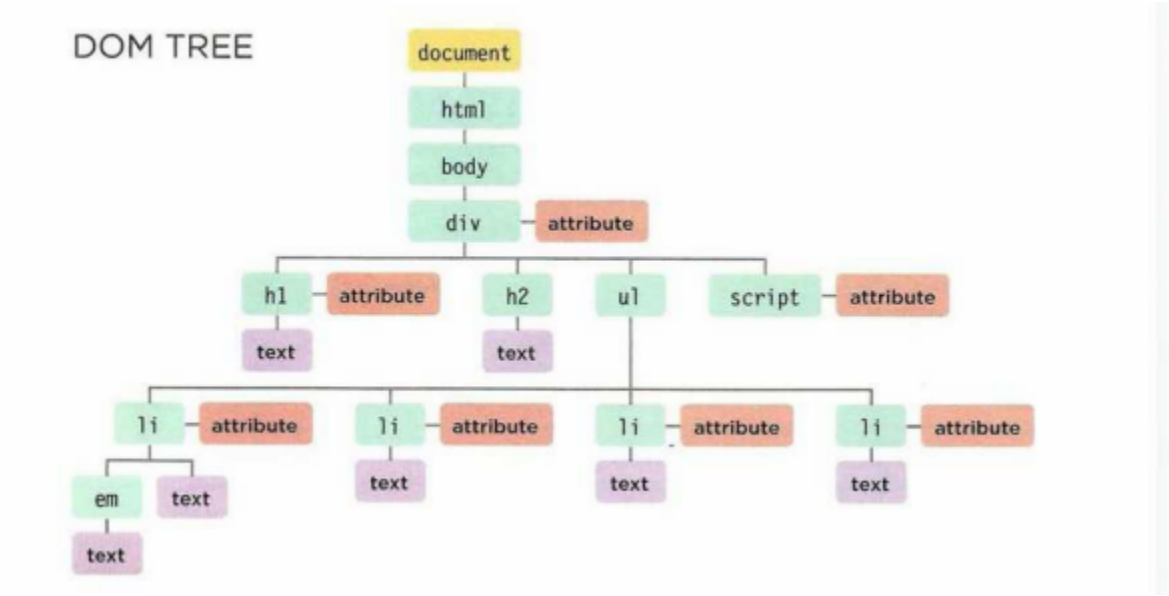
# Module-02

# Document Object Model

## 1. Introduction to DOM

- DOM(Document Object Model) represents the structure of an HTML document as a tree of objects.

  A **DOM Node** is any part of an HTML document (elements, text, attributes, or comments). JavaScript allows us to **create, modify, and remove** these nodes dynamically.

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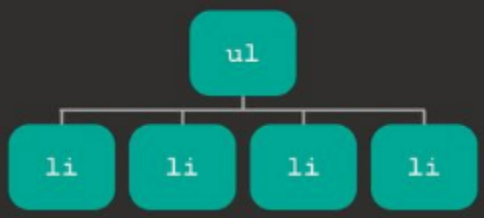
### 1 Types of DOM Nodes

| Node Type | Description | Example |
|---|---|---|
| Element Node | Represents HTML elements | `<div>`, `<p>`, `<button>` |
| Text Node | Holds the text inside an element | `"Hello World"` inside `<p>Hello World</p>` |
| Attribute Node | Represents attributes of an element | `id="myDiv"`, `class="box"` |
| Comment Node | Represents comments in the document | `<!-- This is a comment -->` |

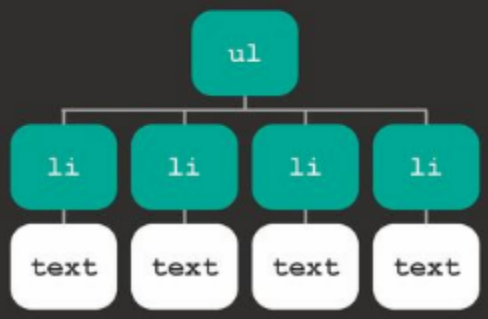
# ELEMENT NODES

```
<ul>
  <li></li>
  <li></li>
  <li></li>
  <li></li>
</ul>
```



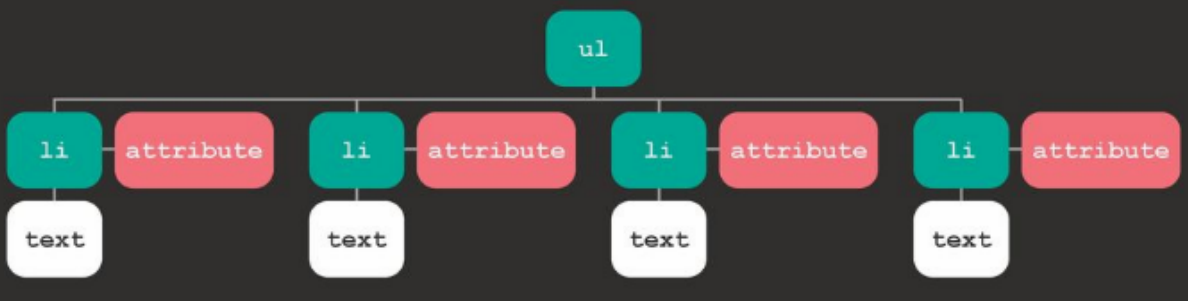
## TEXT NODES

```
<ul>
  <li>fresh figs</li>
  <li>pine nuts</li>
  <li>honey</li>
  <li>balsamic vinegar</li>
</ul>
```




## ATTRIBUTE NODES

```
<ul>
  <li id="one" class="hot">fresh figs</li>
  <li id="two" class="hot">pine nuts</li>
  <li id="three" class="hot">honey</li>
  <li id="four">balsamic vinegar</li>
</ul>
```



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**DOM Manipulation:** DOM Manipulation refers to dynamically changing HTML elements, styles, and attributes using JavaScript.

```
<!DOCTYPE html>
<html>
<body>
<p id="demo">Hello World</p>
<button onclick="changeText()">Click Me</button>

<script>
  function changeText() {
    let element = document.getElementById("demo");
    element.innerText = "Text Changed!";
    element.style.color = "red";
  }
</script>

</body>
</html>
```

- Java Script can access and manipulate these elements dynamically.

## 2. Selecting Elements in DOM

### Selecting Elements

To modify elements, we first need to **select** them. JavaScript provides multiple methods for selection.

