be Declared before use.

Variables defined with `let` have Block Scope.

Cannot be Redeclared

Variables defined with `let` cannot be **redeclared**.

You cannot accidentally redeclare a variable.

With `let` you can not do this:

Example

```
let x = "John Doe";

let x = 0;

// SyntaxError: 'x' has already been declared
```

With `var` you can:

Example

```
var x = "John Doe";

var x = 0;
```

Block Scope

Before ES6 (2015), JavaScript had only **Global Scope** and **Function Scope**.

ES6 introduced two important new JavaScript keywords: `let` and `const`.

These two keywords provide **Block Scope** in JavaScript.

Variables declared inside a { } block cannot be accessed from outside the block:

Example

```
{
  let x = 2;
}
// x can NOT be used here
```

Variables declared with the `var` keyword can NOT have block scope.

Variables declared inside a { } block can be accessed from outside the block.

Example

```
{
  var x = 2;
}
// x CAN be used here
```

Redeclaring Variables

Redeclaring a variable using the `let` keyword can solve this problem.

Redeclaring a variable inside a block will not redeclare the variable outside the block:

Example

```
let x = 10;
// Here x is 10

{
let x = 2;
// Here x is 2
}

// Here x is 10
```

Let Hoisting

Variables defined with `var` are **hoisted** to the top and can be initialized at any time.

Meaning: You can use the variable before it is declared:

Example

This is OK:

```
carName = "Volvo";
var carName;
```

Variables defined with `let` are also hoisted to the top of the block, but not initialized.

Meaning: Using a `let` variable before it is declared will result in a `Reference Error`:

Example

```
carName = "Saab";
let carName = "Volvo";
```

JavaScript Output

JavaScript Display Possibilities

JavaScript can "display" data in different ways:

- Writing into an HTML element, using `innerHTML`.
- Writing into the HTML output using `document.write()`.
- Writing into an alert box, using `window.alert()`.

Using innerHTML

To access an HTML element, JavaScript can use the `document.getElementById(id)` method.

The `id` attribute defines the HTML element. The `innerHTML` property defines the HTML content:

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Web Page</h1>
<p>My First Paragraph</p>

<p id="demo"></p>

<script>
document.getElementById("demo").innerHTML = 5 + 6;
</script>

</body>
</html>
```

Using document.write()

For testing purposes, it is convenient to use `document.write()`:

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Web Page</h1>
<p>My first paragraph.</p>

<script>
document.write(5 + 6);
</script>

</body>
</html>
```

Using document.write() after an HTML document is loaded, will **delete all existing HTML**:

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Web Page</h1>
<p>My first paragraph.</p>

<button type="button" onclick="document.write(5 + 6)">Try it</button>

</body>
</html>
```

The document.write() method should only be used for testing.

Using window.alert()

You can use an alert box to display data:

Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Web Page</h1>
<p>My first paragraph.</p>

<script>
window.alert(5 + 6);
</script>

</body>
</html>
```

You can skip the `window` keyword.

In JavaScript, the window object is the global scope object, that means that variables, properties, and methods by default belong to the window object. This also means that specifying the `window` keyword is optional:

JavaScript Print

JavaScript does not have any print object or print methods.

You cannot access output devices from JavaScript.

The only exception is that you can call the `window.print()` method in the browser to print the content of the current window.

Example

```
<!DOCTYPE html>
<html>
<body>

<button onclick="window.print()">Print this page</button>

</body>
</html>
```

JavaScript Statements

JavaScript Programs

A **computer program** is a list of "instructions" to be "executed" by a computer.

In a programming language, these programming instructions are called **statements**.

A **JavaScript program** is a list of programming **statements**.

In HTML, JavaScript programs are executed by the web browser.

JavaScript Statements

JavaScript statements are composed of:

Values, Operators, Expressions, Keywords, and Comments.

This statement tells the browser to write "Hello Dolly." inside an HTML element with id="demo":

Example

```
document.getElementById("demo").innerHTML = "Hello Dolly.";
```

Most JavaScript programs contain many JavaScript statements.

The statements are executed, one by one, in the same order as they are written.

JavaScript programs (and JavaScript statements) are often called JavaScript code.

Semicolons ;

Semicolons separate JavaScript statements.

Add a semicolon at the end of each executable statement:

JavaScript White Space

JavaScript ignores multiple spaces. You can add white space to your script to make it more readable.

