Tuesday Readings

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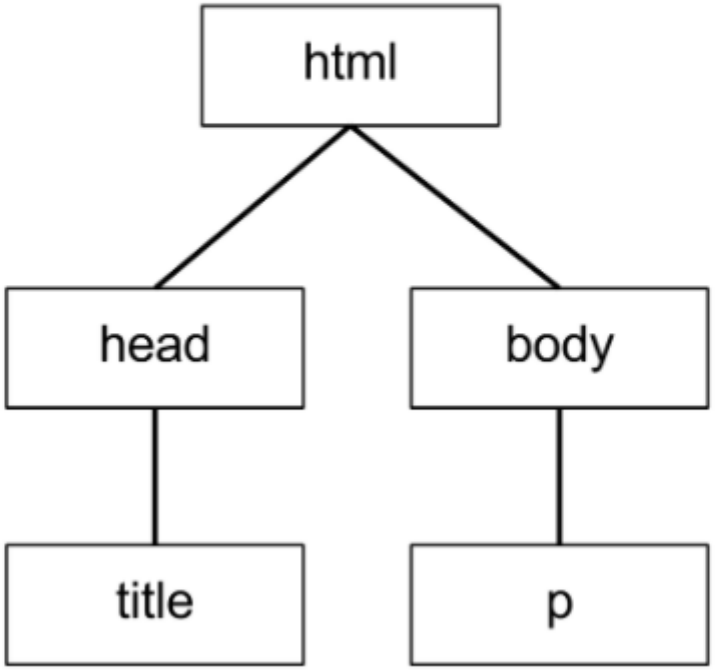
The Document Object Model, or DOM, is an object-oriented representation of an HTML document or Web page, meaning that the document is represented as objects, or nodes. It allows developers to access the document via a programming language, like Javascript.

The DOM is typically depicted as a tree with a specific hierarchy. (See the image below.) Higher branches represent parent nodes, while lower branches represent child nodes, or children. More on that later.



A `node` is the generic name for any type of object in the DOM hierarchy. A `node` could be one of the built-in DOM elements such as `document` or `document.body`, it could be an HTML tag specified in the HTML such as `<input>` or `<p>` or it could be a text node that is created by the system to hold a block of text inside another element. So, in a nutshell, a `node` is any DOM object.

An `element` is one specific type of `node` as there are many other types of nodes (text nodes, comment nodes, document nodes, etc...).

The DOM consists of a hierarchy of nodes where each node can have a parent, a list of child nodes and a nextSibling and previousSibling. That structure forms a tree-like hierarchy. The `document` node would have its list of child nodes (the `head` node and the `body` node). The `body` node would have its list of child nodes (the top level elements in your HTML page) and so on.

So, a `nodeList` is simply an array-like list of `nodes`.

An element is a specific type of node, one that can be directly specified in the HTML with an HTML tag and can have properties like an `id` or a `class`. can have children, etc... There are other types of nodes such as comment nodes, text nodes, etc... with different characteristics. Each node has a property `.nodeType` which reports what type of node it is. You can see the various types of nodes here (diagram from MDN):

Name	Value
ELEMENT_NODE	1
ATTRIBUTE_NODE 👎	2
TEXT_NODE	3
CDATA_SECTION_NODE 👎	4
ENTITY_REFERENCE_NODE 👎	5
ENTITY_NODE 👎	6
PROCESSING_INSTRUCTION_NODE	7
COMMENT_NODE	8
DOCUMENT_NODE	9
DOCUMENT_TYPE_NODE	10
DOCUMENT_FRAGMENT_NODE	11
NOTATION_NODE 👎	12

You can see an `ELEMENT_NODE` is one particular type of node where the `nodeType` property has a value of `1`.

So `document.getElementById("test")` can only return one node and it's guaranteed to be an element (a specific type of node). Because of that it just returns the element rather than a list.

Since `document.getElementsByClassName("para")` can return more than one object, the designers chose to return a `nodeList` because that's the data type they created for a list of more than one node. Since these can only be elements (only elements typically have a class name), it's technically a `nodeList` that only has nodes of type element in it and the

designers could have made a differently named collection that was an `elementList`, but they chose to use just one type of collection whether it had only elements in it or not.

we have an HTML file that includes the following `div`:

HTML

```
<div id=""”catch-me-if-you-can”"">HI!</div>
```

This HTML <div -- CSS Selector -- element is available in the DOM for us to reference and manipulate.

CSS selectors define the elements to which a set of CSS rules apply.

> **Note**: There are no selectors or combinators to select parent items, siblings of parents, or children of parent siblings.

Basic selectors

Universal selector

Selects all elements. Optionally, it may be restricted to a specific namespace or to all namespaces.

Syntax: `*` `ns|*` `*|*`
Example: `*` will match all the elements of the document.

