



# DOM

(Document Object Model)

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.NET

The **Document Object Model (DOM)** is the data representation of the objects that comprise the structure and content of a document on the web. The DOM represents an HTML (or XML) document in memory.

# DOM (Document Object Model)

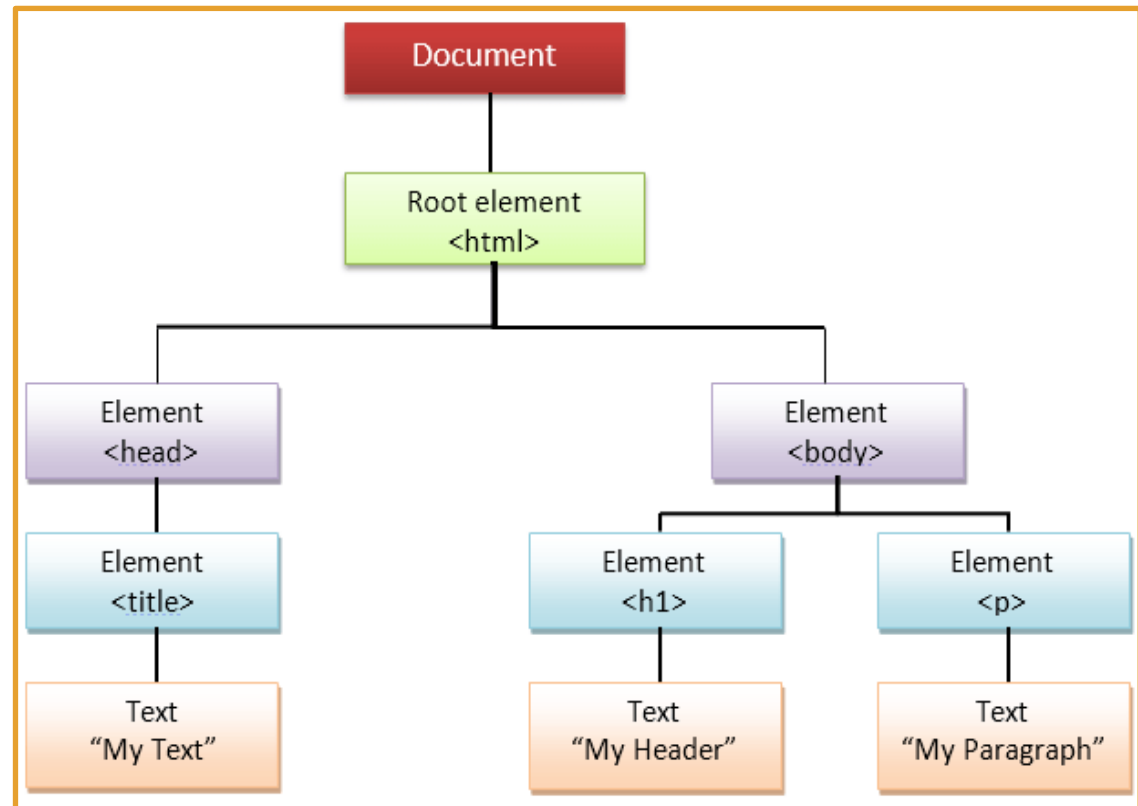
[https://developer.mozilla.org/en-US/docs/Web/API/Document\\_Object\\_Model/Introduction](https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model/Introduction)

The *Document Object Model (DOM)* is a programming interface for HTML and XML documents. It represents the page as nodes and objects. The DOM allows programs to change the documents' structure, style, and content.

A Web page is a document that can be

- displayed in the browser window,
- viewed as HTML, and
- represented by the DOM.

The DOM can be manipulated by scripting languages like JavaScript.



# DOM in action

<https://javascript.info/>

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All the properties, methods, and events available for manipulating and creating web pages are organized into objects.

For example:

- the “document” object represents the document itself
- the **<table>** object implements the *HTMLTableElement* DOM interface. It is used to access HTML tables.