The following lines are equivalent:

```
let person = "Hege";
let person="Hege";
```

A good practice is to put spaces around operators (= + - * /):

```
let x = y + z;
```

JavaScript Line Length and Line Breaks

For best readability, programmers often like to avoid code lines longer than 80 characters.

If a JavaScript statement does not fit on one line, the best place to break it is after an operator:

Example

```
document.getElementById("demo").innerHTML =
"Hello Dolly!";
```

JavaScript Code Blocks

JavaScript statements can be grouped together in code blocks, inside curly brackets {...}.

The purpose of code blocks is to define statements to be executed together.

One place you will find statements grouped together in blocks, is in JavaScript functions:

Example

```
function myFunction() {
  document.getElementById("demo1").innerHTML = "Hello Dolly!";
  document.getElementById("demo2").innerHTML = "How are you?";
}
```

In this tutorial we use 2 spaces of indentation for code blocks.
You will learn more about functions later in this tutorial.

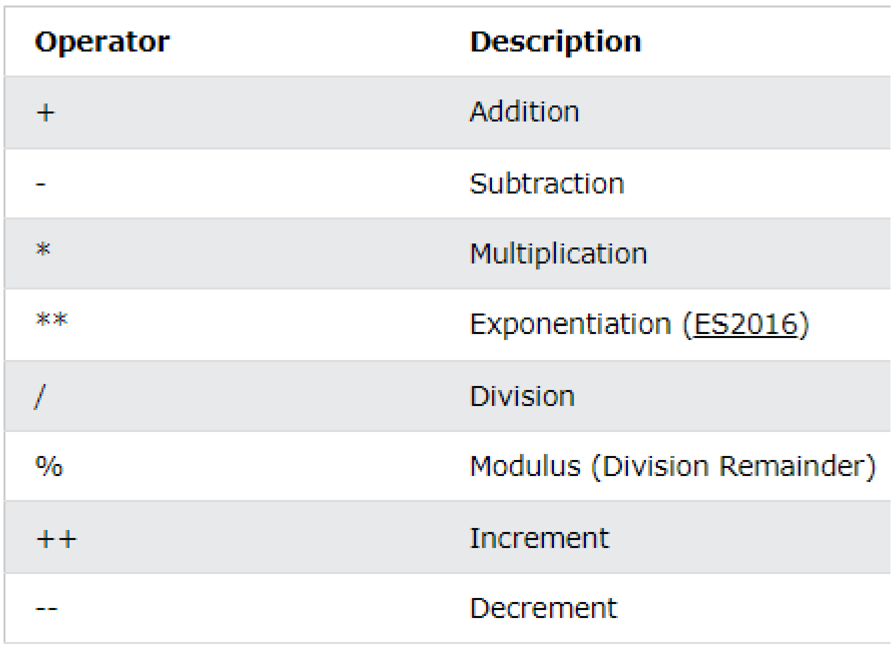
Comments

Single line comments start with `//`.

Multi-line comments start with `/*` and end with `*/`.

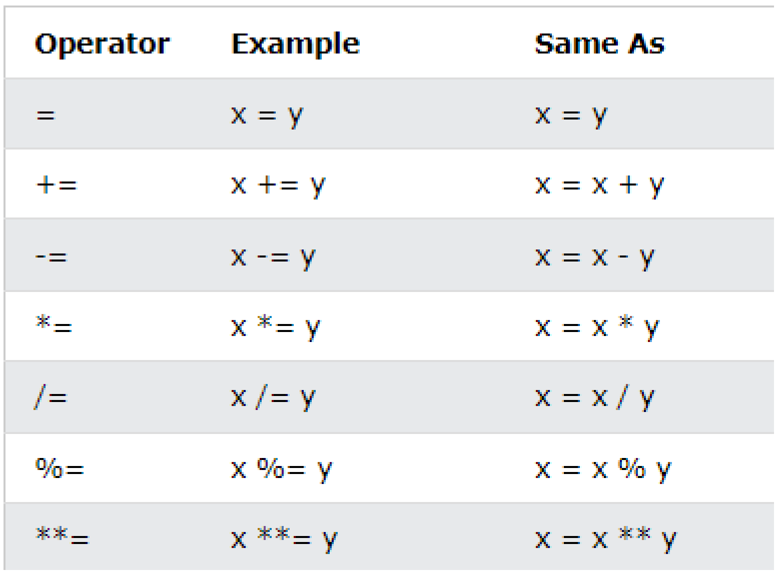
JavaScript Operators

JavaScript Arithmetic Operators



Operator	Description
+	Addition
-	Subtraction
*	Multiplication
**	Exponentiation (ES2016)
/	Division
%	Modulus (Division Remainder)
++	Increment
--	Decrement

