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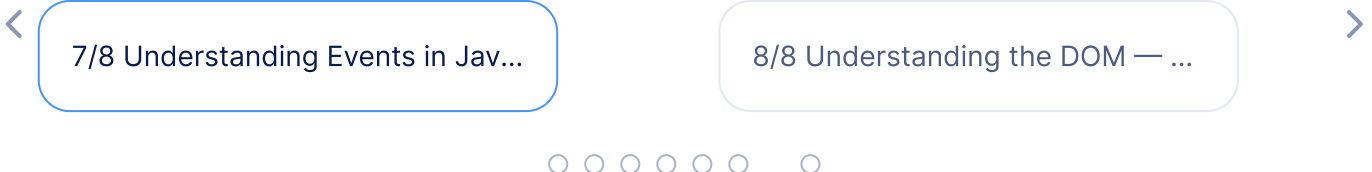
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Understanding Events in JavaScript

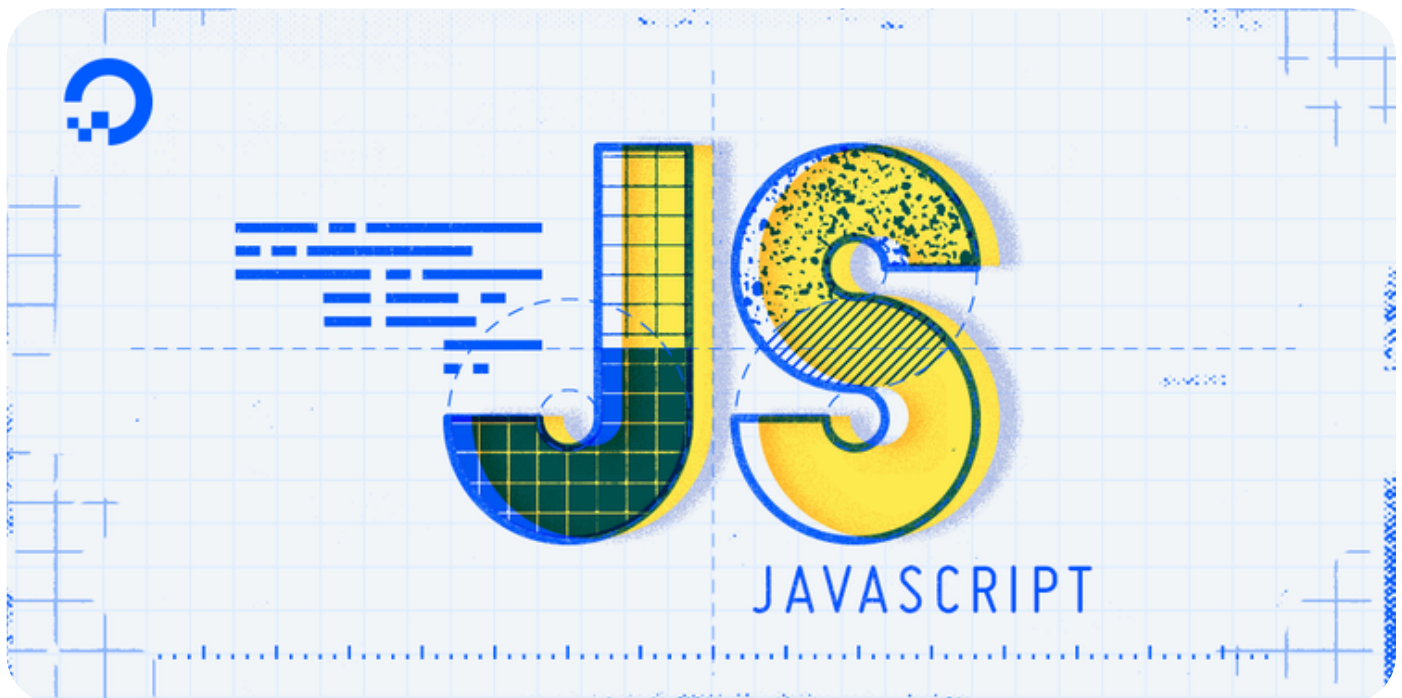
Published on June 19, 2018 · Updated on August 25, 2021

JavaScript

Development



By [Tania Rascia](#)



Introduction

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Although at this point we can now make almost any change we want to the DOM, from a user perspective it is not very helpful because we have only manually triggered changes. By learning about events, we will understand how to tie everything together to make interactive websites.

Events are actions that take place in the browser that can be initiated by either the user or the browser itself. Below are a few examples of common events that can happen on a website:

- The page finishes loading
- The user clicks a button
- The user hovers over a dropdown
- The user submits a form
- The user presses a key on their keyboard

By coding JavaScript responses that execute upon an event, developers can display messages to users, validate data, react to a button click, and many other actions.

In this article, we will go over event handlers, event listeners, and event objects. We'll also go over three different ways to write code to handle events, and a few of the most common events. By learning about events, you'll be able to make a more interactive web experience for end users.

Event Handlers and Event Listeners

When a user clicks a button or presses a key, an event is fired. These are called a click event or a keypress event, respectively.

An **event handler** is a JavaScript function that runs when an event fires.

An **event listener** attaches a responsive interface to an element, which allows that particular element to wait and “listen” for the given event to fire.

There are three ways to assign events to elements:

- Inline event handlers
- Event handler properties
- Event listeners

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To begin learning about event handlers, we'll first consider the **inline event handler**. Let's start with a very basic example that consists of a `button` element and a `p` element. We want the user to click the `button` to change the text content of the `p`.

