10. Closures in JS

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❓ Questions and Answers

1. What is a Closure in JavaScript?

Q: What does "closure" mean in JavaScript?

A: A closure is a function that retains access to its lexical scope, even when the function is executed outside that scope. In simpler terms, it's a function bundled together with its surrounding state (the lexical environment).

Analogy: Imagine a backpack (the function) that you can carry around. Even if you leave the room (execute the function elsewhere), the backpack still contains the items (variables) you packed earlier.

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2. How Does Lexical Scope Relate to Closures?

Q: What is lexical scope, and how does it relate to closures?

A: Lexical scope refers to the location where a variable is declared in the source code. Closures are functions that "remember" the scope in which they were created, allowing them to access variables from that scope even after the function has finished executing.

Example:

```
function outer() {
  var outerVar = 'I am outer';
  function inner() {
    console.log(outerVar);
  }
  return inner;
}
const closureFunction = outer();
closureFunction(); // Logs: 'I am outer'
```

Explanation: Even though `outer()` has finished executing, `closureFunction` retains access to `outerVar` because it forms a closure over the `outer` function's lexical environment.

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3. How Do You Create a Closure?

Q: How can you create a closure in JavaScript?

A: A closure is created when a function is defined inside another function and the inner function references variables from the outer function. When the outer function returns the inner function, the inner function retains access to the outer function's variables.

Example:

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

Explanation: The returned function forms a closure that retains access to the `count` variable, allowing it to maintain state between calls.

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4. What Are the Advantages of Using Closures?

Q: What benefits do closures offer in JavaScript?

A: Closures provide several advantages:

- **Data Encapsulation:** They allow for private variables, encapsulating data within a function and exposing only necessary methods.
- **Function Factories:** Closures can generate functions with customized behavior based on their lexical environment.
- **Maintaining State:** They enable functions to maintain state between invocations without relying on global variables.

Example:

```
function createMultiplier(factor) {
  return function(number) {
    return number * factor;
  };
}
const double = createMultiplier(2);
console.log(double(5)); // Logs: 10
```

Explanation: The `double` function is a closure that remembers the `factor` value from its lexical environment, allowing it to multiply any number by 2.

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5. What Are Common Use Cases for Closures?

Q: Where are closures commonly used in JavaScript?

A: Closures are widely used in various scenarios:

- **Event Handlers:** They allow event listeners to access variables from the scope in which they were created.
- **setTimeout/setInterval:** Closures enable callbacks to access variables even after the timer has expired.
- **Module Pattern:** They help in creating modules with private and public methods.

Example:

```
function setupButton() {
  let count = 0;
  document.getElementById('myButton').addEventListener('click', function()
{
    count++;
    console.log(count);
  });
}
setupButton();
```

Explanation: The event listener function forms a closure over the `count` variable, allowing it to maintain and update the click count each time the button is clicked.

🔑 Summary and Key Takeaways

- **Definition:** A closure is a function that retains access to its lexical scope, even after the function has executed.
- **Creation:** Closures are created when a function is defined inside another function and the inner function references variables from the outer function.
- **Advantages:** They provide data encapsulation, function factories, and the ability to maintain state between function calls.
- **Use Cases:** Closures are commonly used in event handlers, timers, and implementing the module pattern.