JavaScript Assignment Operators



Operator	Example	Same As
=	x = y	x = y
+=	x += y	x = x + y
-=	x -= y	x = x - y
*=	x *= y	x = x * y
/=	x /= y	x = x / y
%=	x %= y	x = x % y
**=	x **= y	x = x ** y

JavaScript Comparison Operators

Operator	Description
==	equal to
===	equal value and equal type
!=	not equal
!==	not equal value or not equal type
>	greater than
<	less than
>=	greater than or equal to
<=	less than or equal to
?	ternary operator

JavaScript Logical Operators

Operator	Description
&&	logical and
||	logical or
!	logical not

Operator Precedence

Operator precedence describes the order in which operations are performed in an arithmetic expression.

```
let x = 100 + 50 * 3;
```

Is the result of example above the same as 150 * 3, or is it the same as 100 + 150?

Is the addition or the multiplication done first?

As in traditional school mathematics, the multiplication is done first.

Multiplication (*) and division (/) have higher **precedence** than addition (+) and subtraction (-).

And (as in school mathematics) the precedence can be changed by using parentheses:

```
let x = (100 + 50) * 3;
```

When using parentheses, the operations inside the parentheses are computed first.

When many operations have the same precedence (like addition and subtraction), they are computed from left to right:

```
let x = 100 + 50 - 3;
```

JavaScript Operator Precedence Values

Value	Operator	Description	Example
21	( )	Expression grouping	(3 + 4)
20	.	Member	person.name
20	[]	Member	person["name"]
20	()	Function call	myFunction()
20	new	Create	new Date()
18	++	Postfix Increment	i++
18	--	Postfix Decrement	i--
17	++	Prefix Increment	++i
17	--	Prefix Decrement	--i
17	!	Logical not	!(x==y)
17	typeof	Type	typeof x

16	**	Exponentiation (ES2016)	10 ** 2
15	*	Multiplication	10 * 5
15	/	Division	10 / 5
15	%	Division Remainder	10 % 5
14	+	Addition	10 + 5
14	-	Subtraction	10 - 5
13	<<	Shift left	x << 2
13	>>	Shift right	x >> 2
13	>>>	Shift right (unsigned)	x >>> 2
12	<	Less than	x < y
12	<=	Less than or equal	x <= y
12	>	Greater than	x > y
12	>=	Greater than or equal	x >= y
12	in	Property in Object	"PI" in Math
12	instanceof	Instance of Object	instanceof Array
11	==	Equal	x == y
11	===	Strict equal	x === y
11	!=	Unequal	x != y
11	!==	Strict unequal	x !== y
10	&	Bitwise AND	x & y
9	^	Bitwise XOR	x ^ y

8	|	Bitwise OR	x | y
7	&&	Logical AND	x && y
6	||	Logical OR	x || y
5	??	Nullish Coalescing	x ?? y
4	? :	Condition	? "Yes" : "No"
3	+=	Assignment	x += y
3	/=	Assignment	x /= y
3	-=	Assignment	x -= y
3	*=	Assignment	x *= y
3	%=	Assignment	x %= y
3	<<=	Assignment	x <<= y
3	>>=	Assignment	x >>= y
3	>>>=	Assignment	x >>>= y
3	&=	Assignment	x &= y
3	^=	Assignment	x ^= y
3	|=	Assignment	x |= y
2	yield	Pause Function	yield x
1	,	Comma	5 , 6

JavaScript Data Types

JavaScript variables can hold different data types: numbers, strings, objects and more:

```
let length = 16;                                // Number
let lastName = "Johnson";                       // String
let x = {firstName:"John", lastName:"Doe"};     // Object
```

The Concept of Data Types

In programming, data types is an important concept.

To be able to operate on variables, it is important to know something about the type.

Without data types, a computer cannot safely solve this:

```
let x = 16 + "Volvo";
```

Result: `16Volvo`

Does it make any sense to add "Volvo" to sixteen? Will it produce an error or will it produce a result?

JavaScript will treat the example above as:

```
let x = "16" + "Volvo";
```

When adding a number and a string, JavaScript will treat the number as a string.

