

Introduction to web technologies

HTML + CSS + Javascript

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Goals

Introduction to web technologies:

- **HTML** to create the document structure and content
- **CSS** to control its visual aspect
- **Javascript** for interactivity



Deploy

What do we need to start:

- a good web-browser (Chrome or Firefox)
- [the example HTML code](#) to start
- a good text editor like Editplus (win), VSCode (cross platform), textWrangler (osx), vim (unix) or sublime text (cross platform)

How can I test my code

Just open the [index.html](#) from the template in your text editor and in your browser.

When you do any change to the code, check it in the browser by pressing F5 (refresh site)

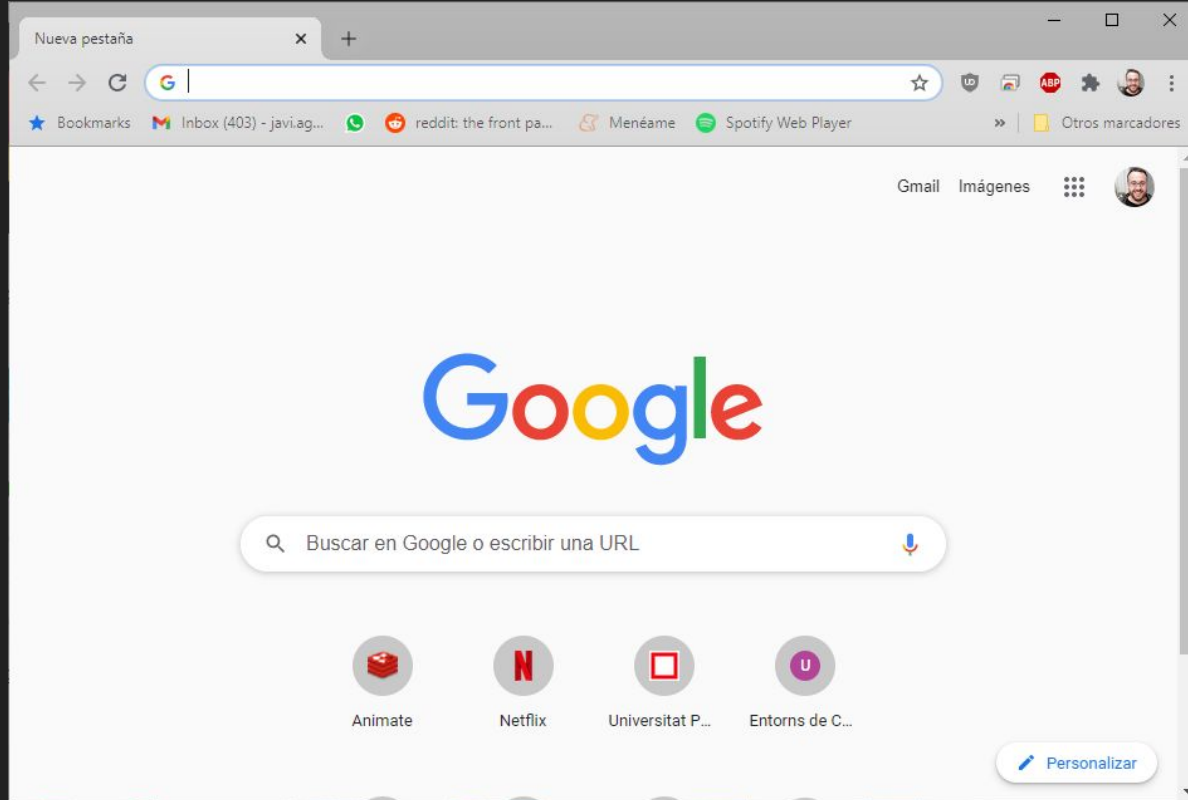
To open the developer tools press:

Windows: Control + Shift + I or F12

OSX: Command + Opt + I

Other tools are online editors like [scratchpad](#) or [htmledit](#)