Let's begin with an HTML page with a button in the body. We'll be referencing a JavaScript file that we'll add code to in a bit.

events.html

Copy

```
<!DOCTYPE html>
<html lang="en-US">

<head>
  <title>Events</title>
</head>

<body>

  <!-- Add button -->
  <button>Click me</button>

  <p>Try to change me.</p>

</body>

<!-- Reference JavaScript file -->
<script src="js/events.js"></script>

</html>
```

Directly on the `button`, we will add an attribute called `onclick`. The attribute value will be a function we create called `changeText()`.

events.html

Copy

```
<!DOCTYPE html>
<html lang="en-US">

<head>
  <title>Events</title>
</head>
```

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```
</body>

<script src="js/events.js"></script>

</html>
```

Let's create our `events.js` file, which we placed in the `js/` directory here. Within it, we will create the `changeText()` function, which will modify the `textContent` of the `p` element.

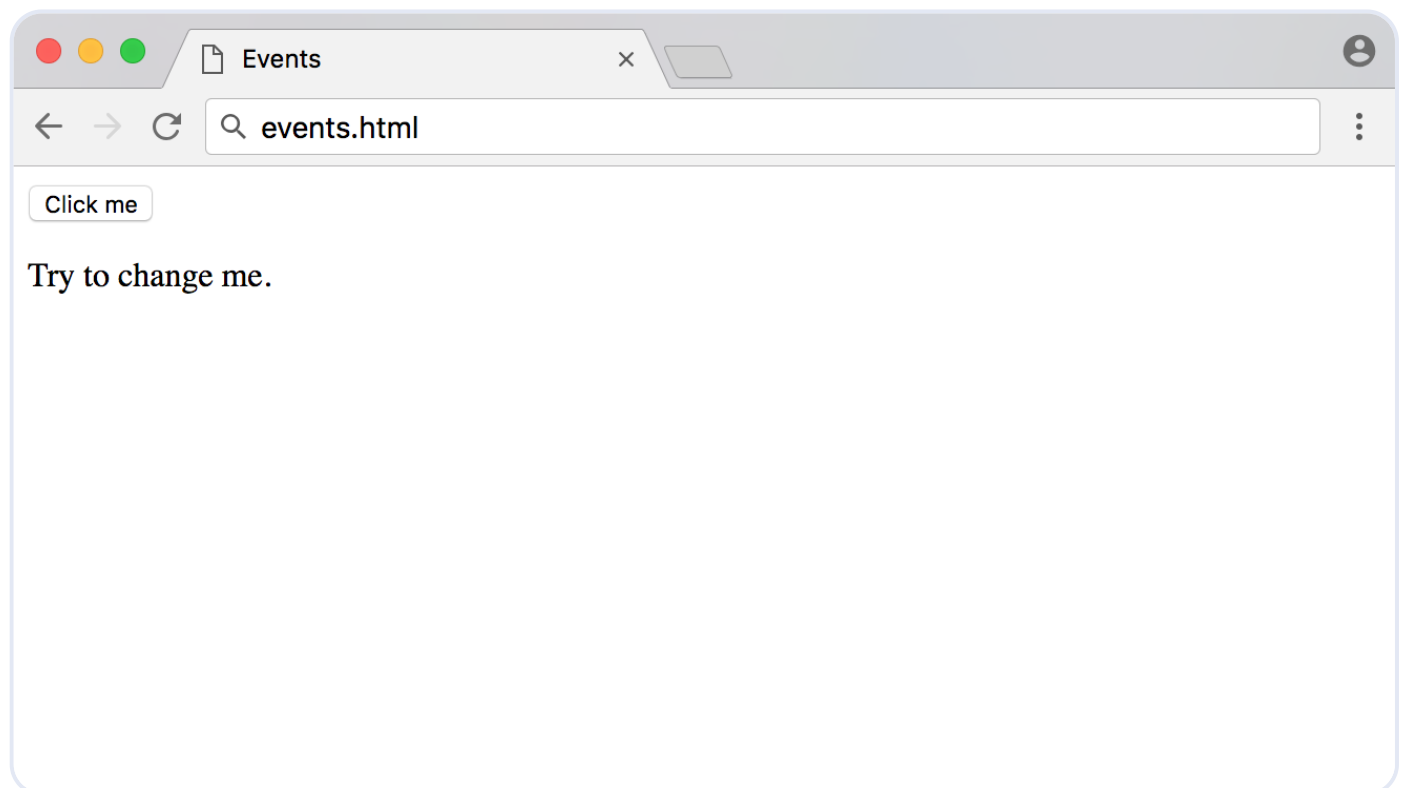
js/events.js

```
// Function to modify the text content of the paragraph
const changeText = () => {
  const p = document.querySelector('p');

