



JavaScript Functions

.NET

JavaScript (JS) programming language conforms to the ECMAScript specification. JavaScript is a high-level language that is just-in-time compiled, has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.

[HTTPS://EN.WIKIPEDIA.ORG/WIKI/JAVASCRIPT](https://en.wikipedia.org/wiki/JavaScript)

Create Sample .html and .js docs

Create a **.html** document and create the HTML template inside (use 'doc' shortcut).

This can be used to experiment with the examples in the presentation.

The **.js** file and the **.html** file should be in the same folder.

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-
width, initial-scale=1.0">
  <meta http-equiv="X-UA-Compatible" content="ie=edge">
  <title>JS Example Document</title>
</head>
<body>
  <script src="functions.js"></script>
</body>
</html>
```

JavaScript – Functions

<https://javascript.info/function-basics>

- A function can return a value at any point using **return**;
- It can also **return**; without a value.
- JS assumes a **;** after the keyword **return**.
- Never place return data on a separate line.

```
1 function checkAge(age) {  
2   if (age >= 18) {  
3     return true;  
4   } else {  
5     return confirm('Do you have permission from your parents?');  
6   }  
7 }  
8  
9 let age = prompt('How old are you?', 18);  
10  
11 if ( checkAge(age) ) {  
12   alert( 'Access granted' );  
13 } else {  
14   alert( 'Access denied' );  
15 }
```

```
1 function showMovie(age) {  
2   if ( !checkAge(age) ) {  
3     return;  
4   }  
5  
6   alert( "Showing you the movie" ); // (*)  
7   // ...  
8 }
```

Function Declarations

<https://javascript.info/function-basics>

- JS functions can declare variables inside the function scope.
- If a function's local variable has the same name as a variable outside the function, the local variable **shadows** the outer variable.
- Primitives are passed by value in JS.
- Objects are passed by reference.
- A function with multiple **parameters** can be called with fewer **arguments** than parameters. The unused parameters are shown as **undefined**.
- A **parameter** can be given a default value.

```
1 function showMessage(from, text = "no text given") {  
2     alert( from + ": " + text );  
3 }  
4  
5 showMessage("Ann"); // Ann: no text given
```

```
1 function showMessage(from, text) { // arguments: from, te  
2     alert(from + ': ' + text);  
3 }  
4  
5 showMessage('Ann', 'Hello!'); // Ann: Hello! (*)  
6 showMessage('Ann', "What's up?"); // Ann: What's up? (**)
```

JavaScript – Function Expressions

<https://javascript.info/function-expressions>

In JavaScript, a function is considered a value. Figure 1 shows a *function expression* called `sayHi()`. It is considered a value. This means the whole function can also be passed to other functions as a callback function.

A *Function Expression* is created when program execution reaches its declaration. It is usable only from that moment onward.

Figure 1

```
1 let sayHi = function() {  
2   alert( "Hello" );  
3 };
```

This *Function Declaration*:

- (1) creates the function called `sayHi`.
- (2) Stores `sayHi()` in a variable, `func`.
- (3) Now the function can be invoked as both `sayHi()` and `func()`.

```
1 function sayHi() { // (1) create  
2   alert( "Hello" );  
3 }  
4  
5 let func = sayHi; // (2) copy  
6  
7 func(); // Hello // (3) run the copy (it works)!  
8 sayHi(); // Hello // this still works too (why wouldn't it)
```

*`sayHi()` invokes the function. `func = sayHi()` would write the result of the call `sayHi()` into `func`.

Arrow Functions

<https://javascript.info/arrow-functions-basics>

Arrow Syntax is a simple and concise syntax for creating functions. Both the below expressions create a function that accepts multiple arguments. They both evaluate the expression and return its result into *func*.

```
1 let func = function(arg1, arg2, ...argN) {  
2   return expression;  
3 };
```

Is the same as...

```
1 let func = (arg1, arg2, ...argN) => expression
```

This function accepts two arguments: a, b.
It returns the result of **a + b**.

```
1 let sum = (a, b) => a + b;  
2  
3 /* This arrow function is a shorter form of:  
4  
5 let sum = function(a, b) {  
6   return a + b;  
7 };  
8 */  
9  
10 alert( sum(1, 2) ); // 3
```

```
1 let sayHi = () => alert("Hello!");
```

```
1 let double = n => n * 2;
```

With one argument, **()** are not required. With zero arguments empty **()** are required.