***document.getElementsByTagName("p")*** returns a array of all the **<p>** elements in the document.

```
1 | const paragraphs = document.getElementsByTagName("p");
2 | // paragraphs[0] is the first <p> element
3 | // paragraphs[1] is the second <p> element, etc.
4 | alert(paragraphs[0].nodeName);
```

# DOM – How to Access the DOM

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Within the `<head>` of your `.html` file or at the bottom of the `<body>`, include a `<script>` tag which contains the `.js` file you want to use for the `.html` page. You can then access the *document* in the `.js` file using dot-notation on the keyword `document`:

```
document.getElementById("IdName")
```

```
<head>
    <!--metadata tags....-->
</head>
<body>
    <!--body content-->
    <script type="text/javascript" src="jsfile.js"></script>
</body>
```

# DOM – Selectors

<https://blog.bitsrc.io/dom-selectors-explained-70260049aaf0>

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JS DOM **Selectors** are used to select HTML **elements** within a **document**. There are 5 **selectors**.

Selector Name	Purpose
<code>let myLi = document.getElementsByTagName("li")</code>	Returns an <b>HTMLCollection</b> (array) of items matching the tag name.
<code>document.getElementsByClassName("myClass")</code>	Returns an <b>HTMLCollection</b> (array) of items matching the class name.
<code>document.getElementById("myId")</code>	Returns the <u>first</u> matched id name. Id's are supposed to be unique in the <b>.HTML</b> file.
<code>document.querySelector("#myId")</code> <code>document.querySelector(".myClass")</code> <code>document.querySelector("p")</code>	Returns the <u>first</u> element that matches the specified selector. The <b>'.'</b> is needed for classes. The <b>'#'</b> is need for id's.
<code>document.querySelectorAll("ol")</code>	Returns an <b>HTMLCollection</b> of the elements that match the specified selector.

# Walking the DOM - Basics

<https://javascript.info/dom-navigation>

We can perform many actions on *elements* and their contents after accessing them.

The topmost tree nodes are available directly as document properties:

To get the `<html>` element, use:

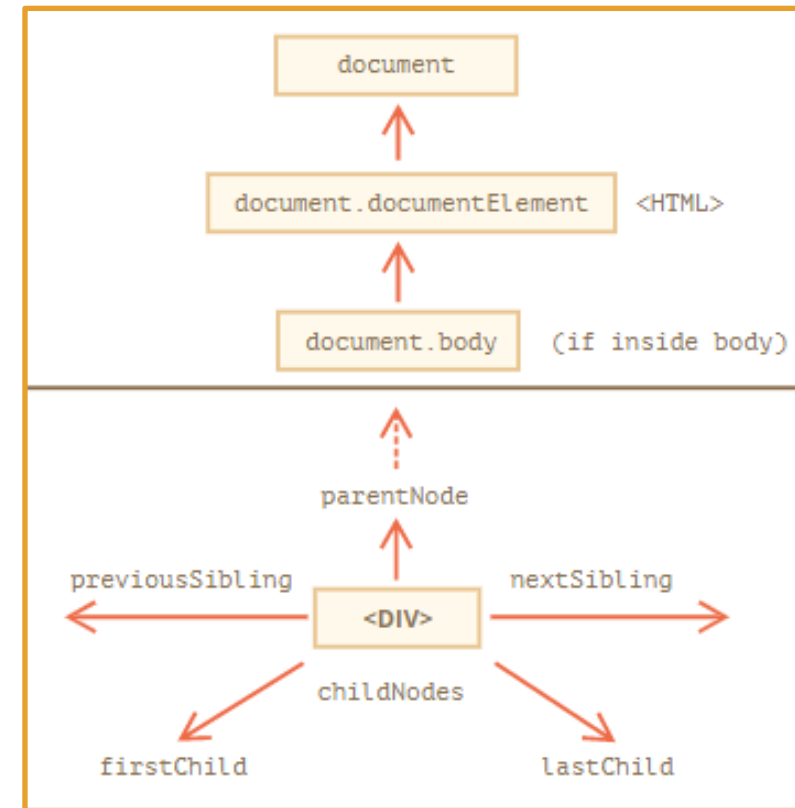
- `let html = document.documentElement;`

To get the `<body>` element, use:

- `let body = document.body;`

To get the `<head>` element, use

- `let head = document.head;`





# Walking the DOM - Basics

<https://javascript.info/dom-navigation>

- Child nodes – Elements that are nested in the given element. `<head>` and `<body>` are both children of `<html>`.
- Siblings - nodes that are children of the same parent.
- Descendants – all elements nested in the given element. This includes children, their children, etc.