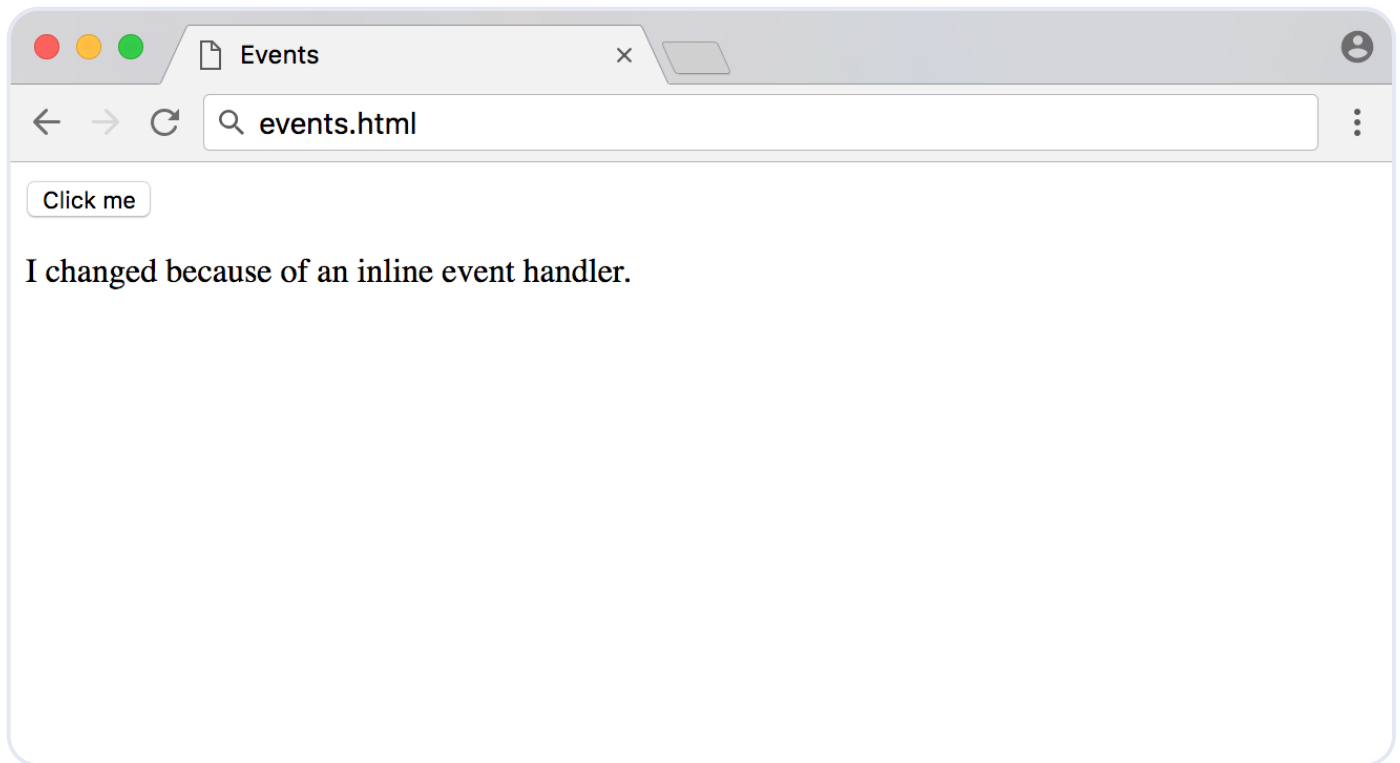
  p.textContent = "I changed because of an inline event handler.";
}
```

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When you first load the `events.html`, you'll see a page that looks like this:



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Inline event handlers are a straightforward way to begin understanding events, but they generally should not be used beyond testing and educational purposes.

You can compare inline event handlers to inline CSS styles on an HTML element. It is much more practical to maintain a separate stylesheet of classes than create inline styles on every element, just as it is more feasible to maintain JavaScript that is handled entirely through a separate script file than add handlers to every element.

Event Handler Properties

The next step up from an inline event handler is the **event handler property**. This works very similarly to an inline handler, except we're setting the property of an element in JavaScript instead of the attribute in the HTML.

The setup will be the same here, except we no longer include the `onclick="changeText()"` in the markup:

events.html

...

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```
</body>
```

```
...
```

Our function will remain similar as well, except now we need to access the `button` element in the JavaScript. We can simply access `onclick` just as we would access `style` or `id` or any other element property, then assign the function reference.

js/events.js

```
// Function to modify the text content of the paragraph
const changeText = () => {
  const p = document.querySelector('p');

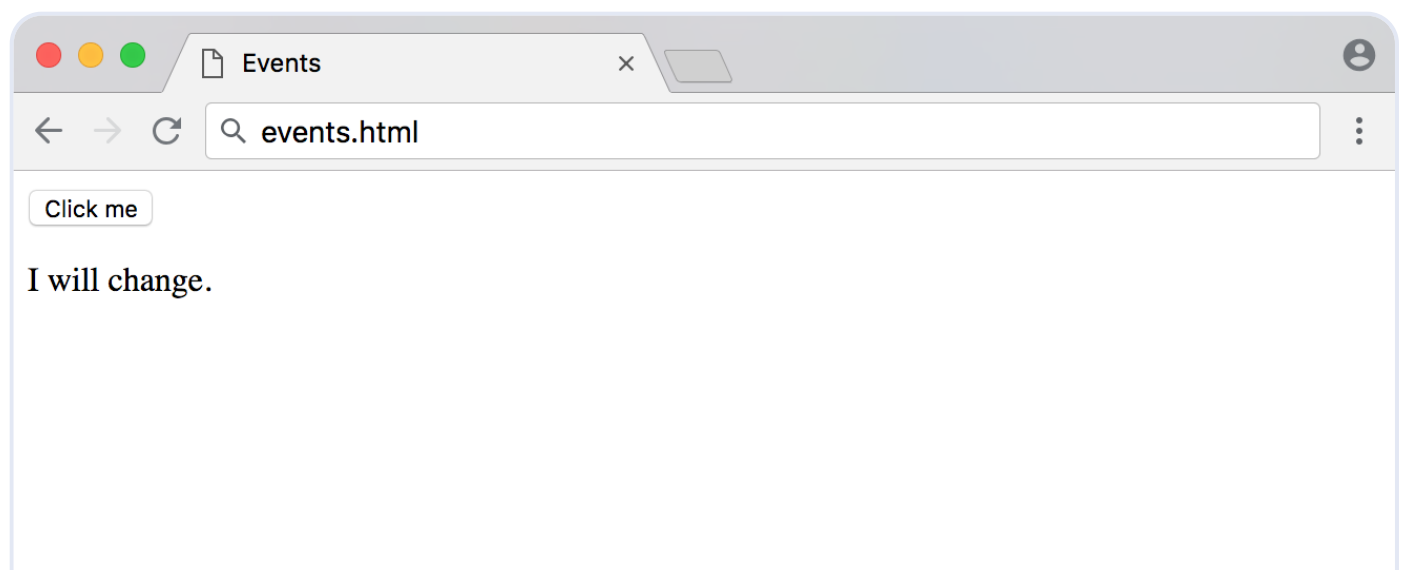
  p.textContent = "I changed because of an event handler property.";
}

// Add event handler as a property of the button element
const button = document.querySelector('button');
button.onclick = changeText;
```

