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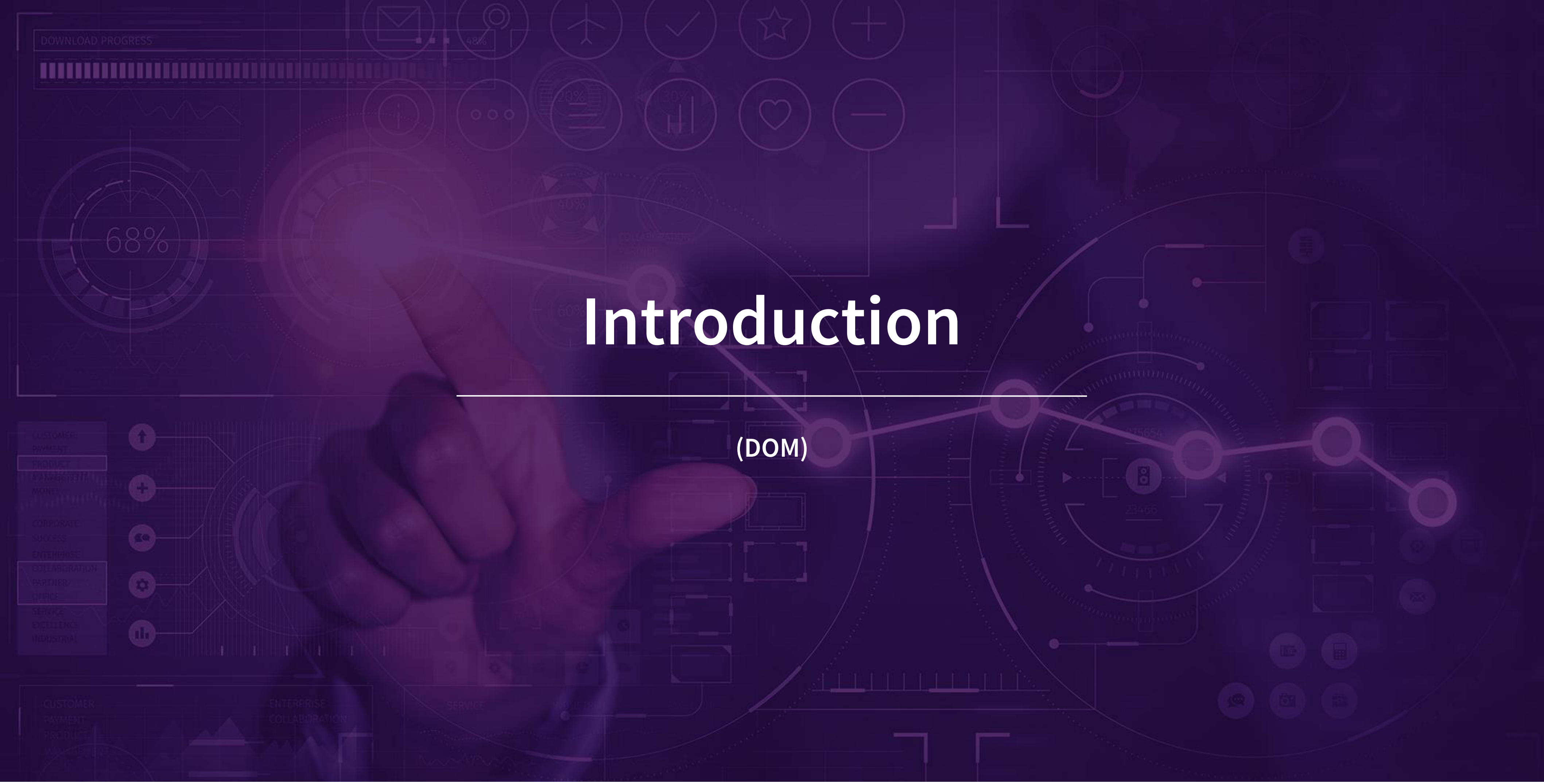
# Document Object Model

## JavaScript



# Introduction

(DOM)

