PART 3

MASYNCTECH
SCHOOL

FULLSTACK WEB DEV

JAVASCRIPT JS

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JAVASCRIPT ARRAYS OF OBJECTS

JS

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THE CONCEPT OF OBJECT

REFERENCING IN ARRAYS

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THE CONCEPT OF OBJECT REFERENCES IN ARRAYS

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High-Level Explanation

- JavaScript: Objects passed by reference
- Assignment or passing = reference, not copy
- Points to object in memory

Basic Explanation

- Analogy: Object like a rented bike
- You get a "key" (reference), not a new bike
- Friends get a copy of the key, not a new bike
- Changes affect anyone with the key

Deep Dive

- Variable stores a "reference," not object itself
- Variables, functions share same memory location
- Changes affect all references to the object

Best Practices

- Be cautious with functions modifying passed objects; changes impact original.
- Create a "deep copy" to prevent unintended side effects.
- Employ functional programming for immutability, reduce side effects.

Take Note

- "Pass-by-reference" for objects and arrays, not primitives.
- Reassigning a variable to a new object won't change the original object; it updates the reference to a new memory location.

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ARRAY-OBJECT HYBRID

OBJECTS IN ARRAYS

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ARRAY-OBJECT HYBRID (OBJECTS IN ARRAYS)

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High-Level Explanation

- Arrays of objects: Elements are objects
- Ideal for lists with multi-property items

Deep Dive

- Combine arrays (order) and objects (key-value pairs)
- Achieve flexible, ordered lists with rich attributes
- Ideal for ordered lists of complex objects, e.g., user data

When to use?

- Objects in arrays useful when:
  - Managing multi-attribute item lists.
  - Preserving item order is essential.
  - Need to access, add, or remove items based on properties.

Basic Explanation

- Analogy: Concert line as an array
- Each person in line as an object
- Object properties: name, seat number, VIP status
- Combining ordered list and rich attributes

Best Practices

- Descriptive property names enhance readability.
- Keep objects homogenous for consistency.
- Utilize built-in array methods (map, filter, find) for manipulation.

Take Note

- Access: Array element first, then property.
- Modifying one object doesn't affect others.
- Array index = order, object properties = attributes.

ARRAY-OBJECT HYBRID (OBJECTS IN ARRAYS)

Syntax

```
const arrayOfObjects = [
  { key1: value1, key2: value2 },
  { key1: value3, key2: value4 },
  ...
];
```

- `const arrayOfObjects = [ ... ];`: Declares an array.

- `{ key1: value1, key2: value2 }, ...`: Objects in the array.

- `key1: value1, key2: value2`: Key-value pairs in each object.

- Useful for managing records with multiple properties.

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ARRAY-OBJECT HYBRID

ARRAYS IN OBJECTS

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ARRAY-OBJECT HYBRID (ARRAYS IN OBJECTS)

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High-Level Explanation

- Array-Object Hybrids: Objects containing arrays
- Object properties can be arrays
- Organize and store complex data hierarchically

Basic Explanation

- Analogy: Locker as an object
- Compartments (properties) in the locker
- One compartment with notebooks (an array)
- Objects hold individual items and arrays (stacks) for organization

Best Practices

- Keep arrays in the object focused on a single data type.
- Use arrays for frequent add/remove operations.
- Follow naming conventions, especially with nested data, for clarity.

Deep Dive

- Objects hold properties with any data type, including arrays.
- Arrays in objects group related data, enhancing organization.
- Common in databases, API responses, front-end states.

When to use?

- Array-Object Hybrids useful when:
  - Handling JSON data.
  - Managing state in React and similar frameworks.
  - Categorizing related items under a single entity.

Take Note

- Access: First access object property, then internal array.
- Beware of accidental nested array modifications (references).
- Apply `map`, `filter`, `reduce`, etc., for functional programming on internal arrays.

ARRAY-OBJECT HYBRID (ARRAYS IN OBJECTS)

Syntax

```
const objectName = {
  propertyName1: valueType1,
  propertyName2: valueType2,
  arrayPropertyName: [element1, element2, ...]
};
```

- `const objectName = { ... };`: Declares an object.

- `propertyName1: valueType1, propertyName2: valueType2, ...`: Key-value pairs with various data types.

- `arrayPropertyName: [element1, element2, ...]`: Property for an array, holding elements of any type.

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ITERATE THROUGH ARRAYS USING forEach()

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ITERATE THROUGH ARRAYS USING `FOREACH()`

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High-Level Explanation

- `forEach()`: Iterates through array, executes provided function.
- Modern, readable alternative to `for` loops.

Basic Explanation

- Analogy: Basket of fruits as an array.
- Using `forEach()` is like having a helper check each fruit.
- Declarative, focusing on end result, not the process.

Best Practices

- Don't use `forEach()` for early loop exits; use `for`.
- Careful with array modification; `forEach()` changes original.
- `forEach()` skips empty slots in arrays.

Deep Dive

- `forEach()`: Takes callback, runs it for each array item.
- Callback: Current value, index, and array itself.
- Declarative, specifying actions for each element, automated iteration.

When to use?

- `forEach()` suits side-effects on array elements.
- No new array creation needed.
- Useful for order-independent, unbroken loop operations.

Take Note

- `forEach()` returns `undefined`.
- Iterates over existing elements; array length changes aren't considered.

ITERATE THROUGH ARRAYS USING `FOREACH()`

Syntax

```
array.forEach(function callback(currentValue, index, array) {
    // Your code logic here
});
```

- `array`: The array with `forEach()` called on it.
- `callback`: Function for each array element.
  - `currentValue`: Current element.
  - `index`: (Optional) Current element's index.
  - `array`: (Optional) The array itself.

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ITERATE THROUGH ARRAYS USING map()

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ITERATE THROUGH ARRAYS USING `MAP()`

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High-Level Explanation

- `map()`: Transforms array elements with a function.
- Returns a new array with transformed elements.

Deep Dive

- `map()`: Takes a callback, applies it to array elements.
- New array contains results of callback on original elements.
- Used for data transformation, preserves original array.

Basic Explanation

- Analogy: `map()` is like photocopying, doubling numbers.
- Original list unchanged; new list with changes.

When to use?

- Use `map()` when:
  - Transforming array elements to a new array.
  - Avoiding modifications to the original array.
  - Chaining with other array methods like `filter()`.

Best Practices

- Avoid `map()` if you won't use the result to save memory.
- Prevent side-effects in callback; no external changes.
- `map()` skips undefined, not `null` values in the array.

Take Note

- `map()` creates a new array; no modification to the original.
- Skips array holes, unlike `forEach()`.

ITERATE THROUGH ARRAYS USING `MAP()`

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Syntax

```
const newArray = originalArray.map(callbackFunction(element, index, array));
```

- `originalArray`: The array with `map()` called on it.
- `newArray`: New array with results.
- `callbackFunction`: Function for each element.
  - `element`: Current element being processed.
  - `index`: Current element's index.
  - `array`: The original array itself.

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ITERATE THROUGH ARRAYS USING filter()

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ITERATE THROUGH ARRAYS USING `FILTER()`

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High-Level Explanation

- `filter()`: Creates new array with elements meeting a condition.
- Condition defined in callback function provided to `filter()`.

Basic Explanation

- Imagery: Basket of fruits.
- `filter()`: Selects and keeps only the apples.
- Leaves other fruits untouched.
- Results in a new basket with only apples.

Best Practices

- Use `filter()` for a new array subset.
- Callback function should be pure (no side effects).
- Don't use `filter()` if modifying the original array; it creates a new filtered array.

Deep Dive

- `filter()`: Takes a callback.
- Callback returns `true` or `false`.
- `true`: Element included in new array.
- Filter based on custom conditions without modifying the original array.

When to use?

- Use `filter()` when you need:
  - A new array with specific criteria.
  - Exclusion of certain elements.
  - Preservation of the original array.

Take Note

- `filter()` doesn't change the original array.
- Original array remains as is.
- Skips elements not in resulting array; doesn't delete them.

ITERATE THROUGH ARRAYS USING `FILTER()`

Syntax

```
const newArray = originalArray.filter(callbackFunction);
```

- `originalArray`: The array to be filtered.
- `callbackFunction`: Decides inclusion based on `true` or `false`.
- `newArray`: Contains elements where `callbackFunction` is `true`.

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TRANSFORMATION AND MANIPULATION USING

splice()

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TRANSFORMATION AND MANIPULATION USING `SPLICE()`

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High-Level Explanation

- `splice()`: Adds/removes array elements.
- Modifies original array; returns removed elements in a new array.

Basic Explanation

- Imagery: Deck of cards as an array.
- `splice()`: Cut, remove, and insert cards in one go.
- Alters the original deck (array) based on splicing.

Best Practices

- `splice()` modifies the original array; make a copy if needed.
- First argument can be negative (counting from the end).
- Omitting second argument deletes from index to end.

Deep Dive

- `splice()`: Multifunctional - remove, insert, or replace elements.
- First argument: Index to start changes.
- Second argument: Number of elements to remove.
- Optional: Additional arguments for elements to add.

When to use?

- Use `splice()` to:
  - Remove elements.
  - Insert elements at a specific index.
  - Replace elements in an array.

Take Note

- Returns an array of removed elements.
- In-place method, alters the original array.
- Empty array if no changes.
- Array length changes with added/removed elements.

TRANSFORMATION AND MANIPULATION USING `SPLICE()`

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Syntax

```
array.splice(startIndex, deleteCount, element1, element2, ...);
```

- `startIndex`: Index to start making changes.
- `deleteCount`: Number of elements to remove.
- `element1, element2, ...`: Elements to add at `startIndex`.

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TRANSFORMATION AND MANIPULATION USING

concat()

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TRANSFORMATION AND MANIPULATION USING `CONCAT()`

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High-Level Explanation

- `concat()` merges arrays into a new one.
- It doesn't alter the originals.
- Useful for combining multiple arrays.

Basic Explanation

- Simplified Explanation:
  - `concat()` is like having two trays of cookies.
  - You get a new empty tray.
  - You put all the cookies from the first and second trays onto the new tray.
  - The original trays still have their cookies; nothing is taken from them.

Best Practices

- Use `concat()` for immutability.
- Consider spread operator for modern codebases.

Deep Dive

- `concat()` takes one or multiple arrays.
- It appends them to the calling array.
- The new array contains shallow copies of elements.
- You can pass individual elements or arrays.

When to use?

- Use `concat()` to merge arrays into one.
- Original arrays remain unchanged.

Take Note

- `concat()` returns a new array.
- It performs a shallow copy, so nested objects are copied by reference.

TRANSFORMATION AND MANIPULATION USING `CONCAT()`

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Syntax

```
const newArray = array1.concat(array2, array3, ..., arrayN);
```

- `array1`: The starting array.
- `array2, array3, ..., arrayN`: Arrays to add to `array1`.

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TRANSFORMATION AND MANIPULATION USING

.assign()

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TRANSFORMATION AND MANIPULATION USING `OBJECT.ASSIGN()`

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High-Level Explanation

- `Object.assign()` copies properties from source objects to a target object.
- It modifies the target object.
- It returns the modified target object.

Deep Dive

- `Object.assign()` accepts a target object and source objects.
- It iterates over source object keys.
- Copies source object values into the target object.
- Overwrites target keys if they already exist.

Basic Explanation

- `Object.assign()` is like transferring toys from different boxes to your toy box.
- If a toy is already in your toy box, it gets replaced with a new one of the same kind.

When to use?

- Use `Object.assign()` to copy properties between objects.
- Great for creating new objects with combined properties.

Best Practices

- Start with an empty object `{}` for a new object.
- Watch out for nested structures; it's a shallow copy.

Take Note

- `Object.assign()` performs a shallow copy, doesn't create a new instance.

Syntax

```
const target = {};
Object.assign(target, source1, source2, ..., sourceN);
```

- `array1`: The starting array.
- `array2, array3, ..., arrayN`: Arrays to add to `array1`.

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SEARCH AND FILTER USING find()

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SEARCH AND FILTER USING `FIND()`

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High-Level Explanation

- `find()`: Get the first element that matches a condition.

Deep Dive

- `find()` checks each item using a function.
- If the function returns `true`, it stops and returns that item.

Basic Explanation

- `find()` is like searching for the first matching item in a list.
- It stops and returns the first match it finds.

When to use?

- `find()` is great for locating the first item in an array that meets specific criteria.
- It stops as soon as it finds a match.

Best Practices

- The method doesn't change the array.
- It returns `undefined` if no elements match the condition.
- It stops as soon as it finds a match.

Take Note

- Only the first element that satisfies the condition is returned.
- `find()` doesn't mutate the original array.
- The array is not changed in any way.

Syntax

```
const found = array.find(function(element, index, array) {
  // return true or false
});
```

- `element`: The current element being processed.
- `index`: The index of the current element.
- `array`: The array `find()` was called upon.

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SEARCH AND FILTER USING some()

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SEARCH AND FILTER USING `SOME()`

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High-Level Explanation

- `some()`: Check if at least one element meets a condition.

Deep Dive

- `some()` checks elements until it finds one that fits the condition.

Basic Explanation

- Imagine a basket of fruits.
- Objective: Find at least one apple.
- Look at each fruit one by one.
- As soon as you find an apple, stop searching and confirm there's an apple.

When to use?

- Use `some()` when:
  - You want to know if at least one element meets a condition.
  - You don't need to identify which one.

Best Practices

- `some()` doesn't change the array.
- It stops on first `true`, returning `true`.

Take Note

- Returns `true` or `false`.
- Doesn't change the original array.

Syntax

```
const result = array.some(function(element, index, array) {
  // return true or false based on condition
});
```

- `element`: The current element being processed.
- `index`: The index of the current element.
- `array`: The array `some()` was called upon.

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SEARCH AND FILTER USING every()

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SEARCH AND FILTER USING `EVERY()`

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High-Level Explanation

- `every()` checks if all elements meet a condition.
- Returns `true` or `false`.

Basic Explanation

- Imagine a basket of fruits.
- Objective: Check if all are apples.
- Examine each fruit one by one.
- If you find one non-apple, declare "Not all are apples."

Best Practices

- `every()` stops at the first `false` condition.
- It doesn't modify the original array.

Deep Dive

- `every()` uses a callback on each element.
- Returns `true` if all pass, else `false`.
- Stops at the first failure.

When to use?

- Use `every()` when:
  - You want to confirm that all elements satisfy a condition.
  - You don't need to identify which ones fail.

Take Note

- Returns a boolean (`true` or `false`).
- Doesn't modify the original array.

SEARCH AND FILTER USING `EVERY()`

Syntax

```
const result = array.every(function(element, index, array) {
  // return true or false based on a condition
});
```

- `element`: The current element being processed.
- `index`: The index of the current element.
- `array`: The array `every()` was called upon.

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INTRODUCTION TO

DOM

DOCUMENT OBJECT MODEL

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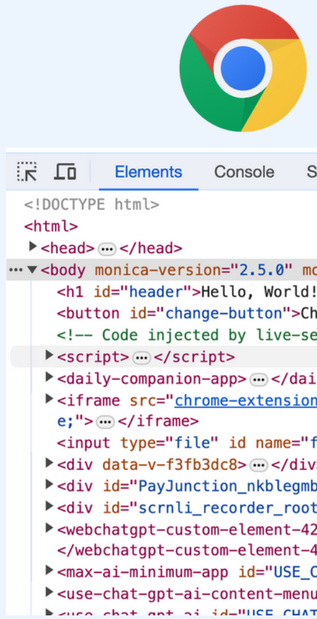
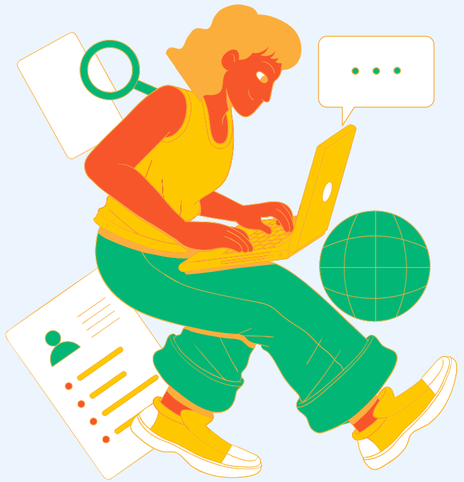
DOM OVERVIEW



DOM

JS

INTERACTING WITH DOM



WEB PAGE

WHAT IS DOM?

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High-Level Explanation

- DOM: Programming interface for web documents
- Represents document structure as a tree
- Objects mirror web page elements (HTML, text)
- Includes representation of the browser window

Basic Explanation

- Webpage = family tree; each element = family member.
- DOM = tree diagram showing relationships.
- Facilitates easy navigation and changes on the webpage.

Best Practices

- Minimize direct DOM manipulations to save CPU.
- Utilize libraries like jQuery or React for ease.
- Opt for a simple DOM structure for better performance.
- Efficient event handling through event delegation.

Deep Dive

- DOM is essential in web development, crucial for JavaScript.
- It bridges web docs and scripts, enabling dynamic manipulation.
- Represents webpages in an object-oriented way.
- It's not a language but a structural representation.
- Allows manipulation with languages like JavaScript.

When to use?

- DOM use cases:
  - Update webpage content/style without refresh.
  - Read/scrape data.
  - Create dynamic, interactive web apps (dashboards, charts).

Take Note

- DOM isn't a language, but a webpage representation.
- DOM manipulations can cause web app performance problems.
- React uses a 'virtual DOM' to alleviate performance issues.

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INTRODUCTION TO DOM

DOM vs JAVASCRIPT

JS

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DOM VS JAVASCRIPT

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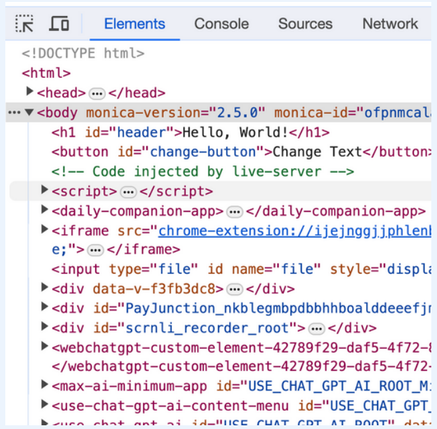
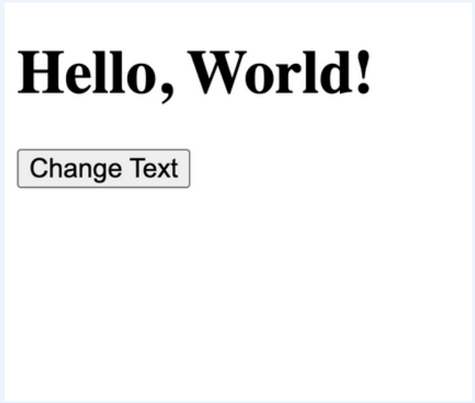
```
<!DOCTYPE html>
<html>
  <head>
    <title>My Webpage
  </head>
  <body>
    <h1 id="header">H
    <button id="chang
  </body>
</html>
```

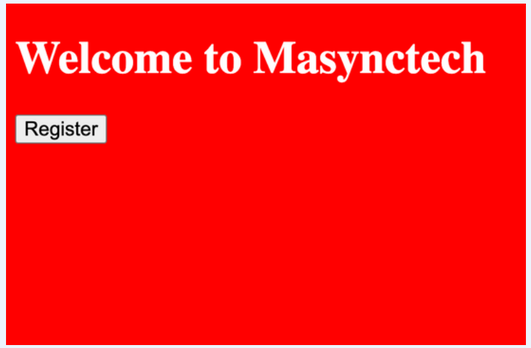
HTML CODE

DOM



WEB PAGE





UPDATED USING DOM

DOM VS JAVASCRIPT

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High-Level Explanation

- DOM and JavaScript work together in web development.
- DOM is an interface for web docs' structure and content.
- JavaScript is used to interact with and manipulate the DOM.