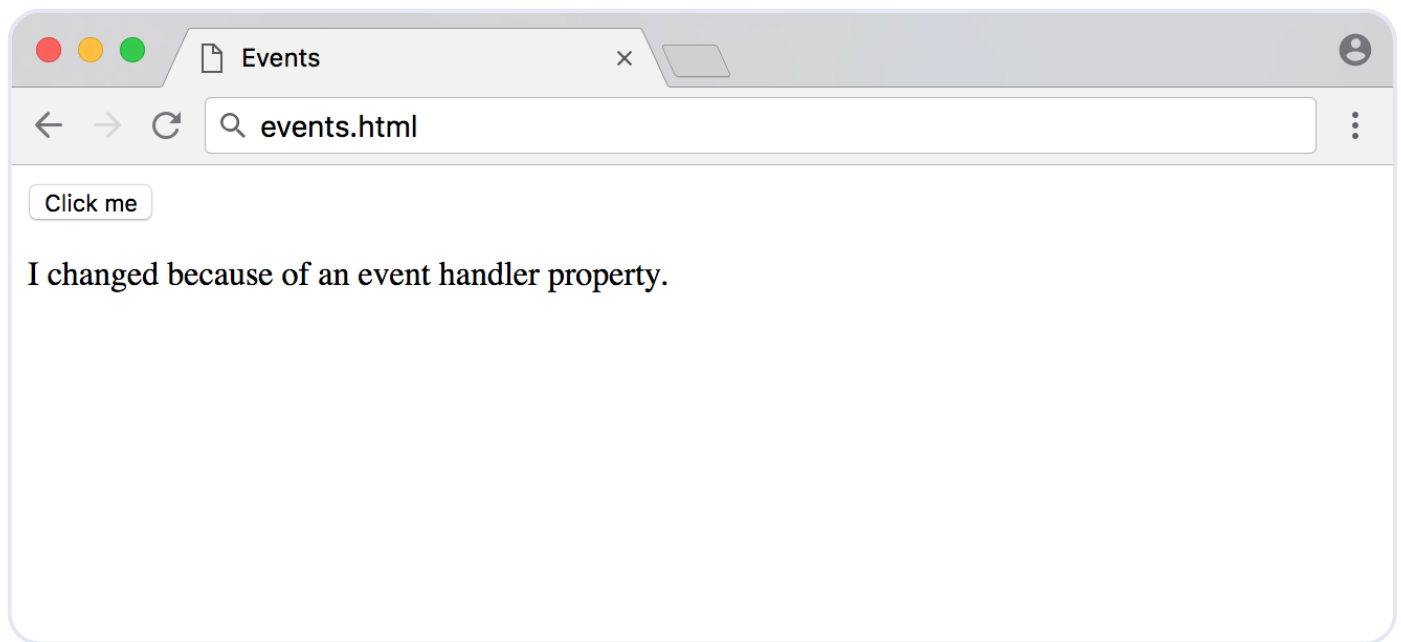
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Note: Event handlers do not follow the camelCase convention that most JavaScript code adheres to. Notice that the code is `onclick`, not `onClick`.

When you first load the page, the browser will display the following:



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Note that when passing a function reference to the `onclick` property, we do not include parentheses, as we are not invoking the function in that moment, but only passing a reference to it.

The event handler property is slightly more maintainable than the inline handler, but it still suffers from some of the same hurdles. For example, trying to set multiple, separate `onclick` properties will cause all but the last one to be overwritten, as demonstrated below.

js/events.js

```
const p = document.querySelector('p');
const button = document.querySelector('button');

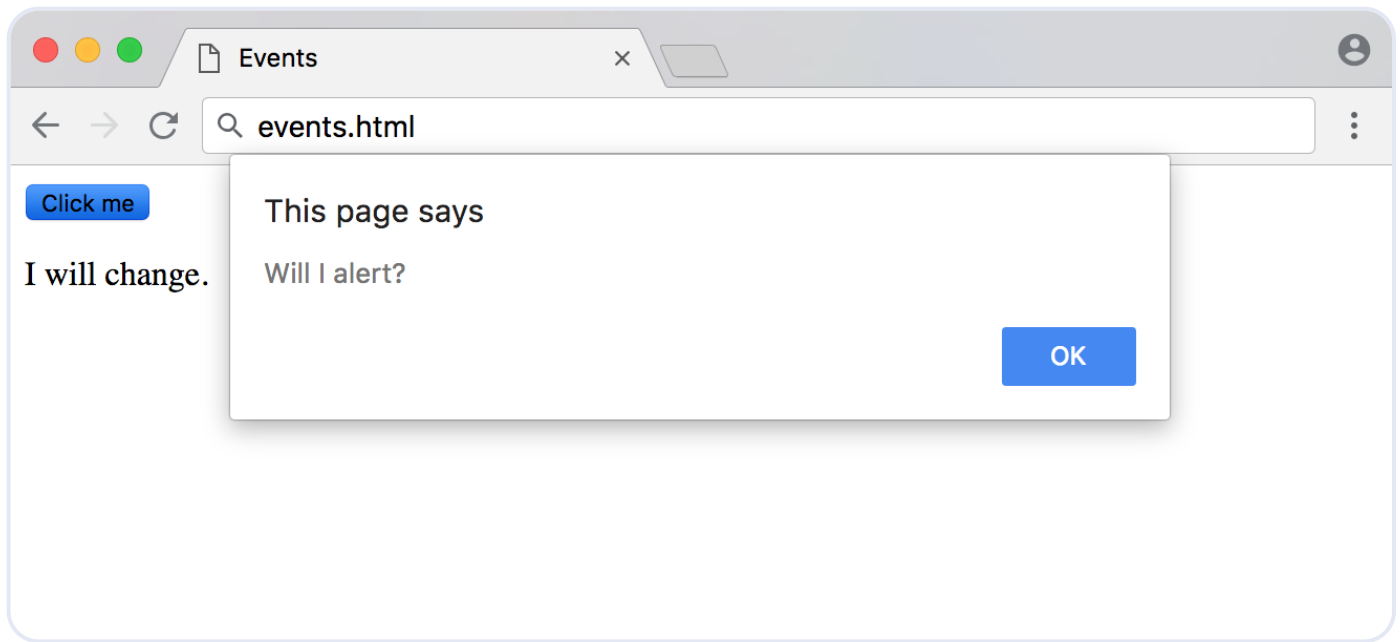
const changeText = () => {
  p.textContent = "Will I change?";
}

const alertText = () => {
  alert('Will I alert?');
}

// Events can be overwritten
button.onclick = changeText;
button.onclick = alertText;
```