Anatomy of a Browser

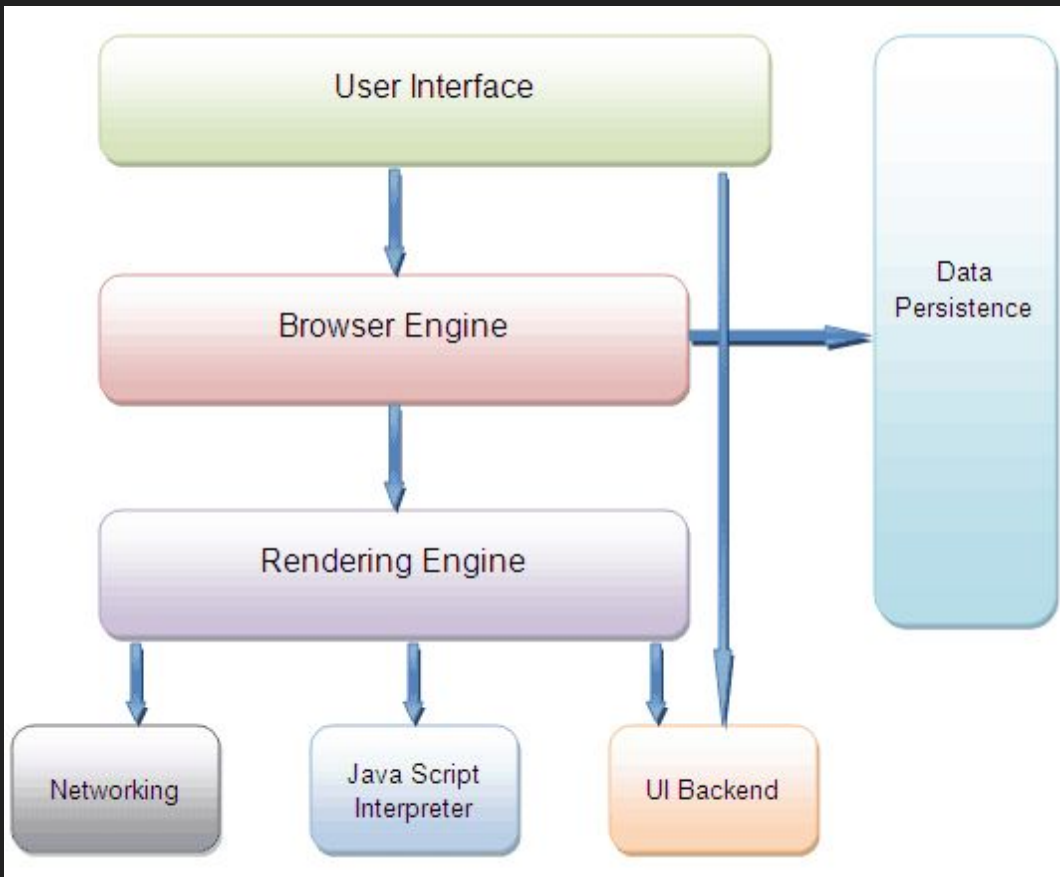


Inside a browser

Browsers have very differentiate parts.

We are interested in two of them:

- the Rendering Engine (in charge of transforming our **HTML+CSS** in a visual image).
- The Javascript Interpreter (also known as VM), in charge of executing the **Javascript** code.



Technologies

- HTML
- CSS
- Javascript



HTML

HTML means Hyper Text Markup Language.

The HTML allow us to construct the visible part of a website.

HTML is **NOT** a programming language, it's a markup language, which means its purpose is to give structure to the content of the website.

It is a series of nested tags (it is a subset of XML) that contain all the website information (like texts, images and videos). Here is an example of tags:

```
<title>This is a title</title>
```

The HTML defines the page structure. A website can have several HTMLs to different pages.

```
<html>
  <head>
  </head>
  <body>
    <div>
      <p>Hi</p>
    </div>
  </body>
</html>
```


HTML: basic rules

Some rules about HTML:

- It uses **XML** syntax (tags with attributes, can contain other tags).
`<tag_name attribute="value"> content </tag_name>`
- It stores all the information that must be shown to the user.
- There are different **HTML** elements for different types of information and behaviour.
- The information is stored in a tree-like structure (nodes that contain nodes inside) called **DOM (Document Object Model)**.
- It gives the document some semantic structure (pe. this is a title, this is a section, this is a form) which is helpful for computers to understand websites content.
- It must not contain information related to how it should be displayed (that information belongs to the **CSS**), so no color information, font size, position, etc.

HTML: syntax example

```
<div id="main">
```

```
  <!-- this is a comment -->
```

This is text without a tag.

```
  <button class="mini">press me</button>
```

```
  
```

```
</div>
```

HTML: syntax example

Diagram illustrating HTML syntax components with annotations:

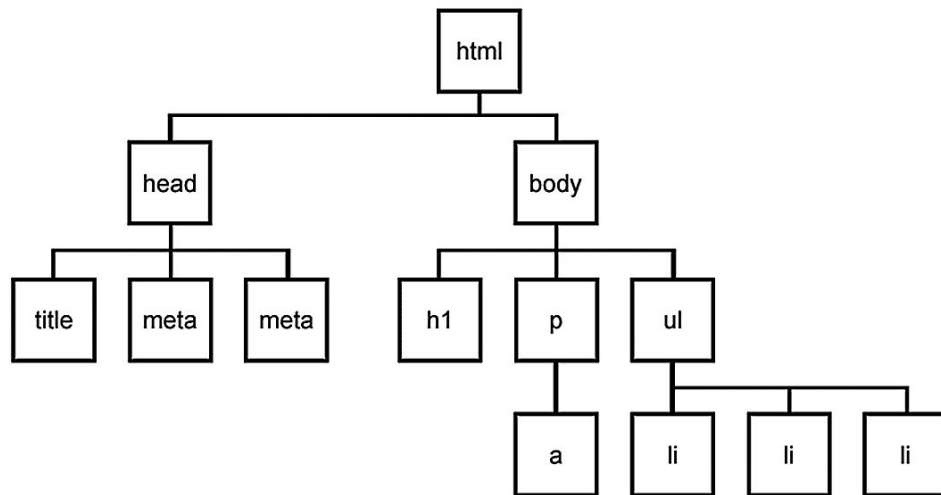
- Tag name:** `<div>`
- attributes:** `id="main"`
- comment:** `<!-- this is a comment -->`
- text tag:** `This is text without a tag.`
- self-closing tag:** ``