In this example, `<body>` has two children, `<div>` and `<ul>`. `<div>` and `<ul>` are siblings

Among the descendants of `<body>` are the direct children `<div>` and `<ul>` and more deeply nested elements, like `<li>` (child of `<ul>`) and `<b>` (child of `<li>`).

```
1  <html>
2  <body>
3      <div>Begin</div>
4
5      <ul>
6          <li>
7              <b>Information</b>
8          </li>
9      </ul>
10 </body>
11 </html>
```

`<div>` is the first child of the `<body>`. `<ul>` is the 2<sup>nd</sup> child of the `<body>`.  
`<li>` is the first child of the `<ul>`.  
`<li>` is a descendent of the `<body>`.



# Walking the nodes of the DOM

<https://javascript.info/dom-navigation>

<https://developer.mozilla.org/en-US/docs/Web/API/Node/nodeType>

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Method	Explanation/Example
<a href="#">.body.childNodes</a>	<code>document.body.childNodes</code> lists all child nodes as an HTMLCollection, includes text and comments.
<a href="#">.firstChild</a>	<code>elem.firstChild</code> gives access to the first child. Also returns non-element nodes like plain text and <code>&lt;!--comments--&gt;</code> .
<a href="#">.lastChild</a>	<code>elem.lastChild</code> gives access to the last child.
<a href="#">.nextSibling</a>	Access the following or “right” sibling going down the page.
<a href="#">.previousSibling</a>	Access the prior or “left” sibling going up the page.
<a href="#">.parentNode</a>	Access the parent of the current node.
<a href="#">.createElement('div');</a>	Create a new element in the document object.

# Walking the elements of the DOM

<https://javascript.info/dom-navigation#children-childnodes-firstchild-lastchild>

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Method	Explanation/Example
<a href="#">.firstElementChild</a>	Gives access to the first child element.
<a href="#">.lastElementChild</a>	Gives access to the last child element.
<a href="#">.nextElementSibling</a>	Access the next (“right”) sibling element going down the page.
<a href="#">.previousElementSibling</a>	Access the prior (“left”) sibling element going up the page.
<a href="#">.parentElement</a>	Access the parent of the current node if it’s an element. Returns <i>null</i> if not an element
<a href="#">.children</a>	Returns an <i>HTMLCollection</i> of all children elements.

# DOM – Events Overview

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

<https://developer.mozilla.org/en-US/docs/Web/API/GlobalEventHandlers/onclick>

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DOM **Events** are emitted when something happens on the HTML page, such as when a **button** is clicked, or an object is ‘moused’ over.

Each **event** is represented by an **event object** which is based on the **Event** interface that can have fields and/or functions used to get additional information about what happened.

The two most common **events** are ‘**click**’ and ‘**submit**’ form submissions.



# Event Listeners and Event Handlers

[https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First\\_steps/A\\_first\\_splash](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First_steps/A_first_splash)

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**event listener** - The “construct” that listens for an event to happen.

**event handler** - The block of code that runs when the event fires.

This code creates an object that represents an HTML element with id='button'. The **button** variable holds all the data from an element.

A built-in JS helper function called **.addEventListener()** is used. It takes two arguments.

1. The type of event we are listening for (**click**), and
2. A **callback** function to the code we want to run when the event occurs.

```
const button = document.getElementById("button");
```

```
button.addEventListener('click', (e) => {do  
    some stuff});  
// another event listener can use the same callback function  
otherButton.addEventListener('mouseover',  
    callbackFunction);
```

# Bubbling and Capture

[https://developer.mozilla.org/en-US/docs/Web/API/Document\\_Object\\_Model/Examples#Example\\_5:\\_Event\\_Propagation](https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model/Examples#Example_5:_Event_Propagation)  
[https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building\\_blocks/Events](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building_blocks/Events)  
<https://javascript.info/bubbling-and-capturing>

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Event ***bubbling*** and event ***capture*** are two mechanisms that describe what happens when two ***event handlers*** are triggered on one ***element***.

When an ***event*** ('***click***') is fired on an element that has parent elements, browsers run two different event phases — the ***capturing*** phase and the ***bubbling*** phase.