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With an understanding of both inline event handlers and event handler properties, let's move onto event listeners.

Event Listeners

The latest addition to JavaScript event handlers are event listeners. An **event listener** watches for an event on an element. Instead of assigning the event directly to a property on the element, we will use the `addEventListener()` method to listen for the event.

`addEventListener()` takes two mandatory parameters — the event it is to be listening for, and the listener callback function.

The HTML for our event listener will be the same as the previous example.

events.html

```
...  
<button>Click me</button>  
  
<p>I will change.</p>  
...
```

Copy

We will still be using the same `changeText()` function as before. We'll attach the

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```
const p = document.querySelector('p');

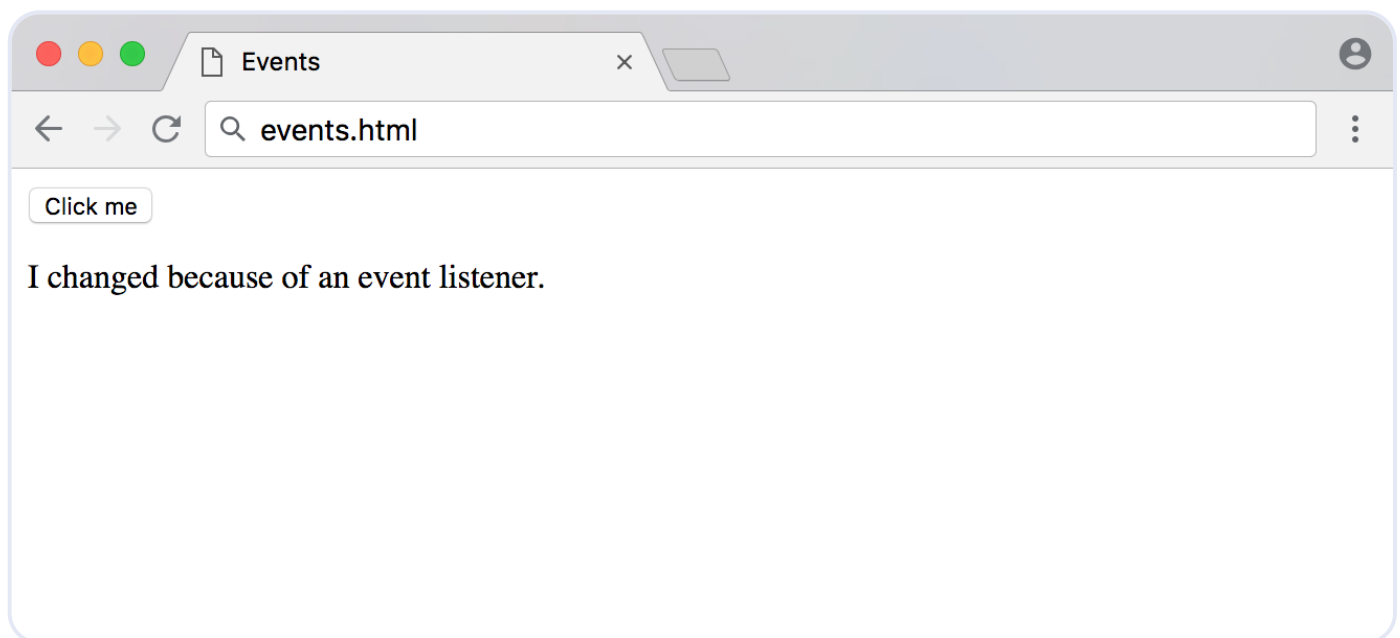
p.textContent = "I changed because of an event listener.";

}

// Listen for click event
const button = document.querySelector('button');
button.addEventListener('click', changeText);
```

Notice that with the first two methods, a click event was referred to as `onclick`, but with event listeners it is referred to as `click`. Every event listener drops the `on` from the word. In the next section, we will look at more examples of other types of events.

When you reload the page with the JavaScript code above, you'll receive the following output:



At first look, event listeners seem very similar to event handler properties, but they have a few advantages. We can set multiple event listeners on the same element, as demonstrated in the example below.

js/events.js

```
const p = document.querySelector('p');
const button = document.querySelector('button');
```

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```
        alert('Will I alert?');
    }

    // Multiple listeners can be added to the same event and element
    button.addEventListener('click', changeText);
    button.addEventListener('click', alertText);
```

In this example, both events will fire, providing the user with both an alert and modified text once clicking out of the alert.