#### Different Ways to Select Elements

Here's an explanation of the table "**Different Ways to Select Elements**" in JavaScript **with examples**:

| Method | Description | Example |
|---|---|---|
| `document.getElementById(id)` | Selects an element by its ID | `document.getElementById("demo")` |
| `document.getElementsByClassName(className)` | Selects all elements with a given class (returns an HTMLCollection) | `document.getElementsByClassName("myClass")[0]` |
| `document.getElementsByTagName(tagName)` | Selects all elements by tag name (returns an HTMLCollection) | `document.getElementsByTagName("p")` |
| `document.querySelector(selector)` | Selects the first matching element (by class, ID, or tag) | `document.querySelector(".myClass")` |
| `document.querySelectorAll(selector)` | Selects all matching eleme... | `document.querySelectorAll("div")` |

1) **getElementById:**

```
<p id="demo">Hello!</p>
<button onclick="changeText()">Click Me</button>

<script>
  function changeText() {
    document.getElementById("demo").innerText = "Hello, World!";
  }
</script>
```

2) **getElementByClassName:**

```
<p class="text">Paragraph 1</p>
<p class="text">Paragraph 2</p>

<script>
  let elements = document.getElementsByClassName("text");
  for (let i = 0; i < elements.length; i++) {
    elements[i].style.color = "blue";
```

```
  }
</script>
```

3) **getElementsByTagName(tagName)**

```
<ul>
  <li>Item 1</li>
  <li>Item 2</li>
</ul>

<script>
  let items = document.getElementsByTagName("li");
  for (let i = 0; i < items.length; i++) {
    items[i].innerText = "Updated Item " + (i + 1);
  }
</script>
```

4) **querySelector(selector):**

Select only one element

```
<p class="highlight">First highlighted text</p>
<p class="highlight">Second highlighted text</p>

<script>
  document.querySelector(".highlight").style.backgroundColor = "yellow";
</script>
```

5) **querySelectorAll(selector)**

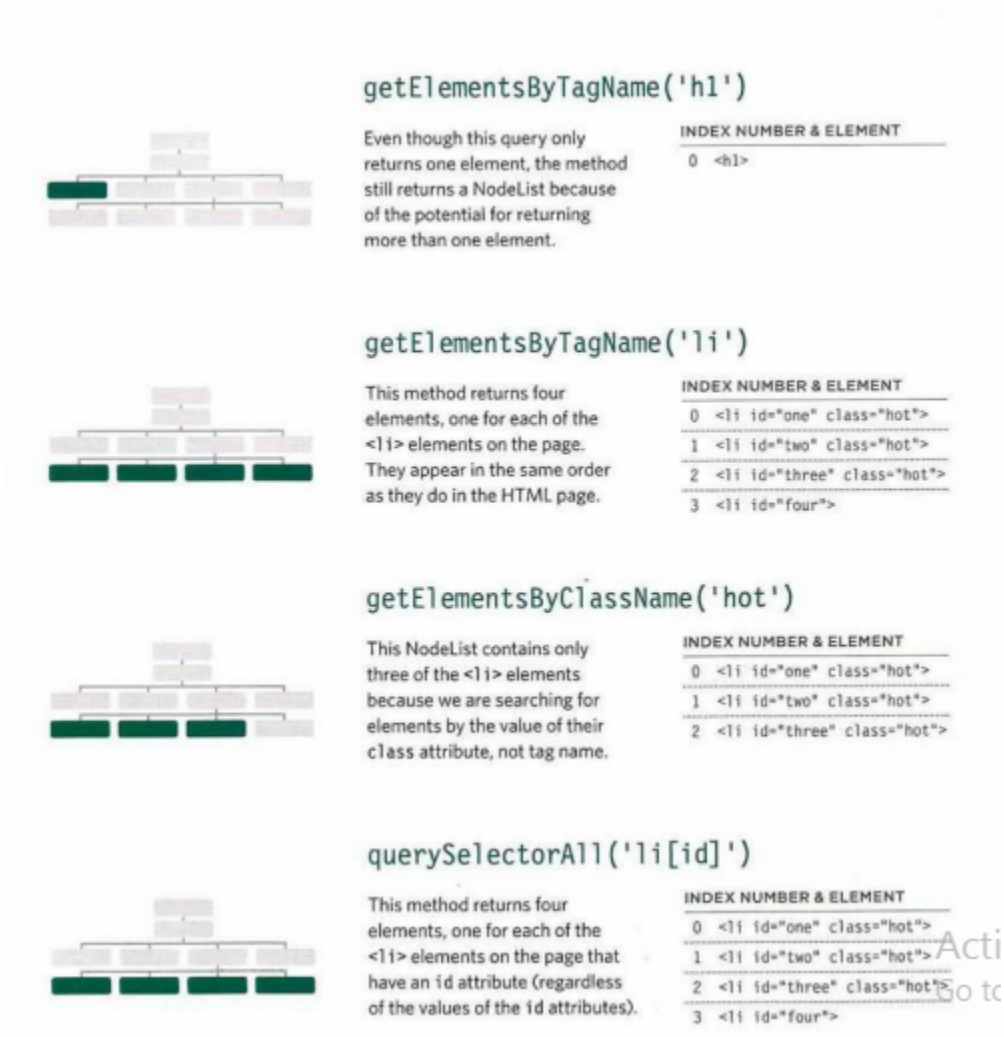
Select all elements

```
<div class="box">Box 1</div>
<div class="box">Box 2</div>

<script>
  let boxes = document.querySelectorAll(".box");
  boxes.forEach(box => {
    box.style.border = "2px solid red";
  });
</script>
```

**NodeList:**

Collection of Element node is called node list.

**Functions that return nodelist are**




**Accessing elements in node list**

**Type1:**

**let items = document.querySelectorAll(".item"); // Returns a NodeList**
**console.log(items[0]); // Logs the first element**
**console.log(items[1]); // Logs the second element**

**Type2:**

**let items = document.querySelectorAll(".item");**
**console.log(items.item(1)); // Same as items[1]**

**Type3: let items = document.querySelectorAll(".item");**

```
items.forEach((item, index) => {
   console.log(`Item ${index + 1}:`, item.textContent);
});
```

**Type4:**

```
let items = document.querySelectorAll(".item");
let itemsArray = Array.from(items);

let itemTexts = itemsArray.map(item => item.textContent);
console.log(itemTexts);
```

**Looping through the nodelist**

**Example1:**

```
let items = document.querySelectorAll("li");

for (let i = 0; i < items.length; i++) {
   console.log(`Item ${i + 1}:`, items[i].textContent);
}
```

**Example2:**

```
let divs = document.querySelectorAll("div");

for (let div of divs) {
   div.style.color = "blue";
}
```

**Creating DOM Nodes**

```
<div id="container"></div>
<button onclick="addElement()">Add Paragraph</button>

<script>
  function addElement() {
    let newPara = document.createElement("p"); // Create <p> element
    newPara.innerText = "This is a new paragraph.";
```

```
    document.getElementById("container").appendChild(newPara); //
Append to div
  }
</script>
```

**Modifying DOM Nodes:**

```
<p id="demo">Original Text</p>
<button onclick="modifyText()">Change Text</button>

<script>
  function modifyText() {
    let element = document.getElementById("demo");
    element.innerText = "Text Updated!";
    element.style.color = "blue";
  }
</script>
```

**Removing DOM Nodes**

```
<p id="removeMe">Click the button to remove me.</p>
<button onclick="removeElement()">Remove</button>

<script>
  function removeElement() {
    let element = document.getElementById("removeMe");
    element.remove(); // Remove the paragraph
  }
</script>
```