[Almost all events bubble.](#)

Capture Phase	Bubble Phase
<p>The browser checks to see if the element's <u>outer-most</u> ancestor (<b>&lt;html&gt;</b>) has an 'onclick' event handler registered on it and, if so, runs it.</p> <p>This continues until it reaches the element that was actually clicked. Capture is rarely used, but <u><a href="#">sometimes can be useful</a></u>.</p>	<p>The browser checks to see if the element that was actually clicked on has an 'onclick' event handler registered on it for the bubbling phase and runs it if so.</p> <p>Then it moves on to the next immediate ancestor element and does the same thing until it reaches the <b>&lt;html&gt;</b> element.</p>

# Bubbling (1/2)

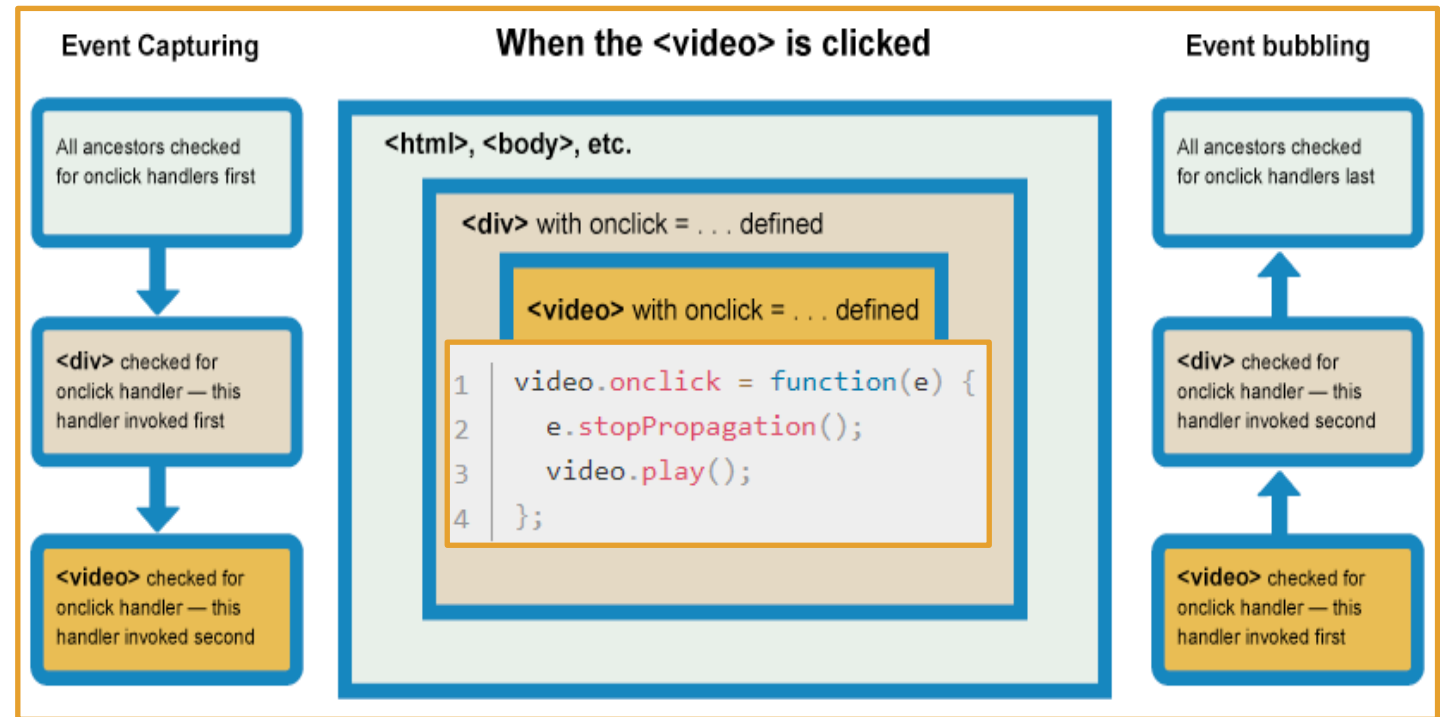
[https://developer.mozilla.org/en-US/docs/Web/API/Document\\_Object\\_Model/Examples#Example\\_5:\\_Event\\_Propagation](https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model/Examples#Example_5:_Event_Propagation)  
[https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building\\_blocks/Events](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building_blocks/Events)  
<https://www.carlrippon.com/stoppropagation-v-stopimmediatepropagation/>

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Browsers automatically register event handlers for the *bubbling* phase.