Often, anonymous functions will be used instead of a function reference on an event listener. Anonymous functions are functions that are not named.

```
// An anonymous function on an event listener
button.addEventListener('click', () => {
    p.textContent = "Will I change?";
});
```

[Copy](#)

It is also possible to use the `removeEventListener()` function to remove one or all events from an element.

```
// Remove alert function from button element
button.removeEventListener('click', alertText);
```

[Copy](#)

Furthermore, you can use `addEventListener()` on the `document` and `window` object.

Event listeners are currently the most common and preferred way to handle events in JavaScript.

Common Events

We have learned about inline event handlers, event handler properties, and event listeners using the click event, but there are many more events in JavaScript. We will go over a few of the most common events below.

Mouse Events

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Event	Description
<code>click</code>	Fires when the mouse is pressed and released on an element
<code>dblclick</code>	Fires when an element is clicked twice
<code>mouseenter</code>	Fires when a pointer enters an element
<code>mouseleave</code>	Fires when a pointer leaves an element
<code>mousemove</code>	Fires every time a pointer moves inside an element

A `click` is a compound event that is comprised of combined `mousedown` and `mouseup` events, which fire when the mouse button is pressed down or lifted, respectively.

Using `mouseenter` and `mouseleave` in tandem recreates a hover effect that lasts as long as a mouse pointer is on the element.

Form Events

Form events are actions that pertain to forms, such as `input` elements being selected or unselected, and forms being submitted.

Event	Description
<code>submit</code>	Fires when a form is submitted
<code>focus</code>	Fires when an element (such as an input) receives focus

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Focus is achieved when an element is selected, for example, through a mouse click or navigating to it via the `TAB` key.

JavaScript is often used to submit forms and send the values through to a backend language. The advantage of using JavaScript to send forms is that it does not require a page reload to submit the form, and JavaScript can be used to validate required input fields.

Keyboard Events

Keyboard events are used for handling keyboard actions, such as pressing a key, lifting a key, and holding down a key.

Event	Description
<code>keydown</code>	Fires once when a key is pressed
<code>keyup</code>	Fires once when a key is released
<code>keypress</code>	Fires continuously while a key is pressed

Although they look similar, `keydown` and `keypress` events do not access all the exact same keys. While `keydown` will acknowledge every key that is pressed, `keypress` will omit keys that do not produce a character, such as `SHIFT`, `ALT`, or `DELETE`.

Keyboard events have specific properties for accessing individual keys.

If a parameter, known as an `event` object, is passed through to the event listener, we can access more information about the action that took place. Two properties that pertain to keyboard objects include `key` and `code`.

For example, if the user presses the letter `a` key on their keyboard, the following properties pertaining to that key will surface:

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Property	Description	Example
key	Represents the character name	a
code	Represents the physical key being pressed	KeyA

To show how to gather that information via the JavaScript Console, we can write the following lines of code.

```
// Test the key and code properties
document.addEventListener('keydown', event => {
    console.log('key: ' + event.key);
    console.log('code: ' + event.code);
});
```

[Copy](#)

Once we press `ENTER` on the Console, we can now press a key on the keyboard, in this example, we'll press `a`.

Output

```
key: a
code: KeyA
```

The `key` property is the name of the character, which can change — for example, pressing `a` with `SHIFT` would result in a `key` of `A`. The `code` property represents the physical key on the keyboard.

To learn more, you can view the [complete list of events on the Mozilla Developer Network](#).

Event Objects

The `Event` object consists of properties and methods that all events can access. In addition to the generic `Event` object, each type of event has its own extensions, such as `KeyboardEvent` and `MouseEvent`.

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To try it out, create a basic HTML file with `<p>` tags and load it into a browser.

event-test-p.html

```
<!DOCTYPE html>
<html lang="en-US">
<head>
  <title>Events</title>
</head>
<body>

  <p></p>

</body>
</html>
```

Copy

Then, type the following JavaScript code into your browser's [Developer Console](#).