Full HTML structure example:

```
<div id="main">  
  <!-- this is a comment -->  
  This is text without a tag.  
  <button class="mini">press me</button>  
    
</div>
```

DOM is a tree

Every node can only have one parent, and every node can have several children, so the structure looks like a tree.



HTML: main tags

Although there are lots of tags in the HTML specification, 99% of the webs use a subset of HTML tags with less that 10 tags, the most important are:

- `<div>`: a container, usually represents a rectangular area with information inside.
- ``: an image
- `<a>`: a clickable link to go to another URL
- `<p>`: a text paragraph
- `<h1>`: a title (h2,h3,h4 are titles of less importance)
- `<input>`: a widget to let the user introduce information
- `<style>`: to insert CSS rules
- `<script>`: to execute Javascript
- ``: a null tag (doesn't do anything)

HTML: other interesting tags

There are some tags that could be useful sometimes:

- `<button>`: to create a button
- `<audio>`: for playing audio
- `<video>`: to play video
- `<canvas>`: to draw graphics from javascript
- `<iframe>`: to put another website inside ours

HTML: tagging correctly

Try to avoid doing this:

```
<div>
```

```
Title
```

```
Here is some content
```

```
Here is more content
```

```
</div>
```

DONT DO THIS

Do this instead

```
<div>
```

```
  <h1>Title</h1>
```

```
  <p>Here is content.</p>
```

```
  <p>Here is more
```

```
content</p>
```

```
</div>
```

HTML good use

It is good to have all the information properly wrapped in tags that give it some semantics.

We also can extend the code semantics by adding extra attributes to the tags:

- **id**: tells a **unique** identifier for this tag
- **class**: tells a **generic** identifier for this tag

```
<div id="profile-picture" class="mini-image">...</div>
```

HTML references

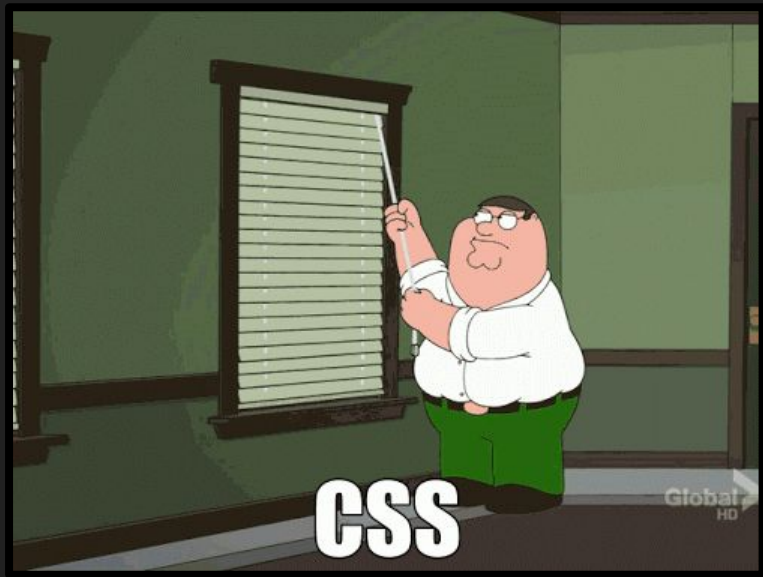
[HTML Reference](#): a description of all HTML tags.

[The 25 Most used tags](#): a list with information of the more common tags.