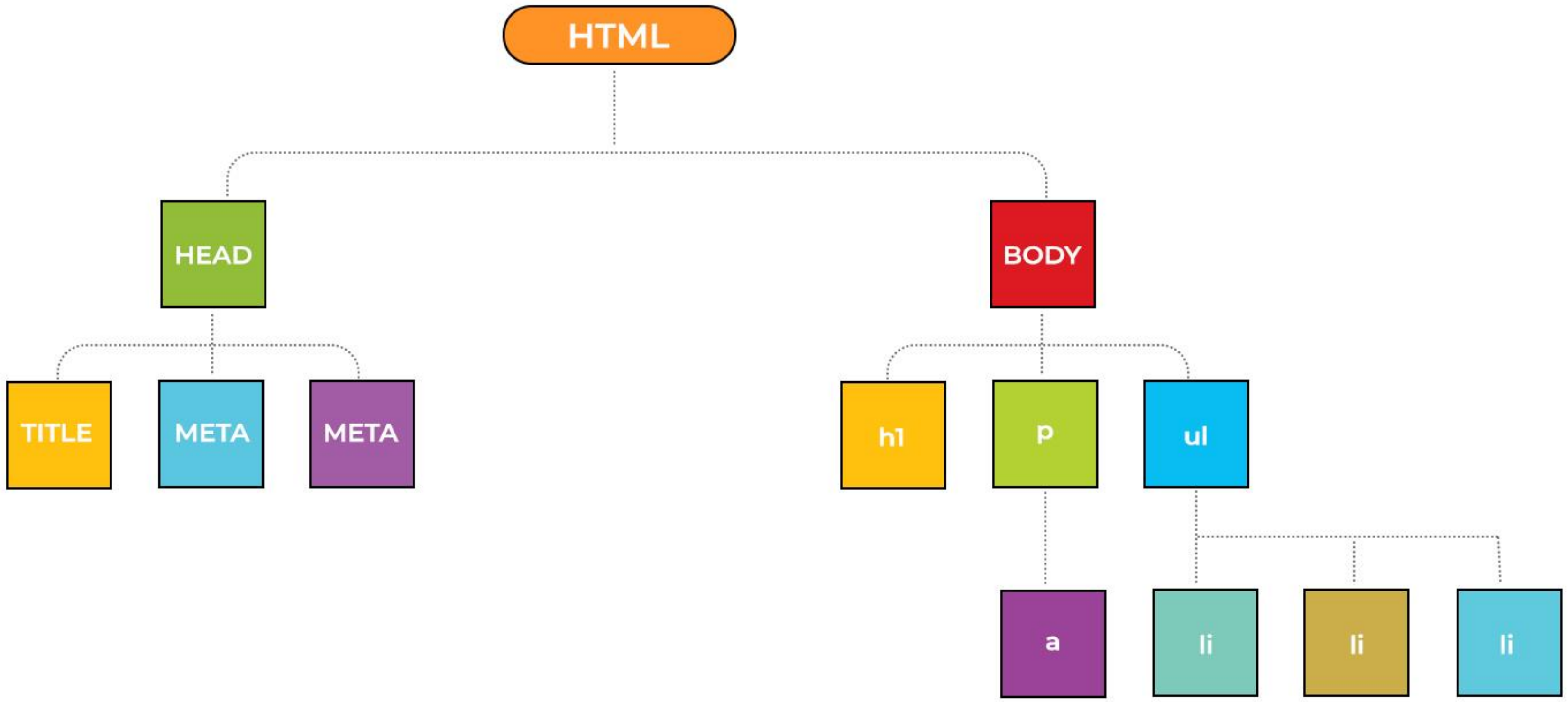
## What is DOM?

- The Document Object Model (DOM) is a cross-platform and language-independent application programming interface.
- The DOM, is the API through which JavaScript interacts with content within a website.
- The DOM API is used to access, traverse and manipulate HTML and XML documents.
- The DOM is a W3C (World Wide Web Consortium) standard.

## What is DOM Tree?

- The DOM treats an HTML, XHTML, or XML document as a tree
- structure
- Each node is an object representing a part of the document
- User case of HTML, XML and XHTML are different but DOM acts as a common standard

# HTML DOM Tree Objects



# Types of DOM nodes

- **Element nodes (HTML tag):** Can have children / attributes.

- **Text nodes:** Text nodes are contained within element nodes and cannot have child elements. Text nodes means all the text within nodes.

- **Attribute nodes (Attribute / Value pairs):** Text / Attributes are children of  element node, they cannot further have children or attributes

# DOM standards

## DOM level 0:

- Earliest implementation of DOM
- There existed no standard when its was implemented in some of the major browsers before 1998

## DOM level 1

- It was  recommended by W3C in 1998
- It will provide complete model for an entire HTML or XML document, to change any portion of the document

## DOM level 2

- It was published in 2000 by introducing additional features – getElementById, Event model,

  XML namespace (Avoiding name conflicts), Stylesheet

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# DOM standards

## DOM level 3

- It was published in 2004
- Added support for Xpath (Navigating between multiple nodes in XML)
- Keyboard event handling

## DOM level 4

- It was published in 2015
- Latest version of DOM

## Methods

(APIs in DOM)

## DOM methods

- HTML DOM **Methods** are actions we can perform on HTML elements
- HTML DOM **Properties** are values that we can set or change

```
<script>

document.getElementById("ex").innerHTML = "Hello World!";

</script>
```

- getElementById -> Method
- innerHTML -> Property

# DOM Methods

## getElementById()

- Accesses any element on the page via its ID attribute
- A fundamental method within the DOM for accessing elements on the page
- This method will returns single element

## innerHTML

- The innerHTML is used to get and replace the content of HTML elements.

