Closures

LET KEYWORD

The let allows you to declare variables that are limited in scope to the block, statement, or expression on which it is used. This is unlike the var keyword, which defines a variable globally, or locally to an entire function regardless of block scope.

- **Scoping Rules**

  Variables declared by 'let' have their scope in the block for which they are defined, as well as in any contained sub-blocks. In this way, let works very much like var. The main difference is that the scope of a var variable is the entire enclosing function:

```
function varTest() {
    var x = 1;
    if (true) {
        var x = 2; // same variable!
        console.log(x); // 2
    }
    console.log(x); // 2
}

function letTest() {
    let x = 1;
    if (true) {
        let x = 2; // different variable
        console.log(x); // 2
    }
    console.log(x); // 1
}
```

Let in for loop – Consider the following for loop.

```
for (var a = 1; a < 5; a++) {
    setTimeout(function() {
        console.log(a)
    }, 1000);
}
```

This loop will print 1 2 3 4. Every round of let creates a new variable and bounds it with the closure. Let a gets a new binding for every iteration of the loop. This means that every closure, if a function is created in a loop captures a different instance.

<u>EXTRA</u>: You can read about let from the links below -
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Statements/let
https://www.geeksforgeeks.org/difference-between-var-and-let-in-javascript/

EXECUTION CONTEXT AND LEXICAL ENVIRONMENT

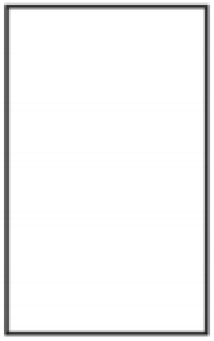
- **Execution Context**

  When the **JavaScript Engine** is used to run your code, your code is executed in a **specific Execution Context for each statement**. There are two main types of Execution Context in the JavaScript environment. When your code is first run, even if it's spread across multiple pages using the <script /> tag, JavaScript creates one **Global Execution Context** in which your code is placed when it executes and runs inside the browser. The second is the **Function Execution Context,** which was created when you called the function you defined.

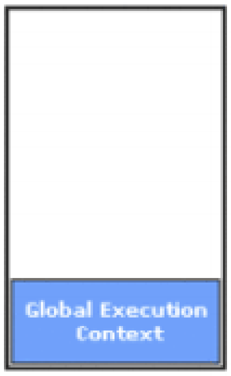
  Each time you call a function, a new Function Execution Context is created.

```
var message = 'Hello there';

function foo(message) {
    bar(message);
}

function bar(message) {
    console.log(message);
}
foo(message);
```

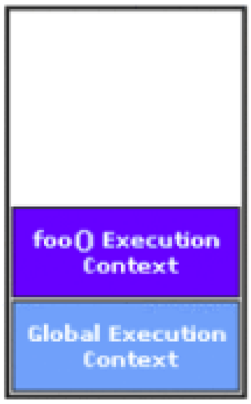
  Initially, **Execution Context Stack** is empty.



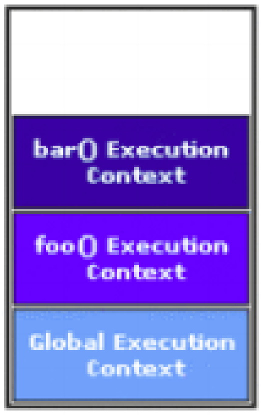
When this code runs, the JavaScript engine ***creates one Global Execution Context*** and pushes it to Execution Context Stack.



When we call the function foo, Global Execution Context was paused because JavaScript is a single-threaded environment that can only execute one code at a time. After that JavaScript engine will create a new Function Execution Context for foo and push it into Execution Context Stack.



When the foo function is executed we invoked the bar inside the foo definition. JavaScript engine paused the execution context in the foo function and ***creates a new Function Execution Context for the bar()*** and pushed it into the stack.



After the bar is finished executing it will be popped out in the Execution Context Stack and go back to foo and resume its execution. The same process will be applied to the foo until we finish and go back to the Global Execution Context and resume the execution.

