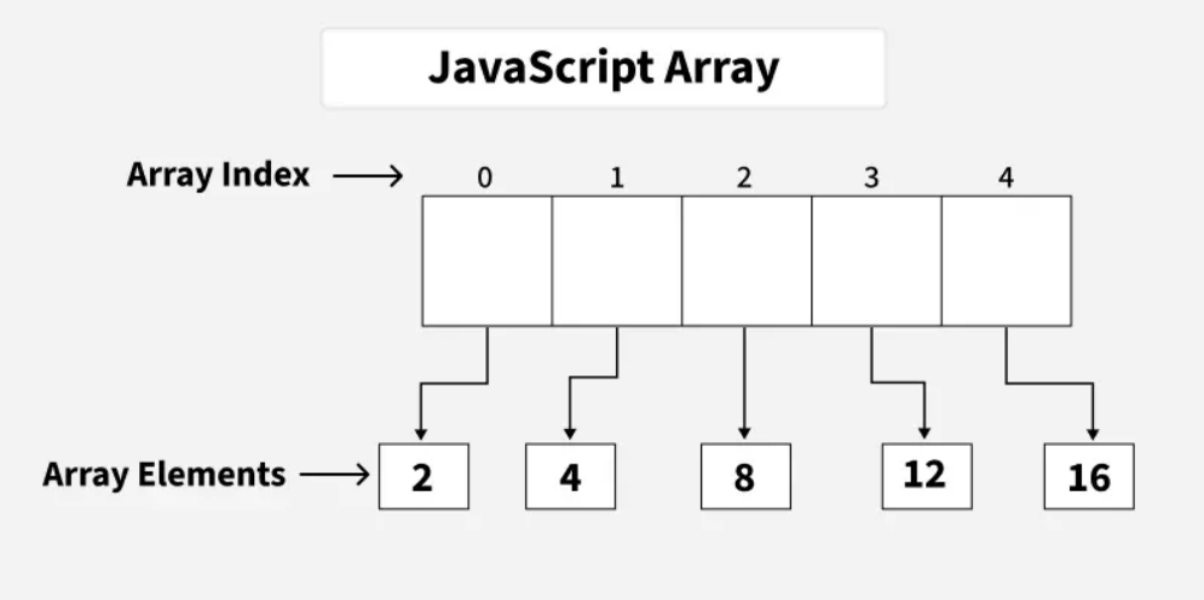
ARRAY

In JavaScript, an array is an ordered list of values. Each value, known as an element, is assigned a numeric position in the array called its index. The indexing starts at 0, so the first element is at position 0, the second at position 1, and so on.

Arrays can hold any type of data-such as numbers, strings, objects, or even other arrays—making them a flexible and essential part of JavaScript programming.



Example:

If you have a list of items (a list of car names, for example), storing the cars in single variables could look like this:

```
let car1 = "Saab"
let car2 = "Volvo"
let car3 ="BMW"
```

However, what if you want to loop through the cars and find a specific one? And what if you had not 3 cars, but 300?

The solution is an array!

An array can hold many values under a single name, and you can access the values by referring to an index number.

1. Create Array using Literal

Creating an array using array literal involves using square brackets [] to define and initialize the array.

```
// Creating an Empty Array

let a = [];

console.log(a);


// Creating an Array and Initializing with Values

let b = [10, 20, 30];

console.log(b);
```

Output

```
[]

[ 10, 20, 30 ]
```

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2. Create using new Keyword (Constructor)

The "**Array Constructor**" refers to a method of creating arrays by invoking the Array constructor function.

```
// Creating and Initializing an array with values

let a = new Array(10, 20, 30);

console.log(a);
```

Output

```
[ 10, 20, 30 ]
```

Note: *Both the above methods do exactly the same. Use the array literal method for efficiency, readability, and speed.*

Basic Operations on JavaScript Arrays

1. Accessing Elements of an Array

Any element in the array can be accessed using the index number. The index in the arrays starts with 0.

```
// Creating an Array and Initializing with Values

let a = ["HTML", "CSS", "JS"];
```

```
// Accessing Array Elements
console.log(a[0]);
console.log(a[1]);
```

Output

```
HTML
CSS
```

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2. Accessing the First Element of an Array

The array indexing starts from 0, so we can access first element of array using the index number.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];

// Accessing First Array Elements
let fst = a[0];

console.log("First Item: ", fst);
```

Output

```
First Item:  HTML
```

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3. Accessing the Last Element of an Array

We can access the last array element using [array.length - 1] index number.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];

// Accessing Last Array Elements
let lst = a[a.length - 1];
console.log("First Item: ", lst);
```

Output

```
First Item:  JS
```

4. Modifying the Array Elements

Elements in an array can be modified by assigning a new value to their corresponding index.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];
console.log(a);

a[1]= "Bootstrap";
console.log(a);
```

Output

```
[ 'HTML', 'CSS', 'JS' ]
[ 'HTML', 'Bootstrap', 'JS' ]
```

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5. Adding Elements to the Array

Elements can be added to the array using methods like push() and unshift().

- The push() method add the element to the end of the array.
- The unshift() method add the element to the starting of the array.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];

// Add Element to the end of Array
a.push("Node.js");

// Add Element to the beginning
a.unshift("Web Development");

console.log(a);
```

Output

```
[ 'Web Development', 'HTML', 'CSS', 'JS', 'Node.js' ]
```

6. Removing Elements from an Array

To remove the elements from an array we have different methods like pop(), shift(), or splice().