Basic Explanation

- DOM: Lego blocks forming a webpage.
- JavaScript: Your hands, manipulates the blocks.
- Use JavaScript to change webpage content.

Best Practices

- **DOM:**
  - Minimize direct manipulations for performance.
  - Efficient event handling with delegation.
- **JavaScript**
  - Maintainable code through modularity.
  - Non-blocking tasks with asynchronous operations.

Deep Dive

- DOM: structured webpage representation, tree structure.
- Standard model for language interaction.
- JavaScript: high-level, interpreted language.
- Controls DOM, enables dynamic changes to content and styling.

When to use?

- DOM: Ideal for web document element access and modification.
- JavaScript: Perfect for interactivity and DOM manipulation.
- Suitable for various programming languages.

Take Note

- DOM works with various languages, not just JavaScript.
- JavaScript extends beyond DOM, covering server tasks, databases, etc.

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INTRODUCTION TO DOM

ANATOMY OF WEBPAGE

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```html
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>Basic Web Page</title>
  <!-- CSS -->
  <style>
    body {
      font-family: Arial, sans-serif;
      text-align: center;
    }
    h1 {
      color: blue;
    }
    #infoText {
      color: green;
    }
  </style>
</head>
<body>
  <!-- HTML -->
  <h1 id="mainHeading">Welcome to My Web Page</h1>
  <p id="infoText">This is a simple paragraph.</p>
  <button id="changeTextButton">Change Text</button>
  <img id="sampleImage" src="example.jpg" alt="Example image">

  <!-- JavaScript -->
  <script>
    // Get elements
    const mainHeading = document.getElementById("mainHeading");
    const infoText = document.getElementById("infoText");
    const changeTextButton = document.getElementById("changeTextButton");

    // Add button click event
    changeTextButton.addEventListener("click", function() {
      infoText.innerHTML = "The text has been changed!";
    });
  </script>
```

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ANATOMY OF A BASIC WEB PAGE.

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High-Level Explanation

- Basic web page consists of HTML, CSS, and JavaScript.
- HTML structures content and layout.
- CSS styles design and appearance.
- JavaScript adds interactivity for users.

Basic Explanation

- DOM: Lego blocks forming a webpage.
- JavaScript: Your hands, manipulates the blocks.
- Use JavaScript to change webpage content.

When to use?

- HTML: Define web page structure and content.
- CSS: Style and organize HTML elements.
- JavaScript: Add interactivity, DOM manipulation, async operations.

Deep Dive

- **HTML**: Defines web page structure and content using tags.
- **CSS**: Controls visual design, layout, and styling.
- **JavaScript**: Adds interactivity and dynamic features.

Take Note

- Technologies are intertwined for a complete web experience.
- Separation of concerns (HTML, CSS, JavaScript) for maintainability and scalability.

Best Practices

- HTML:
  - Use semantic elements for SEO and accessibility.
  - Maintain clean indentation and nesting.
- CSS:
  - Prefer classes over inline styles for reusability.
  - Apply responsive design principles.
- JavaScript:
  - Ensure modular and well-commented scripts.
  - Validate user input for security.

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SELECTING DOM ELEMENTS

WHAT'S DOM TREE

JS

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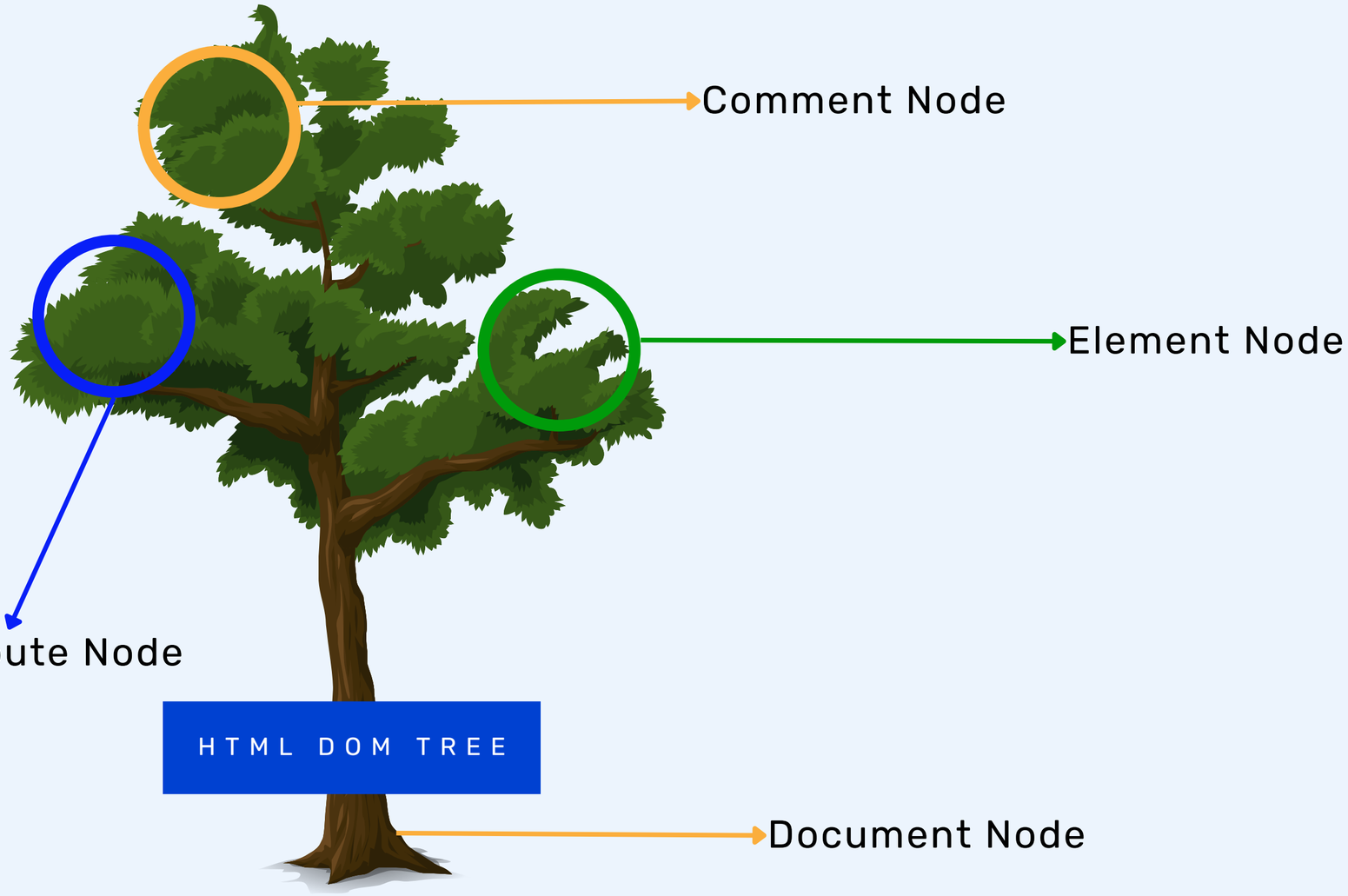
WHAT IS DOM TREE



WHAT IS DOM TREE

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High-Level Explanation

- DOM Tree: Hierarchy of HTML/XML elements and content.
- Connects web pages to JavaScript for scripting.

Basic Explanation

- Webpage as a family tree analogy.
- Grandparent: Root or document.
- Parents: Major divisions (e.g., `head`, `body`).
- Children: Individual elements (paragraphs, images).
- DOM Tree shows family member relationships.
- Changes in the tree reflect on the web page.

Deep Dive

- DOM Tree: Elements, attributes, text as nodes.
- Root node, parent-child structure.
- "Live" model, changes reflect instantly.
- Allows programmatic interaction with web documents.

DOM Tree components:

- Document Node: Represents the entire document.
- Element Nodes: Represent HTML/XML elements.
- Text Nodes: Contain text inside elements.
- Attribute Nodes: Represent element attributes.
- Comment Nodes: Represent document comments.

When to use?

- DOM Tree use cases:
  - Dynamic updates to content, structure, or style.
  - Reading or extracting web page information.
  - Handling user interactions (e.g., clicks, forms).

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Best Practices

- Caution in referencing nodes to prevent errors.
- Minimize direct DOM manipulations for performance.
- Batch changes for efficient DOM updates.
- Prefer modern API methods for clarity and efficiency.

Take Note

- Language-agnostic DOM Tree.
- Nodes include text, attributes, and comments.
- DOM changes impact reflows/repaints, watch frequency.

WHAT IS DOM TREE

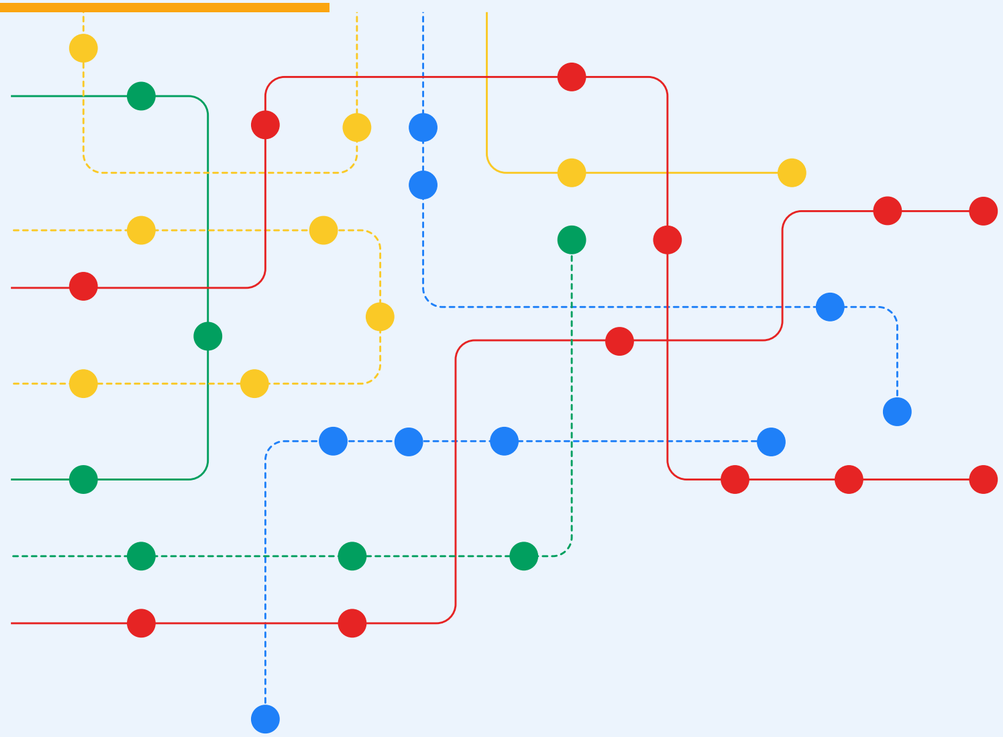
```
├── <html> (Element Node)
|   ├── <head> (Element Node)
|   |   └── <title> (Element Node)
|   |       └── "My Web Page" (Text Node)
|   └── <body> (Element Node)
|       └── <div id="container"> (Element Node)
|           ├── <h1> (Element Node)
|           |   └── "Welcome to My Web Page" (Text Node)
|           ├── <p class="intro"> (Element Node)
|           |   └── "This is an introductory paragraph." (Text Node)
|           ├── <ul id="list"> (Element Node)
|           |   ├── <li> (Element Node)
|           |   |   └── "Item 1" (Text Node)
|           |   ├── <li> (Element Node)
|           |   |   └── "Item 2" (Text Node)
|           |   └── <li> (Element Node)
|           |       └── "Item 3" (Text Node)
```

ANOTHER EXAMPLE

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

DOM NODES



JS

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DOM NODES

MASYNCTECH SCHOOL

High-Level Explanation

- DOM is a programming interface for web docs.
- Structures HTML/XML as object tree (nodes).
- Nodes manipulated via languages like JavaScript.
- Node types: Document, Element, Text, Attribute, Comment.
- Operations: Traverse, manipulate, query, style.

Basic Explanation

- DOM is akin to a house blueprint.
- Document Node is the foundation.
- Element Nodes represent rooms/structures.
- Text Nodes label items.
- Attribute Nodes define specific features.
- Comment Nodes act as side notes.
- JavaScript enables changes like moving furniture.

Deep Dive

- DOM is a live interface for real-time updates.
- Node types (Document, Element, Text, Attribute, Comment) play vital roles.
- Nodes enable traversal, manipulation, querying, styling.
- Unique properties/methods for each node type.

Properties & Methods

-Properties:

- `parentNode`, `nextSibling`, `previousSibling`
- `firstChild`, `lastChild`, `nodeValue`, `nodeName`
- `nodeType`, and more.

- **Methods**
  - `appendChild()`, `removeChild()`, `insertBefore()`
  - `cloneNode()`, `replaceChild()`, and more.

DOM NODES

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Best Practices

- Consider node type for specific properties/methods.
- Utilize the most specific method for performance.
- For complex queries, explore `querySelector` and `querySelectorAll`.

When to use?

- Utilize DOM nodes for:
  - Traversal: Finding specific parts.
  - Manipulation: Adding, deleting, modifying elements.
  - Querying: Searching for elements/attributes.
  - Styling: Applying/changing styles dynamically.

Take Note

- DOM is "live," changes reflect instantly.
- Node types serve distinct roles, have unique properties/methods.

WHAT IS DOM TREE

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SCHOOL