**Replacing DOM Nodes**

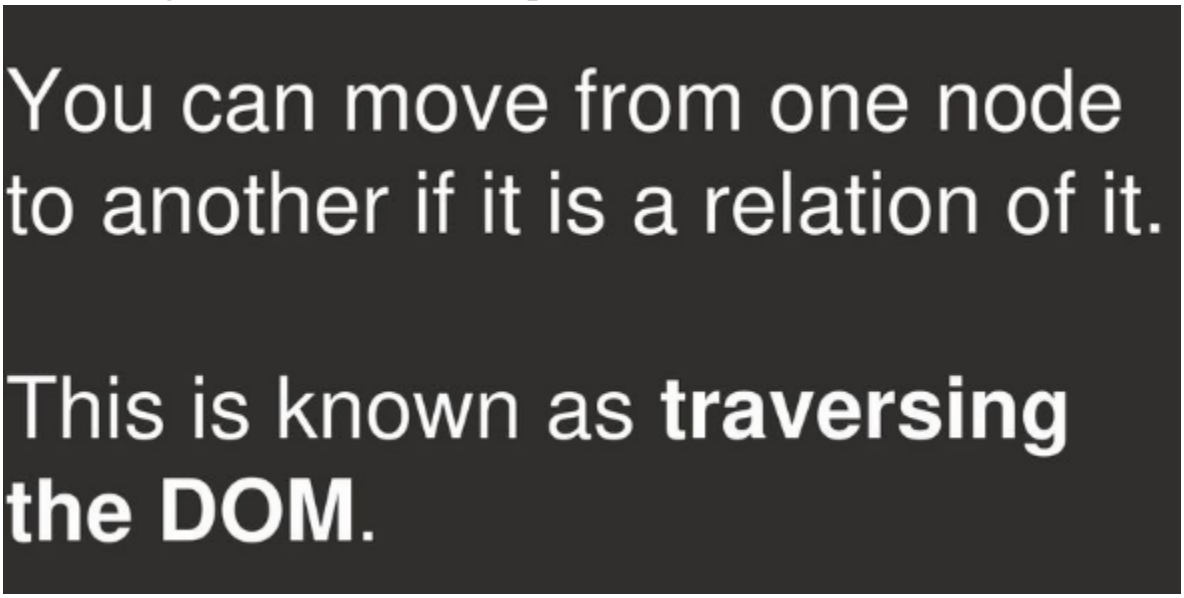
```
<p id="oldPara">This will be replaced.</p>
<button onclick="replaceElement()">Replace</button>

<script>
  function replaceElement() {
    let newPara = document.createElement("p");
    newPara.innerText = "This is the new paragraph!";
```

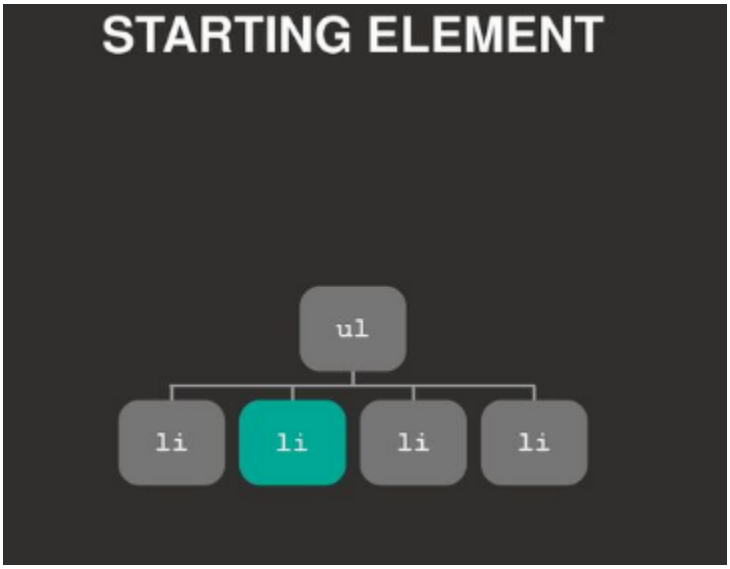
```
    let oldPara = document.getElementById("oldPara");
    oldPara.parentNode.replaceChild(newPara, oldPara);
  }
</script>
```

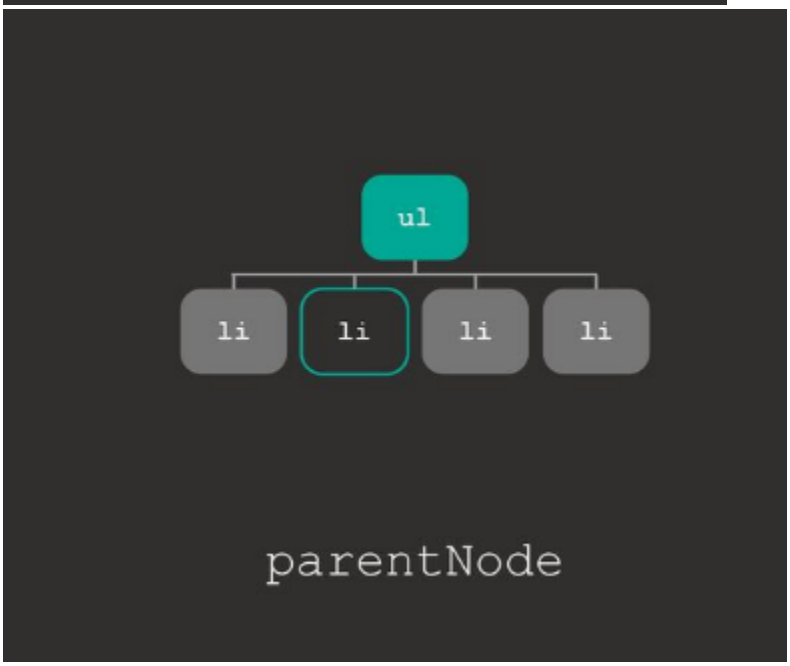
**Cloning DOM Nodes**

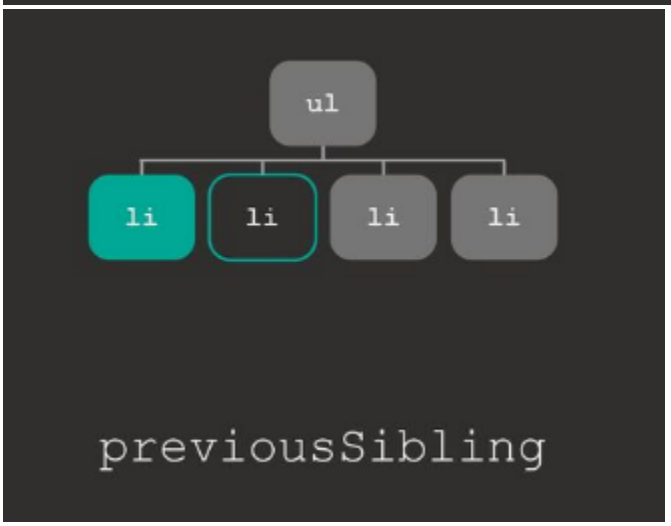
```
<p id="original">I am the original paragraph.</p>
<button onclick="cloneElement()">Clone</button>

<script>
  function cloneElement() {
    let original = document.getElementById("original");
    let clone = original.cloneNode(true); // Clone the element
    document.body.appendChild(clone); // Add clone to the body
  }
</script>
```