Type selector

Selects all elements that have the given node name.
Syntax: `elementname`
Example: `input` will match any `<input>` element.

Class selector

Selects all elements that have the given `class` attribute.
Syntax: `.classname`
Example: `.index` will match any element that has a class of "index".

ID selector

Selects an element based on the value of its `id` attribute. There should be only one element with a given ID in a document.
Syntax: `#idname`
Example: `#toc` will match the element that has the ID "toc".

Attribute selector

Selects all elements that have the given attribute.
Syntax: `[attr]` `[attr=value]` `[attr~=value]` `[attr|=value]` `[attr^=value]` `[attr$=value]` `[attr*=value]`
Example: `[autoplay]` will match all elements that have the `autoplay` attribute set (to any value).

Grouping selectors

Selector list

The `,` is a grouping method, it selects all the matching nodes.

Syntax: `A, B`
Example: `div, span` will match both `<span>` and `<div>` elements.

Combinators

Descendant combinator

The ` ` (space) combinator selects nodes that are descendants of the first element.

Syntax: `A B`

Example: `div span` will match all `<span>` elements that are inside a `<div>` element.

Child combinator

The `>` combinator selects nodes that are direct children of the first element.

Syntax: `A > B`

Example: `ul > li` will match all `<li>` elements that are nested directly inside a `<ul>` element.

General sibling combinator

The `~` combinator selects siblings. This means that the second element follows the first (though not necessarily immediately), and both share the same parent.

Syntax: `A ~ B`

Example: `p ~ span` will match all `<span>` elements that follow a `<p>`, immediately or not.

Adjacent sibling combinator

The `+` combinator selects adjacent siblings. This means that the second element directly follows the first, and both share the same parent.
Syntax: *`A + B`*
Example: `h2 + p` will match all `<p>` elements that directly follow an `<h2>`.

Column combinator

The `||` combinator selects nodes which belong to a column.
Syntax: *`A || B`*
Example: `col || td` will match all `<td>` elements that belong to the scope of the `<col>`.

Using JavaScript, we can reference this element by scanning the document and finding the element by its id with the method:

document.getElementById().

->We then assign (capture with a variable initialized to the html reference) the reference to a variable.

Javascript

```
const divOfInterest = document.getElementById(“catch-me-if-you-can”)
```

Now let’s say that our HTML file contains seven `span` elements that share a class name of `cloudy`, like below:

HTML

```
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
<span class=""“cloudy”""></span>
```

Can also be written as shown below:

HTML

```
<span class=""“cloudy”""></span><span class=""“cloudy”""></span><span class=""“cloudy
```

In Javascript, we can reference all seven of these elements and store them in a single variable.

Javascript

```
const cloudySpans = document.querySelectorAll("span.cloudy");
```

While `getElementById` allows us to reference a single element,

`querySelectorAll` references all elements with the class name “cloudy” as a static `NodeList` (*static* meaning that any changes in the DOM do not affect the content of the collection).

Note that a NodeList is different from an array, but it is possible to iterate over a NodeList as with an array using forEach().

`NodeList` objects are collections of nodes, usually returned by properties such as `Node.childNodes` and methods such as `document.querySelectorAll()`.

> Although `NodeList` is not an `Array`, it is possible to iterate over it with `forEach()`. It can also be converted to a real `Array` using `Array.from()`.

> However, some older browsers have not implemented `NodeList.forEach()` nor `Array.from()`. This can be circumvented by using `Array.prototype.forEach()` — see this document's Example.

Live vs. Static NodeLists

Although they are both considered `NodeList`s, there are 2 varieties of NodeList: *live* and *static*.

Live NodeLists

In some cases, the `NodeList` is *live*, which means that changes in the DOM automatically update the collection.

For example, `Node.childNodes` is live:

```
const parent = document.getElementById('parent');let child_nodes = parent.childNod
console.log(child_nodes.length); // let's assume "2"
parent.appendChild(document.createElement('div'));
console.log(child_nodes.length); // outputs "3"
```

Static NodeLists

In other cases, the `NodeList` is *static,* where any changes in the DOM does not affect the content of the collection. The ubiquitous `document.querySelectorAll()` method returns a *static* `NodeList`.

It's good to keep this distinction in mind when you choose how to iterate over the items in the `NodeList`, and whether you should cache the list's `length`.

Properties

`NodeList.length`
: The number of nodes in the `NodeList`.

Methods

`NodeList.item()`
: Returns an item in the list by its index, or `null` if the index is out-of-bounds.

  An alternative to accessing `nodeList[i]` (which instead returns `undefined` when `i` is out-of-bounds). This is mostly useful for non-JavaScript DOM implementations.

`NodeList.entries()`
: Returns an `iterator`, allowing code to go through all key/value pairs contained in the collection. (In this case, the keys are numbers starting from `0` and the values are nodes.)