JavaScript evaluates expressions from left to right. Different sequences can produce different results:

```
let x = 16 + 4 + "Volvo";
```

Result: `20Volvo`

```
let x = "Volvo" + 16 + 4;
```

Result: `Volvo164`

JavaScript Types are Dynamic

JavaScript has dynamic types. This means that the same variable can be used to hold different data types:

Example

```
let x;              // Now x is undefined
x = 5;              // Now x is a Number
x = "John";         // Now x is a String
```

JavaScript Strings

A string (or a text string) is a series of characters like "John Doe".

Strings are written with quotes. You can use single or double quotes:

You can use quotes inside a string, as long as they don't match the quotes surrounding the string:

Example

```
let answer1 = "It's alright";          // Single quote inside double quotes
let answer2 = "He is called 'Johnny'"; // Single quotes inside double quotes
let answer3 = 'He is called "Johnny"'; // Double quotes inside single quotes
```

JavaScript Numbers

JavaScript has only one type of numbers.

Numbers can be written with, or without decimals:

Example

```
let x1 = 34.00;     // Written with decimals
let x2 = 34;        // Written without decimals
```

JavaScript Booleans

Booleans can only have two values: `true` or `false`.

Example

```
let x = 5;
let y = 5;
let z = 6;
(x == y)       // Returns true
(x == z)       // Returns false
```

JavaScript Arrays

JavaScript arrays are written with square brackets.

Array items are separated by commas.

The following code declares (creates) an array called `cars`, containing three items (car names):

Example

```
const cars = ["Saab", "Volvo", "BMW"];
```

Array indexes are zero-based, which means the first item is [0], second is [1], and so on.

JavaScript Objects

JavaScript objects are written with curly braces `{}`.

Object properties are written as name:value pairs, separated by commas.

Example

```
const person = {firstName:"John", lastName:"Doe", age:50, eyeColor:"blue"};
```

The typeof Operator

You can use the JavaScript `typeof` operator to find the type of a JavaScript variable.

The `typeof` operator returns the type of a variable or an expression:

Example

```
typeof ""              // Returns "string"
typeof "John"          // Returns "string"
typeof "John Doe"      // Returns "string"

typeof 0               // Returns "number"
typeof 314             // Returns "number"
typeof 3.14            // Returns "number"
typeof (3)             // Returns "number"
typeof (3 + 4)         // Returns "number"
```

Undefined

In JavaScript, a variable without a value, has the value `undefined`. The type is also `undefined`.

Example

```
let car;     // Value is undefined, type is undefined

car = undefined;     // Value is undefined, type is undefined
```

Empty Values

An empty value has nothing to do with `undefined`.

An empty string has both a legal value and a type.

Example

```
let car = "";     // The value is "", the typeof is "string"
```

JavaScript Functions

A JavaScript function is a block of code designed to perform a particular task.

A JavaScript function is executed when "something" invokes it (calls it).

Example

```
function myFunction(p1, p2) {
  return p1 * p2;   // The function returns the product of p1 and p2
}
```

JavaScript Function Syntax

A JavaScript function is defined with the `function` keyword, followed by a **name**, followed by parentheses **()**.

Function names can contain letters, digits, underscores, and dollar signs (same rules as variables).

The parentheses may include parameter names separated by commas:
(parameter1, parameter2, ...)

The code to be executed, by the function, is placed inside curly brackets: **{}**

```
function name(parameter1, parameter2, parameter3) {
  // code to be executed
}
```

Function **parameters** are listed inside the parentheses () in the function definition.

Function **arguments** are the **values** received by the function when it is invoked.

Inside the function, the arguments (the parameters) behave as local variables.

A Function is much the same as a Procedure or a Subroutine, in other programming languages.

Function Invocation

The code inside the function will execute when "something" **invokes** (calls) the function:

- When an event occurs (when a user clicks a button)
- When it is invoked (called) from JavaScript code
- Automatically (self invoked)

You will learn a lot more about function invocation later in this tutorial.

Function Return

When JavaScript reaches a `return` statement, the function will stop executing.

If the function was invoked from a statement, JavaScript will "return" to execute the code after the invoking statement.

Functions often compute a **return value**. The return value is "returned" back to the "caller":

Example

Calculate the product of two numbers, and return the result:

```
let x = myFunction(4, 3);   // Function is called, return value will end up
in x

function myFunction(a, b) {
  return a * b;             // Function returns the product of a and b
}
```

Why Functions?