- The pop() method removes an element from the last index of the array.
- The shift() method removes the element from the first index of the array.
- The splice() method removes or replaces the element from the array.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];
console.log("Original Array: " + a);

// Removes and returns the last element
let lst = a.pop();
console.log("After Removing the last: " + a);

// Removes and returns the first element
let fst = a.shift();
console.log("After Removing the First: " + a);

// Removes 2 elements starting from index 1
a.splice(1, 2);
console.log("After Removing 2 elements starting from index 1: " + a);
```

Output

```
Original Array: HTML,CSS,JS
After Removing the last: HTML,CSS
After Removing the First: CSS
After Removing 2 elements starting from index 1: CSS
```

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7. Array Length

We can get the length of the array using the array length property.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];


let len = a.length;


console.log("Array Length: " + len);
```

Output

```
Array Length: 3
```

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8. Increase and Decrease the Array Length

We can increase and decrease the array length using the JavaScript length property.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"]


// Increase the array length to 7
a.length = 7;


console.log("After Increasing Length: ", a);


// Decrease the array length to 2
a.length = 2;
console.log("After Decreasing Length: ", a)
```

Output

```
After Increasing Length:  [ 'HTML', 'CSS', 'JS', <4 empty items> ]
After Decreasing Length:  [ 'HTML', 'CSS' ]
```

9. Iterating Through Array Elements

We can iterate array and access array elements using for loop and forEach loop.

Example: It is an example of for loop.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];


// Iterating through for loop
for (let i = 0; i < a.length; i++) {
   console.log(a[i])
}
```

Output

HTML

CSS

JS

Example: It is the example of Array.forEach() loop.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];


// Iterating through forEach loop
a.forEach(function myfunc(x) {
   console.log(x);
});
```

Output

HTML

CSS

JS

10. Array Concatenation

Combine two or more arrays using the concat() method. It returns new array containing joined arrays elements.

```
// Creating an Array and Initializing with Values

let a = ["HTML", "CSS", "JS", "React"];

let b = ["Node.js", "Expess.js"];


// Concatenate both arrays

let concateArray = a.concat(b);


console.log("Concatenated Array: ", concateArray);
```

Output

```
Concatenated Array:  [ 'HTML', 'CSS', 'JS', 'React', 'Node.js', 'Expess.js' ]
```

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11. Conversion of an Array to String

We have a builtin method **toString()** to converts an array to a string.

```
// Creating an Array and Initializing with Values

let a = ["HTML", "CSS", "JS"];


// Convert array ot String

console.log(a.toString());
```

Output

```
HTML,CSS,JS
```

12. Check the Type of an Arrays

The JavaScript typeof operator is used ot check the type of an array. It returns "object" for arrays.

```
// Creating an Array and Initializing with Values
let a = ["HTML", "CSS", "JS"];


// Check type of array
console.log(typeof a);
```

Output

```
object
```

Recognizing a JavaScript Array

There are two methods by which we can recognize a JavaScript array:

- **By using Array.isArray() method**
- **By using instanceof method**

Below is an example showing both approaches:

```
const courses = ["HTML", "CSS", "Javascript"];
console.log("Using Array.isArray() method: ", Array.isArray(courses))
console.log("Using instanceof method: ", courses instanceof Array)
```

Output

```
Using Array.isArray() method:  true
Using instanceof method:  true
```

Note: A common error is faced while writing the arrays:

```
const a = [5]
// and
const a = new Array(5)
```

The above two statements are not the same.

Output: This statement creates an array with an element " [5] ". Try with the following examples

```
// Example 1
const a1 = [5]
console.log(a1)
```

```
// Example 2
const a2 = new Array(5)
console.log(a2)
```

Output

```
[ 5 ]
[ <5 empty items> ]
```

- **Basic Problems**
    - Print Alternates
    - Linear Search
    - Largest Element
    - Second Largest
    - Remove Duplicates from Sorted
    - Generate all Subarrays
    - Reverse an Array
    - Rotate an Array
- **Easy Problems**
    - Largest Element in an Array in Javascript
    - Second Largest Element in Array
    - Check if array is sorted in Javascript
    - Reverse an Array in Javascript
    - Move all zeros to end in Javascript
    - Left Rotate by One in an Array in JavaScript
    - Leaders in an Array in JS
    - Frequencies in a Sorted array in JS
- **Medium Problems**
    - Sort an array of 1 to n
    - Reorder according to given indexes
    - Minimum Swaps to Sort
    - Sort an array of 0s, 1s and 2s
    - Merge with O(1) extra space
    - Majority Element
- **Hard Problems**
    - 4 Sum - Distinct Quadruples
    - 4 Sum - All Quadruples
    - 4 Sum - Closest Quadruple
    - Surpasser Count
    - Top K Frequent Elements in an Array
    - Kth Missing Positive Number in a Sorted Array