```
├── <html> (Element Node)
|   ├── <head> (Element Node)
|   |   └── <title> (Element Node)
|   |       └── "My Web Page" (Text Node)
|   └── <body> (Element Node)
|       └── <div id="container"> (Element Node)
|           ├── <h1> (Element Node)
|           |   └── "Welcome to My Web Page" (Text Node)
|           ├── <p class="intro"> (Element Node)
|           |   └── "This is an introductory paragraph." (Text Node)
|           ├── <ul id="list"> (Element Node)
|           |   ├── <li> (Element Node)
|           |   |   └── "Item 1" (Text Node)
|           |   ├── <li> (Element Node)
|           |   |   └── "Item 2" (Text Node)
|           |   └── <li> (Element Node)
|           |       └── "Item 3" (Text Node)
```

ANOTHER EXAMPLE

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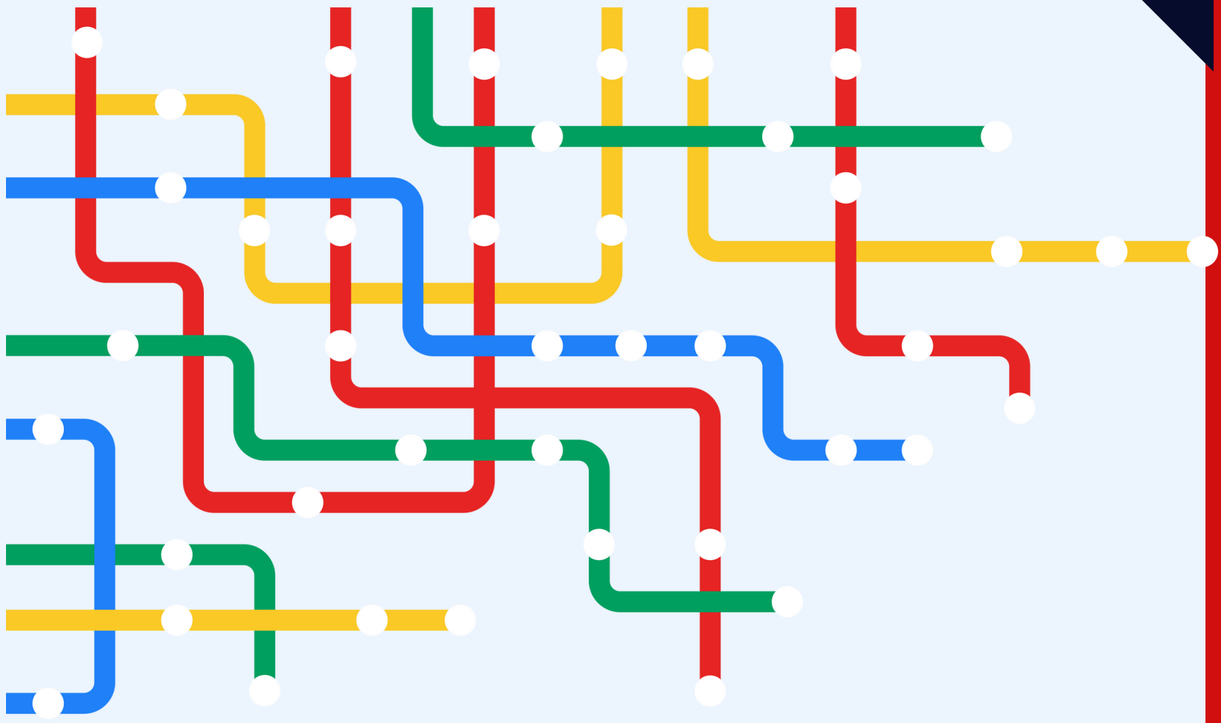
SELECTING DOM ELEMENTS

ELEMENT NODES



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ELEMENT NODES

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High-Level Explanation

- Element nodes represent HTML/XML elements.
- Contain start/end tags, attributes, child nodes.
- Primary building blocks for web docs.
- Enable manipulation of content, structure, style.

Basic Explanation

- Webpage as Lego structure.
- Element nodes like Lego blocks.
- Blocks can have stickers (attributes).
- Connected to smaller blocks (child nodes).
- JavaScript allows block manipulations.

Deep Dive

- Element nodes are objects with properties/methods.
- Part of the DOM hierarchy, have relationships.
- Contain attributes and various child node types.
- Rich API for appending, removing, attributing, and event handling.
- Main interaction point for DOM manipulation.

Properties & Methods

- Accessing Element Nodes: Methods like `getElementById()`, `querySelector()`, etc.
- Modifying Attributes: Methods `getAttribute()`, `setAttribute()`, `removeAttribute()`.
- Changing Content: Properties like `innerHTML` or `innerText`.

When to use?

Element nodes are essential for:

- Modifying element content
- Adding/modifying attributes (e.g., `class`, `id`)
- Inserting new elements into the structure
- Attaching interactive behaviors (click, hover)

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SCHOOL

Best Practices

- When manipulating element nodes, be cautious of unintentionally altering or removing child nodes.
- Try to batch your DOM manipulations to reduce reflows and repaints, as these can affect performance.
- Use appropriate methods for tasks: for example, `setAttribute` for modifying attributes and `appendChild` for adding child nodes.

Take Note

- Element nodes ≠ HTML tags; they're DOM objects.
- Include attributes and child nodes.
- Vital for webpage structure/content.
- Offer rich properties/methods for interactions.

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

USING

getElementByIld

JS

ADVANCED

USING GETELEMENTBYID

MASYNCTECH
SCHOOL

High-Level Explanation

- `getElementById` method targets HTML element by its unique `id` attribute.

Deep Dive

- `getElementById` in `document` object.
- Searches DOM for matching `id` attribute.
- Returns first matching element as DOM object.
- Enables property/method manipulation.

Basic Explanation

- `getElementById` is like finding a book with an ISBN.
- Uses a unique `id` to locate elements instantly on a webpage.

When to use?

- Use `getElementById` when:
  - Targeting a specific element with a unique `id`.
  - Seeking fast, direct access to a single element.
  - The targeted element is crucial for functionality/interactivity.

Best Practices

- Ensure unique `id` across the document.
- Enhance code readability with descriptive `id` names.
- Check for `null` before manipulating; it's returned if element not found.

Take Note

- `getElementById` is case-sensitive.
- If multiple elements share the same `id`, it returns the first encountered.
- Only returns a single element, even if multiple have the same `id`.

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SELECTING DOM ELEMENTS

BROWSER WINDOW OBJECT

JS

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SELECTING DOM ELEMENTS

USING

getElementsByClassName

JS

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USING GETELEMENTSBYCLASSNAME

MASYNCTECH
SCHOOL

High-Level Explanation

- `getElementsByClassName` selects elements by class.
- Returns an HTMLCollection, a live list.
- Enables interaction with multiple elements.

Basic Explanation

- `getElementsByTagName` is like selecting folders.
- Retrieves all items matching specified tag.
- Similar to selecting all 'Photos' folders on a computer.

Best Practices

- HTMLCollection is live; DOM changes affect it.
- Be cautious when iterating; changes can impact loops.

Deep Dive

- Versatile for actions on multiple elements.
- Returned HTMLCollection is live (updates with DOM).
- Case-insensitive, works on `document` or elements.

When to use?

- Use `getElementsByTagName` when:
  - Styling/manipulating multiple elements of the same type.
  - Creating a collection for iteration.
  - Needing a live collection reflecting DOM changes.

Take Note

- HTMLCollection is zero-indexed, accessed with `[0]`, `[1]`, etc.
- `getElementsByTagName` is case-insensitive.

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

USING

querySelector

JS

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USING QUERYSELECTOR

MASYNCTECH SCHOOL

High-Level Explanation

- `querySelector` selects elements using CSS selectors.
- Returns the first matching element or `null` if none.

Basic Explanation

- `querySelector` is like an advanced Twitter search.
- Enables specific criteria to find elements.
- Similar to searching tweets by user, hashtag, date.

Best Practices

- Correct CSS selector syntax for `querySelector`.
- Use when sure only one element is needed.
- Avoid in loops or high-performance scenarios due to computational cost.

Deep Dive

- `querySelector` uses various CSS selectors.
- Versatile: Classes, IDs, pseudo-classes, attributes, combos.
- Adaptable, mirrors CSS targeting syntax.

When to use?

- Use `querySelector` for complex or combined criteria.
- Ideal for selecting the first matching element.

Take Note

- `querySelector` is case-sensitive.
- Returns the first element among multiple matches.
- Searches depth-first in the DOM tree.

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

USING

querySelectorAll

JS

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USING QUERYSELECTORALL

MASYNCTECH SCHOOL

High-Level Explanation

- `querySelectorAll` selects multiple elements with CSS selectors.
- Returns a NodeList with all matching elements.

Basic Explanation

- `querySelector` finds the first post with a hashtag.
- `querySelectorAll` finds all posts with the same hashtag.

Best Practices

- Check NodeList length for expected elements.
- Re-run `querySelectorAll` if DOM changes.
- Convert NodeList to an array for extra methods.

Deep Dive

- `querySelectorAll` is flexible, similar to `querySelector`.
- Complex CSS selectors and combinations work.
- Differs in returning all matches, not just the first.
- NodeList is static, doesn't update with DOM changes.

When to use?

- Use `querySelectorAll` for operations on multiple elements.
- Ideal for tasks like styling or DOM manipulation with element collections.

Take Note

- `querySelectorAll` is not live, doesn't auto-update.
- Returns a NodeList, not an array.
- Case-sensitive matching.

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

Child VS Children Nodes

JS

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CHILD VS CHILDREN NODES

MASYNCTECH SCHOOL

High-Level Explanation

- "Child Nodes" are all direct descendants.
- "Children Nodes" specifically mean element nodes.
- `.childNodes` includes all node types.
- `.children` fetches only element nodes.

Basic Explanation

- `.childNodes` includes everyone in the family.
- `.children` focuses only on human family members.
- Like taking a full family portrait vs. a human-centric one.

Best Practices

- Both `.childNodes` and `.children` are "live."
- Watch out for whitespace creating text nodes in `.childNodes`.
- Check length before accessing items to avoid errors.

Deep Dive

- "Child Nodes" include all DOM descendants.
- "Children Nodes" are only element nodes.
- `.childNodes` gives full structure, `.children` simplifies.
- `.childNodes` returns a NodeList, `.children` returns HTMLCollection.

When to use?

- Use `.childNodes` for a full picture, including text/comments.
- Useful for understanding/manipulating the entire DOM.
- Use `.children` for element nodes, e.g., changes to visible page parts.

Take Note

- `.children` returns an HTMLCollection, not a NodeList.
- HTMLCollection and NodeList have different methods/properties.
- `.childNodes` includes all node types, not just element nodes.

MASYNCTECH
SCHOOL

SELECTING DOM ELEMENTS

USING

getElementByName

FOR FORM ELEMENTS

JS

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GETELEMENTBYNAME (FOR FORM ELEMENTS)

MASYNCTECH SCHOOL

High-Level Explanation

- `getElementsByName` selects elements by `name` attribute.
- Commonly used with form elements but not limited to them.
- Returns a `NodeList` with matching elements.

Basic Explanation

- `getElementsByName` is like finding health potions in a game.
- Helps locate elements by their specified name.
- Returns a list of all matching elements.

Best Practices

- Check the `NodeList` length to confirm elements found.
- Loop through the `NodeList` for individual changes.
- Consider modern query methods for complex queries.

Deep Dive

- `getElementsByName` is in the `document` object.
- Differs from `getElementById` as it returns multiple elements.
- Results in a `NodeList` (array-like but not live).
- Changes after NodeList generation don't update it.

When to use?

- Use `getElementsByName` for:
  - Multiple form elements with the same `name`.
  - Grouping and programmatically manipulating elements.

Take Note

- `getElementsByName` is case-sensitive.
- Returns elements in document order.
- Found in the `document` object, not on individual elements.

MASYNCTECH
SCHOOL

ACCESSING

PARENT & CHILDREN ELEMENTS

JS

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ACCESSING PARENT AND CHILD ELEMENTS

MASYNCTECH SCHOOL

High-Level Explanation

- Web development frequently involves DOM manipulation.
- JavaScript provides tools for accessing parent and child elements.
- Properties like `parentNode` and `parentElement` help move up the DOM tree.
- Methods like `firstChild`, `lastChild`, `firstElementChild`, and `lastElementChild` aid in navigating downwards.

Basic Explanation

- Group photo: You & mom = parent & child.
- Siblings: Immediate neighbors in DOM.
- Identify: Locate adjacent elements in the picture.