`NodeList.forEach()`
: Executes a provided function once per `NodeList` element, passing the element as an argument to the function.

`NodeList.keys()`

Returns an `iterator`, allowing code to go through all the keys of the key/value pairs contained in the collection. (In this case, the keys are numbers starting from `0`.)

`NodeList.values()`
Returns an `iterator` allowing code to go through all values (nodes) of the key/value pairs contained in the collection.

Example

It's possible to loop over the items in a `NodeList` using a for loop:

```
for (let i = 0; i < myNodeList.length; i++) {
let item = myNodeList[i];}
```

Don't use `for...in` to enumerate the items in `NodeLists`, since they will *also* enumerate its `length` and `item` properties and cause errors if your script assumes it only has to deal with `element` objects. Also, `for..in` is not guaranteed to visit the properties in any particular order.

`for...of` loops **will** loop over `NodeList` objects correctly:

```
const list = document.querySelectorAll('input[type=checkbox]');for (let checkbox c
checkbox.checked = true;}
```

Recent browsers also support iterator methods (`forEach()`) as well as `entries()`, `values()`, and `keys()`.

There is also an Internet Explorer-compatible way to use `Array.prototype.forEach` for iteration:

```
const list = document.querySelectorAll('input[type=checkbox]');Array.prototype.for
checkbox.checked = true;});
```

Using `forEach()` on a NodeList:

Javascript

```
const cloudySpans = document.querySelectorAll("span.cloudy");//cloudy spans is a

cloudySpans.forEach(span => {
console.log("Cloudy!");
});
```

Creating New DOM Elements

Now that we know how to reference DOM elements, let's try creating new elements. First we'll set up a basic HTML file with the appropriate structure and include a reference to a Javascript file that exists in the same directory in the `head`.

HTML

```
<!DOCTYPE html><html>
<head>
<title></title>
<script type="text/javascript" src="example.js"></script>
</head>
<body></body></html>
```

In our example.js file, we'll write a function to:

create a new `h1` element,

assign it an id,

give it content,

and attach it to the body of our HTML document.

Javascript

```
const addElement = () => {
```

```
// create a new div element
const newElement = document.createElement("h1");

// set the h1's id
newElement.setAttribute("id", "sleeping-giant");

// and give it some content
const newContent = document.createTextNode("Jell-O, Burled!");

// add the text node to the newly created div
//The Node.cloneNode() method can be used to make a copy of the node before appending it under the
//Note that the copies made with cloneNode will not be automatically kept in sync.
newElement.appendChild(newContent);

// add the newly created element and its content into the DOM
document.body.appendChild(newElement);};// run script when page is loadedwindow.
```

If we open up our HTML file in a browser, we should now see the words `Jell-O Burled!` on our page.

If we use the browser tools to inspect the page (right-click on the page and select “inspect”, or hotkeys fn + f12), we notice the new `h1` with the id we gave it.

Sets the value of an attribute on the specified element. If the attribute already exists, the value is updated; otherwise a new attribute is added with the specified name and value.To get the current value

of an attribute, use `getAttribute()`; to remove an attribute, call `removeAttribute()`.

In an HTML document, the `document.createElement()` method creates the HTML element specified by *tagName*, or an `HTMLUnknownElement` if *tagName* isn't recognized.

Syntax

```
let element = document.createElement(tagName[, options]);
```

Parameters

tagName

A string that specifies the type of element to be created. The `nodeName` of the created element is initialized with the value of *tagName*. Don't use qualified names (like "html:a") with this method. When called on an HTML document, `createElement()` converts *tagName* to lower case before creating the element. In Firefox, Opera, and Chrome, `createElement(null)` works like `createElement("null")`.

options Optional

An optional `ElementCreationOptions` object, containing a single property named `is`, whose value is the tag name of a custom element previously defined via `customElements.define()`. See Web component example for more details.

Return value

The new `Element`.

Syntax

```
Element.setAttribute(name, value);
```

Parameters

name

A `DOMString` specifying the name of the attribute whose value is to be set. The attribute name is automatically converted to all lower-case when `setAttribute()` is called on an HTML element in an HTML document.

`value`

A `DOMString` containing the value to assign to the attribute. Any non-string value specified is converted automatically into a string.

Boolean attributes are considered to be `true` if they're present on the element at all, regardless of their actual `value`; as a rule, you should specify the empty string (`""`) in `value` (some people use the attribute's name; this works but is non-standard). See the example below for a practical demonstration.

Since the specified `value` gets converted into a string, specifying `null` doesn't necessarily do what you expect. Instead of removing the attribute or setting its value to be `null`, it instead sets the attribute's value to the string `"null"`. If you wish to remove an attribute, call `removeAttribute()`.

