

Closures

Explanation : A closure is when a function "remembers" variables from its outer scope, even after that outer function has finished executing.

- Enables data privacy and function factories.



```
function createCounter() {  
  let count = 0;  
  return function() {  
    count++;  
    return count;  
  };  
}  
  
const counter = createCounter();  
console.log(counter());  => 1  
console.log(counter());  => 2
```

Promises & Async/Await

Explanation: Promises handle asynchronous operations.
Async/await makes promise code look synchronous.

- Essential for API calls and handling delayed operations.



```
=> Promise
fetch('https:...')
  .then(response => response.json())
  .then(data => console.log(data));

=> Async/Await
async function getData() {
  const response = await fetch('https:...');
  const data = await response.json();
  console.log(data);
}
```

The 'this' Keyword

Explanation: 'this' refers to the object executing the current function. Its value depends on HOW the function is called.



```
const user = {  
    name: 'Shailesh',  
    greet: function() {
```

```
        console.log('Hi, I am ' + this.name);  
    }  
};
```

```
user.greet(); => "Hi, I am Shailesh"
```

```
const greetFunc = user.greet;  
greetFunc(); => "Hi, I am undefined"
```

```
//..... Fix with bind().....
```

```
const boundGreet = user.greet.bind(user);  
boundGreet(); => "Hi, I am Shailesh"
```

Event Loop

Explanation: JavaScript is single-threaded but uses an event loop to handle async tasks without blocking.

- Why it matters: Understand how code execution order works.



```
console.log('First');

setTimeout(() => {
  console.log('Second');
}, 0);

console.log('Third');

=> Output: First, Third, Second
=> setTimeout goes to task queue,
  runs after main code.
```

Hoisting

Explanation: Variable and function declarations are moved to the top of their scope during compilation.

= Explains why some code works before declaration.



```
console.log(x);  => undefined (not an error)
var x = 5;

=> var x; (hoisted)
=> console.log(x);
=> x = 5;

greet();  => "Hello!" - Functions are hoisted

function greet() {
  console.log('Hello!');
}

=> BUT let/const are NOT initialized when hoisted
console.log(y);  => ReferenceError!
let y = 10;
```

Arrow Functions

Explanation: A shorter syntax for functions. They DON'T have their own 'this'.

- Great for callbacks, but behaves differently than regular functions



```
console.log(x);  => undefined (not an error)
var x = 5;

=> var x; (hoisted)
=> console.log(x);
=> x = 5;

greet();  => "Hello!" - Functions are hoisted

function greet() {
  console.log('Hello!');
}

=> BUT let/const are NOT initialized when hoisted
console.log(y);  => ReferenceError!
let y = 10;
```

Destructuring

Explanation: Extract values from arrays or objects into separate
Cleaner, more readable code.



..... Array Destructuring

```
const colors = ['red', 'green', 'blue'];
const [first, second] = colors;
console.log(first); => 'red'
```

..... Object Destructuring

```
const person = { name: 'John', age: 30, city: 'NYC' };
const { name, age } = person;
console.log(name); => 'John'
```

..... With function parameters

```
function printUser({ name, age }) {
  console.log(` ${name} is ${age} years old`);
}
printUser(person);
```

Spread & Rest Operators

Explanation: The ... operator. Spread expands arrays/objects.

Rest collects items into an array.

- Powerful tool for copying and combining data.



----- Spread - expands elements

```
const arr1 = [1, 2, 3];
const arr2 = [...arr1, 4, 5]; => [1, 2, 3, 4, 5]
```

```
const user = { name: 'Bob', age: 25 };
```

```
const updatedUser = { ...user, age: 26 };
```

=> Copy and update

----- Rest - collects into array

```
function sum(...numbers) {
  return numbers.reduce((total, num) => total + num, 0);
}
console.log(sum(1, 2, 3, 4)); => 10
```

map(), filter(), reduce()

Explanation: Array methods for transforming data without mutating the original array.

- Functional programming style, essential for modern JS.



```
const numbers = [1, 2, 3, 4, 5];  
  
----- map - transform each element  
const doubled = numbers.map(num => num * 2);  
=> [2, 4, 6, 8, 10]  
  
----- filter - keep elements that pass test  
const evens = numbers.filter(num => num % 2 === 0);  
=> [2, 4]  
  
----- reduce - reduce to single value  
const sum = numbers.reduce((total, num) => total + num, 0);  
=> 15
```

Call, Apply, and Bind

Explanation: Methods to control what 'this' refers to in a function.

- Crucial for context management in JavaScript.



```
const person = {
  name: 'Sarah',
  greet: function(greeting, punctuation) {
    console.log(` ${greeting}, I'm ${this.name}${punctuation}`);
  }
};

const anotherPerson = { name: 'Mike' };

---- call - invokes immediately with arguments
person.greet.call(anotherPerson, 'Hello', '!');
=> "Hello, I'm Mike!"

---- apply - same but arguments as array
person.greet.apply(anotherPerson, ['Hi', '?']);
=> "Hi, I'm Mike?"

---- bind - returns new function with bound 'this'
const mikeGreet = person.greet.bind(anotherPerson);
mikeGreet('Hey', '!!!!');
=> "Hey, I'm Mike!!!!"
```