Best Practices

- Check for `null` before node access.
- Specify node type: element or any.
- Use appropriate properties accordingly.

Deep Dive

- DOM interaction involves nodes' relatives.
- Access parent: `parentNode`, `parentElement`.
- Note: Differences between `parentNode` and `parentElement`.
- Get children: `firstChild`, `lastChild`.
- For elements: `firstElementChild`, `lastElementChild`.

When to use?

- Upward navigation: `parentNode`, `parentElement`.
- Downward navigation: `firstChild`, `lastChild`, `firstElementChild`, `lastElementChild`.

Take Note

- `parentNode` vs. `parentElement` differences.
- `firstChild`, `lastChild` may return text/comments.
- For elements only: `firstElementChild`, `lastElementChild`.

MASYNCTECH
SCHOOL

USING

DATA ATTRIBUTES

JS

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USING DATA ATTRIBUTES

MASYNCTECH SCHOOL

High-Level Explanation

- Data attributes in HTML for extra info.
- Access and change with JS: `.getAttribute()`, `.setAttribute()`, `dataset` property.

Basic Explanation

- Party name tags: Like data attributes.
- QR codes hold extra info, like data attributes.
- QR codes keep name tags tidy, like HTML elements.
- JavaScript "scans" data attributes for extra info.

Best Practices

- camelCase for `data-*` with `dataset`.
- Avoid if standard HTML attributes suffice.
- Data attributes ≠ database or localStorage.

Deep Dive

- Data attributes store custom data in HTML.
- Start with "data-" followed by a name.
- Avoid non-semantic practices like extra classes or IDs.
- Used for data not fitting into existing attributes.
- In JavaScript: `getAttribute('data-*')`, `setAttribute('data-*', value)`.
- `element.dataset` as DOMStringMap for all data attributes.

When to use?

- Use data attributes for storing metadata.
- Track state (selected/disabled).
- Dynamic elements with extra info not in HTML attributes.

Take Note

- `dataset` for `data-*` attributes only.
- JavaScript changes in `dataset` are session-specific.

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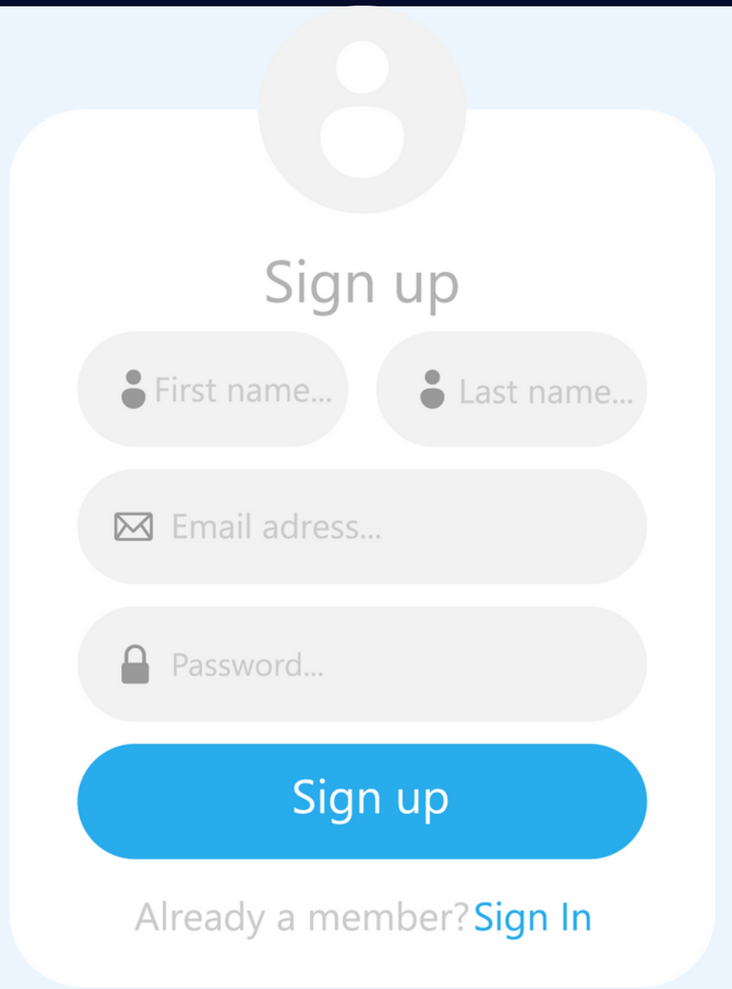
SCHOOL

SELECTING

FORM ELEMENTS



JS

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SELECTING FORM ELEMENTS

MASYNCTECH SCHOOL

High-Level Explanation

- Select form elements in JavaScript.
- Methods: `getElementById()`, `getElementsByClassName()`, `getElementsByTagName()`.
- Also, `querySelector()` and `querySelectorAll()`.

Basic Explanation

- Supermarket analogy for web form selection.
- Specific: Unique ID elements.
- General: Group-related elements, e.g., checkboxes.
- JavaScript provides tools for both scenarios.

Best Practices

- Check if selector returns an element to avoid errors (null).
- `getElementById()`: Faster, simpler for ID selection.
- `querySelectorAll()`: Returns NodeList, not full array methods.

Deep Dive

- JS selects HTML form elements.
- Methods: `getElementById()`, `getElementsByClassName()`, `getElementsByTagName()`.
- `querySelector()` and `querySelectorAll()` for advanced querying.

When to use?

- `getElementById()` for unique elements.
- `querySelector()` for complex or first match.
- `querySelectorAll()`, `getElementsByClassName()`, or `getElementsByTagName()` for multiple elements.

Take Note

- `getElementById()`: Case-sensitive.
- `getElementsByClassName()`, `getElementsByTagName()`: Case-insensitive.
- `querySelectorAll()`: Static NodeList, no automatic DOM updates.

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

JS

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TRAVERSING OVERVIEW

MASYNCTECH SCHOOL

High-Level Explanation

- Traversing in JavaScript DOM: Navigation through HTML structure.
- Essential for locating, accessing, and manipulating nodes.
- Involves moving through the DOM tree hierarchy.

Basic Explanation

- Family tree analogy for DOM traversal.
- Seeking relatives like grandparents or cousins.
- Follow lines up, down, or sideways.
- Web page elements form a 'family tree.'
- Traversing means moving between family members.
- Goal: Finding the needed element.

Take Note

- Traversal impact on complex DOMs.
- Watch for browser compatibility.
- Beware of incorrect traversing causing bugs.

Deep Dive

- Traversing in DOM like a family tree search.
- Finding specific elements in the hierarchy.
- Elements can be parents, children, or siblings.
- Techniques for moving up and down hierarchy.
- Use properties like `parentNode`, `nextSibling`.
- Methods like `querySelector` and `getElementsByTagName`.
- Method choice depends on task and DOM complexity.

When to use?

- Traversing benefits:
  - Access dynamically generated elements.
  - Navigate complex, nested web apps.
  - Create reusable components independent of HTML structure.

Best Practices

- Specificity speeds up traversal.
- Cache elements for reuse.
- Opt for modern methods (e.g., `querySelector`).
- Minimize excessive DOM manipulation.
- Efficiency is key to avoid performance problems.

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING parentNode()

JS

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USING `PARENTNODE` IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- `parentNode` in DOM traversal.
- Move from child to immediate parent.
- Useful for relative positioning.

Basic Explanation

- `parentNode` in forest analogy.
- Baby tree to mother tree.
- Look directly up for parent element.

Best Practices

- Check for `null` before using `parentNode`.
- Cache parent node for repeated use.
- Understand the DOM tree structure to avoid unnecessary traversal.

Deep Dive

- Nodes in hierarchical relationships.
- `parentNode` accesses immediate parent.
- Trace back up hierarchy.
- Useful for dynamic content and nested structures.

When to use?

- Use `parentNode` when:
  - Manipulating a child's parent.
  - Navigating from deeply nested elements.
  - Code needs to be generic and independent of IDs or classes.

Take Note

- `parentNode` returns `null` for root or removed nodes.
- Includes all node types (e.g., text or comments).

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING childNodes

JS

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USING CHILDNODES IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- - `childNodes` property: Returns NodeList of child nodes
- - Includes text, comment nodes

- Useful for traversing DOM tree, accessing parent's children

Basic Explanation

- - Analogy: Toy box for `childNodes`
- - Get everything when you dump it out

- Includes toys (elements) and not-so-good stuff (text, comments)

Best Practices

- Type checking important for specific element nodes.
- Watch out for whitespace treated as text nodes.
- `children` property preferred for element nodes.

Deep Dive

- - `childNodes` for raw, low-level DOM traversal
- - Access immediate children
- - Includes element, text, comment nodes

- Requires care to avoid unexpected results

When to use?

- `childNodes` usage:
  - Loop through all nodes, regardless of type.
  - Working with XML where text nodes matter.
  - Need fine-grained DOM structure control.

Take Note

- `childNodes` returns NodeList, array-like but lacks all array methods.
- NodeList is live, updates real-time with DOM changes.

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING

previousSibling()

JS

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USING `PREVIOUSSIBLING` IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- `previousSibling` navigates sideways in DOM.
- Selects immediately preceding sibling node.
- Useful for accessing related elements with known parent.

Basic Explanation

- `previousSibling` akin to kids in an ice cream line.
- Identifies the node just before the current one.
- Works within the same parent element.

Best Practices

- Check node type when using `previousSibling`.
- Handle `null` for elements lacking previous siblings.
- Use `previousSibling` carefully for performance optimization.

Deep Dive

- `previousSibling` returns various node types.
- Granularity offers power and complexity.
- May require extra checks for intended node type.

When to use?

- Use `previousSibling` when:
  - Linear navigation through elements.
  - Accessing immediate neighbor of a node.
  - Prioritizing performance by avoiding extra queries.

Take Note

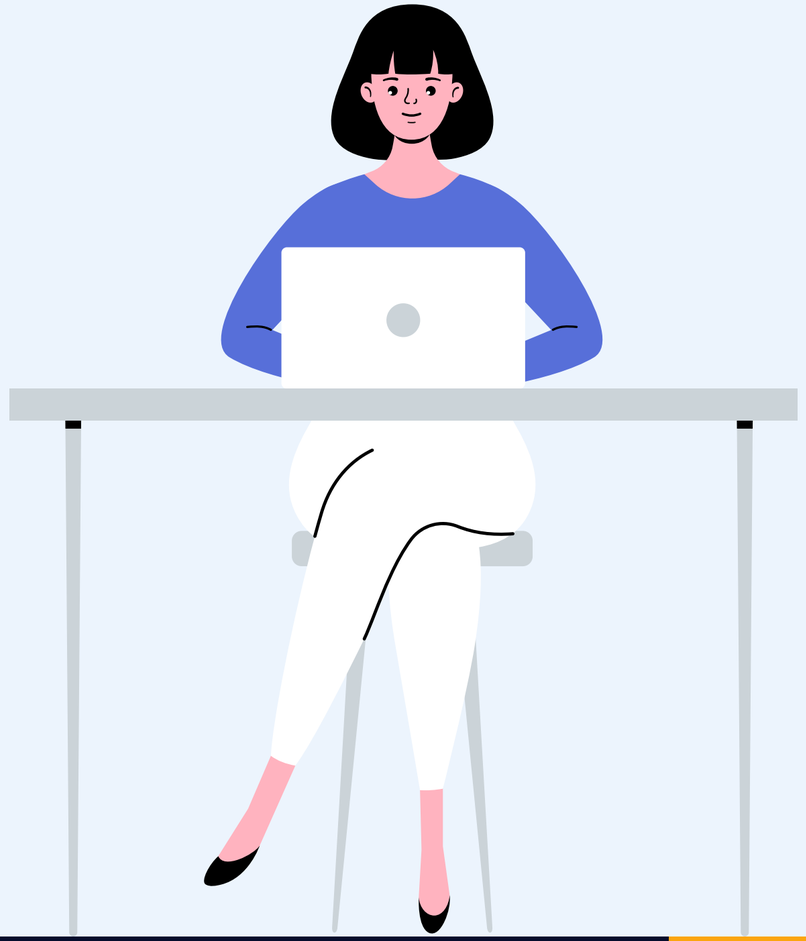
- `previousSibling` can return `null` for first child.
- Returns various node types, including text and comments.

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING

nextSibling()



JS

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USING NEXTSIBLING` IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- `nextSibling` accesses succeeding sibling.
- Allows horizontal traversal within same parent.
- Navigates to elements sharing the same parent.

Basic Explanation

- `nextSibling` like a bookshelf with books.
- Finds next node with the same parent.
- Works within the DOM tree.

Best Practices

- Confirm node type when using `nextSibling`.
- Prepare for `null` if the last child has no next sibling.
- Optimize performance by minimizing reflows and repaints with `nextSibling`.

Deep Dive

- `nextSibling` moves in opposite direction of `previousSibling`.
- Returns various node types, including text and comments.
- Additional checks often needed for intended node type.

When to use?

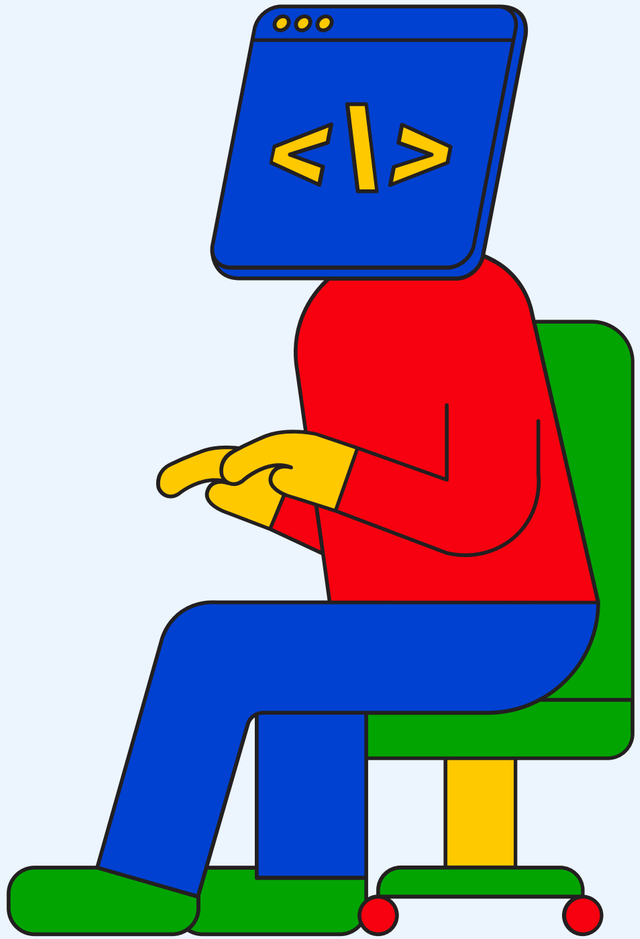
- Utilize `nextSibling` when:
  - Accessing immediate next sibling of a node.
  - Traversing parent node's children sequentially.
  - Enhancing performance by minimizing extra queries.

Take Note

- `nextSibling` may return `null` without a next sibling.
- Potential for text or comment nodes; check node type.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING

previousElementSibling()

JS

ADVANCED

USING USING PREVIOUSELEMENTSIBLING` IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- `previousElementSibling` accesses preceding sibling.
- Considers only element nodes, skips text/comments.
- Efficient for horizontal DOM traversal.

Basic Explanation

- In a queue, the person in front is your "previous sibling."
- `previousElementSibling` finds the immediate preceding node.
- Similar to identifying the person right in front.

Best Practices

- Perform null checks for `previousElementSibling`.
- No need for node type checks; it filters non-element nodes.

Deep Dive

- `previousElementSibling` gets preceding element.
- Ignores text and comment nodes.
- Returns closest previous element or `null`.

When to use?

- Employ `previousElementSibling` when:
  - Navigating backward from a known element.
  - Focusing solely on element nodes, ignoring text/comments.
  - Aiming for efficient element traversal, reducing DOM queries.

Take Note

- `previousElementSibling` returns `null` for the first child.