[HTML5 Good practices](#): some tips for starters

Technologies

- HTML
- CSS
- Javascript

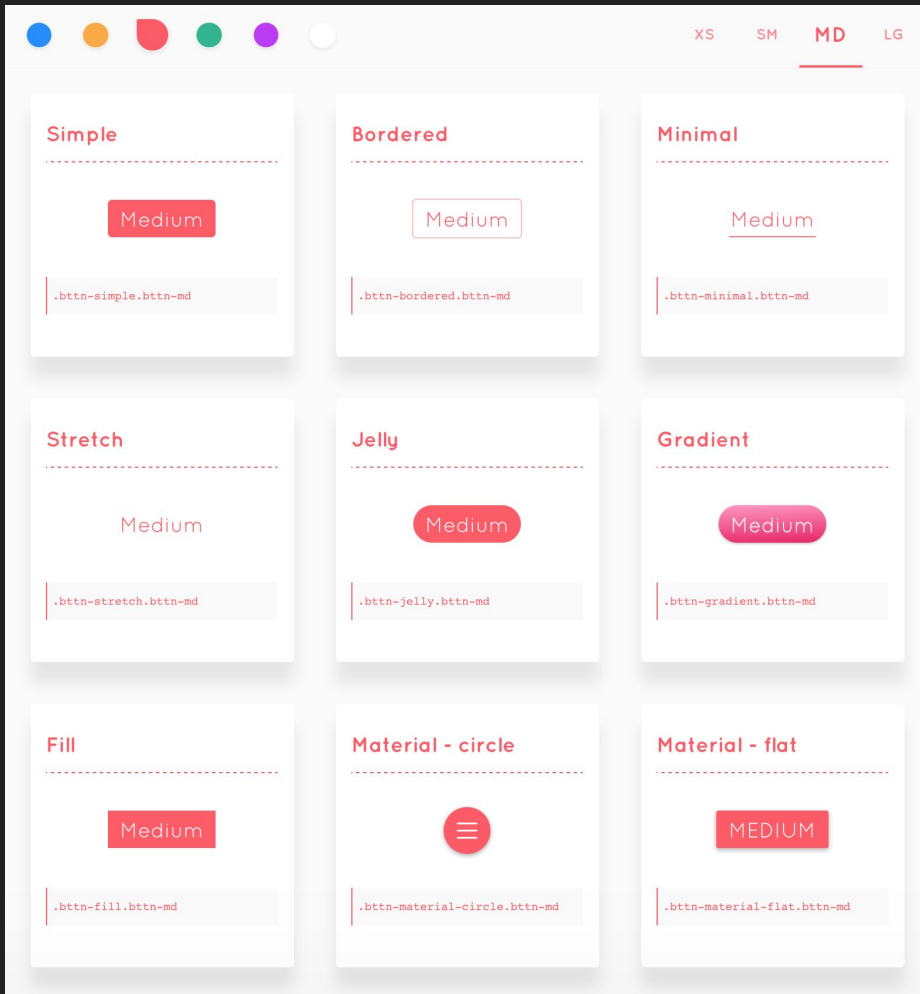


CSS

Allows to specify how to present (render) the document info stored in the HTML.

Allows to controls all the aspects of the visualization and some other features:

- **Colors**: content, background, borders
- **Margins**: interior margin, exterior margin
- **Position**: where to put it
- **Sizes**: width, height
- **Behaviour**: changes on mouse over



CSS example

```
* {  
    color: blue; /*a comment */  
    margin: 10px;  
    font: 14px Tahoma;  
}
```

This will change all the tags in my web ('*' means all) to look blue with font Tahoma with 14px, and leaving a margin of 10px around.

CSS fields

Here is a list of the most common CSS fields and an example:

- `color: #FF0000; red; rgba(255,00,100,1.0);` //different ways to specify colors
- `background-color: red;`
- `background-image: url('file.png');`
- `font: 18px 'Tahoma';`
- `border: 2px solid black;`
- `border-top: 2px solid red;`
- `border-radius: 2px;` //to remove corners and make them more round
- `margin: 10px;` //distance from the border to the outer elements
- `padding: 2px;` //distance from the border to the inner elements
- `width: 100%; 300px; 1.3em;` //many different ways to specify distances
- `height: 200px;`
- `text-align: center;`
- `box-shadow: 3px 3px 5px black;`
- `cursor: pointer;`
- `display: inline-block;`
- `overflow: hidden;`

CSS how to add it

There are three ways to add CSS rules to your website:

- Inserting the code inside a style tag

```
<style>
  p { color: blue }
</style>
```

- Referencing an external CSS file

```
<link href="style.css" rel="stylesheet" />
```

- Using the attribute style on a tag

```
<p style="color: blue; margin: 10px">
```


CSS selectors

What if we want to change one specific tag (not all the tags of the same type).

We can specify more precise selectors besides the name of the tag. For instance, by class or id:

```
p.intro {  
    color: red;  
}
```

This will affect only the tag `<p class="intro">`

CSS Selectors

The main selectors are:

- **tag name**: just the name of the tag
 - `p { ... }` //affects to all `<p>` tags
- **dot (.)**: affects to tags with that class
 - `p.highlight { ... }` //affects all `<p>` tags with `class="highlight"`
- **sharp character (#)**: specifies tags with that id.
 - `p#intro { ... }` //affects to the `<p>` tag with the `id="intro"`
- **two dots (:**): behaviour states (mouse on top)
 - `p:hover { ... }` //affects to `<p>` tags with the mouse over
- **brackets ([attr='value'])**: tags with the attribute attr with the value 'value'
 - `input[type="text"] {...}` // affects to the input tags of the type text

CSS Selectors

You can also specify tags by its context, for example: tags that are inside of tags matching a selector. Just separate the selectors by an space:

```
div#main p.intro { ... }
```

This will affect to the `p` tags of class `intro` that are inside the tag `div` of id `main`

```
<div id="main">  
  <p class="intro">....</p> ← Affects this one  
</div>
```

```
<p class="intro">....</p> ← but not this one
```

CSS Selectors

And you can combine selectors to narrow it down more.

```
div#main.intro:hover { ... }
```

will apply the CSS to the any tag `div` with id `main` and class `intro` if the mouse is `over`.