Return value

`undefined`.

Creates a new `Text` node. This method can be used to escape HTML characters.

Syntax

```
var text = document.createTextNode(data);
```

- *text* is a `Text` node.
- *data* is a string containing the data to be put in the text node.

Example

```
<!DOCTYPE html><html lang="en"><head><title>createTextNode example</title><script>
var newtext = document.createTextNode(text),
p1 = document.getElementById("p1");

p1.appendChild(newtext);}</script></head>

<body>
<button onclick="addTextNode('YES! ');">YES!</button>
<button onclick="addTextNode('NO! ');">NO!</button>
<button onclick="addTextNode('WE CAN! ');">WE CAN!</button>

<hr />

<p id="p1">First line of paragraph.</p></body></html>
```

The **`Node.appendChild()`** method adds a node to the end of the list of children of a specified parent node. If the given child is a reference to an existing node in the document, `appendChild()` moves it from its current position to the new position (there is no requirement to remove the node from its parent node before appending it to some other node).

This means that a node can't be in two points of the document simultaneously. So if the node already has a parent, the node is first removed, then appended at the new position. The `Node.cloneNode()` method can be used to make a copy of the node before appending it under the new parent. Note that the copies made with `cloneNode` will not be automatically kept in sync.

If the given child is a `DocumentFragment`, the entire contents of the `DocumentFragment` are moved into the child list of the specified parent node.

> **Newer API avaliable!**
>
> The `ParentNode.append()` method supports multiple arguments and appending strings.

Syntax

```
element.appendChild(aChild)
```

Parameters

`aChild`

The node to append to the given parent node (commonly an element).

Return value

The returned value is the appended child (*`aChild`*), except when *`aChild`* is a `DocumentFragment`, in which case the empty `DocumentFragment` is returned.

Notes

Chaining may not work as expected, due to `appendChild()` returning the child element:

```
let aBlock = document.createElement('block').appendChild( document.createElement('
```

Sets *`aBlock`* to `<b></b>` only, which is probably not what you want.

Example

```
// Create a new paragraph element, and append it to the end of the document bodyle
document.body.appendChild(p);
```

Javascript

```
const addElements = () => {
// create a new div element
//Notice that our function is now called addElements, plural,
// because we're appending two elements to the body
const newElement = document.createElement("h1");

// set the h1's id
newElement.setAttribute("id", "sleeping-giant");

// and give it some content
const newContent = document.createTextNode("Jell-O, Burled!");

// add the text node to the newly created div
newElement.appendChild(newContent);

// add the newly created element and its content into the DOM
document.body.appendChild(newElement);

// append a second element to the DOM after the first one
const lastElement = document.createElement("div");
lastElement.setAttribute("id", "lickable-frog");
document.body.appendChild(lastElement);};// run script when page is loadedwindow
```

Referencing a JS File vs. Using a Script Block

HTML

```
<!DOCTYPE html><html>
<head>
<script type="text/javascript">
//Javascript goes here!
</script>
</head>
<body></body></html>
```

Inside of our script block, we'll:

- create a `ul` element with no id
- create an `li` element with the id `dreamy-eyes`
- add the `li` as a child to the `ul` element
- add the `ul` element as the first child of the `body` element.

HTML

```
<!DOCTYPE html><html>
<head>
<title>My Cool Website</title>
<script type="text/javascript">
const addListElement = () => {
```

```
const listElement = document.createElement("ul");
const listItem = document.createElement("li");
listItem.setAttribute("id", "dreamy-eyes");
listElement.appendChild(listItem);
document.body.prepend(listElement);
};
window.onload = addListElement;
</script>
</head>
<body></body></html>
```

Refresh the HTML in your browser, inspect the page, and notice the `ul` and `li` elements that were created in the script block.

Window.onload:

Syntax

```
target.onload = functionRef;
```

Value

`functionRef` is the handler function to be called when the window's `load` event fires.

Examples

```
window.onload = function() {
init();
doSomethingElse();};
```

```
<!doctype html><html>
<head>
<title>onload test</title>
// ES5
<script>
function load() {
console.log("load event detected!");
}
window.onload = load;
</script>
// ES2015
<script>
const load = () => {
```

```
    console.log("load event detected!");
    }
    window.onload = load;
    </script>
    </head>
    <body>
    <p>The load event fires when the document has finished loading!</p>
    </body></html>
```

Notes

The `load` event fires at the end of the document loading process. At this point, all of the objects in the document are in the DOM, and all the images, scripts, links and sub-frames have finished loading.

There are also DOM Events like `DOMContentLoaded` and `DOMFrameContentLoaded` (which can be handled using `EventTarget.addEventListener()`) which are fired after the DOM for the page has been constructed, but do not wait for other resources to finish loading.

Incomplete.....