- Ignores non-element nodes, simpler than `previousSibling`.

MASYNCTECH
SCHOOL

TRANSVERSING THE DOM

USING

nextElementSibling()

JS

ADVANCED

USING USING NEXTELEMENTSIBLING` IN DOM TRAVERSAL

MASYNCTECH SCHOOL

High-Level Explanation

- `nextElementSibling` returns following sibling element.
- Returns `null` if no such element exists.

Basic Explanation

- `nextElementSibling` like hitting "Next" on a playlist.
- Reveals the next element in the sequence.
- Returns `null` at the end, like the last song.

Best Practices

- Check for `null` to prevent errors with `nextElementSibling`.
- Consider bi-directional traversal with `previousElementSibling`.
- Use IDs or classes for critical navigation alongside `nextElementSibling`.

Deep Dive

- `nextElementSibling`: Sibling-to-sibling DOM navigation.
- Ignores non-element nodes (text, comments).
- Returns only actual HTML elements.

When to use?

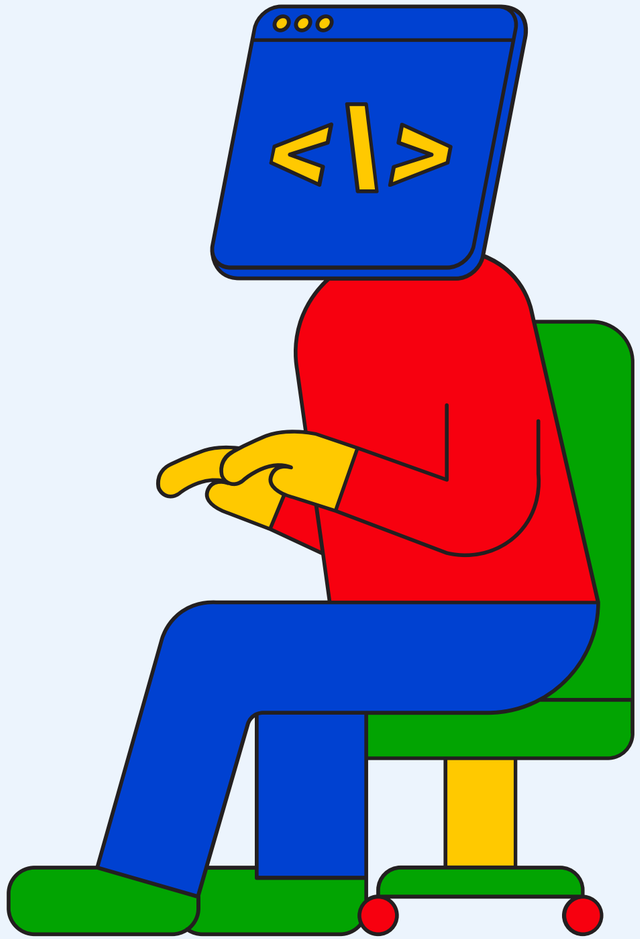
- Use `nextElementSibling` when:
  - Iterating over a list to find what comes next.
  - Traversing menus for dynamic styles/classes.
  - Guiding users through interactive forms.
  - Managing slideshows or carousels to find the next slide.

Take Note

- Returns elements, ignores text and non-element nodes.
- Read-only; cannot be manually set.
- Generally well-supported but check compatibility.

MASYNCTECH
SCHOOL

CODE DEMO



JS

ADVANCED

MASYNCTECH
SCHOOL

DOM MANIPULATION

JS

ADVANCED

MASYNCTECH
SCHOOL

DOM MANIPULATION

INNERHTML
TEXTCONTENT
INNERTEXT

JS

ADVANCED

USING TEXTCONTENT, INNERHTML & INNERTEXT

MASYNCTECH SCHOOL

High-Level Explanation

- `textContent`: Accesses plain text in an element and its children.
- `innerHTML`: Accesses HTML content within an element.
- `innerText`: Accesses visible text in an element.

Basic Explanation

- `textContent`: Gets plain text, like reading a book's story.
- `innerHTML`: Gets text, images, fonts, colors, like a styled book.
- `innerText`: Gets only visible words, like reading open book pages.

Best Practices

- `textContent`: Safely handles plain text, no XSS risk.
- `innerHTML`: Caution needed for dynamic HTML, XSS risk.
- `innerText`: Triggers reflow, impacts performance.

Deep Dive

- `textContent`: Returns raw text, ignores HTML tags, and is faster.
- `innerHTML`: Includes HTML tags, can expose to XSS if misused.
- `innerText`: Considers styling and doesn't show hidden CSS text.

When to use?

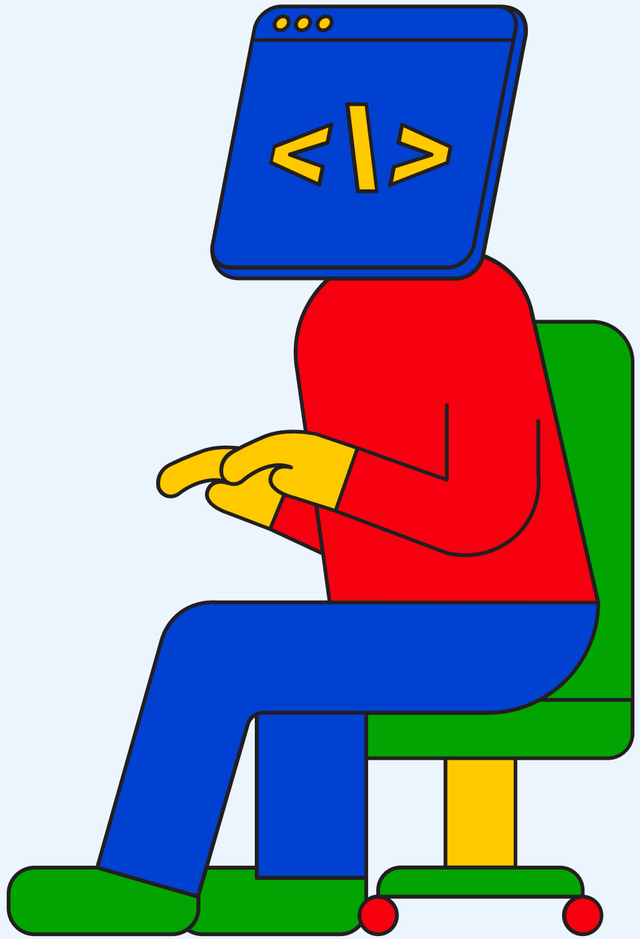
- `textContent`: For quick text access, no HTML structure.
- `innerHTML`: Embedded HTML content handling.
- `innerText`: Visible text with styling.

Take Note

- `textContent`: Fastest and safest for text handling.
- `innerHTML`: Handles HTML, but watch for security.
- `innerText`: Slower, considers visibility.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

DOM
MANIPULATION
setAttribute()

JS

ADVANCED

DOM MANIPULATION USING USING SETATTRIBUTE

MASYNCTECH SCHOOL

High-Level Explanation

- `setAttribute`: Sets an attribute's value on an element.

Basic Explanation

- `setAttribute` analogy: Like changing shirt color in a game.
- It modifies attributes in HTML elements.
- Enables customization, e.g., shirt color from red to blue.

Best Practices

- `setAttribute` use cases:
- Works for HTML and custom data attributes (`data-*`).
- Caution with Boolean attributes; properties often better.

Deep Dive

- Method updates or adds attributes in HTML elements.
- Takes 2 arguments: attribute name and new value.
- Updates existing or creates new attributes.

When to use?

- `setAttribute` usage:
- Modify attribute values programmatically.
- Add new attributes to HTML elements.
- Useful for dynamic attribute manipulation.

Take Note

- `setAttribute` behavior:
- Overwrites existing attribute values.
- To modify, retrieve existing value and set a new one.

MASYNCTECH
SCHOOL

DOM MANIPULATION

getAttribute()

JS

ADVANCED

DOM MANIPULATION USING USING GETATTRIBUTE

MASYNCTECH SCHOOL

High-Level Explanation

- `getAttribute`: Retrieves specified attribute value from an HTML element.

Basic Explanation

- `getAttribute` analogy:
- Like using a cheat sheet in a game.
- Check it for specific details, like your character's armor type.

Best Practices

- Use `getAttribute` for HTML and `data-*` attributes.
- Boolean attributes may return empty string as `true`.

Deep Dive

- `getAttribute` method:
- Accesses current attribute value.
- Accepts attribute name as argument.
- Returns value as string, or `null` if attribute doesn't exist.

When to use?

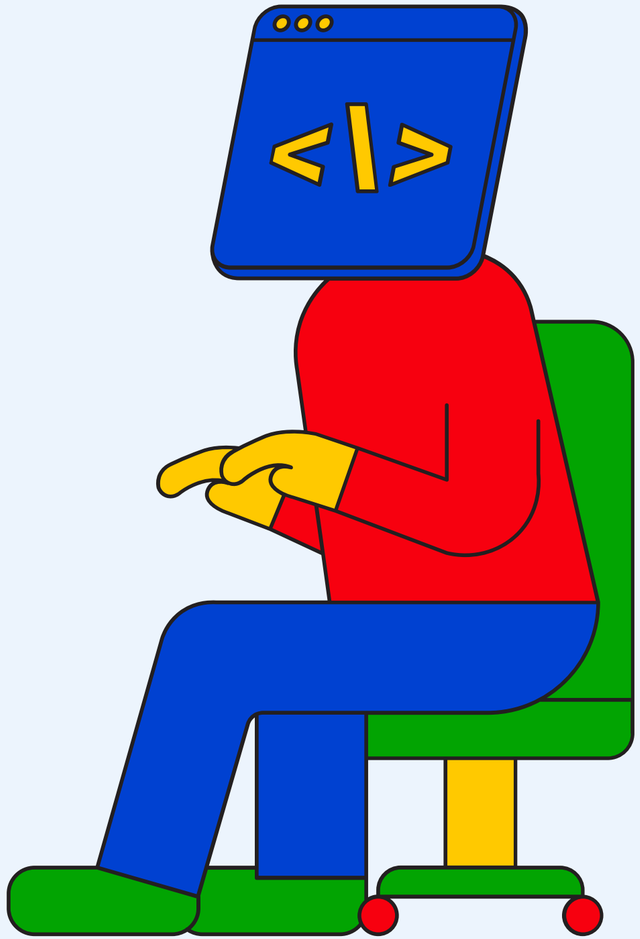
- `getAttribute` usage:
- To read current HTML attribute value.
- Useful for decision-making or code manipulations.

Take Note

- `getAttribute` retrieves the initial attribute value.
- It doesn't reflect property changes.
- Useful for accessing initial values.

MASYNCTECH
SCHOOL

CODE DEMO



JS

ADVANCED

MASYNCTECH
SCHOOL

DOM MANIPULATION

createElement()

appendChild()

JS

ADVANCED

USING CREATEELEMENT & APPENDCHILD()

MASYNCTECH SCHOOL

High-Level Explanation

- `createElement` creates empty HTML elements.
- `appendChild()` inserts elements into the DOM.
- Essential for dynamic HTML element creation.
- `appendChild()` adds elements as last children.

Basic Explanation

- `createElement` is like getting a new Lego piece.
- Piece isn't part of the structure yet.
- `appendChild()` is attaching the Lego piece.
- It becomes a permanent part of the layout.

Best Practices

- Append elements semantically in HTML.
- Use `textContent` to avoid script injection.
- Batch DOM operations for better performance.
- Consider accessibility when creating elements.

Deep Dive

- `createElement` constructs an HTML element.
- Doesn't append to DOM, stays virtual.
- `appendChild()` adds to DOM, last child.
- Connects elements to specified parent.

When to use?

- Dynamic list item addition
- Safe insertion of user-generated content
- Creating single-page applications (SPAs)
- Form validation with immediate feedback

Take Note

- `createElement` creates but doesn't add to DOM.
- `appendChild()` can relocate elements.
- Watch out for inefficient DOM changes.

MASYNCTECH
SCHOOL

DOM MANIPULATION

insertBefore()

JS

ADVANCED

USING INSERTBEFORE

MASYNCTECH SCHOOL

High-Level Explanation

- `insertBefore` inserts a node before an existing child.
- Provides precise control over insertion position.
- Useful for specifying element placement.

Basic Explanation

- `insertBefore` is like placing books on a shelf.
- Allows precise placement, like before a favorite book.
- `appendChild()` puts the book at the end.

Best Practices

- Maintain semantic sense in HTML structure.
- Batch DOM operations for performance.
- Verify conditions to avoid unintended placements.

Deep Dive

- `insertBefore` offers nuanced element positioning.
- Requires two arguments: new node and existing child.
- If second argument is `null`, it's like `appendChild()`.

When to use?

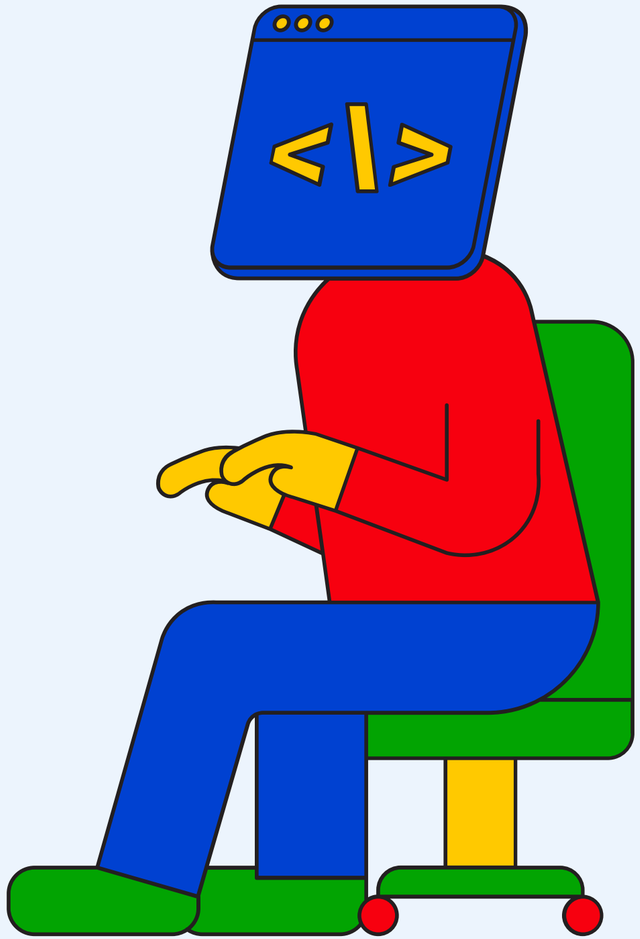
- Insert into a sorted list without reordering.
- Add ads within an article.
- Change element order based on user actions.
- Paginate content at specific positions.

Take Note

- Second argument must be a child or `null`.
- `insertBefore` relocates an existing node.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

DOM MANIPULATION

REPLACING ELEMENTS

JS

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REPLACING ELEMENTS

MASYNCTECH SCHOOL

High-Level Explanation

- `replaceChild` swaps an existing child node.
- Replaces one element with another.
- Alters the DOM structure.

Basic Explanation

- `replaceChild` swaps elements like changing photos.
- Replaces the old element with a new one.
- Simulates updating elements on a webpage.

Best Practices

- Prepare the new element fully.
- Minimize layout recalculations.
- Don't break existing JavaScript references.
- Watch out for event handler issues.

Deep Dive

- `replaceChild` on a parent node.
- Arguments: new and existing nodes.
- Replaces existing with new node.
- Atomic update of the DOM.

When to use?

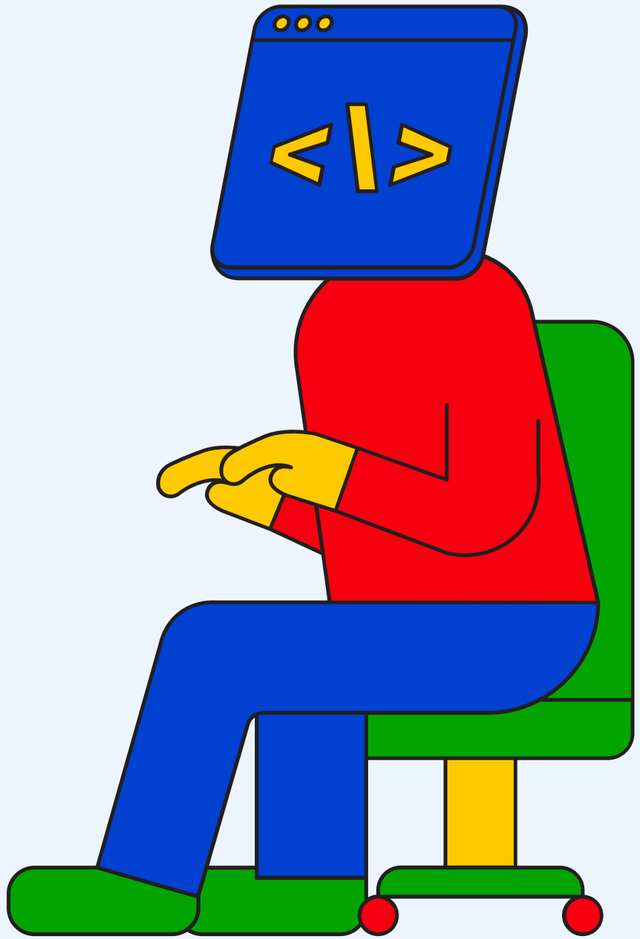
- Update UI components selectively.
- Swap elements based on interactions or updates.
- Create tabbed interfaces with dynamic content.

Take Note

- Replace direct child nodes only.
- Removed child can be reused elsewhere.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

DOM
MANIPULATION

removeChild()

JS

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USING REMOVECHILD

MASYNCTECH SCHOOL

High-Level Explanation

- `removeChild` removes a child element.
- Eliminates the targeted element and its content.
- Alters the DOM structure.

Basic Explanation

- `removeChild` is like removing a chocolate.
- Eliminates unwanted items, makes room for desired ones.
- Instantaneous change in the web structure.

Best Practices

- Check for attached event listeners.
- Beware of live collection updates.
- Ensure the child is part of the parent.

Deep Dive

- `removeChild` on parent with child argument.
- Returns removed node for potential re-insertion.
- Instantaneous removal from the DOM.

When to use?

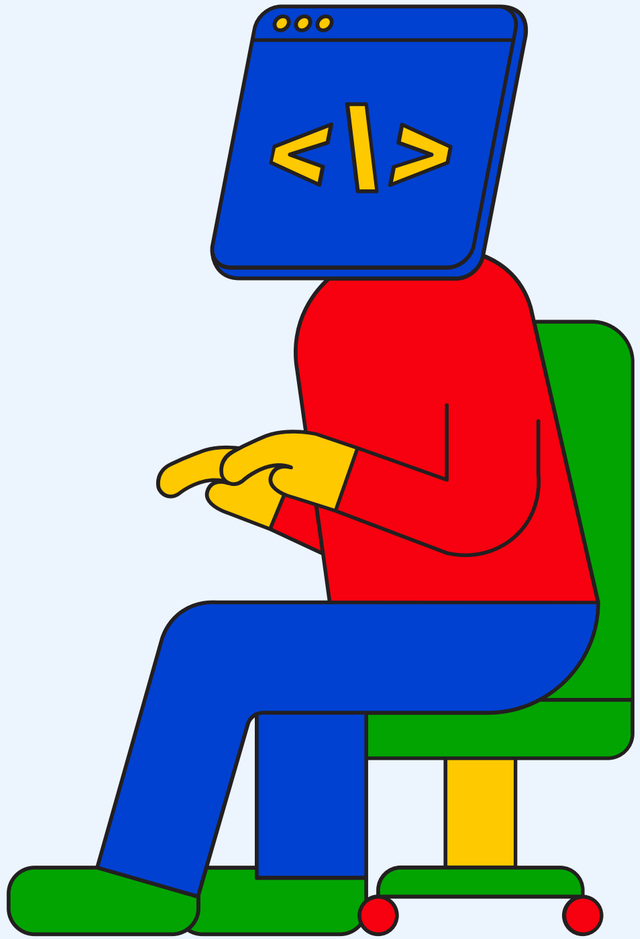
- Remove outdated content from web pages.
- Implement delete buttons for items.
- Optimize performance by cleaning up DOM.

Take Note

- Removed node exists in memory, can be reinserted.
- Removing non-direct child causes DOM exception.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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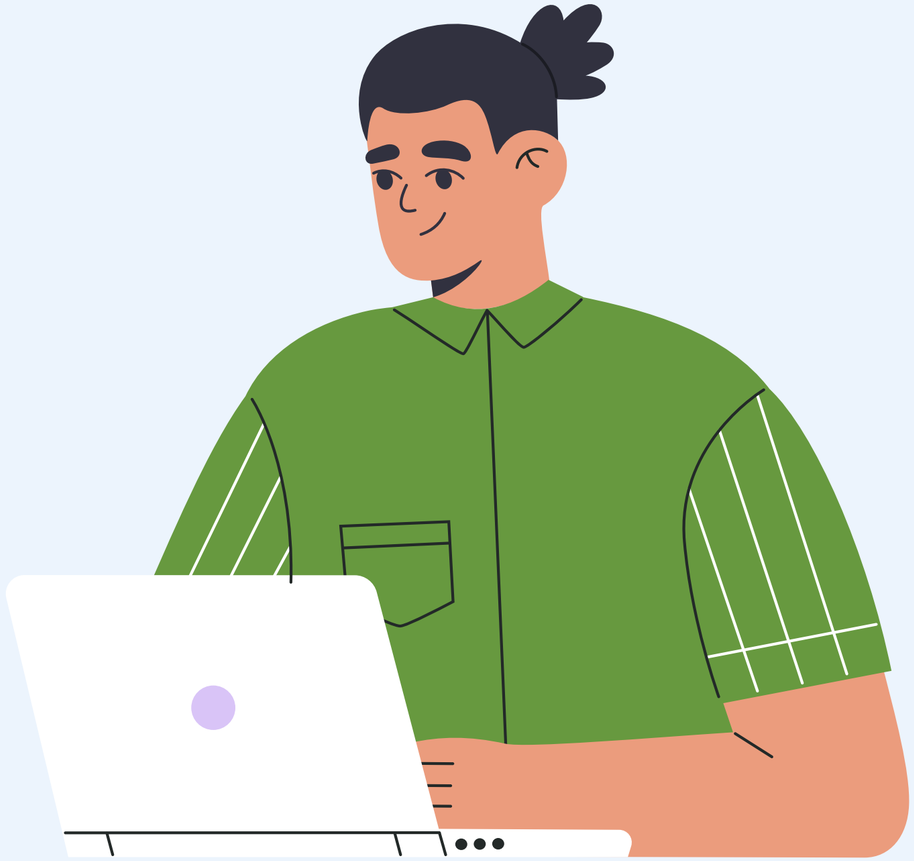
SCHOOL

DOM MANIPULATION

classList



JS

ADVANCED

USING CLASSLIST

MASYNCTECH SCHOOL

High-Level Explanation

- `classList` manipulates HTML element classes.
- Add, remove, toggle, and check class existence.

Basic Explanation

- Wardrobe as an HTML element.
- Classes represent clothing types.
- `classList` for adding, removing, switching.

Best Practices

- Use descriptive class names.
- Check class existence before removal.
- Consider class sequence for CSS logic.

Deep Dive

- `classList` returns a live `DOMTokenList`.
- Offers methods like `add()`, `remove()`, `toggle()`, and `contains()`.
- Provides intuitive class list manipulation.

When to use?

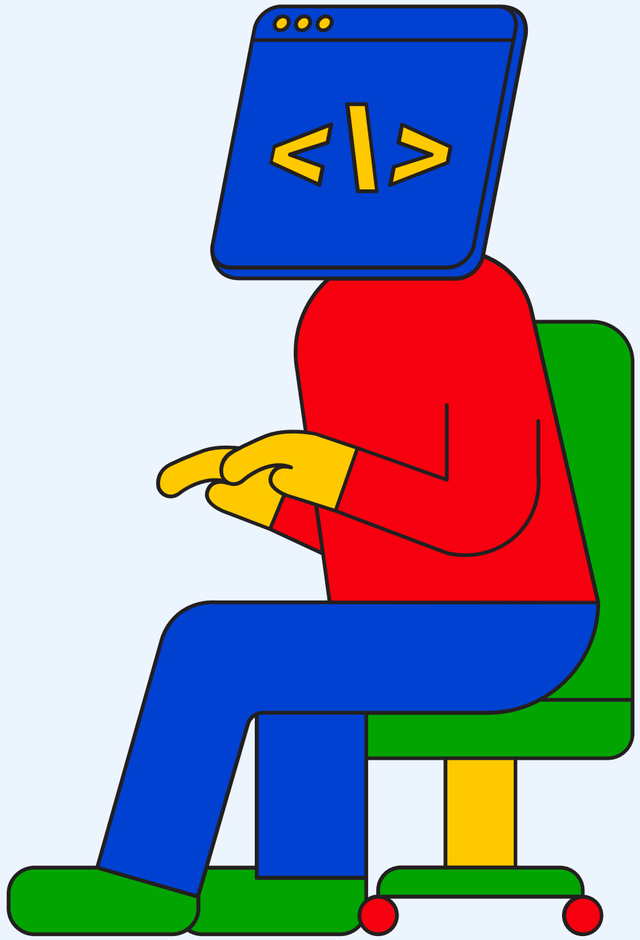
- Dynamic styling with user interactions.
- Toggles for UI elements like buttons.
- Filtering in lists or grids.

Take Note

- `classList` is a live collection.
- Automatically updates with class attribute changes.
- Chain methods for compact code.

MASYNCTECH
SCHOOL

CODE DEMO



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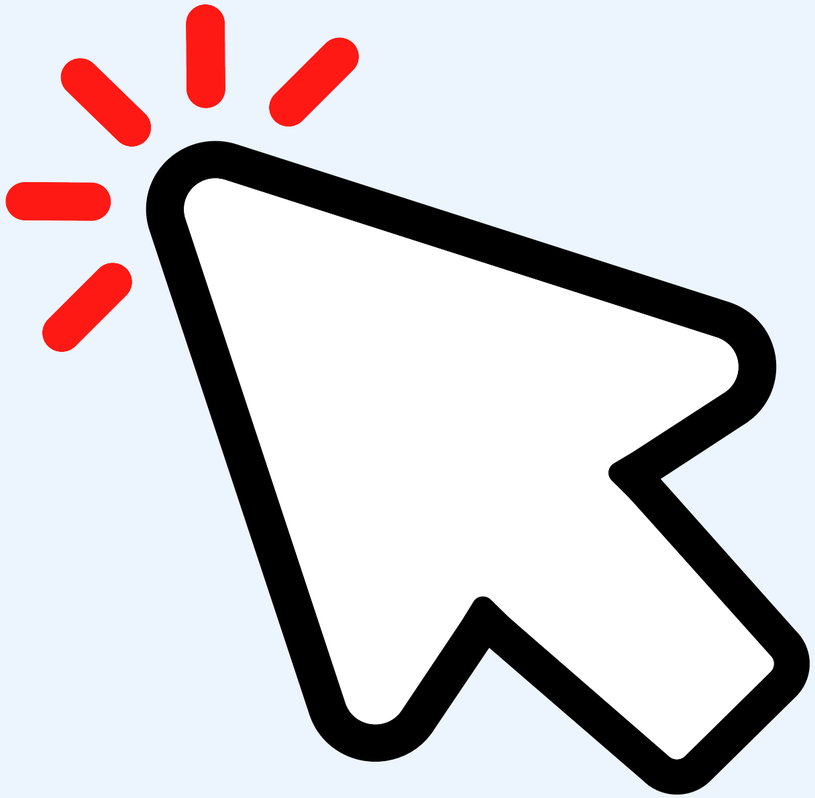
SCHOOL

DOM EVENT HANDLING



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SCHOOL

DOM EVENT HANDLING

WHAT ARE EVENTS

JS

