JavaScript 1

CS571: Building User Interfaces

Cole Nelson

JavaScript

This is not a comprehensive introduction to JS, so these are great additional resources:

- MDN Web Docs
- W3 Schools

Periodically, we will also use StackBlitz or CodePen for code snippets.

Learning Objectives

1. Obtain a broad understanding of web programming.
2. Understand the essentials of JavaScript.
3. Be able to use JavaScript in web programming.
4. Know of other popular tools.

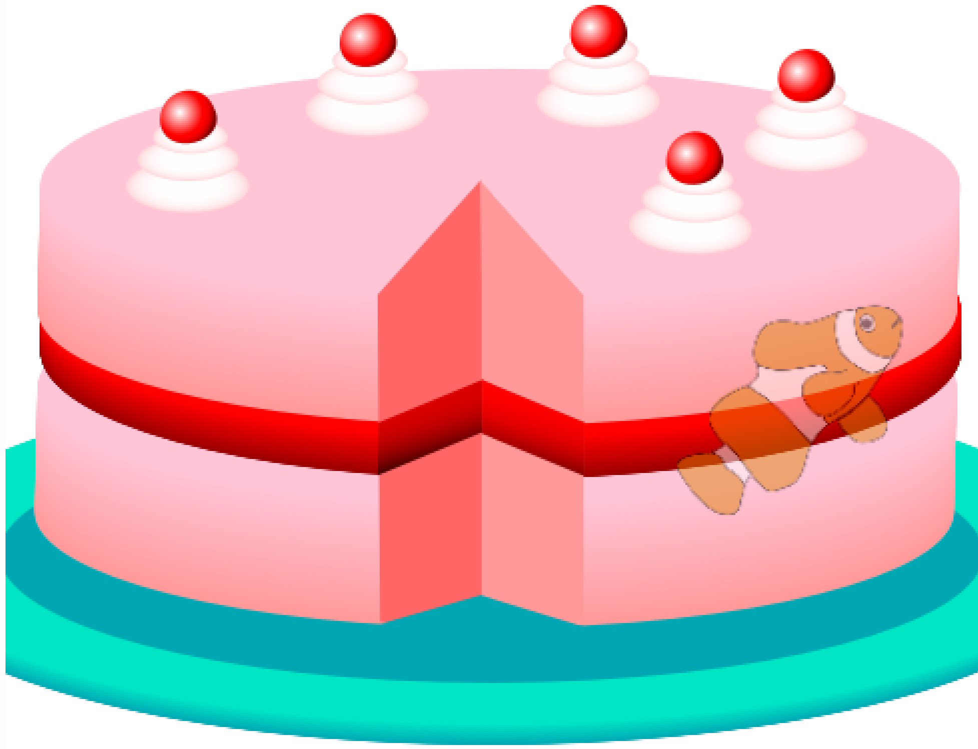
History

- Developed by Netscape Communications (Brendan Eich) in 1995.
    - It was designed in 10 days.
- A "glue language" for HTML.
- Mocha > LiveScript > JavaScript.
- Specifications are ECMAScript (e.g. "ES").

A Classic Frontend

A cake with 3 attributes.