CSS Selectors

If you want to select only elements that are direct child of one element (not that have an ancestor with that rule), use the `>` character:

```
ul.menu > li { ... }
```

Finally, if you want to use the same CSS actions to several selectors, you can use the comma `,` character:

```
div, p { ... } ← this will apply to all divs and p tags
```

HTML arrange

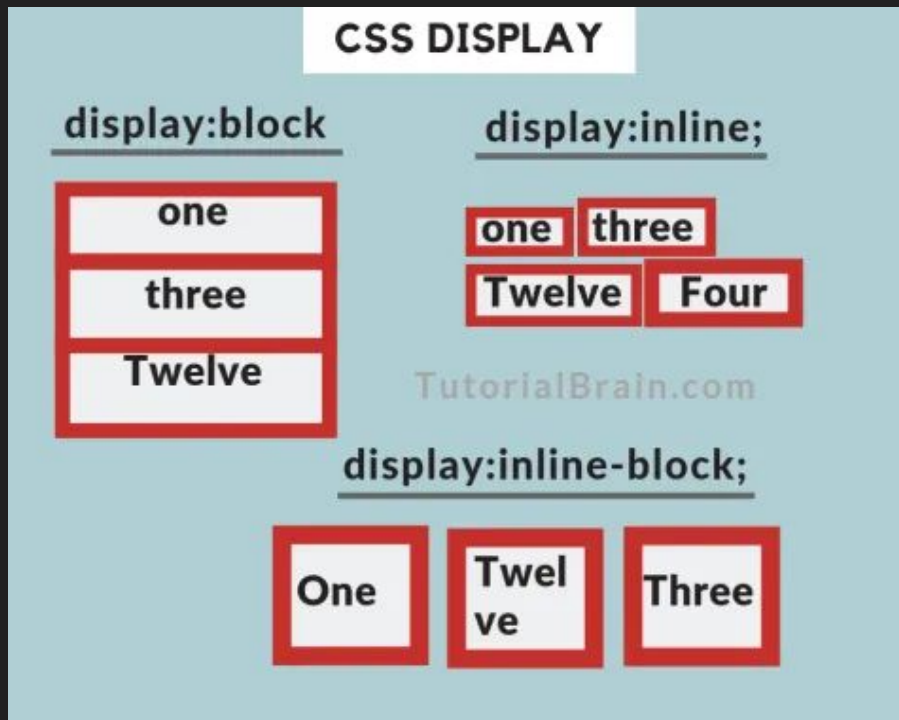
It is important to understand how the browser arranges the elements on the screen.

Check [this tutorial](#) where it explains the different ways an element can be arranged on the screen.

You can change the way elements are arranged using the display property:

```
div { display: inline-block; }
```

Also check the property [float](#).



Box Model

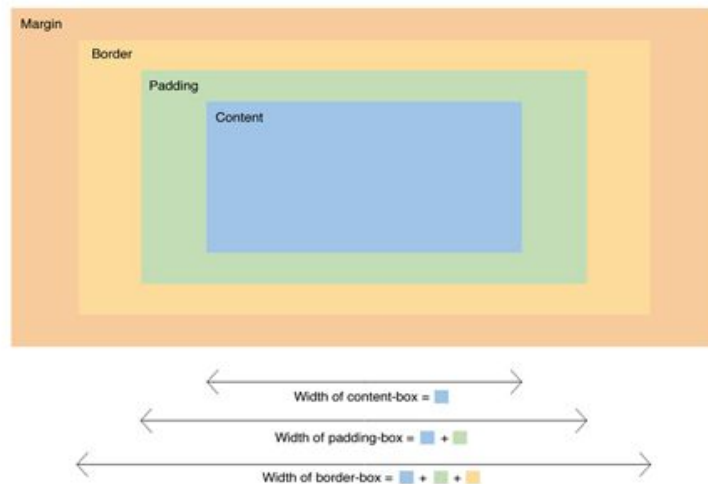
It is important to note that by default any width and height specified to an element will not take into account its margin, so a div with width 100px and margin 10px will measure 120px on the screen, not 100px.

This could be a problem breaking your layout.

You can change this behaviour changing the box model of the element so the width uses the outmost border:

```
div { box-sizing: border; }
```

Box-Sizing

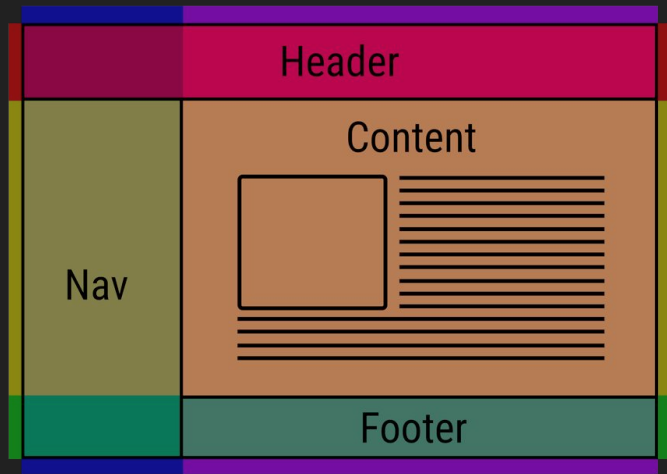


Layout

One of the hardest parts of CSS is construing the layout of your website (the structure inside the window) .