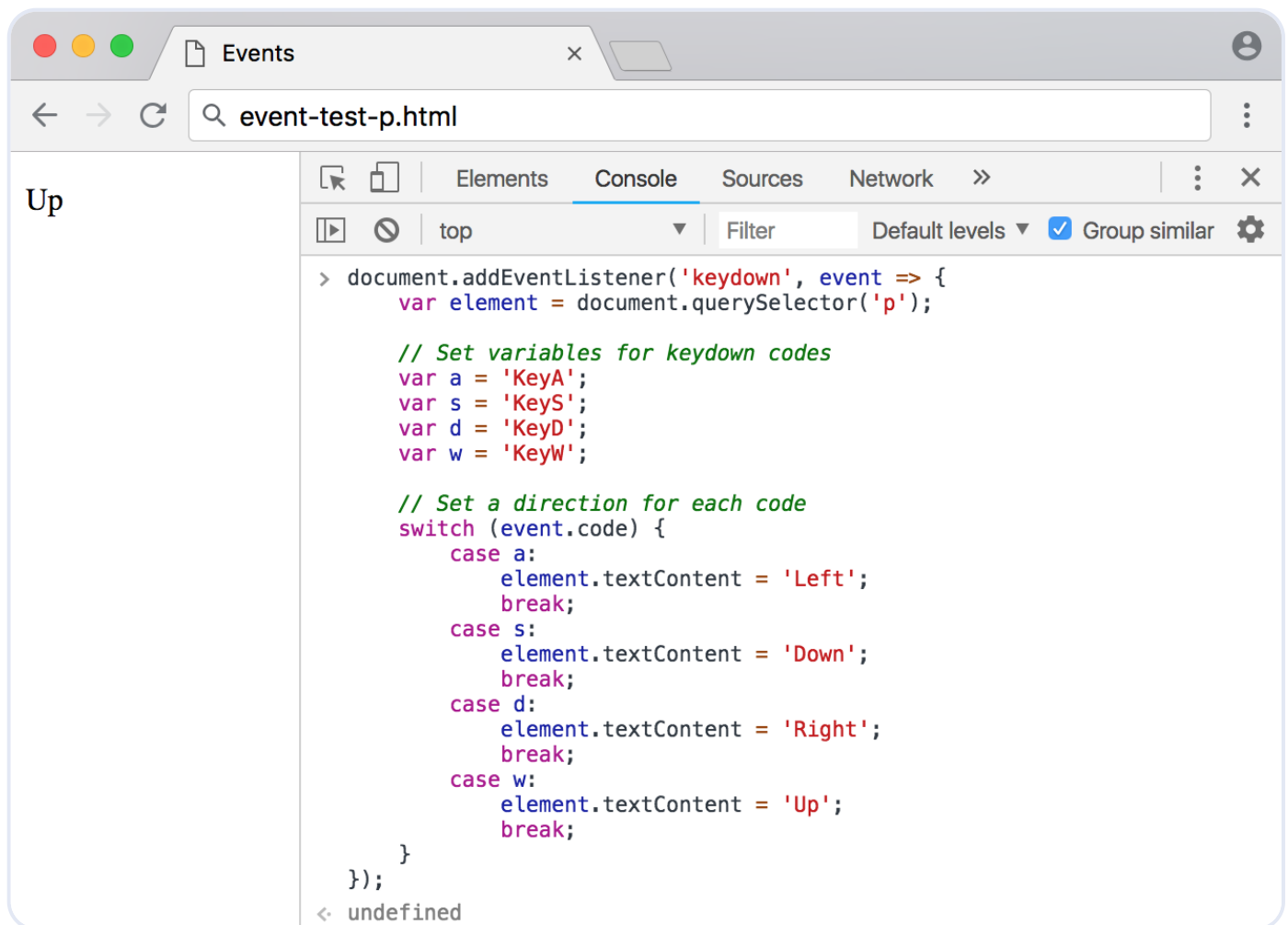
```
// Pass an event through to a listener
document.addEventListener('keydown', event => {
  var element = document.querySelector('p');

  // Set variables for keydown codes
  var a = 'KeyA';
  var s = 'KeyS';
  var d = 'KeyD';
  var w = 'KeyW';

  // Set a direction for each code
  switch (event.code) {
    case a:
      element.textContent = 'Left';
      break;
    case s:
      element.textContent = 'Down';
      break;
    case d:
      element.textContent = 'Right';
      break;
    case w:
      element.textContent = 'Up';
      break;
```

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From here, you can continue to develop how the browser will respond and to the user pressing those keys, and can create a more dynamic website.

Next, we'll go over one of the most frequently used event properties: the `target` property. In the following example, we have three `div` elements inside one `section`.

event-test-div.html

```
<!DOCTYPE html>
<html lang="en-US">
<head>
  <title>Events</title>
</head>
<body>
```

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```
</body>
</html>
```

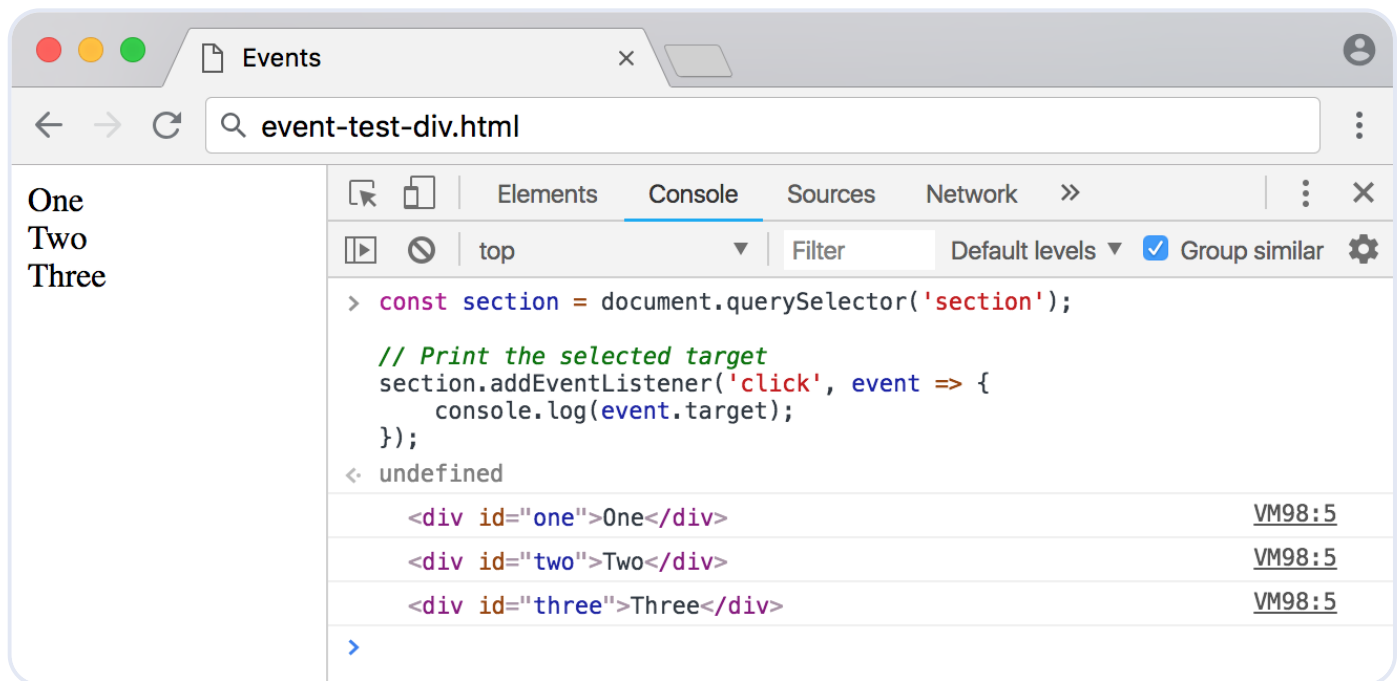
Using `event.target` with JavaScript in our browser's Developer Console, we can place one event listener on the outer `section` element and get the most deeply nested element.