Aspect	Behavior	Cake
HTML	Structure	Sponge
CSS	Design	Icing
JS	Behavior	Clown

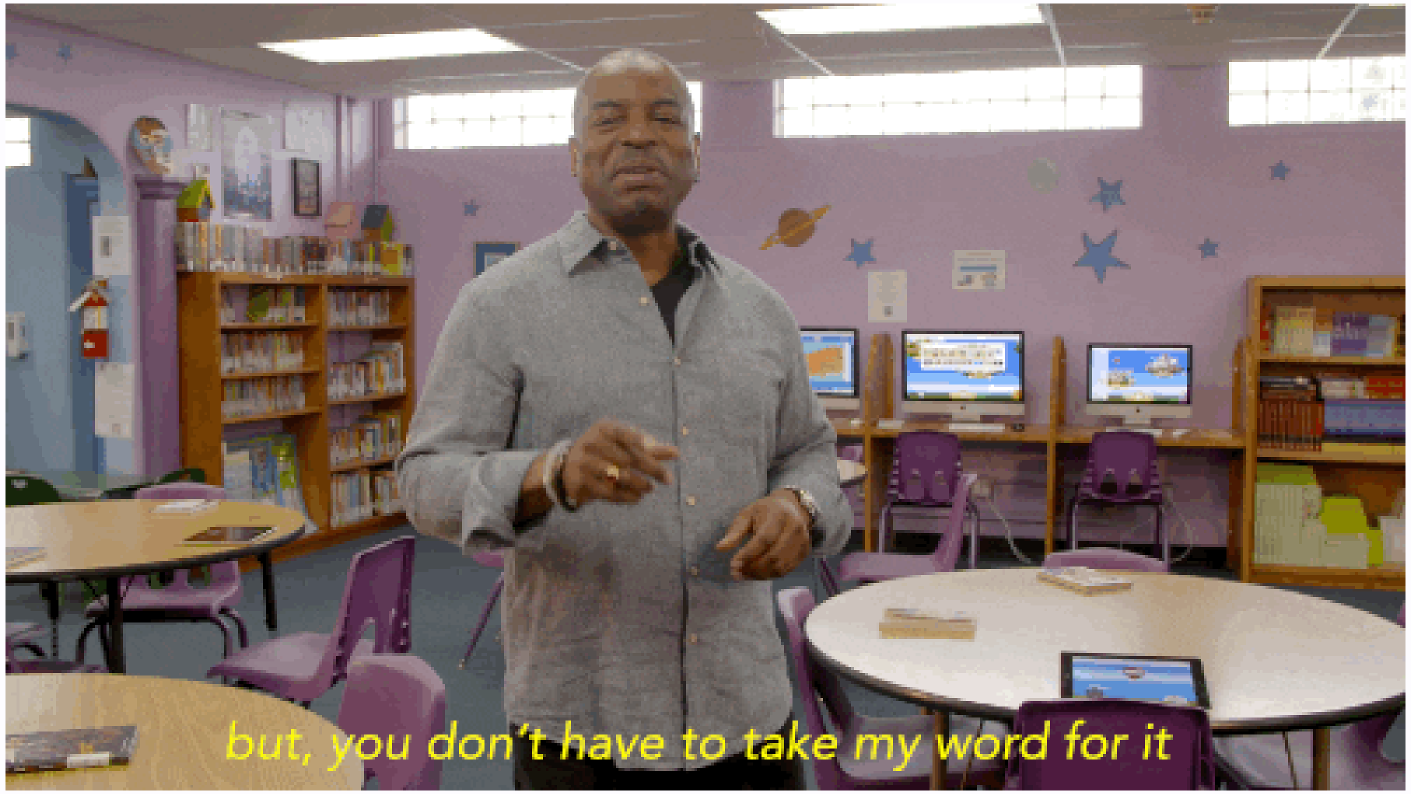


Badger Bakery: HTML + CSS

JavaScript Essentials

Try It!

Browser > F12 > Console



Variables

JS is a dynamic, loosely-typed language. The data type is inferred from the declaration and can be changed.

Variables are *containers* that hold data.

There are 7 standard data types: numbers, string, boolean, null, undefined, symbol, object. The first 6 are considered *primitive* and are stored on the *stack*. Object is considered *complex* and stored on the *heap*.

Variable Declarations

Variables can be declared with `var`, `let`, or `const`.

Keyword	Scope	Re-assignable?	Preferred?
var	function	yes	no
let	block	yes	yes
const	block	no	yes

`let` and `const` were introduced in ES6. They are the preferred ways of declaring a variable.

Variable Examples

Consider the following block of code...

```
let age = 27;
const name = "Ashley";
var hasCar = false;
```

Can we perform `age = 28`? Yes! We use `let`.

Can we perform `name = "Carl"`? No! We use `const`.

Is `hasCar` declared correctly? Yes, but we should use `let` instead of `var`.

Variable Examples

Is this block of code correct?

```
let name = "Ahmed";
console.log("My name is " + name);
name = 27;
console.log("My age is " + name);
name += 1;
console.log("My age a year later is " + name);
```

It's not *good* code, but it is *correct* code! Variables can change types during runtime.