```
1 let sum = (a, b) => { // the curly brace opens a multiline function  
2   let result = a + b;  
3   return result; // if we use curly braces, then we need an explicit "return"  
4 };  
5  
6 alert( sum(1, 2) ); // 3
```

JavaScript – Callback Functions

<https://javascript.info/function-expressions#callback-functions>
<https://gist.github.com/ericelliott/414be9be82128443f6df>

A function passed as a value is a **Callback Function**. On line 15, the arguments `showOk` and `showCancel` of the call to `ask()` are **callback functions**.

A function passed can be “called back” later (if necessary). `showOk()` becomes the callback for a “yes” answer, and `showCancel()` for a “no” answer.

```
1 function ask(question, yes, no) {
2   if (confirm(question)) yes()
3   else no();
4 }
5
6 function showOk() {
7   alert( "You agreed." );
8 }
9
10 function showCancel() {
11   alert( "You canceled the execution." );
12 }
13
14 // usage: functions showOk, showCancel are passed as arguments to ask
15 ask("Do you agree?", showOk, showCancel);
```

We can use **Function Expressions** when calling `ask()`. It is the same function, but much shorter. These are called **Anonymous Functions**

```
1 function ask(question, yes, no) {
2   if (confirm(question)) yes()
3   else no();
4 }
5
6 ask(
7   "Do you agree?",
8   function() { alert("You agreed."); },
9   function() { alert("You canceled the execution."); }
10 );
```


IIFE - Immediately Invoked Function Expression

<https://developer.mozilla.org/en-US/docs/Glossary/IIFE>

https://en.wikipedia.org/wiki/Immediately_invoked_function_expression

An *Immediately Invoked Function Expression* (IIFE, pronounced “iffy”) is a *JavaScript* function that runs as soon as it is defined. It’s also known as a *Self-Executing Anonymous Function*.

IIFE’s contain two major parts:

- The first is the anonymous function with lexical scope enclosed within the Grouping Operator, `()`. This prevents accessing variables within the *IIFE* as well as polluting the global scope.
- The second part is another pair of `()`, which complete the statement/function call. Now, the JavaScript engine will directly interpret the function.

```
1 | (function () {  
2 |     statements  
3 | })();
```

```
(function() {  
    alert('I am NOT an IIFE.');
```

```
(function() {  
    alert('NOW I am an IIFE!');
```

```
((() => alert('I am also an IIFE.'))());
```

IIFE - Immediately Invoked Function Expression

<https://developer.mozilla.org/en-US/docs/Glossary/IIFE>

https://en.wikipedia.org/wiki/Immediately_invoked_function_expression

Any variable declared within an *IIFE* cannot be accessed from outside it.

Assigning an *IIFE* to a variable stores the function's return value, not the function definition itself.

```
1 | (function () {  
2 |     var aName = "Barry";  
3 | })();  
4 | // Variable aName is not accessible from the outside scope  
5 | aName // throws "Uncaught ReferenceError: aName is not defined"
```

```
1 | var result = (function () {  
2 |     var name = "Barry";  
3 |     return name;  
4 | })();  
5 | // Immediately creates the output:  
6 | result; // "Barry"
```

Scope with Nested Functions (and Closure)

<https://javascript.info/closure>

If a variable is declared inside a code block, `{ }`, it's only visible inside that block.

A nested function can access variables declared inside its code block and inside its parent code block.

A nested function can be returned as a property of a new object or as a result by itself. It can then be used anywhere else, and it will still have access to the same outer variables.

```
1 function sayHiBye(firstName, lastName) {  
2  
3     // helper nested function to use below  
4     function getFullName() {  
5         return firstName + " " + lastName;  
6     }  
7  
8     alert( "Hello, " + getFullName() );  
9     alert( "Bye, " + getFullName() );  
10  
11 }
```

```
1 function makeCounter() {  
2     let count = 0;  
3  
4     return function() {  
5         return count++;  
6     };  
7 }  
8  
9 let counter = makeCounter();  
10  
11 alert( counter() ); // 0  
12 alert( counter() ); // 1  
13 alert( counter() ); // 2
```

Scope and Closure

<https://developer.mozilla.org/en-US/docs/Web/JavaScript/Closures>

A ***closure*** is a ***function*** enclosed with references to its surrounding state (the ***lexical environment***). A ***closure*** gives access to an outer ***function's*** scope from an inner ***function***.