## DOM Element

### getElementsByName(name)

Returns an list with the given name attribute

```
var allParagraphs = document.getElementsByName(“number”);
```

### getElementsByTagName(name)

Returns a list of elements with the given tag name.

```
var allParagraphs = document.getElementsByTagName(“p”);
```

## Element by class name

**getElementsByClassName()**

Returns a list of all elements with given class name

```
var elements = document.getElementsByClassName(“example”);
```

## DOM Example

```
<script>
function GetById(){
   document.getElementById("div1").innerHTML=document.getElementById("num").value;
}
function GetByName()
{
    var nums= document.getElementsByName("number");
    var res='';
    for(var i=0; i<nums.length; i++)
    {
        res+=nums[i].value +"<br/>";
        document.getElementById("div1").innerHTML= res;
    }
  }
 </script>
```

# DOM Example

```
<body>
    <form id="form1">
    <div>
        <input type="text" id="num" value="12345" />
        <input type="text" name="number" value="num1" />
        <input type="text" name="number" value="num2" />
        <input type="text" name="number" value="num3" />
    </div>
    <br />
    <div id="div1" style="border-style: solid; border-width: thick; border-color: blue;
        width: 515px; height: 100px;">
          Div Section
    </div>
    <br />
    <input type="button" onclick="GetById();" value="Get Element By Id" />
    <input type="button" onclick="GetByName();" value="Get Element By Name" />
    </form>
</body>
```

## Elements by CSS Selectors

### querySelector()

Returns the first match of the passed selector string

```
firstMatchElement = document.querySelector(“.example”);
```

### querySelectorAll()

Returns a NodeList of DOM elements that match the query

```
allMatchElements = document.querySelectorAll(“.example");
```

## Exercise

ACTIVITY

- Write a JavaScript program to modify the text-align, font-size, font-family of heading1 using getElementById
- Write a JavaScript program to change the background color of all the <div> tag
- Write a JavaScript to add the text shadow in all paragraphs in the given essay

**Some useful tips:**

- `<element-name>.style.textShadow = "Apx Bpx"` will set you the shadow

## Documents

(Manipulating documents using DOM APIs)

## Documents

- Web browser window is represented by window object
- Every window has a document property that refers to document objects
- The document objects represents the web page
- We can access and manipulate HTML using document objects

## Changing HTML elements

| Methods | Description |
|---|---|
| `EvalError` | Change the inner HTML of an HTML element |
| `RangeError` | Change the attribute value of an HTML element |
| `ReferenceError` | Changes the attribute value of an HTML element |
| `SyntaxError` | |
| `TypeError` | |

## Adding and Deleting Element

| Methods | Description |
|---|---|
| `document.createElement()` | Create an HTML Element |
| `document.removeChild()` | Remove an HTML Element |
| `document.appendChild()` | Add an HTML Element |
| `document.replaceChild()` | Replace an HTML Element |
| `document.write()` | Write into the HTML output stream |
| `document.insertBefore()` | Insert before an HTML element |

## Adding Event Handlers

| Methods | Description |
|---|---|
| `Document.getElementById(id).onclick = function() {  // Code here… }` | Adding an event hander on mouse clicking |

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# HTML DOM – Handling images