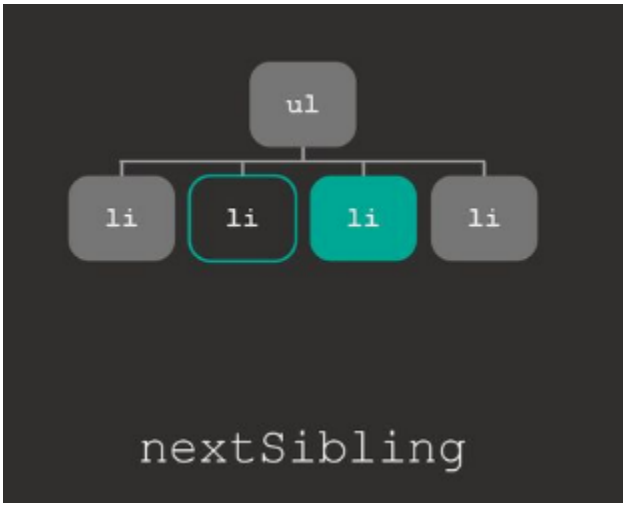
**Traversing the DOM in JavaScript**

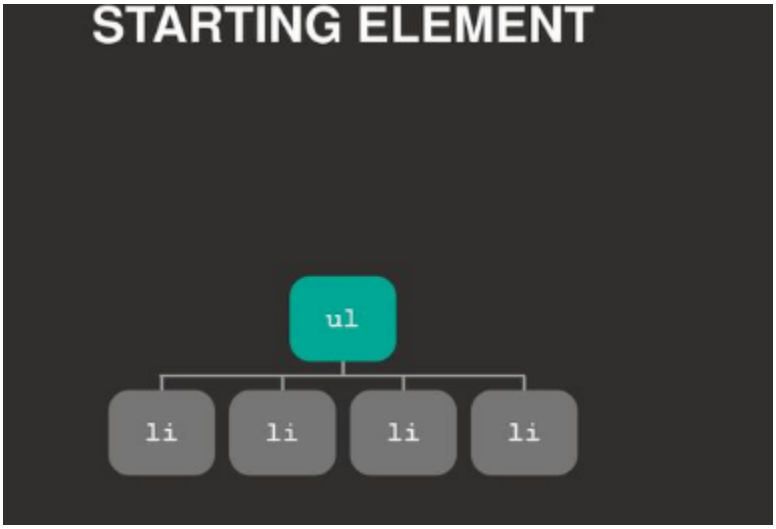


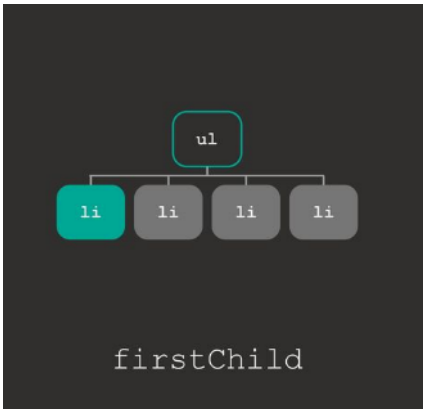

STARTING ELEMENT
ul
li
li
li
li

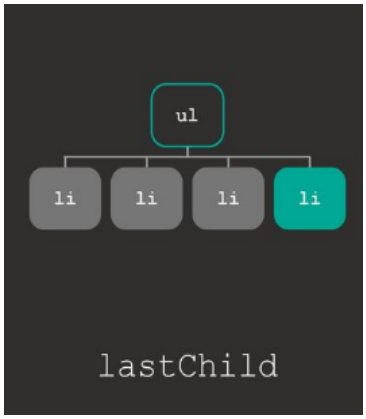

ul
li
li
li
li
parentNode


ul
li
li
li
li
previousSibling




## Parent, Child, and Sibling Relationships in DOM

The **DOM Tree** is structured as a hierarchy:

- **Parent Node** → The node that contains child nodes.
- **Child Node** → The nodes inside another node.
- **Sibling Nodes** → Nodes that share the same parent.

```
<div id="parent">
   <p id="child1">First Paragraph</p>
   <p id="child2">Second Paragraph</p>
</div>
```

**Accessing Parent Nodes**

```
<p id="child">This is a paragraph.</p>
<button onclick="findParent()">Find Parent</button>

<script>
  function findParent() {
    let child = document.getElementById("child");
    console.log(child.parentNode); // Logs the parent element (usually
<body> or <div>)
  }
</script>
```

**Accessing Child Nodes**

We can move down the DOM tree using:

.children (Only element nodes)
.firstElementChild
.lastElementChild
.childNodes (Includes text, comments, etc.)

```
<div id="parent">
  <p>First Child</p>
  <p>Second Child</p>
</div>

<script>
  let parent = document.getElementById("parent");
  console.log(parent.firstElementChild); // Logs the first <p>
  console.log(parent.lastElementChild);  // Logs the last <p>
```

```
</script>
```

**Accessing Sibling Nodes**

To move sideways between elements:
.nextElementSibling → Next element on the same level.
.previousElementSibling → Previous element on the same level.

```
<p id="para1">First Paragraph</p>
<p id="para2">Second Paragraph</p>

<script>
  let secondPara = document.getElementById("para2");
  console.log(secondPara.previousElementSibling); // Logs the first
paragraph
</script>
```

**Looping Through Child Nodes**

```
<ul id="list">
  <li>Item 1</li>
  <li>Item 2</li>
  <li>Item 3</li>
</ul>

<script>
  let list = document.getElementById("list");
  let children = list.children; // Gets all <li> elements

  for (let i = 0; i < children.length; i++) {
    console.log(children[i].innerText);
  }
</script>
```

## 🟡 Summary Table

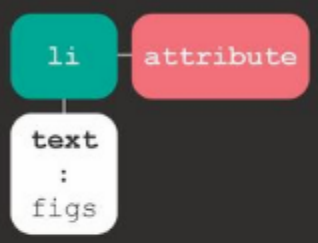
| Property | Description | Example |
|---|---|---|
| `.parentNode` | Gets parent node | `element.parentNode` |
| `.parentElement` | Gets parent element | `element.parentElement` |
| `.children` | Gets only child elements | `element.children` |
| `.childNodes` | Gets all child nodes (including text/comments) | `element.childNodes` |
| `.firstElementChild` | First child element | `element.firstElementChild` |
| `.lastElementChild` | Last child element | `element.lastElementChild` |
| `.nextElementSibling` | Next sibling element | `element.nextElementSibling` |
| `.previousElementSibling` | Previous sibling element | `element.previousElementSibling` |

**Final Example: Traversing Parent, Child, and Sibling Nodes**

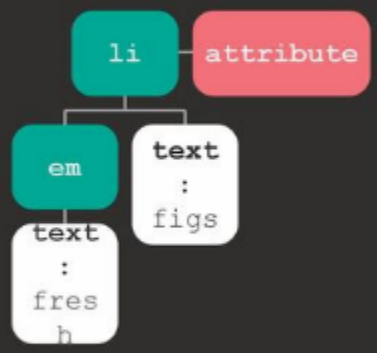
```
<div id="container">
  <h2>Heading</h2>
  <p>Paragraph 1</p>
  <p id="middle">Paragraph 2</p>
  <p>Paragraph 3</p>
</div>

<script>
  let middle = document.getElementById("middle");
  console.log(middle.parentNode);            // Logs <div id="container">
  console.log(middle.previousElementSibling); // Logs <p>Paragraph 1</p>
  console.log(middle.nextElementSibling);     // Logs <p>Paragraph 3</p>
</script>
```

# Elements can contain:

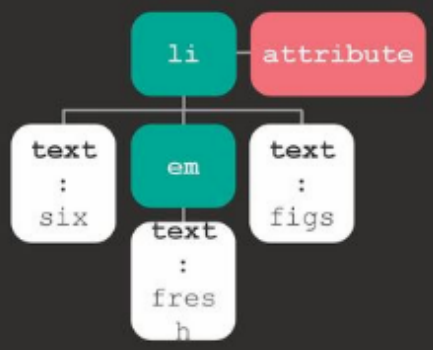
- Text nodes
- Element content
- Attributes




```
<li id="one">figs</li>
```




```
<li id="one"><em>fresh</em> figs</li>
```




```
<li id="one">six <em>fresh</em> figs</li>
```