When the video is clicked, the 'click' event bubbles outward from the **<video>** element outwards to its parent **<div>**, to the **<html>**. If any of these elements has an '**on-click**' event handler, they will fire.

***.stopPropagation()*** and ***.stopImmediatePropagation()*** are used to stop further bubbling propagation.

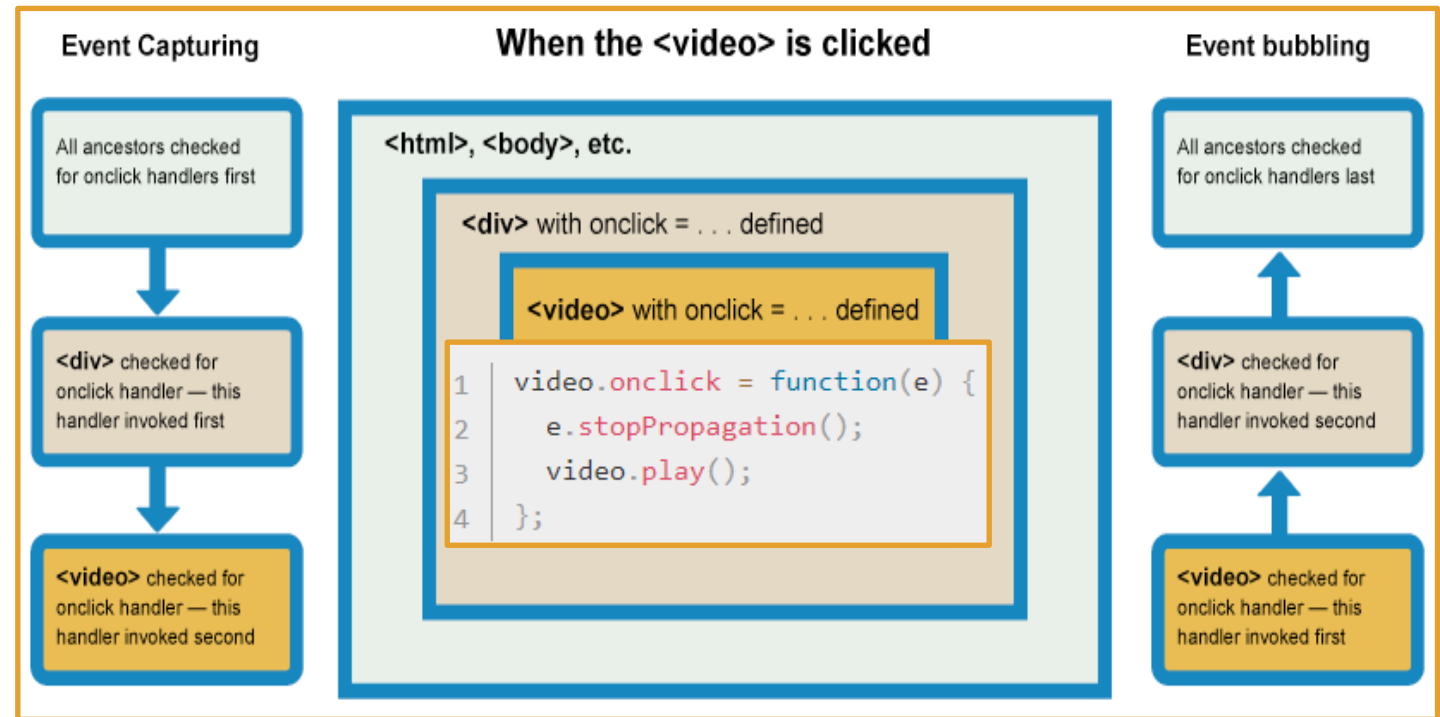


# Bubbling (2/2)

[https://developer.mozilla.org/en-US/docs/Web/API/Document\\_Object\\_Model/Examples#Example\\_5:\\_Event\\_Propagation](https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model/Examples#Example_5:_Event_Propagation)  
[https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building\\_blocks/Events](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Building_blocks/Events)  
<https://www.carlrippon.com/stoppropagation-v-stopimmediatepropagation/>

Browsers automatically register event handlers for the *bubbling* phase.