Determining Data Types

We can query the data type at runtime using `typeof`.

```
let foo = "Charles";
console.log(typeof foo);
foo = 1932;
console.log(typeof foo);
foo = true;
console.log(typeof foo);
```

```
string
number
boolean
```

Conditionals

Conditionals allow the code to make decisions and carry out different actions.

Three types:

1. `if`, `else if`, and `else` statements
2. `switch` statements
3. ternary operators `evalExpr ? trueExpr : falseExpr`

Conditionals

Any value that is not `false`, `undefined`, `null`, `0`, `NaN`, or `""` returns `true`. Why is this useful?

```
var currentMember = "Alice";
let textContent = "?";
if (currentMember) {
  textContent = "View Profile";
} else {
  textContent = "Sign Up";
}
console.log(textContent)
```

```
'View Profile'
```

Comparison and Logical Operators

Operator	**Meaning**
=== and !==	identical to/not identical *objects*
== and !=	identical to/not identical *values*
< and >	less/greater than
<= and =>	less/greater than or equal to
&&	and
||	or

Objects

Objects are unordered collections of data defined using key-value pairs.

```
let teachingAssistant = {
   firstName: "Alice",
   lastName: "Smith",
   age: 24
};
console.log(teachingAssistant);
```

```
{firstName: 'Alice', lastName: 'Smith', age: 24}
```

Object Properties

There are two different notations to access object properties.

```
console.log(teachingAssistant.lastName);
console.log(teachingAssistant["firstName"]);
```

```
'Smith'
'Alice'
```

Arrays

An array is a variable that contains multiple elements.

```
let fruits = ["apple", "banana", "coconut"];
fruits[0] = "apricot";
console.log(fruits);
fruits.push(17);
console.log(fruits);
```

```
['apricot', 'banana', 'coconut']
['apricot', 'banana', 'coconut', 17]
```

Notice! They don't have to be the same type.

Looping

For Loops

```
for (let i = 0; i < 10; i++) {}  // typical for loop
for (let attr in course) {}      // loop through object properties
for (let item of arr) {}         // loop through array contents
```

While Loops

```
while(cond) {}                         // typical while loop
do {} while(cond);                     // guarantees atleast one execution
```

You can use `break` (exit) and `continue` (skip).

Functions

A procedure that includes a set of statements that performs a task or calculates a value.

```
function fToC(temp) {
  return (temp - 32) * 5/9;
}
fToC(77)
```

```
25
```

Other Ways to Declare Functions

Function Expression

```
const fToC = function(temp) {
  return (temp - 32) * 5/9;
}
```

