12. CRAZY JS INTERVIEW ft. Closures

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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: Think of a closure as 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 a = 10;
  function inner() {
    console.log(a);
  }
  return inner;
}
const closureFunction = outer();
closureFunction(); // Logs: 10
```

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

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3. What Are Common Interview Questions About Closures?

Q: What are some common interview questions related to closures?

A: Common interview questions include:

- **What is a closure in JavaScript?**
- **How do closures work with asynchronous functions like `setTimeout`?**
- **Can closures lead to memory leaks?**
- **How can closures be used for data encapsulation?**
- **What are the advantages and disadvantages of using closures?**

Example:

```
function outer() {
  var a = 10;
  function inner() {
    console.log(a);
  }
  return inner;
}
```

```
const closureFunction = outer();
closureFunction(); // Logs: 10
```

Explanation: This example demonstrates how closures allow inner functions to access variables from their outer functions, even after the outer function has finished executing.

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4. How Can Closures Be Used for Data Encapsulation?

Q: How can closures be used to achieve data encapsulation in JavaScript?

A: Closures can be used to create private variables and methods, allowing for controlled access and modification. This is achieved by defining variables within a function and returning an object with methods that interact with those variables.

Example:

```
function createCounter() {
  let count = 0;
  return {
    increment: function() {
      count++;
      console.log(count);
    },
    decrement: function() {
      count--;
      console.log(count);
    },
    getCount: function() {
      return count;
    }
  };
}
const counter = createCounter();
counter.increment(); // Logs: 1
counter.decrement(); // Logs: 0
console.log(counter.getCount()); // Logs: 0
```

Explanation: In this example, the `count` variable is private to the `createCounter` function and cannot be accessed directly from outside. The returned methods provide controlled access to `count`, demonstrating data encapsulation using closures.

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5. What Are the Advantages and Disadvantages of Using Closures?

Q: What are the advantages and disadvantages of using closures in JavaScript?

A: Advantages of closures include:

- **Data Encapsulation:** Closures allow for private variables and methods, promoting data security.
- **Function Factories:** They enable the creation of functions with customized behavior based on their lexical environment.
- **Maintaining State:** Closures can maintain state between function calls without relying on global variables.

Disadvantages include:

- **Memory Consumption:** Closures can lead to increased memory usage if not managed properly, as they retain references to their lexical environment.
- **Potential Memory Leaks:** Improper use of closures can prevent garbage collection, leading to memory leaks.

Example:

```
function createCounter() {
  let count = 0;
  return {
    increment: function() {
      count++;
      console.log(count);
    }
  };
}
```

```
const counter = createCounter();
counter.increment(); // Logs: 1
```

Explanation: In this example, the `count` variable is retained by the closure, allowing it to maintain state across multiple calls to `increment`.

🔑 Summary and Key Takeaways

- **Definition:** A closure is a function that retains access to its lexical scope, even when the function is executed outside that scope.
- **Usage:** Closures are commonly used for data encapsulation, function factories, and maintaining state.
- **Considerations:** While closures offer powerful capabilities, they should be used judiciously to avoid potential memory issues.