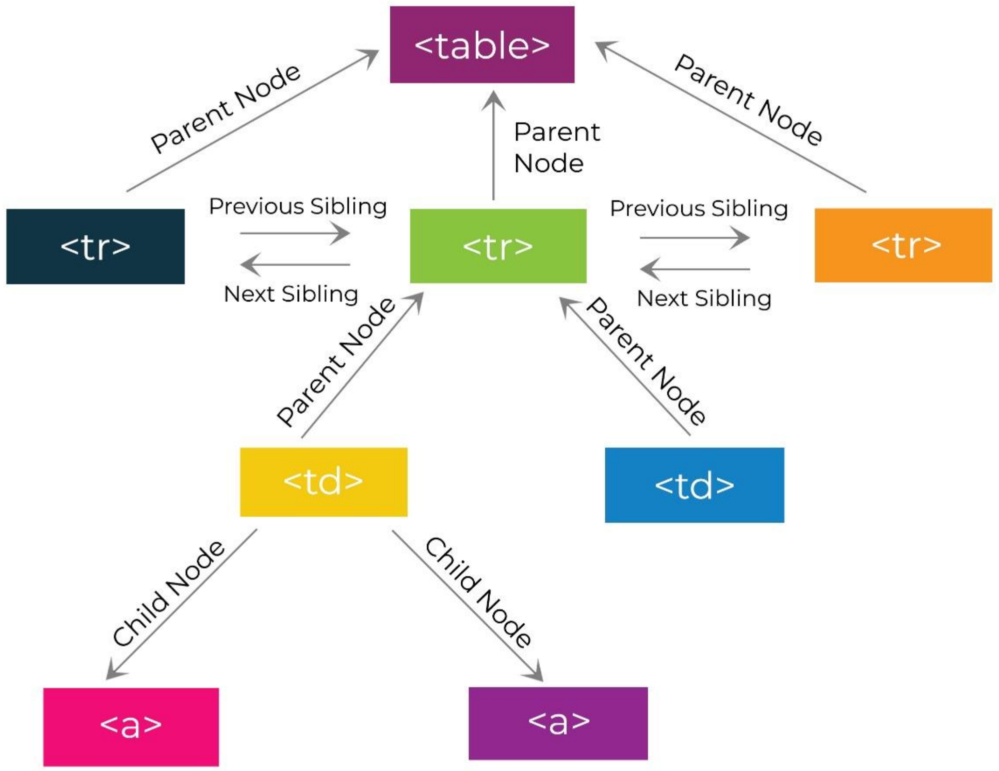
```
<html>
<script>
function imgFunc()
{
   document.getElementById(“myimage").src = “jobsold.jpg";
}
</script>

<body>
   <img id=“myimage" src=“jobsyoung.jpg" width=500 height=200>
   <button onclick="imgFunc()">Click Here to change image</button>
</body>
</html>
```

# HTML DOM – Table manipulation

- The Table object of the DOM supports dynamically generate a table or certain rows/columns
- We can access a <table> element by using getElementbyId()

| Method | Description |
|---|---|
| `createCaption()` | Creates an empty <caption> elements and adds it to the table |
| `deleteCaption()` | Removes the first caption element from the table |
| `insertRow()` | Inserts new row in the specific index |
| `deleteRow()` | Removes a row from the table |
| `insertCell()` | Inserts new column in the specific row |
| `createTHead()` | Creates an empty <thead> elements and adds it to the table |
| `deleteTHead()` | Removes the <thead> element from the table |
| `createTFoot()` | Creates an empty <tfoot> elements and adds it to the table |
| `deleteTFoot()` | Removes the <tfoot> element from the table |

## HTML DOM – Table - Relationship view



## Exercise

- Modify IPL table manipulation program with following options:
  - Taking user input for new row addition (instead of hard-coded value)
  - Adding new column in all rows called “City” and populate the city name the team belongs to
  - Add option to delete the column by taking the column index from the user
  - Insert table head as “IPL Team details” with appropriate column names (Name, Team, Captain etc..)

**Some useful tips:**

- `<table-name>.rows.length` will give you number of rows
- `<table-name>.rows[0].cells.length` will give you number of columns

# JavaScript Animation

(DOM – Animation APIs)

# JavaScript Animation

- The JavaScript animation is implemented as gradual changing of DOM element styles or canvas objects
- The whole process is split into pieces, and each piece is called by timer
- An animation is created by replacing one Image frame with another at speed such that it appears to be a moving Image
- Animations can be created using JavaScript by using a timer which replaces one image frame with another
- The two timer function setTimeout() and setInterval() to execute JavaScript codes at set intervals

# DOM Animation

| Method | Description |
|---|---|
| `setTimeout(function,duration)` | This function calls function after duration milliseconds from now |
| `setInterval(function,duration)` | This function calls function after every duration milliseconds |
| `clearTimeout(timeout)` | This function calls clears any timer set by the setTimeout() functions |

**Some useful tips:**

- `<element-name>.style.left   = A px` sets the left position of the element
- `<element-name>.style.right  = A px` sets the right position of the element
- `<element-name>.style.top    = A px` sets the top position of the element
- `<element-name>.style.bottom = A px` sets the top position of the element

## Exercise

- Write a JavaScript program to move two small squares inside one big square in a random manner. User should be able to start and stop this animation using button based events

**Some useful tips:**

`Math.floor(Math.random() * Math.floor(max)) will give you a random number that is less than max value`