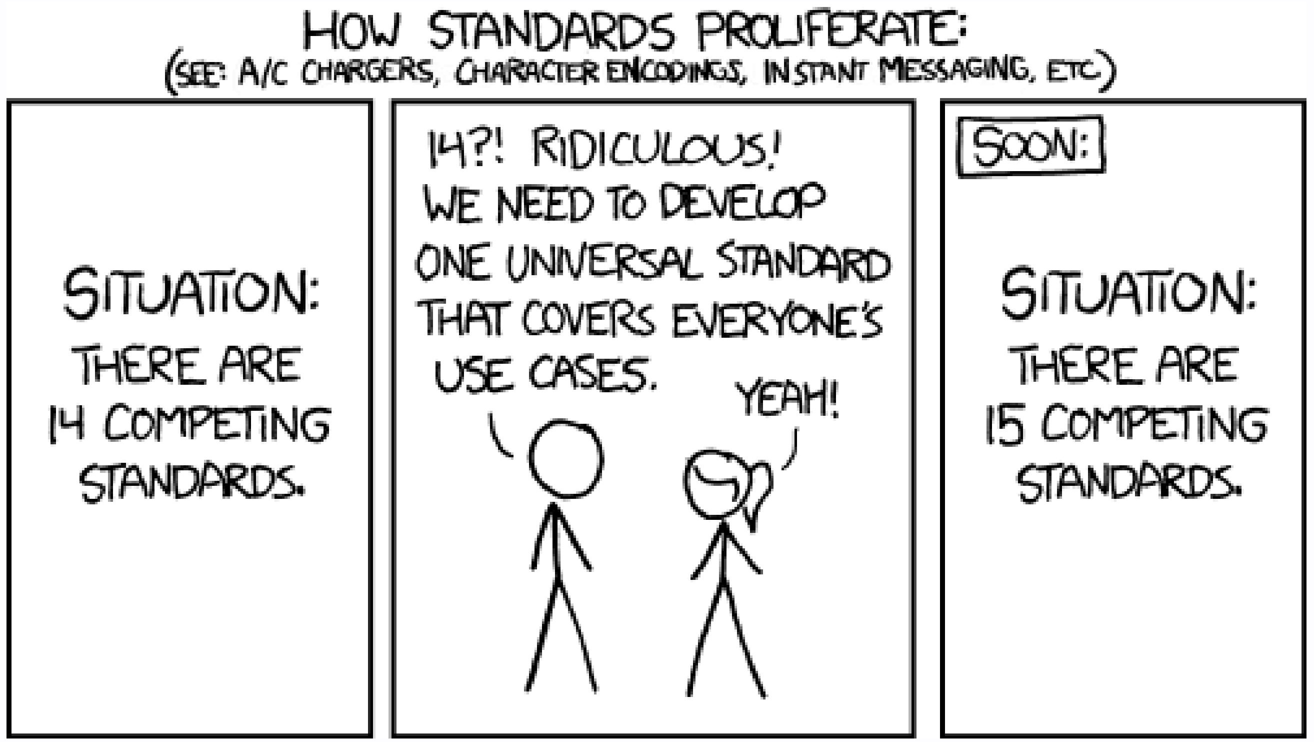
Arrow Function

```
const fToC = (temp) => {
  return (temp - 32) * 5/9;
}
```

JavaScript and the Web

Including JavaScript in Your Webpage

- Inline JS
- Internal JS
- External JS


HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)
SITUATION: THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION: THERE ARE 15 COMPETING STANDARDS.

XKCD 927: Standards

External JavaScript

The JavaScript is included from outside of the HTML.

index.html

```html
<html>
  <h1>Welcome to my webpage!</h1>
  <script src='app.js'></script>
</html>
```

app.js

```javascript
console.log("hello world!");
```

Internal JavaScript

The JavaScript is included inside of the HTML.

index.html

```
<html>
  <h1>Welcome to my webpage!</h1>
  <script>
    console.log("hello world!");
  </script>
</html>
```

Inline JavaScript

The JavaScript is included inside of the HTML element.