By default HTML tends to put everything in one column, which is not ideal.

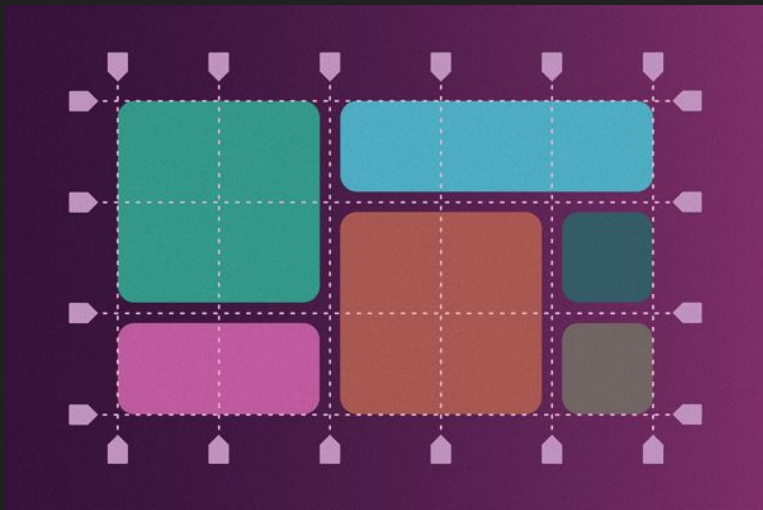
There has been many proposals in CSS to address this issue (tables, fixed divs, flex, grid, ...).



Grid system

Because most sites are structured in a grid, I recommend to use the CSS Grid system.

Check [this tutorial](#) to create the site structure easily



HTML

```
<div class="grid-container">  
  <div class="grid-item1">1</div>  
  <div class="grid-item2">2</div>  
</div>
```

CSS

```
.grid-container {  
  display: grid;  
  grid-template-rows: 100px; 100px;  
  grid-template-columns: 100px; 100px; 100px;  
  grid-gap: 5px;  
}  
  
.grid-item1 {  
  background: blue;  
  border: black 5px solid;  
  grid-column-start: 1;  
  grid-column-end: 5;  
  grid-row-start: 1;  
  grid-row-end: 3;  
}
```

Fullscreen divs

Sometimes we want to have a div that covers the whole screen (to make a webapp), instead of a scrolling website (more like regular documents).

In that case remember to use percentages to define the size of elements, but keep in mind that percentages are relative to the element's parent size, so you must set the size to the `<body>` element to use 100%.

CSS

```
html, body {  
    width: 100%;  
    height: 100%;  
}  
  
div {  
    margin: 0;  
    padding: 0;  
}  
  
#main {  
    width: 100%;  
    height: 100%;  
}
```

Trick to center

Centering divs can be hard sometimes, use this trick:

```
.horizontal-and-vertical-centering {  
  display: flex;  
  justify-content: center;  
  align-items: center;  
}
```

CSS further reading

There are many more rules for selectors.

Check some of the links to understand them better.

[One line layouts tutorials](#)

[Understanding the Box Model](#): a good explanation of how to position the information on your document.

[All CSS Selectors](#): the CSS selectors specification page.

[CSS Transition](#): how to make animations just using CSS

Technologies

- HTML
- CSS
- Javascript



Javascript

A regular programming language, easy to start, **hard to master**.

Allows to give some **interactivity** to the elements on the web.

Syntax similar to C or Java but with no types.

You can change the content of the HTML or the CSS applied to an element.

You can even send or retrieve information from the internet to update the content of the web without reloading the page.

Javascript: insert code

There is three ways to execute javascript code in a website:

- **Embed** the code in the HTML using the `<script>` tag.

```
<script> /* some code */ </script>
```

- **Import** a Javascript file using the `<script>` tag:

```
<script src="file.js" />
```

- **Inject** the code on an event inside a tag:

```
<button onclick="javascript: /*code*/">press me</button>
```

Javascript: Syntax

Very similar to C++ or Java but much simpler.

```
var my_number = 10; //this is a comment
var my_string = "hello";
var my_array = [10,20,"name",true];
var my_object = { name: "javi", city: "Barcelona" };

function say( str )
{
    for(var i = 0; i < 10; ++i)
        console.log(" say: " + str );
}
```


Javascript example

```
<html>
  <body>
    <h1>This is a title</h1>
    <script>
      var title = document.querySelector("h1");
      title.innerHTML = "This is another title";
    </script>
  </body>
</html>
```

Javascript API

Javascript comes with a rich API to do many things like:

- Access the DOM (HTML nodes)
- Do HTTP Requests
- Play videos and sounds
- Detect user actions (mouse move, key pressed)
- Launch Threads
- Access the GPU, get the Webcam image, ...