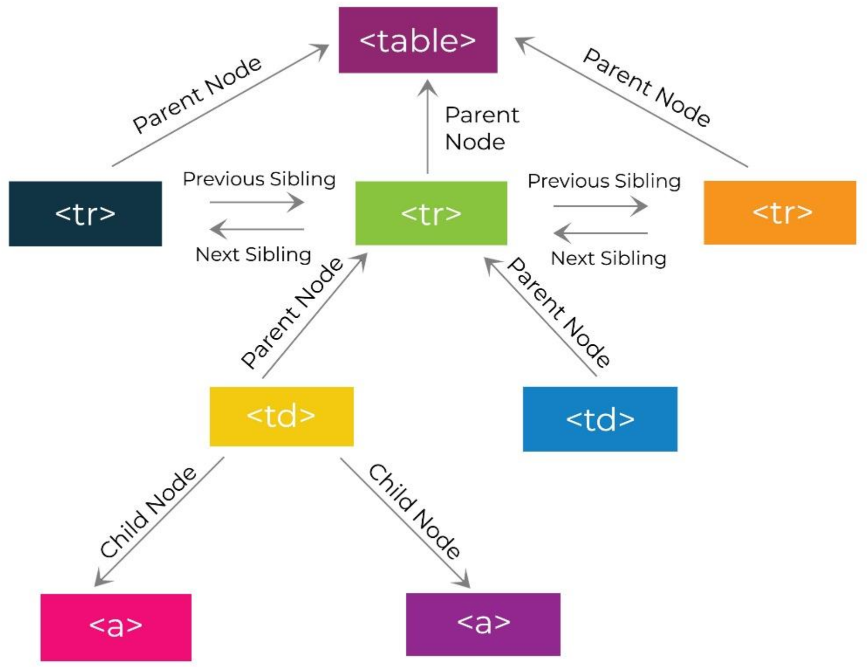
## Node & NodeList Handling

DOM – Node Handling APIs

## DOM Nodes

- In the context of DOM, every entity in an HTML or XML document, is referred as a Node
- In JavaScript, all the Nodes are represented as Objects. They have their own properties and methods
    - <Doctype html> is DocumentType Node
    - <head> is an Element Node, so are meta, title, body, h1, p, ul and li
- Text contents like the title text 'This is a simple HTML document' is a text Node
- Some of the Nodes may have children. Like <ul> has <li> as children
- Body has <h1>, <p>,<ul> as children

# DOM Node – Tree representation - Revisit



## Navigation between nodes

There are some node properties to navigate between nodes:

- `parentNode`
- `childNodes[node number]`
- `firstChild`
- `lastChild`
- `nextSibling`
- `previousSibling`

## Node creation - Example

```javascript
// Creates a new em element
var newnode = document.createElement("em");

// To add text to the em element
var node = document.createTextNode("Text to add");

// Appending the text node to em element
newnode.appendChild(node);

// Appending new element to existing element
var elem = document.getElementById("p");
elem.appendChild(newnode);
```

## Node Creation - Example

```
<body>
<p>Click the button to make a new Button element</p>
<button onclick="myFun()">Click</button>
<script>
function myFun() {
    var btn = document.createElement("BUTTON");
    var t = document.createTextNode("NewButton");
    btn.appendChild(t);
    document.body.appendChild(btn);
}
</script>
</body>
```

## DOM Node - Methods

| Method | Description |
|---|---|
| `appendChild()` | The appendChild() method will add new  element as last child of parent , if we want to insert before last child of parent then insertBefore() can be used.<br><br>Syntax :<br>parentElem.insertBefore(elem, nextSibling); |
| `removeChild()` | Remove child node from parent node.<br><br>Syntax :<br>parentElem.removeChild(elem); |
| `replaceChild()` | Replace the child element of parent Element, referenced by current Element with the element.<br><br>Syntax :<br>parentElem.replaceChild(elem, currentElem); |

# DOM Node List

- The Node List object represents an ordered collection of nodes, indexed by number (starting from zero).
- A Node List is not an array. For example the getElementsByTagName() method returns a node list. The nodes can be accessed by an index number.
- The length property defines number of nodes in the list

```
var allParagraphs  = document.getElementsByTagName("p");
 var firstParagraph = allParagraphs[0];
```

## Exercise

- Write a JavaScript function to manipulate an unordered list with multiple following options:
  - Create multiple lists
  - Dynamically assign ID for each of the lists created
  - In each of the lists created support the following operations:
    - ✓ Insert (Before)
    - ✓ Append
    - ✓ Replace
    - ✓ Remove

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Thank you

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