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WHAT ARE DOM EVENTS?

MASYNCTECH SCHOOL

High-Level Explanation

- DOM events: Browser interactions or occurrences
- User/system-triggered
- Examples: button click, window resize, form submit

Basic Explanation

- Analogy: DOM events as buttons in a game
- Click, scroll, etc., like pressing buttons
- Instruct website/app to perform actions

Best Practices

- Event delegation: Single listener for multiple child elements.
- Event propagation awareness: Understand bubbling.
- Remove unused event listeners to prevent memory leaks.

Deep Dive

- DOM events crucial for interactive web apps
- Generated on user/system interactions
- Simple (mouse-over) to complex (data fetch)
- Enable dynamic, interactive experiences

When to use?

- Use DOM events to:
  - Enhance interaction (e.g., toggle menus)
  - Validate data (e.g., form field on blur)
  - Load dynamic content (e.g., scroll-triggered fetch)

MASYNCTECH
SCHOOL

DOM EVENT HANDLING

COMMON EVENTS

TYPES

JS

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COMMON EVENT TYPES

MASYNCTECH SCHOOL

High-Level Explanation

- JavaScript DOM events: Numerous types
- Mouse events, e.g., `click`
- Form events, e.g., `submit`
- Linked to specific interactions or triggers

Mouse Events

- `click`: Triggered on mouse click.
- `dblclick`: Triggered on double-click.
- `mouseover`: Fires on mouse enter.
- `mouseout`: Fires on mouse exit.

Keyboard Events

- `keydown`: Triggered on key press down.
- `keyup`: Triggered on key release.
- `keypress`: Triggered on key press and release.

Windows Events

- `resize`: Triggered on browser window resize.
- `scroll`: Triggered on viewport scrolling.

Forms Events

- `submit`: Triggered on form submission.
- `focus`: Triggered on element focus.
- `blur`: Triggered on element loss of focus.

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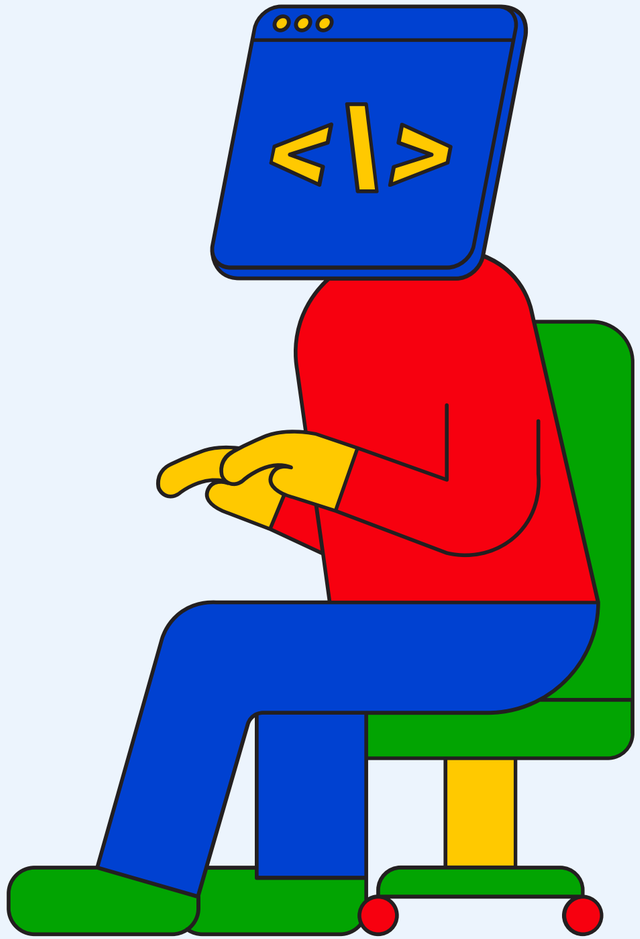
SCHOOL

CODE DEMO



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SCHOOL

DOM EVENT HANDLING

INLINE VS TRADITIONAL EVENTS HANDLERS

JS

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INLINE EVENT VS TRADITIONAL EVENT HANDLERS

MASYNCTECH SCHOOL

High-Level Explanation

- Inline event handlers: JavaScript code in HTML
- Traditional event handlers: Separate JS file or script block

Deep Dive

- Inline Event Handlers:
  - JavaScript in HTML tags (`onclick`, `onsubmit`)
  - Tight coupling of HTML and JS

- Traditional Event Handlers:
  - Separates JavaScript from HTML
  - `element.addEventListener` promotes separation of concerns

Basic Explanation

- Analogy: Inline vs. Traditional event handlers
- Inline: Like a direct speed dial, quick but less flexible
- Traditional: Like a separate app, more setup but easier changes

When to use?

- Inline Event Handlers:
  - Quick prototyping, limited control over JS
  - HTML generated by inflexible systems

- Traditional Event Handlers:
  - Larger, complex apps
  - Multiple functions for one event
  - Advanced features like event delegation

INLINE EVENT VS TRADITIONAL EVENT HANDLERS

MASYNCTECH SCHOOL

When to use?

- Inline Event Handlers:
  - Quick prototyping, limited control over JS
  - HTML generated by inflexible systems

- Traditional Event Handlers:
  - Larger, complex apps
  - Multiple functions for one event
  - Advanced features like event delegation

Best Practices

- Inline Event Handlers:
  - Avoid for maintainability
  - Keep them simple; use separate functions

- Traditional Event Handlers:
  - Prefer for flexibility and maintainability
  - Utilize event delegation for multiple similar elements

Take Note

- Inline event handlers: No event delegation support.
- Traditional event handlers: Easier event object manipulation.
- Traditional handlers: Simplify event unbinding, preventing memory leaks.

MASYNCTECH
SCHOOL

DOM EVENT HANDLING

addEventListener()

METHOD

JS

ADVANCED

`ADDEVENTLISTENER` METHOD

MASYNCTECH SCHOOL

High-Level Explanation

- `addEventListener`: JS function for event handling
- Attach event handlers to DOM elements
- Listen for event types, execute functions

Basic Explanation

- Analogy: `addEventListener` as programming a remote button
- Remote control (DOM element)
- Program button (event) to change channel (execute function)

Best Practices

- Prefer anonymous or named functions over inline code.
- Check for browser compatibility despite wide support.
- Remove unused event listeners with `removeEventListener` to save resources.

Deep Dive

- `addEventListener` is flexible and powerful.
- Separates HTML and JS, multiple event handlers.
- Three main arguments: event type, function, options or capture.

When to use?

- Attaching multiple handlers to the same element.
- Separating HTML and JavaScript for clarity.
- Utilizing advanced event features (capturing, propagation control).

Take Note

- `addEventListener` doesn't overwrite existing handlers.
- `this` in handler refers to the attached DOM element.
- Named function needed for removal; anonymous can't be removed.

MASYNCTECH
SCHOOL

DOM EVENT HANDLING

removeEventListener()

METHOD

JS

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REMOVING EVENT LISTENERS WITH `REMOVEEVENTLISTENER`

MASYNCTECH SCHOOL

High-Level Explanation

- `removeEventListener`: Detach event listener
- Undo `addEventListener`, prevent event triggering

Basic Explanation

- Analogy: `removeEventListener` as unprogramming a remote button.
- Previously changed channel; now, pressing does nothing.

Best Practices

- Prefer named functions for easy removal.
- Caution with `removeEventListener` in conditions.
- Parameters must match `addEventListener`, including options and useCapture flags.

Deep Dive

- `addEventListener` is flexible and powerful.
- Separates HTML and JS, multiple event handlers.
- Three main arguments: event type, function, options or capture.

When to use?

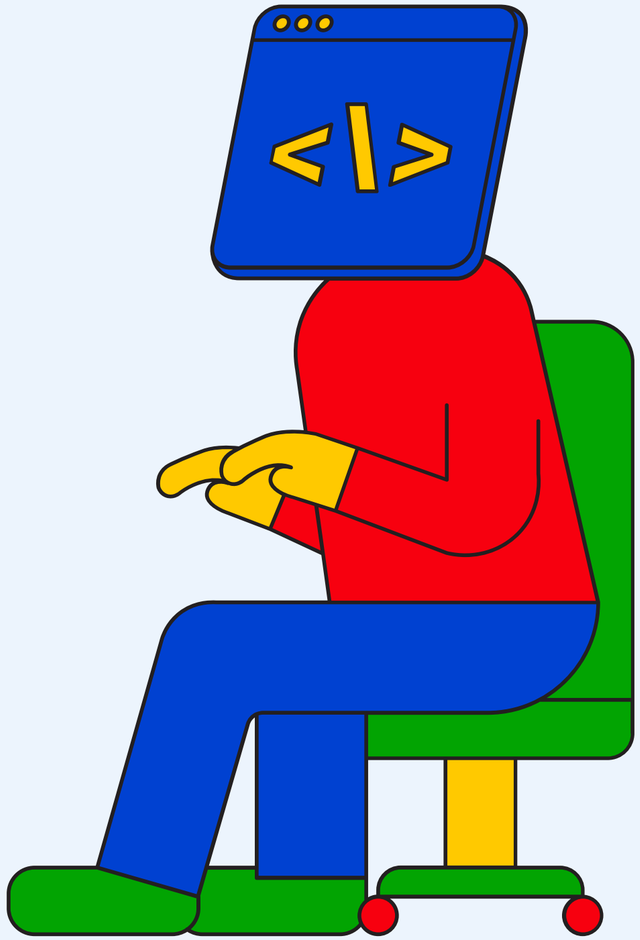
- To prevent an event from executing its function.
- For dynamically adding/removing elements and events.
- To temporarily disable specific functionality.

Take Note

- `removeEventListener` requires the same function as `addEventListener`.
- Binding with `.bind()` requires reference to the bound function for removal.

MASYNCTECH
SCHOOL

CODE DEMO



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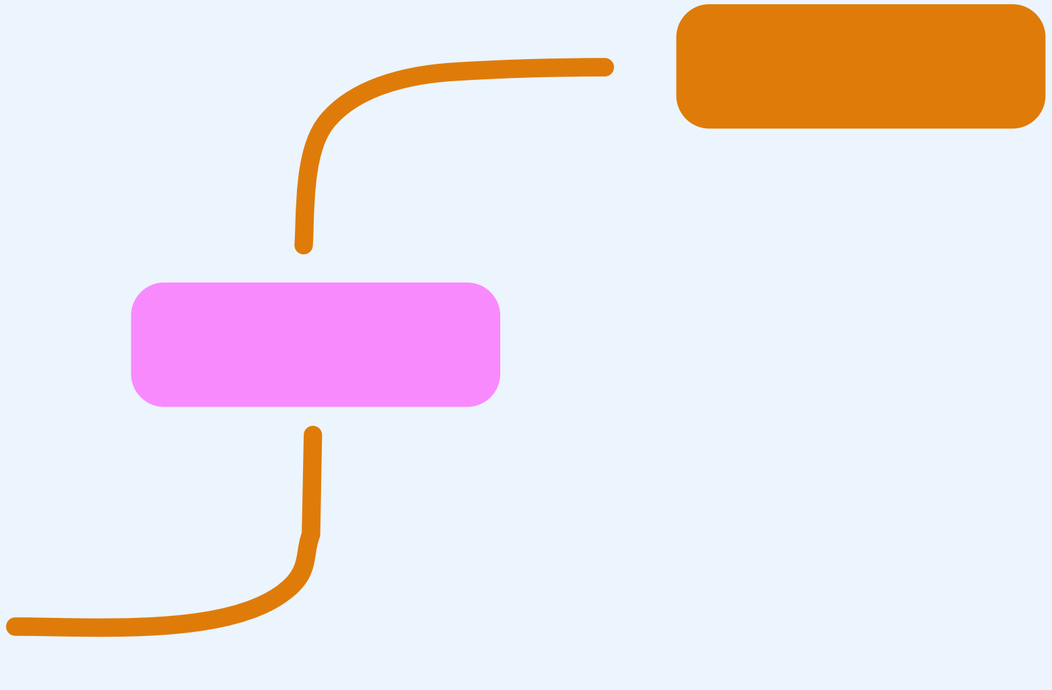
MASYNCTECH
SCHOOL

DOM EVENT HANDLING

UNDERSTANDING THE EVENT FLOW



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UNDERSTANDING THE EVENT FLOW

MASYNCTECH SCHOOL

High-Level Explanation

- Event flow: Capturing, target, and bubbling phases
- Describes event propagation through DOM

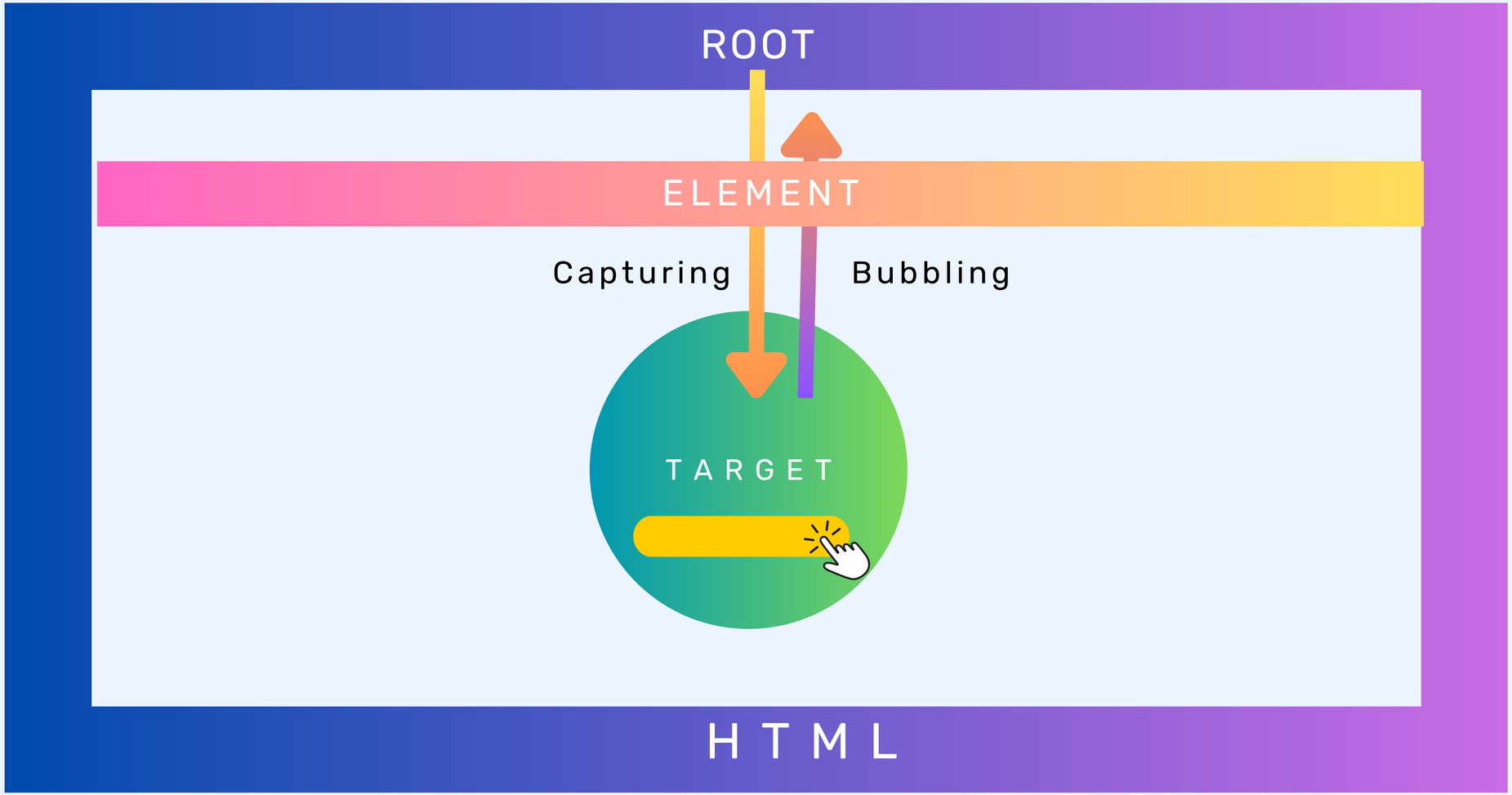
Basic Explanation

- Analogy: Event flow as a family gathering rumor
- Capturing: Oldest to target
- Target: Confirmation/denial
- Bubbling: Target to oldest family members

Deep Dive

- Event flow affects ancestors and children.
- Event flow phases:
  - Capturing: Root to target
  - Target: At target
  - Bubbling: Target to root

EVENT FLOW



UNDERSTANDING THE EVENT FLOW

MASYNCTECH SCHOOL

High-Level Explanation

- Event flow: Capturing, target, and bubbling phases
- Describes event propagation through DOM

Basic Explanation

- Analogy: Event flow as a family gathering rumor
- Capturing: Oldest to target
- Target: Confirmation/denial
- Bubbling: Target to oldest family members

Best Practices

- Caution with stopping propagation; unintended effects possible.
- Event delegation improves performance but needs careful implementation.
- `addEventListener` can specify phase with `capture` parameter.

Deep Dive

- Event flow affects ancestors and children.
- Event flow phases:
  - Capturing: Root to target
  - Target: At target
  - Bubbling: Target to root

When to use?

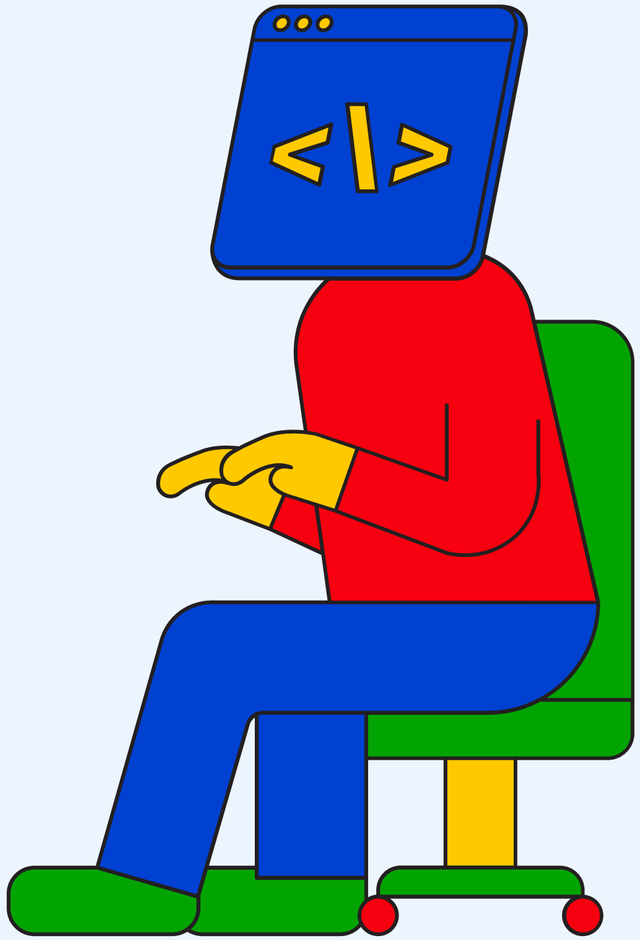
- Event flow understanding important for nested elements.
- Control event propagation, vital in event delegation.
- Parent element listens for child-triggered events.

Take Note

- Events must have `bubbles: true` to bubble.
- Not all events have capturing phases; some start at target.
- `capture` parameter is optional, default is `false` (bubbling phase).

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

DOM EVENT HANDLING

event.stopPropagation()

METHOD

JS

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USING `EVENT.STOPPROPAGATION()`

MASYNCTECH SCHOOL

High-Level Explanation

- `event.stopPropagation()`: Prevent event propagation
- Stops capturing or bubbling phases in event flow

Basic Explanation

- Analogy: `event.stopPropagation()` as "Telephone" game.
- Message stops with current element.
- Event doesn't continue to parent/child elements.

Best Practices

- Use `event.stopPropagation()` judiciously; it can cause unexpected issues.
- Comment code to clarify why propagation is stopped for other developers.

Deep Dive

- Event flow: Capture, target, bubble phases.
- `event.stopPropagation()`: Stops flow in current phase.
- Parent/child elements not notified when stopped.

When to use?

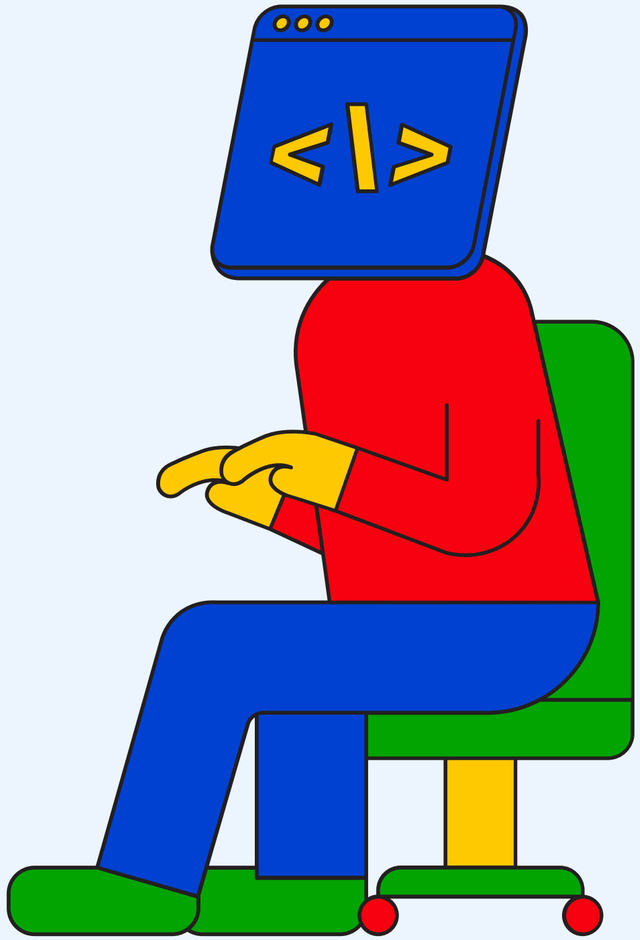
- Use `event.stopPropagation()` to prevent parent reactions to child events.
- Valuable in complex UIs with diverse element roles.

Take Note

- Stops propagation but not other handlers on the same element.
- Only halts event movement, doesn't affect element behavior.

MASYNCTECH
SCHOOL

CODE DEMO



JS

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MASYNCTECH
SCHOOL

DOM EVENT HANDLING

EVENT DELEGATION

JS

ADVANCED

EVENT DELEGATION

MASYNCTECH SCHOOL

High-Level Explanation

- Event delegation: Delegate handling to a parent element for multiple children.

Deep Dive

- Event delegation: Attach one listener to a common parent.
- Parent listens for event and identifies which child was clicked.
- Memory-efficient and simplifies code maintenance.

Basic Explanation

- Analogy: Event delegation as a house party with a trash bin.
- One trash bin for all cups (common parent for multiple elements).
- Minimizes effort for handling common event.

When to use?

- Many child elements needing similar event handling.
- Dynamic addition/removal of child elements, avoiding listener management.

Best Practices

- Identify child element with `event.target`.
- Prefer events that bubble for delegation to work.
- Careful with stopping event propagation; can affect delegation.

Take Note

- Use `event.target` to identify event source.
- Not suitable for non-bubbling events.

MASYNCTECH
SCHOOL

DOM EVENT HANDLING

MULTIPLE EVENTS HANDLERS

JS

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USING MULTIPLE EVENT LISTENERS ON AN ELEMENT

MASYNCTECH SCHOOL

High-Level Explanation

- Multiple event listeners for diverse interactions.
- Handles various types or aspects of one interaction.

Basic Explanation