To access their content you can use:

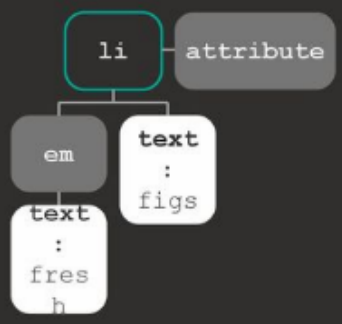
`nodeValue` on text nodes
`textContent` for text content of elements
`innerHTML` for text and markup

## `nodeValue` works on text nodes


```
var el = document.getElementById('one');
el.firstChild.nextSibling.nodeValue;
```

**returns:** figs

## `textContent` just collects text content




```
document.getElementById('one').textContent;
```

**returns:** fresh figs


```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-
scale=1.0">
    <title>nodeValue vs textContent vs innerHTML</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            text-align: center;
            margin-top: 50px;
        }
        .container {
            width: 50%;
            margin: auto;
            padding: 20px;
            border: 2px solid black;
        }
        button {
```

```
            margin: 10px;
            padding: 10px;
            font-size: 16px;
            cursor: pointer;
        }
    </style>
</head>
<body>

    <h2>nodeValue vs textContent vs innerHTML</h2>

    <div class="container">
        <p id="demo">Hello, <b>World!</b></p>
    </div>

    <button onclick="getNodeValue()">Get nodeValue</button>
    <button onclick="getTextContent()">Get textContent</button>
    <button onclick="getInnerHTML()">Get innerHTML</button>

    <button onclick="setTextContent()">Set textContent</button>
    <button onclick="setInnerHTML()">Set innerHTML</button>

    <script>
        function getNodeValue() {
            let textNode = document.getElementById("demo").firstChild;
            alert("nodeValue: " + textNode.nodeValue); // May return null if
whitespace exists
        }

        function getTextContent() {
            let element = document.getElementById("demo");
            alert("textContent: " + element.textContent); // Gets only text,
ignores HTML tags
        }

        function getInnerHTML() {
            let element = document.getElementById("demo");
```

```
        alert("innerHTML: " + element.innerHTML); // Includes HTML tags
    }

    function setTextContent() {
        let element = document.getElementById("demo");
        element.textContent = "This is new plain text!";
    }

    function setInnerHTML() {
        let element = document.getElementById("demo");
        element.innerHTML = "This is <strong>bold</strong> new
content!";
    }
  </script>

</body>
</html>
```

**Working with attributes**

1. Use a DOM query to select an element:

```
var el = document.getElementById('one');
```

2. Method gets attribute from element:

```
el.getAttribute('class');
```

Check for attribute and update it:

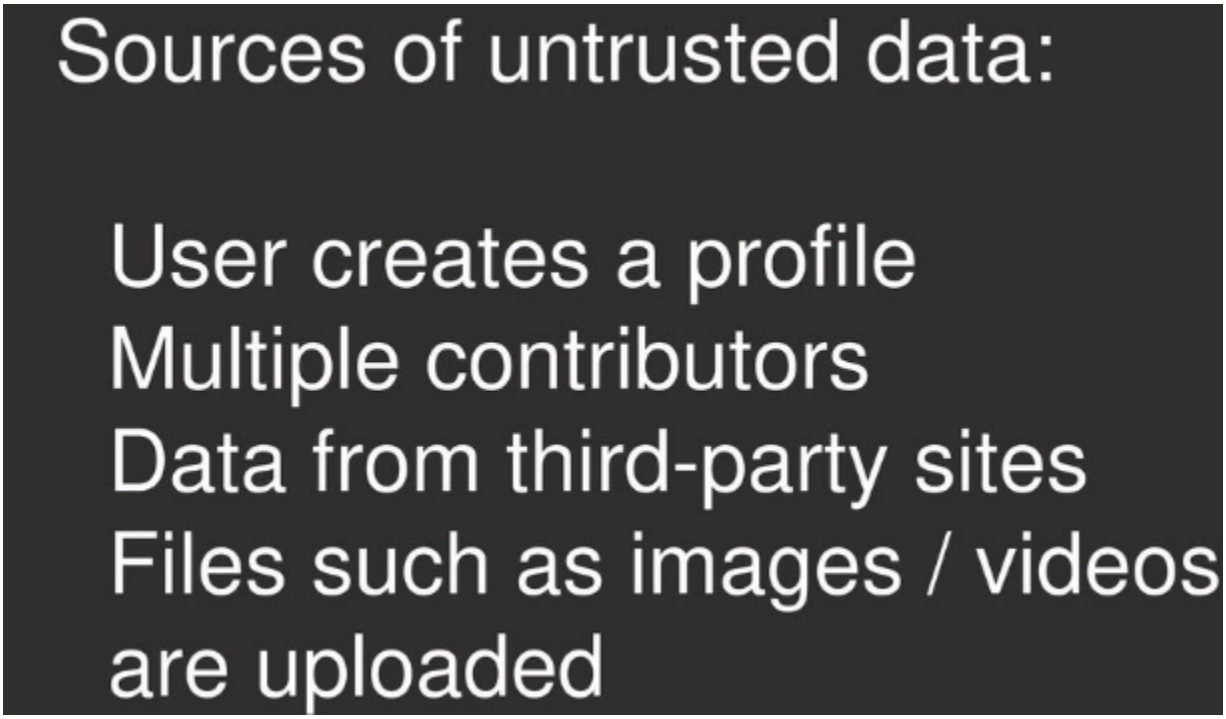
```
var el = document.getElementById('one');

if (el.hasAttribute('class') {
  el.setAttribute('class', 'cool');
}
```

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Attribute Manipulation</title>

</head>
<body>
   <h2>JavaScript Attribute Manipulation</h2>

   <a id="myLink" href="https://chatgpt.com/c/67bfed3e-ff50-8003-831c-36163103642b">Click Me</a>
   <br><br>

   <img id="myImage" src="old-image.jpg" width="200" alt="Old Image">
   <br><br>

   <button id="myButton" onclick=change()>Submit</button>
     <script>
// Selecting Elements
function change()
{
```

```
let link = document.getElementById("myLink");
let image = document.getElementById("myImage");
let button = document.getElementById("myButton");

// Create / Set Attribute
link.setAttribute("href", "https://www.google.com");
link.setAttribute("target", "_blank"); // Opens in new tab
console.log("Updated Link:", link.getAttribute("href")); // Outputs:
https://www.google.com

// Change Attribute
image.src = "images1.jpg"; // Directly modifying attribute
console.log("Updated Image Source:", image.src); // Outputs: new-
image.jpg

// Get Attribute
console.log("Image Alt Text:", image.getAttribute("alt")); // Outputs:
Old Image

// 4 Remove Attribute
button.removeAttribute("disabled");
console.log("Button Disabled?:", button.hasAttribute("disabled")); //
Outputs: false
}
</script>

</body>
</html>
```

**Cross site scripting (XSS) Attacks**

Cross-Site Scripting (**XSS**) is a type of security vulnerability where attackers **inject malicious scripts** into web applications. These scripts run in the browser of unsuspecting users, allowing attackers to steal data, manipulate content, or perform actions on behalf of users.




## Input Validation (Server-Side Security)

**"Validate all input that is sent to the server"**

- Before accepting user input, the **server must check and sanitize** it.
- Prevents malicious scripts from entering the **database** or being processed.
- This applies to **forms, URLs, cookies, and API requests**.

### ✅ Best Practices for Input Validation

✔ **Sanitize user input** – Remove harmful characters like `<script>`.
✔ **Use allowlists** – Only allow expected input formats.
✔ **Reject unexpected input** – E.g., validate email format before storing it