You can reuse code: Define the code once, and use it many times.

You can use the same code many times with different arguments, to produce different results.

The () Operator Invokes the Function

Using the example above, `toCelsius` refers to the function object, and `toCelsius()` refers to the function result.

Accessing a function without () will return the function object instead of the function result.

Example

```
function toCelsius(fahrenheit) {
  return (5/9) * (fahrenheit-32);
}
document.getElementById("demo").innerHTML = toCelsius;
```

Local Variables

Variables declared within a JavaScript function, become **LOCAL** to the function.

Local variables can only be accessed from within the function.

Example

```
// code here can NOT use carName

function myFunction() {
  let carName = "Volvo";
  // code here CAN use carName
}

// code here can NOT use carName
```

Since local variables are only recognized inside their functions, variables with the same name can be used in different functions.

Local variables are created when a function starts, and deleted when the function is completed.

JavaScript Objects

Real Life Objects, Properties, and Methods

In real life, a car is an **object**.

A car has **properties** like weight and color, and **methods** like start and stop:

Object	Properties	Methods

	car.name = Fiat
	car.model = 500
	car.weight = 850kg
	car.color = white
		car.start()
		car.drive()
		car.brake()
		car.stop()

All cars have the same **properties**, but the property **values** differ from car to car.

All cars have the same **methods**, but the methods are performed **at different times**.

JavaScript Objects

You have already learned that JavaScript variables are containers for data values.

Objects are variables too. But objects can contain many values.

This code assigns **many values** (Fiat, 500, white) to a **variable** named car:

```
const car = {type:"Fiat", model:"500", color:"white"};
```

The values are written as **name:value** pairs (name and value separated by a colon).

It is a common practice to declare objects with the `const` keyword.

Object Definition

You define (and create) a JavaScript object with an object literal:

Example

```
const person = {firstName:"John", lastName:"Doe", age:50, eyeColor:"blue"};
```

Spaces and line breaks are not important. An object definition can span multiple lines:

Example

```
const person = {
  firstName: "John",
  lastName: "Doe",
  age: 50,
  eyeColor: "blue"
};
```

Object Properties

The **name:values** pairs in JavaScript objects are called **properties**:

Property	**Property Value**
firstName	John
lastName	Doe
age	50
eyeColor	blue

Accessing Object Properties

You can access object properties in two ways:

objectName.propertyName or *objectName["propertyName"]*

JavaScript objects are containers for **named values** called properties.

Object Methods

Objects can also have **methods**.

Methods are **actions** that can be performed on objects.

Methods are stored in properties as **function definitions**.

Property	Property Value
firstName	John
lastName	Doe
age	50
eyeColor	blue
fullName	function() {return this.firstName + " " + this.lastName;}

A method is a function stored as a property.

Example

```
const person = {
  firstName: "John",
  lastName : "Doe",
  id       : 5566,
  fullName : function() {
    return this.firstName + " " + this.lastName;
  }
};
```

The **this** Keyword

In a function definition, `this` refers to the "owner" of the function.

In the example above, `this` is the **person object** that "owns" the `fullName` function.

In other words, `this.firstName` means the `firstName` property of **this object**.

Accessing Object Methods

You access an object method with the following syntax:

```
objectName.methodName()
```

```
name = person.fullName();
```

If you access a method **without** the () parentheses, it will return the **function definition**:

Conditional Statements

Conditional statements are used to perform different actions based on different conditions.

Very often when you write code, you want to perform different actions for different decisions.

You can use conditional statements in your code to do this.

In JavaScript we have 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 JavaScript 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 a JavaScript error.

Example

Make a "Good day" greeting if the hour is less than 18:00:

```
if (hour < 18) {
  greeting = "Good day";
}
```

The else Statement

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

```
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

If the hour is less than 18, create a "Good day" greeting, otherwise "Good evening":

```
if (hour < 18) {
  greeting = "Good day";
} else {
  greeting = "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

If time is less than 10:00, create a "Good morning" greeting, if not, but time is less than 20:00, create a "Good day" greeting, otherwise a "Good evening":

```
if (time < 10) {
  greeting = "Good morning";
} else if (time < 20) {
  greeting = "Good day";
} else {
  greeting = "Good evening";
}
```

The JavaScript Switch Statement

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.
- If there is no match, the default code block is executed.