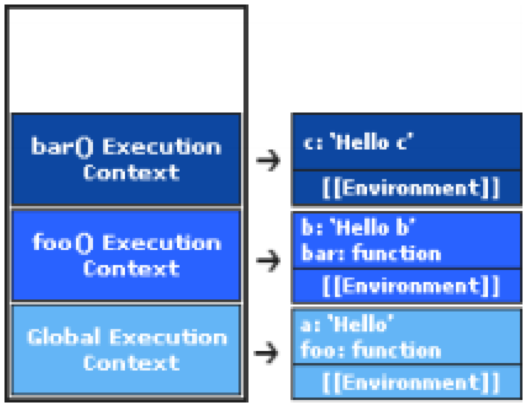
- **Lexical Environment**

Consider the following code:

```
var a = 'a';
function foo() {
    var b = 'b';
    function bar() {
        var c = 'c';
        console.log(c); // You can access me here.
        console.log(b); // You can access me too..
        console.log(a); // You can also access me..
    }
    bar();
}
foo();
```

When this code is first created and foo is stored in a global environment. Only the bar function visible as the bar() is an internal function within the foo environment, it created a new environment when we named the function foe below and saved the variable b in the foo environment. We also called the bar() function when invoking foo(), which also creates a new environment.

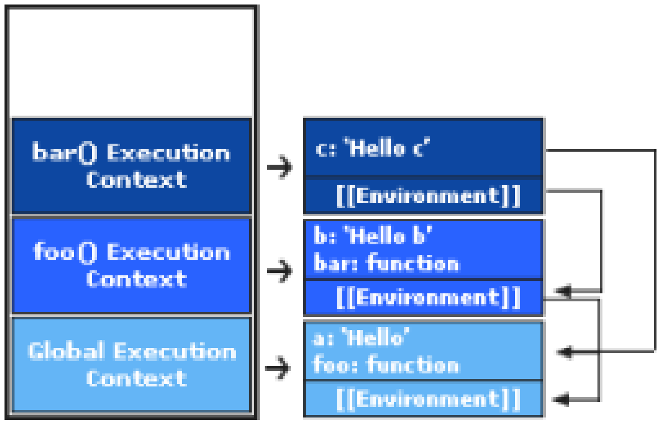
Whenever a function is called, a new function execution context is created, and a new lexical environment is added to the execution context stack.



Inside the bar function, we do logging to check if the variables that we create are visible and if we can access them in their environment.
When variable c was logged in the bar environment, it was displayed successfully obviously because it was inside his environment.

However, when we do logging the variable b and variable it was also successfully displayed. How did this happen?

This is because In the second logging we call the variable b which is not in the bar function scope. So javascript does this internally to search it in other Outer Environment until they find that variable. In our case, they found the variable b at foo function since the bar function has reference to foo function the foo function environment is not pop out in the Execution Context! When variable a was logged it was also successfully displayed because variable a is stored in the Global Execution Context. Everyone can access the Scope in the Global Execution Context.



EXTRA: You can read about them from the links below -
https://blog.bitsrc.io/understanding-execution-context-and-execution-stack-in-javascript 1c9ea8642dd0

CLOSURES

A closure is a feature in JavaScript where an inner function has access to the outer (enclosing) function's variables—a scope chain.

The closure has three scope chains:
it has access to its own scope—variables defined between its curly brackets
it has access to the outer function's variables
it has access to the global variables
A closure is created when an inner function is made accessible from outside of the function that created it. This typically occurs when an outer function returns an inner function. When this happens, the inner function maintains a reference to the environment in which it was created. This means that it remembers all of the variables (and their values) that were in scope at the time. The following example shows how closure is created and used.

```
function add(value1) {
    return function doAdd(value2) {
        return value1 + value2;
    };
}
var increment = add(1);
var foo = increment(2);
// foo equals 3
```

From the above example, we can make the following observations -

The add() function returns its inner function doAdd(). By returning a reference to an inner function, a closure is created.

“value1” is a local variable of add(), and a non-local variable of doAdd(). Non-local variables refer to variables that are neither in the local nor the global scope. “value2” is a local variable of doAdd().

When add(1) is called, a closure is created and stored in “increment”. In the closure’s referencing environment, “value1” is bound to the value one. Variables that are bound are also said to be closed over. This is where the name closure comes from.

When increment(2) is called, the closure is entered. This means that doAdd() is called, with the “value1” variable holding the value one.

***EXTRA*:**
You can read about closure from the links below -
https://medium.com/javascript-scene/master-the-javascript-interview-what-is-a-closureb2f0d2152b36