And the API keeps growing with every new update of the standard.

Check the [WEB API reference](#) to know more

Javascript: retrieving element

You can get elements from the DOM (HTML tree) using different approaches.

- **Crawling the HTML tree** (starting from the body, and traversing its children)
- **Using a selector** (like in CSS)
- **Attaching events listeners** (calling functions when some actions are performed)

Javascript: crawling the DOM

From javascript you have different variables that you can access to get information about the website:

- `document`: the DOM information (HTML)
- `window`: the browser window

The document variable allows to crawl the tree:

```
document.body.children[0] // returns the first node inside body tag
```

Javascript: using selectors

You can retrieve elements using selectors:

```
var nodes = document.querySelectorAll("p.intro");
```

will return an array with all `<p class="intro">` nodes in the web.

Or if we have already a node and we want to search inside:

```
var node = mynode.querySelectorAll("p.intro")
```

Javascript: modify nodes

From JS you can change the attributes

```
mynode.id = "intro"; //sets an id  
mynode.className = "important"; //set class  
mynode.classList.add("good"); //to add to the current classes
```

Change the content

```
mynode.innerHTML = "<p>text to show</p>"; //change content
```

Modify the style (CSS)

```
mynode.style.color = "red"; //change any css properties
```

or add the behaviour of a node

```
mynode.addEventListener("click", function(e) {  
    //do something  
});
```

Javascript: create nodes

Create elements:

```
var element = document.createElement("div");
```

And attach them to the DOM:

```
document.querySelector("#main").appendChild( element );
```

Or remove it from its parent:

```
var element = document.querySelector("foo");  
element.parentNode.removeChild( element );
```

You can clone an element also easily:

```
var cloned = element.cloneNode(true);
```

Javascript: hide and show elements

Sometimes it may be useful to hide one element or show another.

You can change an element CSS directly by accessing its property style.

To avoid being displayed on the web change display to "none"

```
element.style.display = "none"; //hides elements from being rendered  
element.style.display = ""; //displays it again
```


Using Inputs

If you want the user to be able to input some text we use the tag `<input>`:

```
<input type="text"/>
```

There are other inputs, you can [check this list](#).

From Javascript we can attach events like "click" or "keydown".

To read or modify the content of the input:

```
my_input_element.value = ""; //this will clear the text inside the input
```

Example of a website

HTML in index.html

```
<link href="style.css" rel="stylesheet"/>
<h1>Welcome</h1>
<p>
    <button>Click me</button>
</p>
<script src="code.js"/>
```

CSS in style.css

```
h1 { color: #333; }
button {
    border: 2px solid #AAA;
    background-color: #555;
}
```

Javascript in code.js

```
//fetch the button from the DOM
var button = document.querySelector("button");

//attach and event when the user clicks it
button.addEventListener("click", myfunction);

//create the function that will be called when the
button is pressed
function myfunction()
{
    //this shows a popup window
    alert("button clicked!");
}
```

jQuery

jQuery is a library that makes working with the DOM much easier, using an unified syntax and taking advantage of selectors:

```
$("#p").remove(); //remove all tags p
$("#main").hide(); //hides the element of id main
$("#main").append("<h1>titulo</h1>") //adds content to an element
```

```
$("#wrap").css({ color: "red" }); //change the css
```

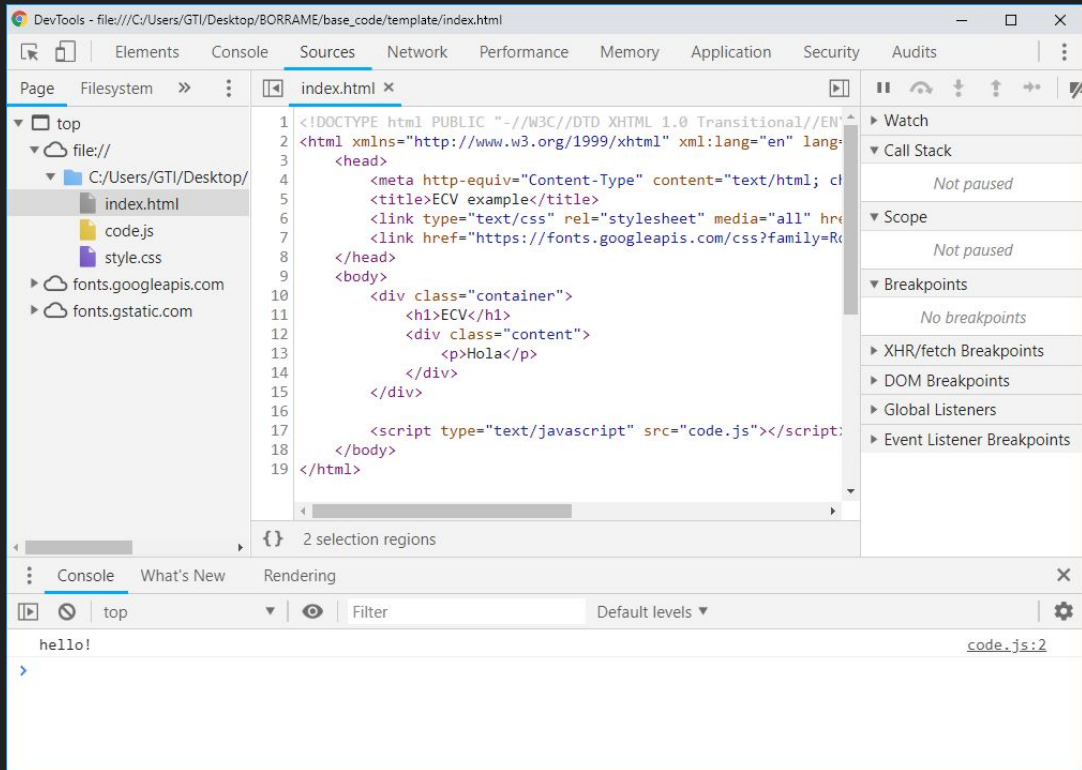
```
$("#button#send").click( function() { /* code */ });
```