Example

The `getDay()` method returns the weekday as a number between 0 and 6.

(Sunday=0, Monday=1, Tuesday=2 ..)

This example uses the weekday number to calculate the weekday name:

```
switch (3) {
  case 0:
    day = "Sunday";
    break;
  case 1:
    day = "Monday";
    break;
  case 2:
     day = "Tuesday";
    break;
  case 3:
    day = "Wednesday";
    break;
  case 4:
    day = "Thursday";
    break;
  case 5:
    day = "Friday";
    break;
  case 6:
    day = "Saturday";
}
```

The break Keyword

When JavaScript reaches a `break` keyword, it breaks out of the switch block.

This will stop the execution inside the switch block.

It is not necessary to break the last case in a switch block. The block breaks (ends) there anyway.

Note: If you omit the break statement, the next case will be executed even if the evaluation does not match the case.

The default Keyword

The `default` keyword specifies the code to run if there is no case match:

Example

The `getDay()` method returns the weekday as a number between 0 and 6.

If today is neither Saturday (6) nor Sunday (0), write a default message:

```
switch (3) {
  case 6:
    text = "Today is Saturday";
    break;
  case 0:
    text = "Today is Sunday";
    break;
  default:
    text = "Looking forward to the Weekend";
}
```

Common Code Blocks

Sometimes you will want different switch cases to use the same code.

In this example case 4 and 5 share the same code block, and 0 and 6 share another code block:

Example

```
switch (new Date().getDay()) {
  case 4:
  case 5:
    text = "Soon it is Weekend";
    break;
  case 0:
  case 6:
    text = "It is Weekend";
    break;
  default:
    text = "Looking forward to the Weekend";
}
```

JavaScript Popup Boxes

JavaScript has three kind of popup boxes: Alert box, Confirm box, and Prompt box.

Alert Box

An alert box is often used if you want to make sure information comes through to the user.

When an alert box pops up, the user will have to click "OK" to proceed.

Syntax

```
window.alert("sometext");
```

The `window.alert()` method can be written without the window prefix.

Example

```
alert("I am an alert box!");
```

Confirm Box

A confirm box is often used if you want the user to verify or accept something.

When a confirm box pops up, the user will have to click either "OK" or "Cancel" to proceed.

If the user clicks "OK", the box returns **true**. If the user clicks "Cancel", the box returns **false**.

Syntax

```
window.confirm("sometext");
```

The `window.confirm()` method can be written without the window prefix.

Example

```
if (confirm("Press a button!")) {
  txt = "You pressed OK!";
} else {
  txt = "You pressed Cancel!";
}
```

Prompt Box

A prompt box is often used if you want the user to input a value before entering a page.

When a prompt box pops up, the user will have to click either "OK" or "Cancel" to proceed after entering an input value.

If the user clicks "OK" the box returns the input value. If the user clicks "Cancel" the box returns null.

Syntax

```
window.prompt("sometext","defaultText");
```

The `window.prompt()` method can be written without the window prefix.

Example

```
let person = prompt("Please enter your name", "Harry Potter");
let text;
if (person == null || person == "") {
  text = "User cancelled the prompt.";
} else {
  text = "Hello " + person + "! How are you today?";
}
```

JavaScript Events

HTML events are **"things"** that happen to HTML elements.

When JavaScript is used in HTML pages, JavaScript can **"react"** on these events.

HTML Events

An HTML event can be something the browser does, or something a user does.

Here are some examples of HTML events:

- An HTML web page has finished loading
- An HTML input field was changed
- An HTML button was clicked

Often, when events happen, you may want to do something.

JavaScript lets you execute code when events are detected.

HTML allows event handler attributes, **with JavaScript code**, to be added to HTML elements.

With single quotes:

```
<element event='some JavaScript'>
```

With double quotes:

```
<element event="some JavaScript">
```

In the following example, an `onclick` attribute (with code), is added to a `<button>` element:

Example

```
<button onclick="document.getElementById('demo').innerHTML = Date()">The time
is?</button>
```

In the example above, the JavaScript code changes the content of the element with id="demo".

In the example above, the JavaScript code changes the content of the element with id="demo".