- **stopPropagation()** prevents other listeners above the triggered listener from being triggered.
- If several listeners are on the same element for the same event type, they are called in sequential order.
- **stopImmediatePropagation()** prevents remaining listeners from being called on the same element.





# DOM Events Order

[https://developer.mozilla.org/en-US/docs/Web/API/Document/DOMContentLoaded\\_event](https://developer.mozilla.org/en-US/docs/Web/API/Document/DOMContentLoaded_event)

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The **DOMContentLoaded** event fires when the initial HTML document has been completely loaded and parsed, without waiting for stylesheets, images, and subframes to finish loading.

A different event, **load**, should be used only to detect a fully-loaded page with images, etc.

- Often, developers use **load** where **DOMContentLoaded** would be faster and more appropriate.

Synchronous JavaScript pauses when parsing the DOM. To parse the DOM as fast as possible after the user has requested the page, make your JavaScript asynchronous to optimize the loading of stylesheets.

If loaded as usual, stylesheets slow down **DOM** parsing as they're loaded in parallel. This "steals" traffic from the main HTML document.

```
1 <script>
2   document.addEventListener('DOMContentLoaded', (event) => {
3     console.log('DOM fully loaded and parsed');
4   });
5
6   for( let i = 0; i < 1000000000; i++)
7   {} // This synchronous script is going to delay parsing of the DOM,
8     // so the DOMContentLoaded event is going to launch later.
9 </script>
```

# DOM Events Order

[https://developer.mozilla.org/en-US/docs/Web/API/Document/DOMContentLoaded\\_event](https://developer.mozilla.org/en-US/docs/Web/API/Document/DOMContentLoaded_event)

*DOMContentLoaded* may fire before your JS script has a chance to run, so it is wise to check before adding a listener.

## HTML

```
1 <div class="controls">
2   <button id="reload" type="button">Reload</button>
3 </div>
4
5 <div class="event-log">
6   <label>Event log:</label>
7   <textarea readonly class="event-log-contents" rows="8" cols="30"></textarea>
8 </div>
```

## JS

```
1 const log = document.querySelector('.event-log-contents');
2 const reload = document.querySelector('#reload');
3
4 reload.addEventListener('click', () => {
5   log.textContent = '';
6   window.setTimeout(() => {
7     window.location.reload(true);
8   }, 200);
9 });
10
11 window.addEventListener('load', (event) => {
12   log.textContent = log.textContent + 'load\n';
13 });
14
15 document.addEventListener('readystatechange', (event) => {
16   log.textContent = log.textContent + `readystate: ${document.readyState}\n`;
17 });
18
19 document.addEventListener('DOMContentLoaded', (event) => {
20   log.textContent = log.textContent + 'DOMContentLoaded\n';
21 });
```

## Result of the above

Reload

### Event log:

```
readystate: interactive
DOMContentLoaded
readystate: complete
load
```

# Commonly used HTML Events

[https://www.w3schools.com/tags/ref\\_eventattributes.asp](https://www.w3schools.com/tags/ref_eventattributes.asp)

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Event	Purpose
<a href="#">blur</a> / <a href="#">focus</a>	Fires when an element loses/gets focus
<a href="#">change</a>	Fires when the value of the element is changed
<a href="#">input</a>	Fires when an element gets user input
<a href="#">invalid</a>	Fires when an element is invalid
<a href="#">reset</a> / <a href="#">submit</a>	Fires when the Reset/submit button in a form is clicked
<a href="#">keyup</a> / <a href="#">keydown</a>	Fires when a user presses or releases a key
<a href="#">mouseover</a> / <a href="#">mouseout</a>	Fires when the mouse pointer moves over/out of an element
<a href="#">click</a> / <a href="#">dblclick</a> / <a href="#">mouseup</a>	Fires on a mouse click/double-click/button-release on the element

# Function DOM manipulation

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Like `.after()`, `.appendChild()` , etc...

<https://developer.mozilla.org/en-US/docs/Web/API/Element/after>

# GuessingGame Tutorial

[https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First\\_steps/A\\_first\\_splash](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/First_steps/A_first_splash)

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1. Complete the guessingGame Tutorial.
2. Change guessingGame from using **events** to using a **form** to get the number.
3. Use <https://javascript.info/ui> for independent study.