```
function sanitizeInput(input) {
   return input.replace(/[<>'"/]/g, ""); // Removes harmful characters
}
```

## Escaping Data on Output (Client-Side Security)

**Escape data coming from the server"**

- Any **data retrieved from the server** (database) must be **escaped** before displaying it in the **browser**.
- Prevents **injected scripts** from executing in the user's browser.

### ✅ Best Practices for Output Escaping

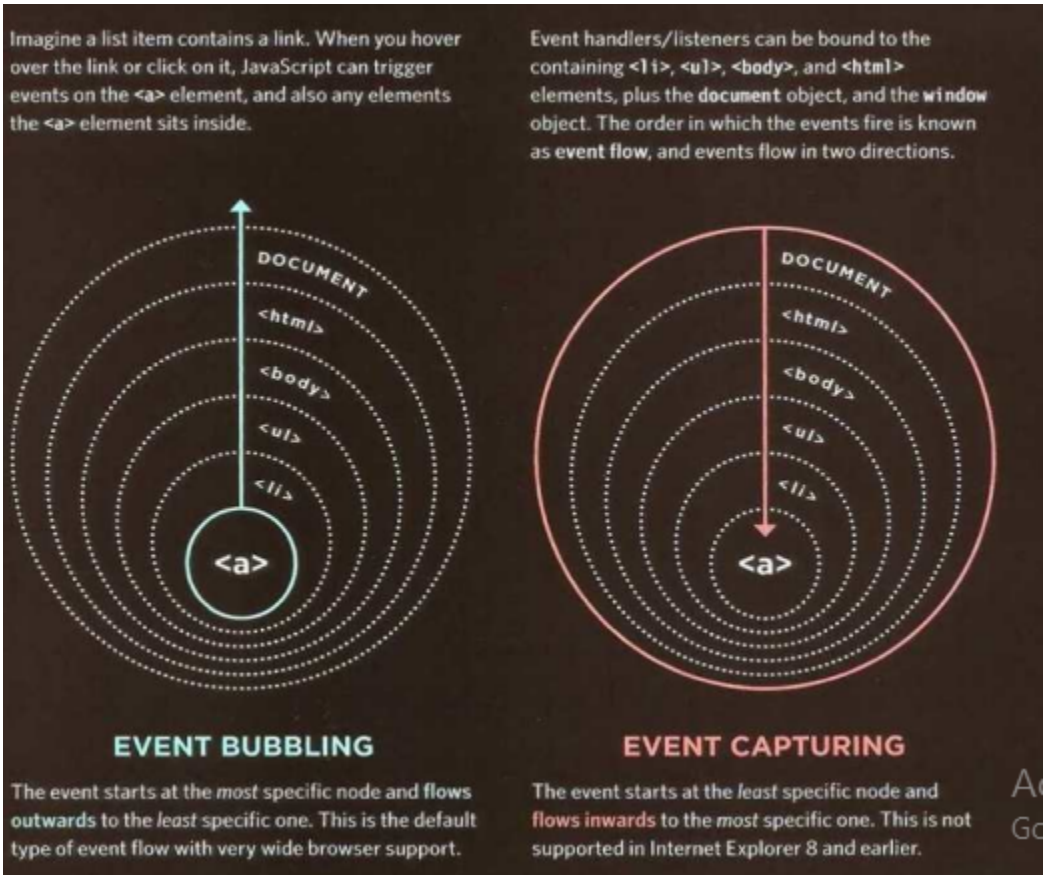
✔ **Use encoding techniques** – Convert `<script>` into safe HTML entities (`<script>`).
✔ **Use frameworks that escape content** – React, Angular, etc.
✔ **Avoid `innerHTML`** – Use `textContent` instead.

```
function encodeHTML(str) {

   let div = document.createElement('div');

   div.innerText = str;

   return div.innerHTML; // Converts <script> to &lt;script&gt;

}
```

# Events in java script

An **event** in JavaScript is an action or occurrence detected by the browser, such as a user clicking a button, pressing a key, or resizing the window. JavaScript allows developers to handle these events to create interactive web applications.

**Event Flow:**
Event flow determines **how events propagate** through the **DOM (Document Object Model)** when an event occurs.




## Three Phases of Event Flow

1. **Capturing Phase (Trickling Down)**
   - The event starts at the **window** and moves **down** the DOM tree to the target element.
2. **Target Phase (Event Handling)**
   - The event reaches the **target element**, where the event listener is executed (if present).
3. **Bubbling Phase (Bubbling Up)**
   - After reaching the target, the event **bubbles up** back through the DOM tree to the **window**.

**Example:**

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Event Flow Example</title>
  <style>
    div { padding: 20px; border: 2px solid black; margin: 10px; }
```

```
    </style>
  </head>
  <body>

    <div id="parent">
      Parent Div
      <div id="child">
        Child Div
      </div>
    </div>

    <script>
      const parent = document.getElementById("parent");
      const child = document.getElementById("child");

      // Capturing Phase (Trickling Down)
      parent.addEventListener("click", function() {
        console.log("Parent Capturing");
      }, true); // 'true' enables capturing

      child.addEventListener("click", function() {
        console.log("Child Capturing");
      }, true);

      // Bubbling Phase (Bubbling Up)
      child.addEventListener("click", function() {
        console.log("Child Bubbling");
      }, false); // 'false' enables bubbling

      parent.addEventListener("click", function() {
        console.log("Parent Bubbling");
      }, false);

    </script>

  </body>
  </html>
```

**3. Event Delegation**

- Used for handling events dynamically on elements that may not exist at the start.

Example:

Without Event Delegation (Inefficient)

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Without Event Delegation</title>
</head>
<body>

    <button class="item">Item 1</button>
    <button class="item">Item 2</button>
    <button class="item">Item 3</button>

    <script>
        // Adding separate event listeners to each button (inefficient)
        document.querySelectorAll(".item").forEach(button => {
            button.addEventListener("click", function() {
                console.log("Clicked:", this.textContent);
            });
        });
```

```
    </script>

</body>
</html>
```

Using Event Delegation (Efficient)

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Event Delegation Example</title>
</head>
<body>

    <div id="parent">
        <button class="item">Item 1</button>
        <button class="item">Item 2</button>
        <button class="item">Item 3</button>
    </div>

    <button onclick="addNewItem()">Add New Item</button>

    <script>
        const parent = document.getElementById("parent");
```

```
        // Using event delegation - adding event listener to parent
        parent.addEventListener("click", function(event) {
            if (event.target.classList.contains("item")) {
                console.log("Clicked:", event.target.textContent);
            }
        });

        // Function to dynamically add a new button
        function addNewItem() {
            const newButton = document.createElement("button");
            newButton.textContent = "New Item";
            newButton.classList.add("item");
            parent.appendChild(newButton);
        }
    </script>

</body>
</html>
```

Types of Events:

Here is a selection of the events that occur in the browser while you are browsing the web. Any of these events can be used to trigger a function in your JavaScript code.