In the next example, the code changes the content of its own element (using `this.innerHTML`):

Example

```
<button onclick="this.innerHTML = Date()">The time is?</button>
```

JavaScript code is often several lines long. It is more common to see event attributes calling functions:

Example

```
<button onclick="displayDate()">The time is?</button>
```

Common HTML Events

Event	Description
onchange	An HTML element has been changed
onclick	The user clicks an HTML element
onmouseover	The user moves the mouse over an HTML element
onmouseout	The user moves the mouse away from an HTML element
onkeydown	The user pushes a keyboard key
onkeyup	The user pushes a keyboard key
onload	The browser has finished loading the page

onchange

```
 <select id="mySelect" onchange="myFunction()">
          <option value="Audi">Audi</option>
          <option value="BMW">BMW</option>
          <option value="Mercedes">Mercedes</option>
          <option value="Volvo">Volvo</option>
</select>
<p id="demo"></p>
<script>
        function myFunction() {
          var x = document.getElementById("mySelect").value;
          document.getElementById("demo").innerHTML = "You selected: " + x;
        }
</script>
```

onclick

```
<button onclick="myFunction()">Click me</button>
<p id="demo"></p>
<script>
        function myFunction() {
          document.getElementById("demo").innerHTML = "Hello World";
        }
</script>
```

onmouseover / onmouseout

```
<img onmouseover="bigImg(this)" onmouseout="normalImg(this)" border="0"
src="smiley.gif" alt="Smiley" width="32" height="32">
<script>
        function bigImg(x) {
          x.style.height = "64px";
          x.style.width = "64px";
        }
        function normalImg(x) {
          x.style.height = "32px";
          x.style.width = "32px";
        }
</script>
```

onkeydown / onkeyup

```
<input type="text" id="demo" onkeydown="keydownFunction()"
onkeyup="keyupFunction()">
<script>
        function keydownFunction() {
          document.getElementById("demo").style.backgroundColor = "red";
        }
        function keyupFunction() {
          document.getElementById("demo").style.backgroundColor = "green";
        }
</script>
```

onkeyup

```
<input type="text" id="fname" onkeyup="myFunction()">
<script>
        function myFunction() {
          var x = document.getElementById("fname");
          x.value = x.value.toUpperCase();
        }
</script>
```

onload

```
<script>
        function myFunction() {
          alert("Page is loaded");
        }
</script>
```

JavaScript Form Validation

HTML form validation can be done by JavaScript.

If a form field (fname) is empty, this function alerts a message, and returns false, to prevent the form from being submitted:

JavaScript Example

```
function validateForm() {
  let x = document.forms["myForm"]["fname"].value;
  if (x == "") {
    alert("Name must be filled out");
    return false;
  }
}
```

The function can be called when the form is submitted:

HTML Form Example

```
<form name="myForm" action="/action_page.php" onsubmit="return
validateForm()" method="post">
Name: <input type="text" name="fname">
<input type="submit" value="Submit">
</form>
```

Automatic HTML Form Validation

HTML form validation can be performed automatically by the browser:

If a form field (fname) is empty, the `required` attribute prevents this form from being submitted:

HTML Form Example

```
<form action="/action_page.php" method="post">
  <input type="text" name="fname" required>
  <input type="submit" value="Submit">
</form>
```

JavaScript Can Validate Numeric Input

```
<p>Please input a number between 1 and 10:</p>
<input id="numb">
<button type="button" onclick="myFunction()">Submit</button>
<p id="demo"></p>
<script>
        function myFunction() {
          let x = document.getElementById("numb").value;
          let text;
          if (x>=1 && x<=10) {
            text = "Input OK";
          } else {
            text = "Input not valid";
          }
          document.getElementById("demo").innerHTML = text;
        }
</script>
```

Data Validation

Data validation is the process of ensuring that user input is clean, correct, and useful.

Validation can be defined by many different methods, and deployed in many different ways.

Server side validation is performed by a web server, after input has been sent to the server.

Client side validation is performed by a web browser, before input is sent to a web server.

AngularJS

AngularJS History

AngularJS version 1.0 was released in 2012.

Miško Hevery, a Google employee, started to work with AngularJS in 2009.

The idea turned out very well, and the project is now officially supported by Google.

AngularJS Introduction

AngularJS is perfect for **Single Page Applications** (SPAs).

AngularJS is a **JavaScript framework**. It can be added to an HTML page with a <script> tag.

AngularJS extends HTML attributes with **Directives**, and binds data to HTML with **Expressions**.

AngularJS is a JavaScript Framework

AngularJS is a JavaScript framework written in JavaScript.