index.html

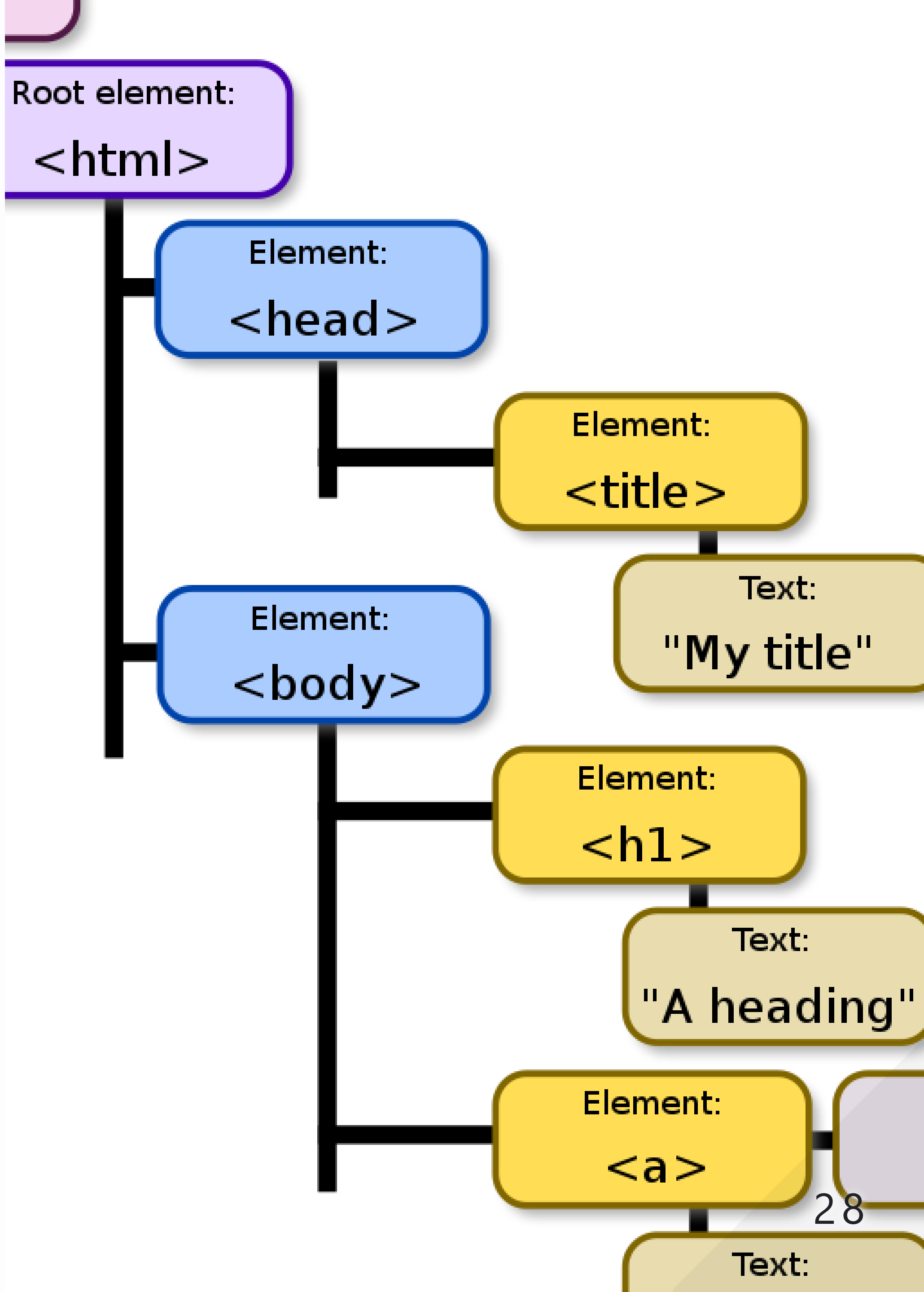
```
<html>
  <h1>Welcome to my webpage!</h1>
  <button onclick="console.log('hello world!')">Click Me!</button>
</html>
```

Document Object Model (DOM)

HTML is just a tree, where each tag (e.g. object on the page) is a node!

We use JavaScript to manipulate this tree.

Document Object Model



Manipulating the DOM

Use `document` to reference the DOM.

```
let title = document.getElementbyId("articleTitle");
let loginBtn = document.getElementsByName("login")[0];
let callouts = document.getElementsByClass("callout"); // *
```

*class refers to a **CSS** class

We can add *event listeners* or read/modify *properties*.

Manipulating the DOM

Using the DOM elements from the previous slide, we..

- Change the title of the article.
- Add an action for when the button is clicked.
- Make all of the callouts red.

```
title.textContent = 'My Website!';
loginBtn.addEventListener("click", () => {
  console.log("You are advancing to the next part of the site...");
}
for (let callout in callouts) {
  callout.style.color = "red";
}
```

Badger Bakery - JS

Other Tools

What is this "TypeScript" I hear about?

TypeScript (TS) is a strict syntactical superset of JS developed to enable the development of large-scale applications and to add static typing.

A preprocessor is used to transpile TS to JS.

Safety of Java + Flexibility of JS = TS

We do not cover TS in this course.

What is this "jQuery" I hear about?

A fast, small, and feature-rich JavaScript library.

Contains all of the functions that you wish were in the standard JavaScript library.

- **jQuery**: `$("#login")`
- **DOM**: `document.getElementById('login')`

Keep your jQuery up-to-date!

We do not cover jQuery in this course.

What is this "Bootstrap" I hear about?

A CSS Framework for developing responsive and mobile-first websites.

We *will* cover this *next* time :)

On to Design Thinking! 🚀