UI EVENTS — Occur when a user interacts with the browser's user interface (UI) rather than the web page

| EVENT | DESCRIPTION |
|---|---|
| `load` | Web page has finished loading |
| `unload` | Web page is unloading (usually because a new page was requested) |
| `error` | Browser encounters a JavaScript error or an asset doesn't exist |
| `resize` | Browser window has been resized |
| `scroll` | User has scrolled up or down the page |

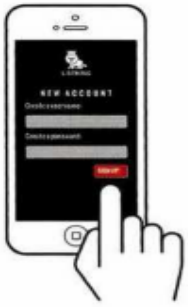
KEYBOARD EVENTS — Occur when a user interacts with the keyboard (see also `input` event)

| EVENT | DESCRIPTION |
|---|---|
| `keydown` | User first presses a key (repeats while key is depressed) |
| `keyup` | User releases a key |
| `keypress` | Character is being inserted (repeats while key is depressed) |

MOUSE EVENTS — Occur when a user interacts with a mouse, trackpad, or touchscreen

| EVENT | DESCRIPTION |
|---|---|
| `click` | User presses and releases a button over the same element |
| `dblclick` | User presses and releases a button twice over the same element |
| `mousedown` | User presses a mouse button while over an element |
| `mouseup` | User releases a mouse button while over an element |
| `mousemove` | User moves the mouse (not on a touchscreen) |
| `mouseover` | User moves the mouse over an element (not on a touchscreen) |
| `mouseout` | User moves the mouse off an element (not on a touchscreen) |

## TERMINOLOGY



### EVENTS FIRE OR ARE RAISED

When an event has occurred, it is often described as having **fired** or been **raised**. In the diagram on the right, if the user is tapping on a link, a `click` event would fire in the browser.

### EVENTS TRIGGER SCRIPTS

Events are said to **trigger** a function or script. When the `click` event fires on the element in this diagram, it could trigger a script that enlarges the selected item.

### FOCUS EVENTS

Occur when an element (e.g., a link or form field) gains or loses focus

| EVENT | DESCRIPTION |
|---|---|
| `focus` / `focusin` | Element gains focus |
| `blur` / `focusout` | Element loses focus |

### FORM EVENTS

Occur when a user interacts with a form element

| EVENT | DESCRIPTION |
|---|---|
| `input` | Value in any `<input>` or `<textarea>` element has changed (IE9+) or any element with the `contenteditable` attribute |
| `change` | Value in select box, checkbox, or radio button changes (IE9+) |
| `submit` | User submits a form (using a button or a key) |
| `reset` | User clicks on a form's reset button (rarely used these days) |
| `cut` | User cuts content from a form field |
| `copy` | User copies content from a form field |
| `paste` | User pastes content into a form field |
| `select` | User selects some text in a form field |

### MUTATION EVENTS*

Occur when the DOM structure has been changed by a script
* To be replaced by mutation observers (see p284)

| EVENT | DESCRIPTION |
|---|---|
| `DOMSubtreeModified` | Change has been made to document |
| `DOMNodeInserted` | Node has been inserted as a direct child of another node |
| `DOMNodeRemoved` | Node has been removed from another node |
| `DOMNodeInsertedIntoDocument` | Node has been inserted as a descendant of another node |
| `DOMNodeRemovedFromDocument` | Node has been removed as a descendant of another node |

# HOW EVENTS TRIGGER JAVASCRIPT CODE

When the user interacts with the HTML on a web page, there are three steps involved in getting it to trigger some JavaScript code. Together these steps are known as **event handling**.

**1**

Select the **element** node(s) you want the script to respond to.

**2**

Indicate which **event** on the selected node(s) will trigger the response.

**3**

State the **code** you want to run when the event occurs.

**Example1:**

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-
scale=1.0">
   <title>JavaScript Event Examples</title>
   <style>
      #hoverDiv, #dragItem, #dropZone, #noRightClick {
         margin-top: 10px;
         padding: 20px;
         text-align: center;
         font-weight: bold;
      }
      #hoverDiv {
         width: 150px;
         height: 50px;
         background-color: lightblue;
      }
      #dragItem {
         width: 100px;
         height: 100px;
         background-color: red;
         color: white;
         cursor: grab;
      }
      #dropZone {
         width: 200px;
         height: 100px;
         background-color: lightgray;
         border: 2px dashed black;
      }
      #noRightClick {
         background-color: orange;
      }
   </style>
```

```
</head>
<body>

    <h1>JavaScript Event Examples</h1>

    <!-- Mouse Events -->
    <h2>Mouse Events</h2>
    <button id="clickBtn">Click Me</button>
    <button id="dblClickBtn">Double Click Me</button>
    <div id="hoverDiv">Hover Over Me</div>

    <!-- Keyboard Events -->
    <h2>Keyboard Events</h2>
    <input type="text" id="keyInput" placeholder="Type something...">

    <!-- Form Events -->
    <h2>Form Events</h2>
    <form id="myForm">
        <input type="text" id="nameInput" placeholder="Enter your name"
required>
        <button type="submit">Submit</button>
    </form>

    <!-- Window Events -->
    <h2>Window Events</h2>
    <button id="resizeBtn">Resize the Window</button>

    <!-- Clipboard Events -->
    <h2>Clipboard Events</h2>
    <input type="text" id="copyInput" value="Try copying this text">

    <!-- Drag & Drop Events -->
    <h2>Drag & Drop Events</h2>
    <div id="dragItem" draggable="true">Drag Me</div>
    <div id="dropZone">Drop Here</div>

    <!-- Media Events -->
```

```
    <h2>Media Events</h2>
    <video id="videoPlayer" width="300" controls>
        <source src="https://www.w3schools.com/html/mov_bbb.mp4"
type="video/mp4">
    </video>

    <!-- Miscellaneous Events -->
    <h2>Miscellaneous Events</h2>
    <div id="noRightClick">Right-click Disabled Here</div>

    <script>
        // Mouse Events
        document.getElementById("clickBtn").addEventListener("click",
function () {
            alert("Button Clicked!");
        });

document.getElementById("dblClickBtn").addEventListener("dblclick",
function () {
            alert("Button Double Clicked!");
        });

        let hoverDiv = document.getElementById("hoverDiv");
        hoverDiv.addEventListener("mouseover", function () {
            hoverDiv.style.backgroundColor = "yellow";
        });
        hoverDiv.addEventListener("mouseout", function () {
            hoverDiv.style.backgroundColor = "lightblue";
        });

        // Keyboard Events
        document.getElementById("keyInput").addEventListener("keydown",
function (event) {
            console.log("Key Pressed: " + event.key);
        });

        // Form Events
```

```
    document.getElementById("myForm").addEventListener("submit",
function (event) {
        event.preventDefault(); // Prevents page refresh
        alert("Form Submitted: " +
document.getElementById("nameInput").value);
    });

    // Window Events
    window.addEventListener("resize", function () {
        console.log("Window Resized: " + window.innerWidth + " x " +
window.innerHeight);
    });

    // Clipboard Events
    document.getElementById("copyInput").addEventListener("copy",
function () {
        alert("Text Copied!");
    });

    // Drag & Drop Events
    let dragItem = document.getElementById("dragItem");
    let dropZone = document.getElementById("dropZone");

    dragItem.addEventListener("dragstart", function (event) {
        event.dataTransfer.setData("text", event.target.id);
    });

    dropZone.addEventListener("dragover", function (event) {
        event.preventDefault();
    });

    dropZone.addEventListener("drop", function (event) {
        event.preventDefault();
        let data = event.dataTransfer.getData("text");
        dropZone.appendChild(document.getElementById(data));
    });
```