AngularJS is distributed as a JavaScript file, and can be added to a web page with a script tag:

```
<script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.6.9/angular.mi
n.js"></script>
```

AngularJS Extends HTML

AngularJS extends HTML with **ng-directives**.

The **ng-app** directive defines an AngularJS application.

The **ng-model** directive binds the value of HTML controls (input, select, textarea) to application data.

The **ng-bind** directive binds application data to the HTML view.

AngularJS Example

```
<!DOCTYPE html>
<html lang="en-US">
<script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.6.9/angular.mi
n.js"></script>
<body>

<div ng-app="">
  <p>Name : <input type="text" ng-model="name"></p>
  <h1>Hello {{name}}</h1> (ng-bind="name")
</div>

</body>
</html>
```

Example explained:

AngularJS starts automatically when the web page has loaded.

The **ng-app** directive tells AngularJS that the <div> element is the "owner" of an AngularJS **application**.

The **ng-model** directive binds the value of the input field to the application variable **name**.

The **ng-bind** directive binds the content of the <p> element to the application variable **name**.

AngularJS Directives

As you have already seen, AngularJS directives are HTML attributes with an **ng** prefix.

The **ng-init** directive initializes AngularJS application variables.

AngularJS Example

```
<div ng-app="" ng-init="firstName='John'">

<p>The name is <span ng-bind="firstName"></span></p>

</div>
```

Alternatively with valid HTML:

You can use **data-ng-**, instead of **ng-**, if you want to make your page HTML valid.

AngularJS Applications

AngularJS **modules** define AngularJS applications.

AngularJS **controllers** control AngularJS applications.

The **ng-app** directive defines the application, the **ng-controller** directive defines the controller.

AngularJS Example

```
<div ng-app="myApp" ng-controller="myCtrl">

First Name: <input type="text" ng-model="firstName"><br>
Last Name: <input type="text" ng-model="lastName"><br>
<br>
Full Name: {{firstName + " " + lastName}}
</div>
<script>
var app = angular.module('myApp', []);
app.controller('myCtrl', function($scope) {
  $scope.firstName= "John";
  $scope.lastName= "Doe";
});
</script>
```

AngularJS modules define applications:

AngularJS Module

```
var app = angular.module('myApp', []);
```

AngularJS controllers control applications:

AngularJS Controller

```
app.controller('myCtrl', function($scope) {
  $scope.firstName= "John";
  $scope.lastName= "Doe";
});
```

AngularJS Expressions

AngularJS expressions are written inside double braces: **{{ expression }}**.

AngularJS will "output" data exactly where the expression is written:

AngularJS Example

```
<!DOCTYPE html>
<html>
<script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.6.9/angular.mi
n.js"></script>
<body>
<div ng-app="">
  <p>My first expression: {{ 5 + 5 }}</p>
</div>
</body>
</html>
```

If you remove the ng-app directive, HTML will display the expression as it is, without solving it:

You can write expressions wherever you like, AngularJS will simply resolve the expression and return the result.

Example: Let AngularJS change the value of CSS properties.

Change the color of the input box below, by changing its value:

Example

```
<div ng-app="" ng-init="myCol='lightblue'">

<input style="background-color:{{myCol}}" ng-model="myCol">

</div>
```

AngularJS Numbers

```
<div ng-app="" ng-init="quantity=1; price=5">

        <h2>Cost Calculator</h2>

        Quantity: <input type="number" ng-model="quantity">

        Price: <input type="number" ng-model="price">

        <h3>Total in Rupee: <span ng-bind="quantity * price"></span></h3>

</div>
```

AngularJS Objects Looping

```
<div ng-app="" ng-init="names=[
{name:'Jani',country:'Norway'},
{name:'Hege',country:'Sweden'},
{name:'Kai',country:'Denmark'}]">
  <p>Looping with objects:</p>
  <ul>
    <li ng-repeat="x in names">
    {{ x.name + ', ' + x.country }}</li>
  </ul>
</div>
```

AngularJS Expressions vs. JavaScript Expressions

Like JavaScript expressions, AngularJS expressions can contain literals, operators, and variables.

Unlike JavaScript expressions, AngularJS expressions can be written inside HTML.

AngularJS expressions do not support conditionals, loops, and exceptions, while JavaScript expressions do.

AngularJS expressions support filters, while JavaScript expressions do not.