```
const section = document.querySelector('section');

// Print the selected target
section.addEventListener('click', event => {
  console.log(event.target);
});
```

[Copy](#)

Clicking on any one of those elements will return output of the relevant specific element to the Console using `event.target`. This is extremely useful, as it allows you to place only one event listener that can be used to access many nested elements.



With the `Event` object, we can set up responses related to all events, including generic events and more specific extensions.

Conclusion

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In this tutorial, we learned what events are, examples of common events, the difference between event handlers and event listeners, and how to access the `Event` object. Using this knowledge, you will be able to begin making dynamic websites and applications.

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The Document Object Model, usually referred to as the DOM, is an essential part of making websites interactive. It is an interface that allows a programming language to manipulate the content, structure, and style of a website. JavaScript is the client-side scripting language that connects to the DOM in an internet browser.

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Great tutorial! Really helpful :)

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[HarryAntonyHirsch](#) • June 14, 2019 

Thank you for this beautiful explanation. Harry

[Reply](#)

[Alan](#) • February 20, 2019 

A short time very well invested. Thank you!

These tutorials are the clearest and most accessible I have found, and in my experience the most efficient. This series has consolidated concepts I had come across previously in various fragments. I've learned a lot in a short time. Thank you very much.

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[BhardwajKeshav](#) • January 15, 2019 

Great explanation for the DOM. Thank You.

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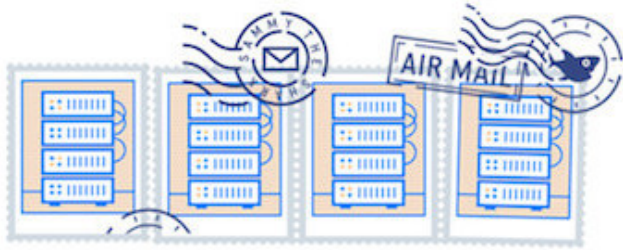
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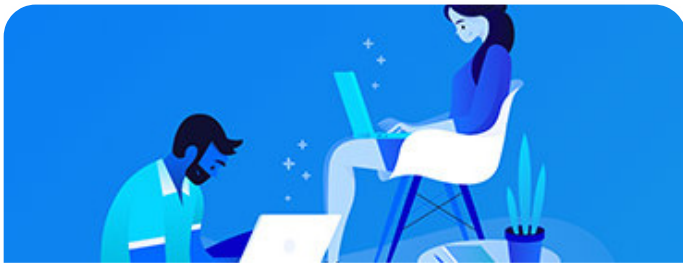


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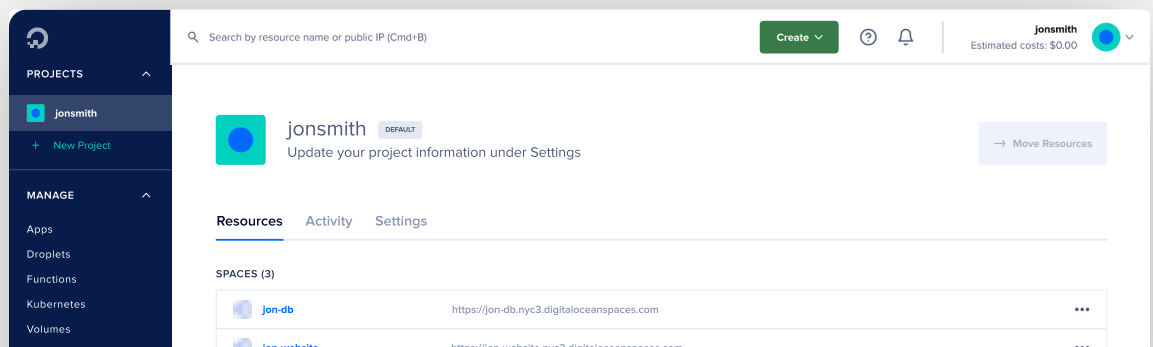
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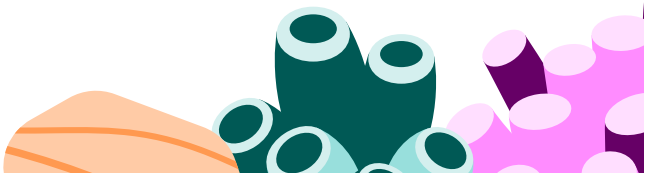
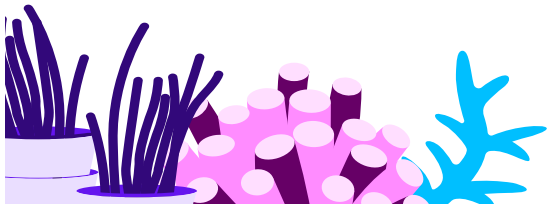
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