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SCHOOL OF ENGINEERING AND DIGITAL SCIENCES

Web Programming and Problem Solving

JavaScript Basics

Date: 10.10.2022

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Content

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- Introduction
- Variables
- Types
- Operators
- Arrays
- Objects

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HTML, CSS, Javascript

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- **Hyper-Text Markup Language (HTML)** is the standard markup language for documents designed to be displayed in a web browser.
  - It describes the structure of the web page

- **Cascading Style Sheets (CSS)** is a stylesheet language used to describe the presentation of a document written in HTML.
  - It describes the style of the web page

- **JavaScript (JS)** is a lightweight and interpreted programming (or scripting) language for Web pages.
  - It adds behavior to the web page

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Brief History

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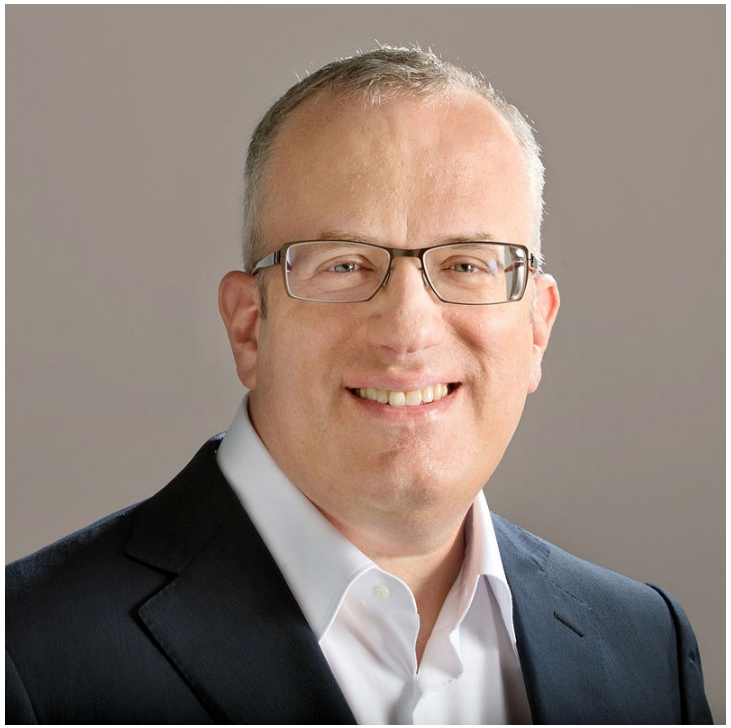
Brendan Eich (/ˈaɪk/), born July 4, 1961, co-founder of the Mozilla project, CEO of Brave Software, created the **JavaScript** programming language in 1995.



ECMAScript (ES) is a JavaScript standard intended to ensure the interoperability of web pages across different browsers.

- ECMA 262, …, ES5, ES6, …, ES2022

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What is JS used to?

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JavaScript can be used to:

- Change the behavior of the web application
- Change HTML content
- Change HTML attribute values
- Change HTML styles (CSS)
- Hide/Show HTML elements
- Do other computations

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How to use JS?

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- Browsers understand JavaScript by **default**, so there is no need to install anything
- To incorporate your JavaScript program in your web page,
  - **wrap** it with <script> tag in the <head> or <body> sections
  - **link** it as an external file in the <head> section
    - <script src="myprogram.js"></script>

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How to see the output?

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Programs can output the intermediate results or other information to users (e.g. debugging):

- Directly into HTML, using innerHTML property
  - document.getElementById("demo").innerHTML = “Hello, World!”
- In pop up message using alert() function
  - alert(“Hello, World!”))
- To the browser’s console using console.log() function
  - console.log(“Hello, World!”)

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Variables

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Variables are containers (pointers) that store data values of the program

- They can be declared using var, let, or const
- They must have unique names (identifiers)
  - Names can contain letters, digits, underscores, and dollar signs.
  - Names must begin with a letter.
  - Names can also begin with $ and _ (but we will not use it in this tutorial).
  - Names are case sensitive (y and Y are different variables).
  - Reserved words (like JavaScript keywords) cannot be used as names.

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Variables

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Variable declarations:

```
var x = 3 + 2;    // x is 5
let y = 10;       // y is 10
const PI = 3.14; // PI is “3.14”
msg = ”Hello!”;   // z is 15
```

Variables declared with let and const **cannot** be redeclared.

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Types

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There are six **primitive** data types:

- Number: integer or decimal numbers – a = 20, b = 3.5
- String: some text – s = “Hello, World!” or empty string - t = “”
- Boolean: **true** or **false** – y = true
- undefined: a variable which is declared but doesn’t contain value – let x;
- null: a variable with **no value** assigned to it – p = null
- Symbol: unique symbolic value (not covering here)

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Operators

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There are different types of operators:

- Assignment Operators
  - let name = “Tom”; x = 3; y = name;
- Arithmetic Operators
  - a = 2 + 3; b = 4 * 5 / 2 - 1; x = “Hello”; y = “World”; z = x + y;
- Comparison Operators
  - a > 0; a < 0; a == 0;

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Arrays

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Array is a data type to store **ordered** values (possibly different).

- To create an array, use square brackets: const A = [”Tom”, 25, 30]
- Elements in the array are indexed by numbers (starting from **0**):

  let x = A[0] // x stores “Tom”
- Changing values in the array: A[1] = 20 // A = [”Tom”, 20, 3]
- Adding new element: A.push(“John”); A[10] = 100;
- The number of elements: let n = A.length; let k = A[n-1];

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Objects

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Object is a complex data type which stores values by their **keys**. The objects may have **properties** and **methods**.

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

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Objects

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Working with objects

- To create an object, use curly brackets and key:value pairs:

```
const car = {
        name: “Fiat”,          // note ending comma
        color: “white”,
}
```

- To access properties, use dot notation or square brackets:

```
let x = car.name;     car[“color”] = “black”;
```

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Summary

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- **Key takeaways**:
  - There are several ways to output data and info
  - Variables are used to **store** values in program
  - There are six **primitive** data types
  - Operators can be used to **manipulate** data
  - Arrays can store **ordered** list of values
  - Objects can store values by their **keys**

Thanks for Attention!