- Smartphone screen: Tap, swipe, pinch = multiple listeners.
- Different interactions on the same element (screen).

Best Practices

- `addEventListener` for modularity.
- Careful with `event.stopPropagation()`.
- Remove unused listeners to free resources.

Deep Dive

- Multiple listeners for complex interactions.
- Separate handlers for clicks, movements, keyboard.
- Different stages of an interaction (e.g., drag-and-drop).

When to use?

- Element responds to multiple interactions.
- Break down complex behavior into manageable parts.

Take Note

- Listeners execute in order if all are capturing/bubbling.
- Removing one won't affect others on the same element.

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DOM EVENT HANDLING

CUSTOM EVENTS

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CREATING AND TRIGGERING CUSTOM EVENTS

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High-Level Explanation

- Create custom events for specific situations.
- Useful when standard DOM events don't fit.
- Dispatch events with `new Event()` and `element.dispatchEvent()`.

Basic Explanation

- Analogy: Custom events as secret handshakes in code
- Unique communication between code parts
- Beyond standard events

Best Practices

- Descriptive event names for clarity.
- Minimal data in `detail` attribute.
- Namespace custom events for library/framework to prevent conflicts.

Deep Dive

- Use the `detail` property to carry additional data.
- Promote modularity and maintainability in applications.
- Facilitate communication between components without tight coupling.

When to use?

- Use custom events when standard DOM events fall short.
- Ideal for reusable components sharing state or info.

Take Note

- Custom events need `bubbles` set to `true` to propagate.
- Use `cancelable` property to specify if event is cancelable.

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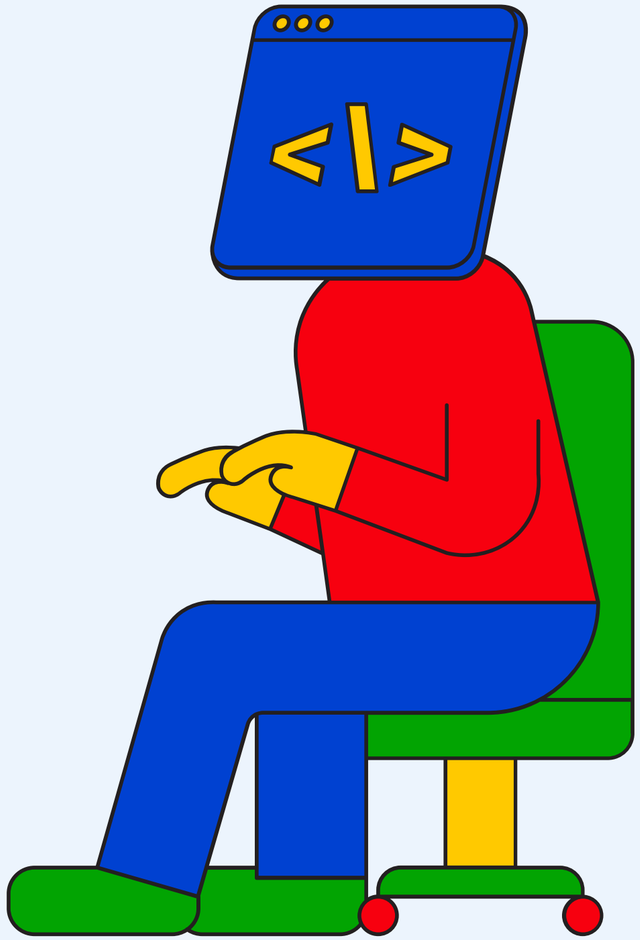
CODE DEMO



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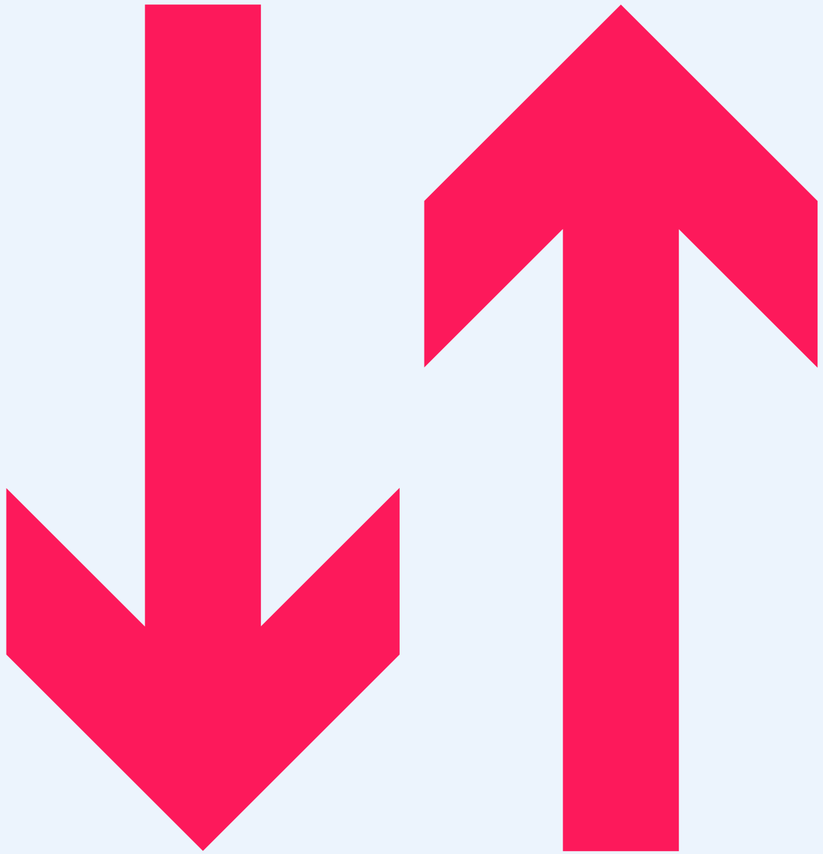
ASYNCHRONOUS PROGRAMMING



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ASYNCHRONOUS PROGRAMMING

WHAT'S IT?

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WHAT IS ASYNCHRONOUS PROGRAMMING?

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High-Level Explanation

- Asynchronous programming: Non-blocking operations
- Tasks run independently of main program flow
- Ideal for I/O-bound, network, and long-running tasks

Basic Explanation

- Analogy: Synchronous programming like fast-food queue
- Orders block others, wait to complete
- Asynchronous programming: Order, step aside
- Continue tasks while waiting for others

Best Practices

- Prefer Promises or async/await for clarity
- Properly handle errors with `catch` or `.catch()`
- Prevent "callback hell" with modularization
- Utilize async libraries/frameworks when available

Deep Dive

- Synchronous programming: Sequential execution
- Each operation waits for the previous one
- Limiting for unpredictable tasks
- Asynchronous decouples initiation from execution
- Allows parallel execution while waiting

When to use?

- Tasks are time-consuming, no need for sequential completion.
- Building scalable network apps.
- Enhancing UI responsiveness.

Summary

- Asynchronous programming: Independent task execution
- Boosts efficiency, responsiveness
- Ideal for I/O-bound, long tasks
- Best practices like Promises and error handling enhance maintainability.

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ASYNCHRONOUS PROGRAMMING

IT'S IMPORTANCE

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WHY ASYNCHRONOUS PROGRAMMING IS IMPORTANT

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High-Level Explanation

- Asynchronous programming is crucial in JavaScript.
- Vital for web browsers and Node.js.
- Non-blocking, event-driven architecture enhances performance, usability.

Basic Explanation

- Analogy: Synchronous app freezes while streaming.
- Annoying, can't do anything else.
- Asynchronous: Stream and browse simultaneously.
- Enhances user experience and multitasking.

Best Practices

- Prefer async/await for readability.
- Stick to one approach (callbacks, Promises, async/await).
- Leverage libraries like Axios, fs.promises.
- Implement robust error handling for catch/rejections.

Deep Dive

- JavaScript is single-threaded.
- Synchronous tasks freeze system with time-consuming ops.
- Asynchronous programming prevents freezing.
- Ensures responsive interfaces, resource management.

When to use?

- JavaScript async crucial for:
  - Web dev: Interactions, APIs, DOM without freezing.
  - Node.js backend: Efficient I/O tasks.
  - Real-time apps: Chat, gaming, collaborative tools.

Summary

- JavaScript relies on asynchronous programming for responsive, non-blocking UI and efficient resource use.
- Critical for I/O-bound and concurrent tasks in frontend and backend.
- Best practices ensure code maintainability, user experience.

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ASYNCHRONOUS PROGRAMMING

SYNCHRONOUS VS ASYNCHRONOUS EXECUTION

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SYNCHRONOUS VS. ASYNCHRONOUS EXECUTION

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High-Level Explanation

- Synchronous execution: Tasks sequentially, one by one.
- Wait for each to finish before starting next.
- Asynchronous execution: Tasks run in parallel.
- No need to wait for one to finish before starting another.

Deep Dive

- **Synchronous Execution:**
  - Linear, predictable flow.
  - Blocks until current operation finishes.
  - Simple, easy to follow and debug.
  - Can cause performance issues with time-consuming tasks.

- **Asynchronous Execution:**
  - Non-linear, tasks start/complete differently.
  - Doesn't block; allows concurrent tasks.
  - More complex with callbacks, promises, async/await.
  - Ideal for time-consuming or external-dependent operations.

Basic Explanation

- **Synchronous:** Single-window fast-food, wait for food, next person orders. Large orders delay others.

- **Asynchronous:** Multi-window fast-food, order, move aside, next person orders. Collect when ready, no delays.

SYNCHRONOUS VS. ASYNCHRONOUS EXECUTION

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When to use?

- **Synchronous:** Ideal for ordered execution, simplicity. E.g., basic algorithms, calculations, string manipulations.

- **Asynchronous:** Ideal for I/O-bound, concurrent tasks, independent of others. E.g., web dev (API calls, DOM), backend (DB queries).

Best Practices

- **Synchronous**
  - Watch for performance bottlenecks.
  - Avoid long-running operations; they can freeze the app.

- **Asynchronous:**
  - Handle errors in async code.
  - Prevent "callback hell" with promises or async/await.
  - Be cautious of race conditions.

Summary

- JavaScript relies on asynchronous programming for responsive, non-blocking UI and efficient resource use.
- Critical for I/O-bound and concurrent tasks in frontend and backend.
- Best practices ensure code maintainability, user experience.

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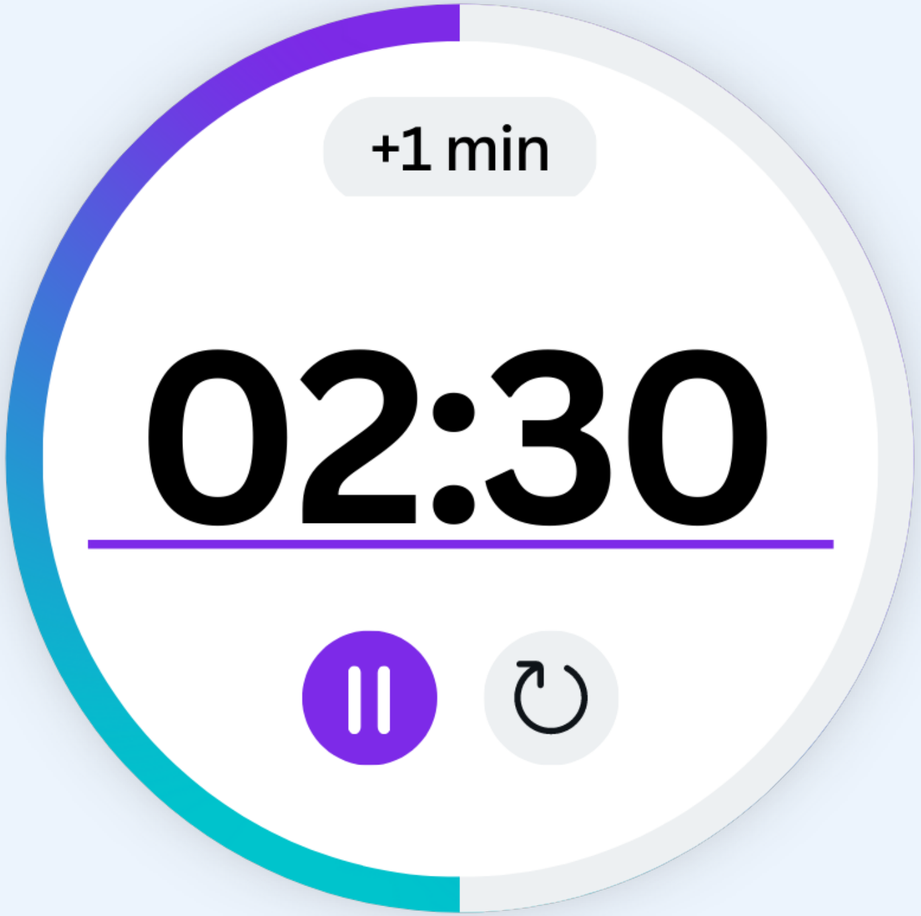
ASYNCHRONOUS PROGRAMMING

SETTIMEOUT

VS

SETINTERVAL



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SETTIMEOUT AND SETINTERVAL FUNCTIONS

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High-Level Explanation

- `setTimeout`: One-time task after delay
- `setInterval`: Recurring task at intervals

Basic Explanation

- setTimeout: Like a one-time alarm reminder
- Rings once and turns off after execution

- **setInterval:** Like a daily repeating alarm
- Rings every day until manually turned off

Best Practices

- Clear intervals/timeouts to prevent issues, memory leaks
- Beware of exact timing reliability due to JS single-threading
- For precision, explore Web Workers or other options

Deep Dive

-setTimeout:
- Schedules callback after specified delay (ms)
- Returns ID for cancellation with `clearTimeout`

- **setInterval:**
- Schedules callback at fixed intervals (ms)
- Returns ID for stopping repetitions with `clearInterval`

When to use?

- **setTimeout:** Ideal for one-time delayed tasks
- Notify after delay, delayed API calls, debouncing input

- **setInterva**l: Ideal for recurring tasks at intervals
- Update live clock, poll API, auto-save content regularly

Summary

- `setTimeout` and `setInterval`: Vital for timed operations
- `setTimeout`: For one-time delayed tasks
- `setInterval`: For recurring tasks at intervals
- Proper usage and management ensure efficiency.

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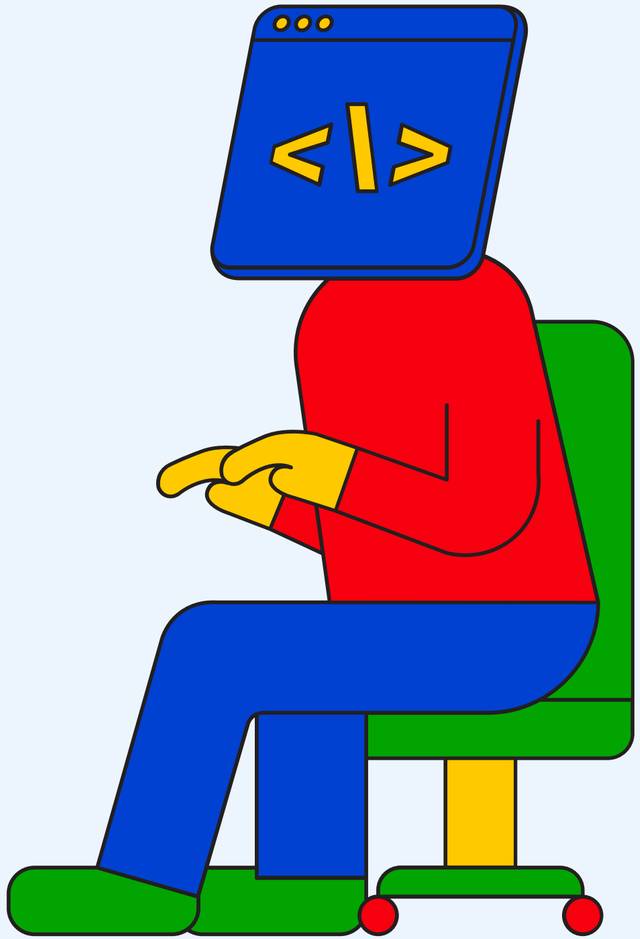
CODE DEMO



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ASYNCHRONOUS PROGRAMMING

BLOCKING
VS
NODE-BLOCKING
CODE

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BLOCKING VS NON-BLOCKING CODE

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High-Level Explanation

- Blocking code: Halts program until completion
- Non-blocking code: Allows program to continue without waiting

Basic Explanation

- **Blocking:** Like waiting in line at a slow coffee order
- **Non-blocking**: Like using multiple self-checkout kiosks, tasks proceed independently

Best Practices

- Avoid long-blocking operations in responsive contexts (UI).
- Use non-blocking code for I/O, especially in Node.js (event-driven).
- Handle errors in non-blocking ops (callbacks, promises, async/await).

Deep Dive

- Blocking Code: Operation completes before next one
- Non-blocking Code: Initiates task and moves on without waiting
- Common in JavaScript for I/O operations

When to use?

- **Blocking**: Suited for dependent, sequential operations
- Often in scripting tasks, order matters

- **Non-blocking:** Ideal for independent, parallel tasks
- Used in responsive apps, web servers, etc.

Summary

- Blocking and non-blocking code impact execution sequence.
- Blocking waits, non-blocking moves on.
- Proper use ensures efficiency and responsiveness.

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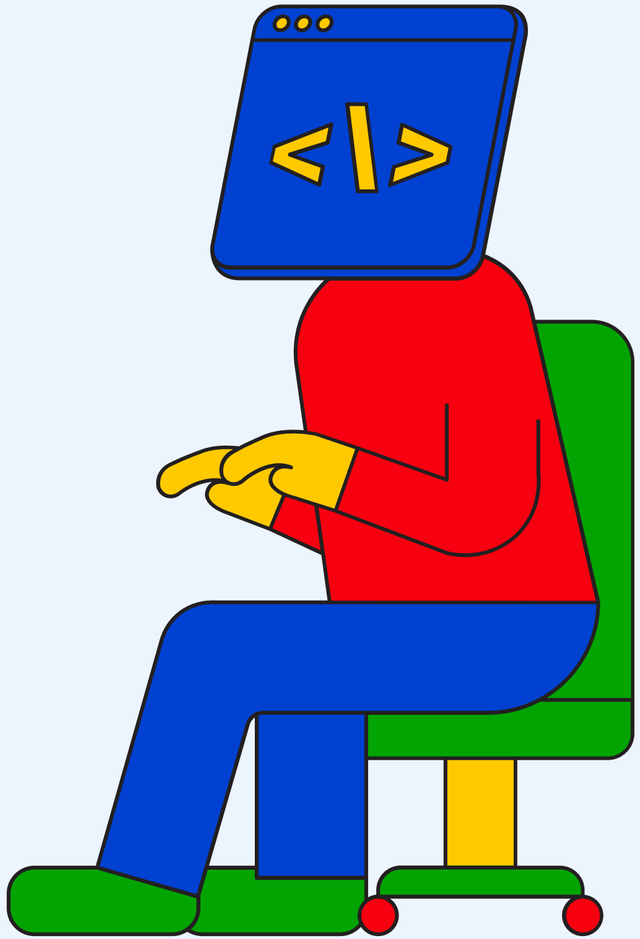
CODE DEMO



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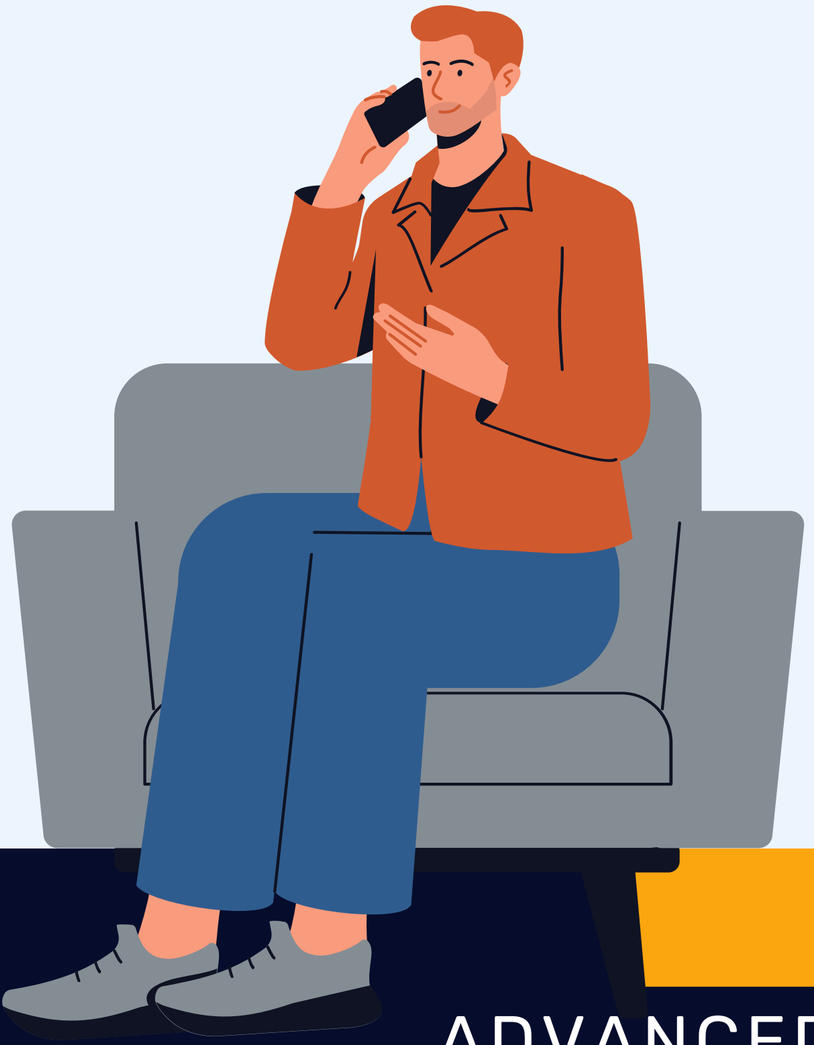
CALLBACKS & EVENT LOOP



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UNDERSTANDING CALLBACK FUNCTION

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UNDERSTANDING CALLBACK FUNCTIONS

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20 Minutes

UNDERSTANDING CALLBACK FUNCTIONS

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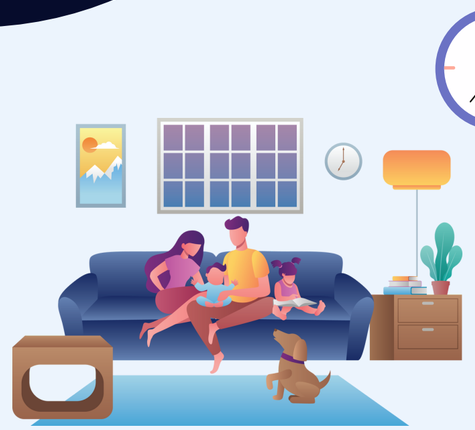

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Callback

20 Minutes

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Defining a Callback Function

Syntax