```
        // Media Events
        let video = document.getElementById("videoPlayer");

        video.addEventListener("play", function () {
            console.log("Video Playing...");
        });

        video.addEventListener("pause", function () {
            console.log("Video Paused.");
        });

        // Miscellaneous Events
document.getElementById("noRightClick").addEventListener("contextmenu
", function (event) {
            event.preventDefault();
            alert("Right-click Disabled!");
        });

    </script>

</body>
</html>
```

**Example2:**

```
<!DOCTYPE html>
<html>
<head>
  <title>JavaScript Events</title>
</head>
<body>
  <h1>JavaScript Events</h1>

  <!-- Mouse Events -->
  <button id="mouse-btn">Click Me!</button>
  <div id="mouse-div"></div>
```

```html
  <!-- Keyboard Events -->
  <input id="keyboard-input" type="text" placeholder="Type something...">
  <div id="keyboard-div"></div>

  <!-- Form Events -->
  <form id="form">
    <label for="name">Name:</label>
    <input type="text" id="name" name="name"><br><br>
    <label for="email">Email:</label>
    <input type="email" id="email" name="email"><br><br>
    <input type="submit" value="Submit">
  </form>
  <div id="form-div"></div>

  <!-- Scroll Events -->
  <div id="scroll-div" style="height: 500px; overflow-y: scroll;">
    Scroll me!
  </div>
  <div id="scroll-status"></div>

  <script src="script.js"></script>
</body>
</html>
```

```javascript
// script.js
// Mouse Events
const mouseBtn = document.getElementById('mouse-btn');
const mouseDiv = document.getElementById('mouse-div');

mouseBtn.addEventListener('click', () => {
  mouseDiv.innerText = 'Button clicked!';
});

mouseBtn.addEventListener('dblclick', () => {
```

```
  mouseDiv.innerText = 'Button double-clicked!';
});

mouseBtn.addEventListener('mouseover', () => {
  mouseDiv.innerText = 'Mouse over button!';
});

mouseBtn.addEventListener('mouseout', () => {
  mouseDiv.innerText = 'Mouse out of button!';
});

// Keyboard Events
const keyboardInput = document.getElementById('keyboard-input');
const keyboardDiv = document.getElementById('keyboard-div');

keyboardInput.addEventListener('keydown', (e) => {
  keyboardDiv.innerText = `Key pressed: ${e.key}`;
});

keyboardInput.addEventListener('keyup', (e) => {
  keyboardDiv.innerText = `Key released: ${e.key}`;
});

keyboardInput.addEventListener('keypress', (e) => {
  keyboardDiv.innerText = `Key pressed: ${e.key}`;
});

// Form Events
const form = document.getElementById('form');
const formDiv = document.getElementById('form-div');

form.addEventListener('submit', (e) => {
  e.preventDefault();
  const name = document.getElementById('name').value;
  const email = document.getElementById('email').value;
  formDiv.innerText = `Form submitted! Name: ${name}, Email: ${email}`;
});
```

```
// Scroll Events
const scrollDiv = document.getElementById('scroll-div');
const scrollStatus = document.getElementById('scroll-status');

scrollDiv.addEventListener('scroll', () => {
  const scrollTop = scrollDiv.scrollTop;
  scrollStatus.innerText = `Scrolled to: ${scrollTop}px`;
});
```

**Mutation Events**

| Event Name | Triggered When... |
|---|---|
| `DOMNodeInserted` | A new node is added. |
| `DOMNodeRemoved` | A node is removed. |
| `DOMSubtreeModified` | Any modification occurs in the subtree. |
| `DOMNodeInsertedIntoDocument` | A node is added to the document. |
| `DOMNodeRemovedFromDocument` | A node is removed from the document. |
| `DOMAttrModified` | An attribute is changed. |
| `DOMCharacterDataModified` | The text inside a node is modified. |

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Mutation Events (Deprecated)</title>
</head>
<body>

   <div id="container">Hello, World!</div>
   <button onclick="changeContent()">Change Content</button>

   <script>
      const container = document.getElementById("container");
```

```
        // Deprecated mutation events
        container.addEventListener("DOMSubtreeModified",
function(event) {
            console.log("DOM modified!", event);
        });

        function changeContent() {
            container.textContent = "Updated Text!";
        }
    </script>

</body>
</html>
```

**Mutation Observer**

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-
scale=1.0">
    <title>MutationObserver Example</title>
</head>
<body>

    <div id="content">Hello, World!</div>
    <button onclick="changeText()">Change Text</button>

    <script>
        // Select the target element
        const targetNode = document.getElementById("content");

        // Create MutationObserver
        const observer = new MutationObserver(function (mutationsList) {
            mutationsList.forEach(mutation => {
                if (mutation.type === "childList") {
```

```
            console.log("Child nodes changed:", mutation);
        }
        if (mutation.type === "attributes") {
            console.log("Attribute changed:", mutation);
        }
    });
});

// Observer Configuration
const config = { childList: true, attributes: true };

// Start Observing
observer.observe(targetNode, config);

// Function to modify DOM
function changeText() {
    targetNode.textContent = "Text Updated!";
}
</script>

</body>
</html>
```

**Module 1:**

1. Create an array of 5 cities and perform the following operations: Log the total number of cities. Add a new city at the end. Remove the first city. Find and log the index of a specific city. **(Lab Program)**
2. Explain the different data types and its literals in JavaScript. (**Refer Notes)**
3. Illustrate how an object can be created in JavaScript using direct method and also using constructor method. List and Explain different inbuilt objects of Javascript **(Refer Notes and Textbook)**
4. Illustrate the following with example. **(Refer Text Book)**
   i) Function creation and calling
   ii) Function Expression and Anonymous Function
   iii) Immediately Invoked Function Expression
5. Illustrate with a programming example how array can be created and displayed. **(Refer Notes)**
6. Explain different looping statements available in Javascript with example for each
7. Read a string from the user, Find its length. Extract the word "JavaScript" using substring() or slice(). Replace one word with another word and log the new string. Write a function isPalindrome(str) that checks if a given string is a palindrome (reads the same backward). **(Lab Program)**
8. Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details) Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object. **(Lab Program)**

**Module 2:**

1. Illustrate the different methods used for selecting single and multiple elements in DOM with example for each. **(Refer Notes and Textbook)**
2. Illustrate with an example, how an element and text node can be created and added to existing tree. **(Refer Notes and Textbook)**
3. Illustrate with an example how a node can be removed from the DOM tree **(Refer Notes and Textbook)**
4. Explain the following with example for each**(Refer Notes and Textbook)**
   InnterHTML, InnerText, Style.property, attribute.value, nodeValue
5. Explain the following with example for each. **(Refer Notes and Textbook)**
   getAttribute(), setAttriubute(), hasAttribute(), removeAttribute()
6. Illustrate Different Javascript events under the category of UI/UX events, Mouse Events, Form Events, Key Board Events, Focus Events. **(Refer Notes and Textbook)**
7. Explain three different ways of binding event to element in JavaScript with example for each. **(Refer Notes and Textbook)**

**Module 3:**

1. What does MERN stands for? Explain the components of MERN stack in detail **(Refer Notes)**

2. Illustrate how to use React and ReactDOM in a single HTML to render Hello Message without server. **(Refer Notes )**