```
1 function init() {  
2     var name = 'Mozilla'; // name is a local variable created by init  
3     function displayName() { // displayName() is the inner function, a closure  
4         alert(name); // use variable declared in the parent function  
5     }  
6     displayName();  
7 }  
8 init();
```

`init()` creates local variable (`name`) and a function, `displayName()`. `displayName()` is available only within the body of `init()`. `displayName()` has no local variables. Because inner functions have access to outer function variables, `displayName()` accesses the `name` variable declared in its parent function, `init()`. This is Lexical Scoping.

Scope and Closure Example

<https://developer.mozilla.org/en-US/docs/Web/JavaScript/Closures>

`makeAdder()` takes a single argument, `x`, and returns a function. The returned function takes a single argument `y` and returns `(x + y)`.

`add5` and `add10` are both *closures*.

They are the function returned by `makeAdder()` but store different *lexical environments*.

In `add5`'s *lexical environment*, `x` is 5, while in `add10`'s, `x` is 10. When `add5` and `add10` are invoked, they still have access to the parameter `x` from `makeAdder()`;

```
1  function makeAdder(x) {  
2      return function(y) {  
3          return x + y;  
4      };  
5  }  
6  
7  var add5 = makeAdder(5);  
8  var add10 = makeAdder(10);  
9  
10 console.log(add5(2)); // 7  
11 console.log(add10(2)); // 12
```

Try/Catch/Finally

<https://javascript.info/try-catch#the-try-catch-syntax>

The JS *Try/Catch* block works similarly to the C# *Try/Catch* Block. There is only one ‘error’ object generated. The ‘error’ object has three parts

- Name – the Error Name, Like “Reference Error”.
- Message – a text message with error details
- Stack – a stack trace of the calls that led to the error.

JavaScript has many built-in, standard errors: *Error*, *SyntaxError*, *ReferenceError*, *TypeError*, and others.

The *Finally* Block always executes.

```
1 let error = new Error(message);
2 // or
3 let error = new SyntaxError(message);
4 let error = new ReferenceError(message);
5 // ...
```

```
1 try {
2
3   alert('Start of try runs'); // (1) <--
4
5   lalala; // error, variable is not defined!
6
7   alert('End of try (never reached)'); // (2)
8
9 } catch(err) {
10
11   alert(`Error has occurred!`); // (3) <--
12
13 }
```

```
1 let json = '{ "age": 30 }'; // incomplete data
2
3 try {
4
5   let user = JSON.parse(json); // <-- no errors
6
7   if (!user.name) {
8     throw new SyntaxError("Incomplete data: no name"); // (*)
9   }
10
11   alert( user.name );
12
13 } catch(e) {
14   alert( "JSON Error: " + e.message ); // JSON Error: Incomplete data
15 }
```


Web Storage API

https://developer.mozilla.org/en-US/docs/Web/API/Web_Storage_API/Using_the_Web_Storage_API

The Web Storage API provides mechanisms by which browsers can securely store key/value pairs. Storage objects are simple key-value stores, but they persist through page loads. The keys and the values are always stored as strings. This means that number types must be converted back to the number upon accessing.

The two types of Web Storage are:

- ***sessionStorage*** - maintains a separate storage area for each given origin that's available for the duration of the page session (as long as the browser is open, including page reloads and restores).
- ***localStorage*** – same as ***sessionStorage***, but also persists even when the browser is closed and reopened.

The commands to interact with either Storage object are the same. To store an object in the either storage, you do not have to use **json.stringify()** unless it's an object. You must use **json.parse()** to access the object using dot notation.

localStorage vs sessionStorage

<https://blog.logrocket.com/localstorage-javascript-complete-guide/#sessionstoragevslocalstorage>

<https://developer.mozilla.org/en-US/docs/Web/API/Window/localStorage>

TODO..

Feature	command	
To set storage	<code>.setItem('myCat', 'Tom');</code>	
To get the thing stored.	<code>const cat = localStorage.getItem('myCat');</code>	
	<code>.removeItem('myCat');</code>	
	<code>.clear();</code>	

sessionStorage

<https://blog.logrocket.com/localstorage-javascript-complete-guide/#sessionstoragevslocalstorage>

<https://developer.mozilla.org/en-US/docs/Web/API/Window/sessionStorage>

TODO..