To include this library just add this to your HTML:

```
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
```

Using the Dev Tools

Press Control + Shift + I (or F12) to open DevTools

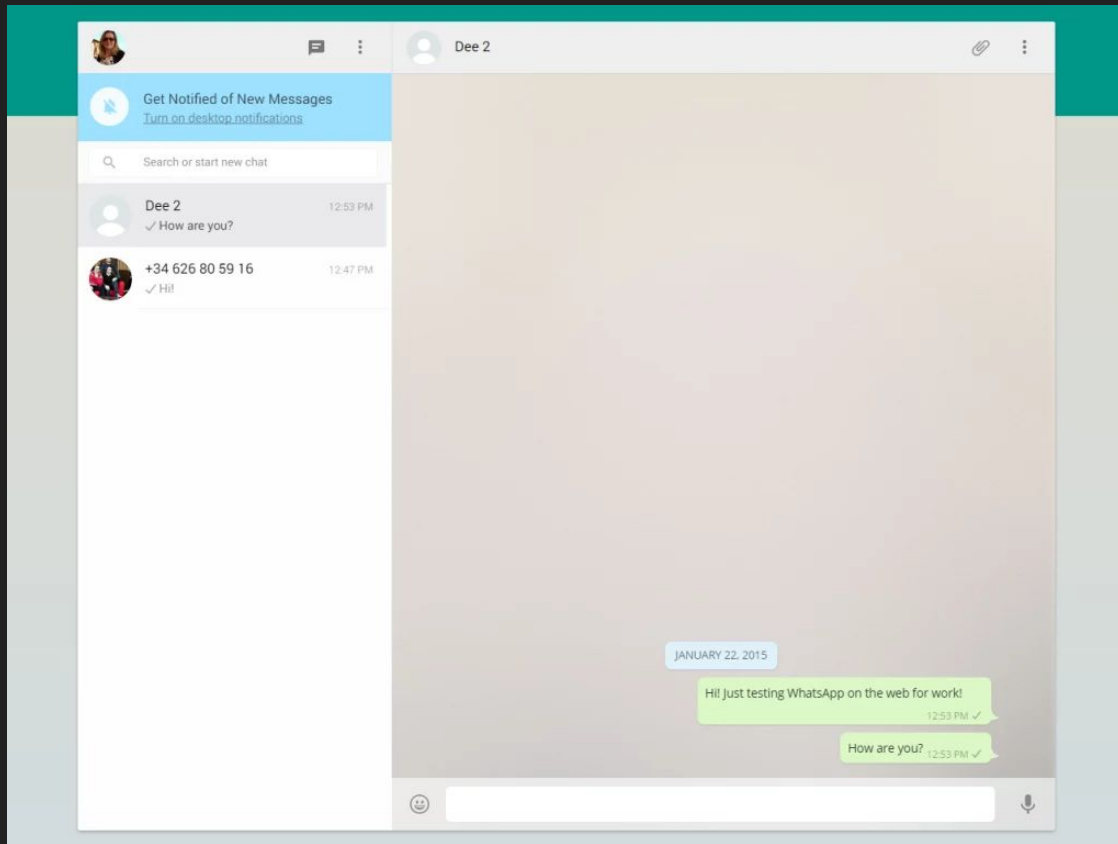


Exercise

Create the layout for a messaging application.

Structured like:

- Main container
 - Messages area
 - message
 - Typing area area
 - input



Further info

HTML + CSS:

<http://www.w3schools.com/>

Selectors: https://developer.mozilla.org/en-US/docs/CSS/Getting_Started/Selectors

To learn Javascript.

<http://codecademy.com>

To learn jQuery:

<http://docs.jquery.com/Tutorials>