```
function callbackFunction(parameter) {
  // Code to be executed
}
```

- callbackFunction: Function passed as callback, contains code to execute.

- parameter: Parameters accepted by callback when invoked.

Passing a Callback Function to Another Function

```
function higherOrderFunction(callback) {
  // Code before calling callback

  callback();

  // Code after calling callback
}

higherOrderFunction(callbackFunction);
```

- higherOrderFunction: Function accepting a callback as parameter, controls async operations.

- callback(): Invokes callback function within higher-order function.

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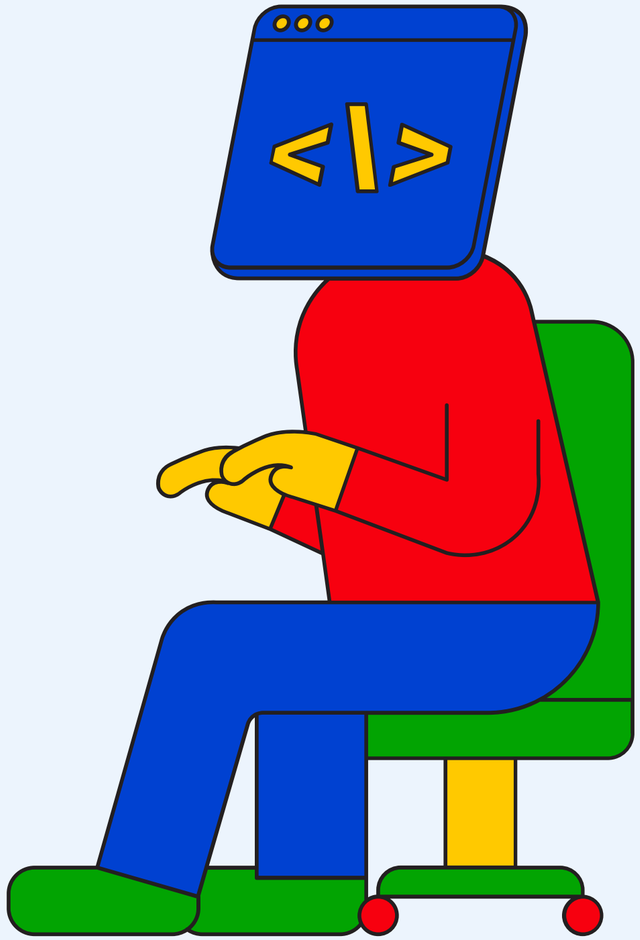
CODE DEMO



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CALLBACK HELL

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CALLBACK HELL (CALLBACK PYRAMID) AND ITS ISSUES

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High-Level Explanation

- Callback Hell (Pyramid of Doom): Heavily nested callbacks.
- Common in async programming, subsequent ops wait for previous.
- Issues: Poor readability, maintenance, error-prone.

Basic Explanation

- Analogy: Callback Hell like stacking boxes.
- Tasks depend on previous, instructions nested.
- Hard to understand, change; changes affect all.

Best Practices

- Modularization: Break down callbacks into modular functions.
- Error Handling: Implement error handling.
- Promises/Async-Await: Transition for cleaner code.
- Comments: Document flow and purpose.
- Limit Nesting: Keep nesting levels minimal for readability.

Deep Dive

- Callback Hell: Nested, sequential async ops.
- Common in dependent async ops (file reads, API calls, DB queries).
- Issues: Poor readability, understanding, modification, debugging, maintenance, error-prone.

When to use?

- Avoiding Callback Hell is ideal, but sometimes complex async ops.
- Use solutions like Promises, Async/Await, Generators for better control.

Summary

- Callback Hell: Nested callbacks, hard-to-read code
- Common in multiple dependent async operations
- Mitigate with modularization, error handling, Promises/Async-Await, comments, nesting limits

CALLBACK HELL (CALLBACK PYRAMID) AND ITS ISSUES

Syntax

```
performOperation1(data, function(result1) {
  |
  |--- performOperation2(result1, function(result2) {
  |       |
  |       |--- performOperation3(result2, function(result3) {
  |       |       |
  |       |       |--- // More Nested Callbacks...
  |       |       |
  |       |       });
  |       |
  |       });
  |
  });
```

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Syntax

```
fetchUserData(userId, function(userData) {
  |
  |--- fetchUserPosts(userData.id, function(userPosts) {
  |       |
  |       |--- userPosts.forEach(function(post) {
  |       |       |
  |       |       |--- fetchPostComments(post.id, function(comments) {
  |       |       |       |
  |       |       |       |--- // Maybe more nested callbacks for each comment.
  |       |       |       |
  |       |       |       });
  |       |       |
  |       |       });
  |       |
  |       });
  |
  });
```

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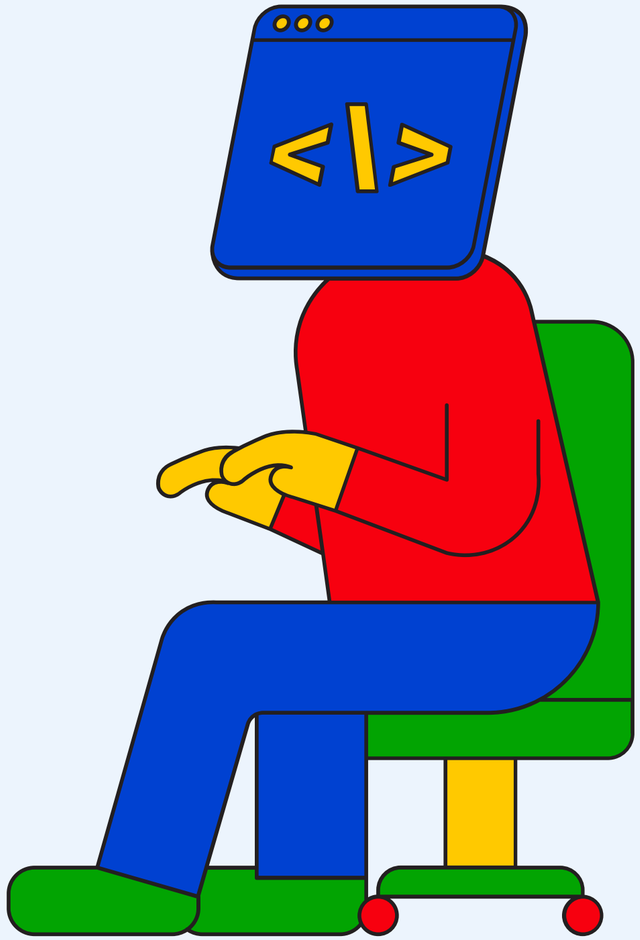
CODE DEMO



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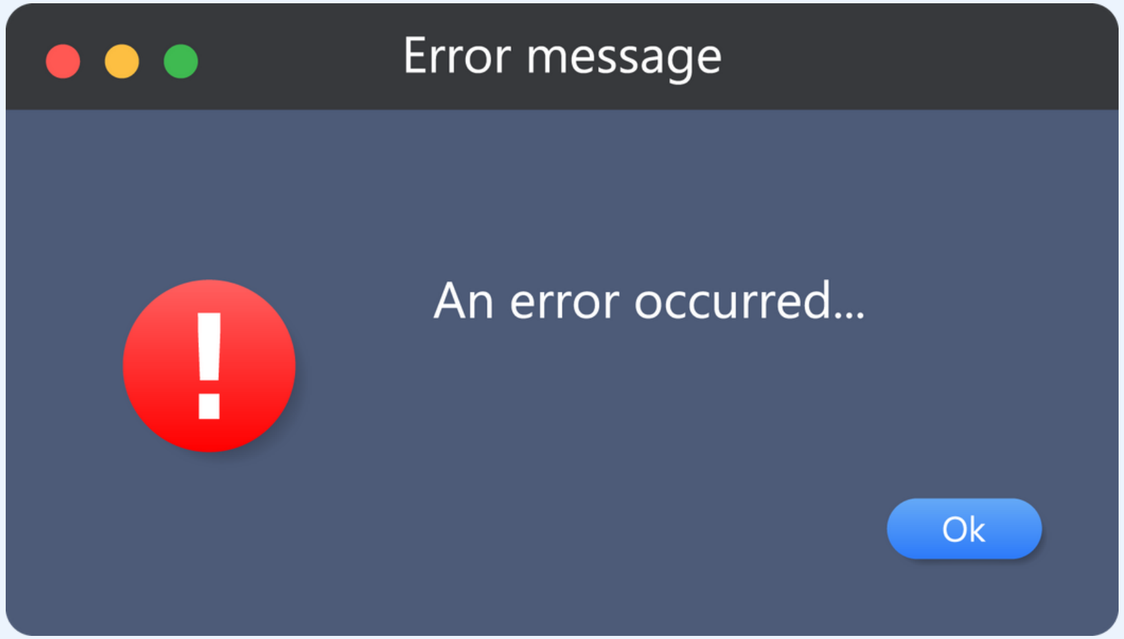
ASYNCHRONOUS PROGRAMMING

HANDLING ERRORS IN CALLBACK



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HANDLING ERRORS IN CALLBACKS

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High-Level Explanation

- Robust async JS requires error handling in callbacks.
- Error-first callback style: 1st arg for error, 2nd for result.

Basic Explanation

- Analogy: Error-first callbacks like asking a friend for a task
- Friend calls back, first mentions any problem (error)
- If all good, then shares the task result
- Error known before result

Best Practices

- Check for errors before processing results.
- Propagate errors for proper handling.
- Graceful error handling: Fallbacks, informative messages.
- Minimize excessive callback nesting for simplicity.

Deep Dive

- Effective error management in async callbacks is crucial.
- Error-first callback: Error passed as 1st argument.
- Enables graceful error handling; `null` if no error, result as 2nd arg.

When to use?

- Error-first pattern valuable for async ops with likely errors.
- Applied in file reading, network requests, database queries.
- Ensures error handling, robust, reliable code.

Summary

- Error handling in async JavaScript is crucial.
- Error-first callback: 1st arg error, 2nd result.
- Ensures error awareness, code robustness, and maintainability.
- Best practices: error checks, propagation, minimal nesting.

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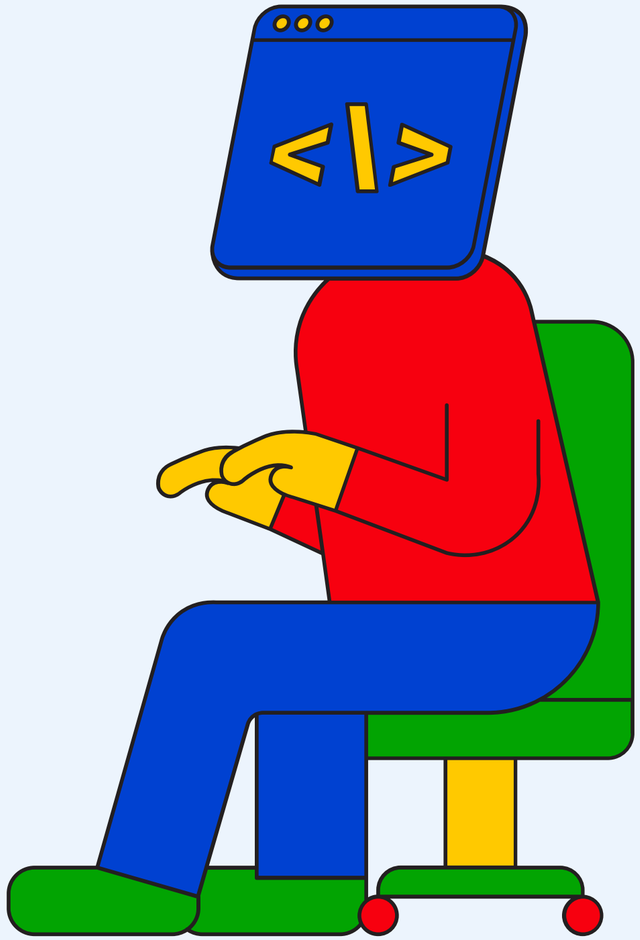
CODE DEMO



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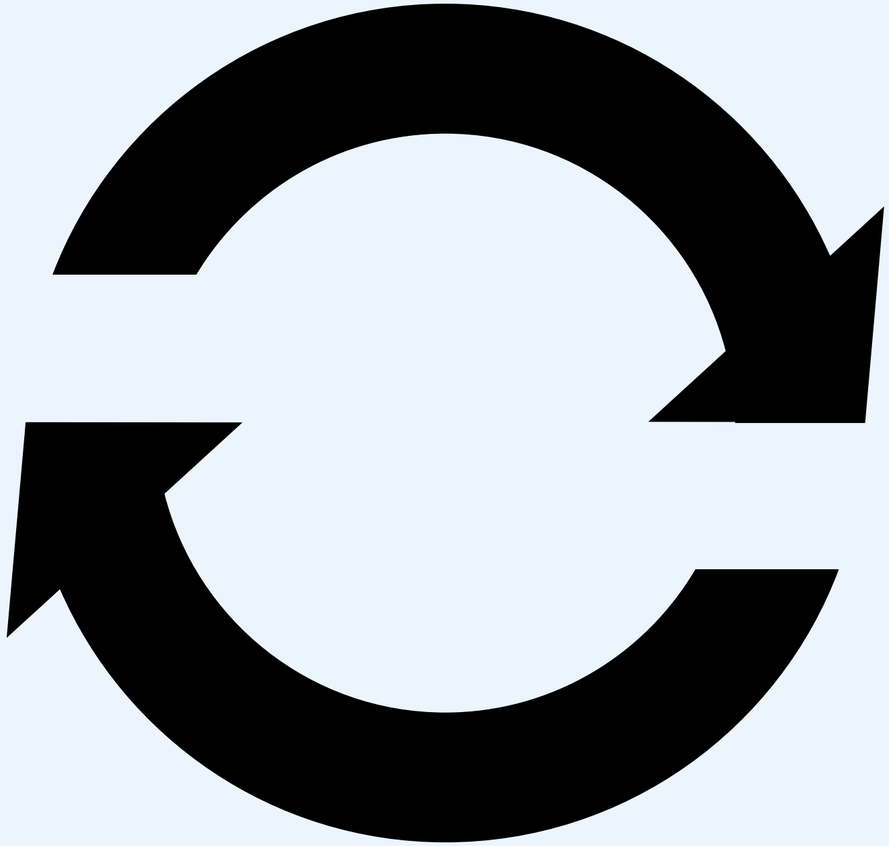
EVENT LOOP



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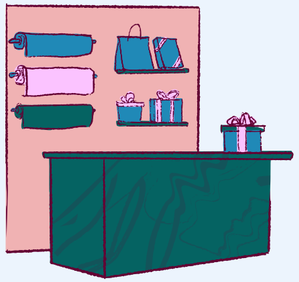
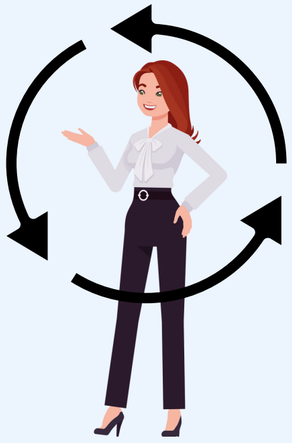
THE JAVASCRIPT EVENT LOOP

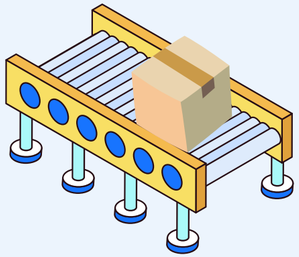
checkout counter(Call Stack)



wrapping station (Web API)



A manager (Event Loop)



conveyor belt (Callback Queue)

THE JAVASCRIPT EVENT LOOP

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High-Level Explanation

- JavaScript Event Loop: Core of async behavior
- Collaborates with Call Stack, Callback Queue, Web APIs
- Orchestrates task execution, keeps JS non-blocking, responsive

Basic Explanation

- Analogy: JavaScript runtime components as a store checkout
- **Call Stack**: Regular items checked out directly.
- **Web APIs:** Special items sent for gift-wrapping (async).
- **Callback Queue:** Wrapped items on conveyor belt (awaiting checkout).
- **Event Loop:** Manager schedules wrapped items once counter is free.

Deep Dive

- JavaScript runtime components:
  - **Call Stack**: Functions executed one at a time, single-threaded.
  - **Web APIs:** Offload async tasks like `setTimeout`.
  - **Callback Queue:** Stores async callback tasks.
  - **Event Loop:** Monitors Call Stack and Callback Queue.
    - Dequeues callbacks to Call Stack when it's empty.

Best Practices

- Avoid long-running tasks to prevent Call Stack blocking.
- For heavy computations, consider Web Workers.
- Handle errors in async code to prevent issues.
- Minimize callback hell; use Promises or async/await for cleaner code.

Summary

- JavaScript runtime uses Call Stack, Web APIs, Callback Queue, Event Loop.
- Manages both sync and async tasks.
- Non-blocking, concurrent handling for smooth user experience.
- Proper coding practices maximize system efficiency.

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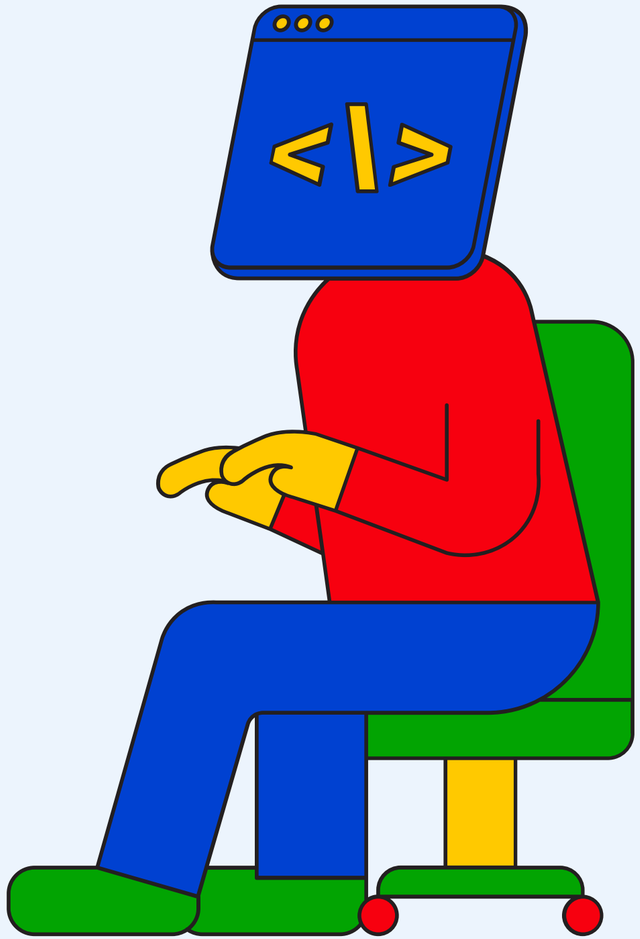
CODE DEMO



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