JavaScript Variable Scopes

Summary: in this tutorial, you will learn about the JavaScript variable scope that determines the visibility and accessibility of variables.

What is variable scope

Scope determines the visibility and accessibility of a variable. JavaScript has three scopes:

- The global scope
- Local scope
- Block scope (started from ES6)

The global scope

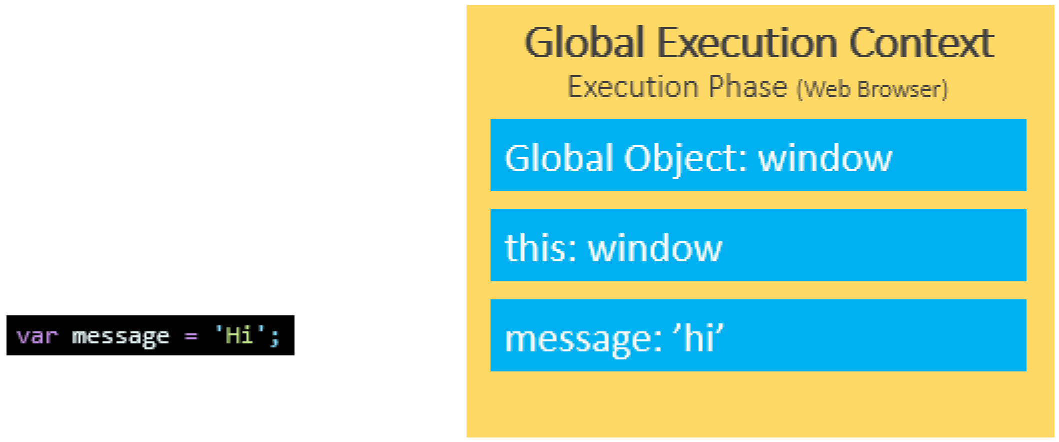
When the JavaScript engine executes a script, it creates a global execution context.

Also, it also assigns variables that you declare outside of functions to the global execution context. These variables are in the global scope. They are also known as global variables.

See the following example:

```
var message = 'Hi';
```

The variable `message` is global-scoped. It can be accessible everywhere in the script.



```
var message = 'Hi';
```

Local scope

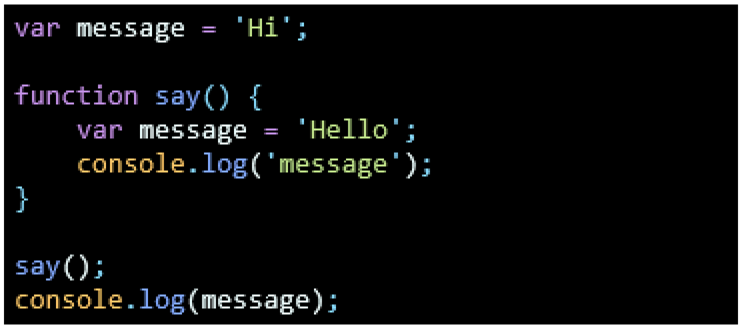
The variables that you declare inside a function are local to the function. They are called local variables. For example:

```
var message = 'Hi';

function say() {
    var message = 'Hello';
    console.log(message);
}

say();
console.log(message);
```

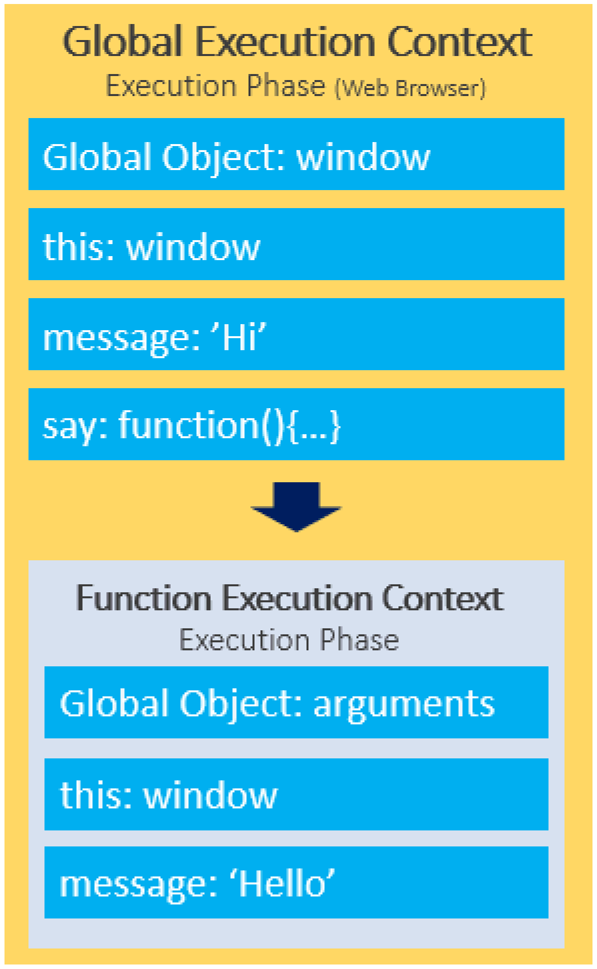
Output:

```
Hello
Hi
```

When the JavaScript engine executes the `say()` function, it creates a function execution context. The variable `message` declared inside the `say()` function is bound to the function execution context of the function, not the global execution context.



```
var message = 'Hi';

function say() {
    var message = 'Hello';
    console.log('message');
}

say();
console.log(message);
```



Scope chain

Consider the following example:

```
var message = 'Hi';

function say() {
    console.log(message);
}

say();
```

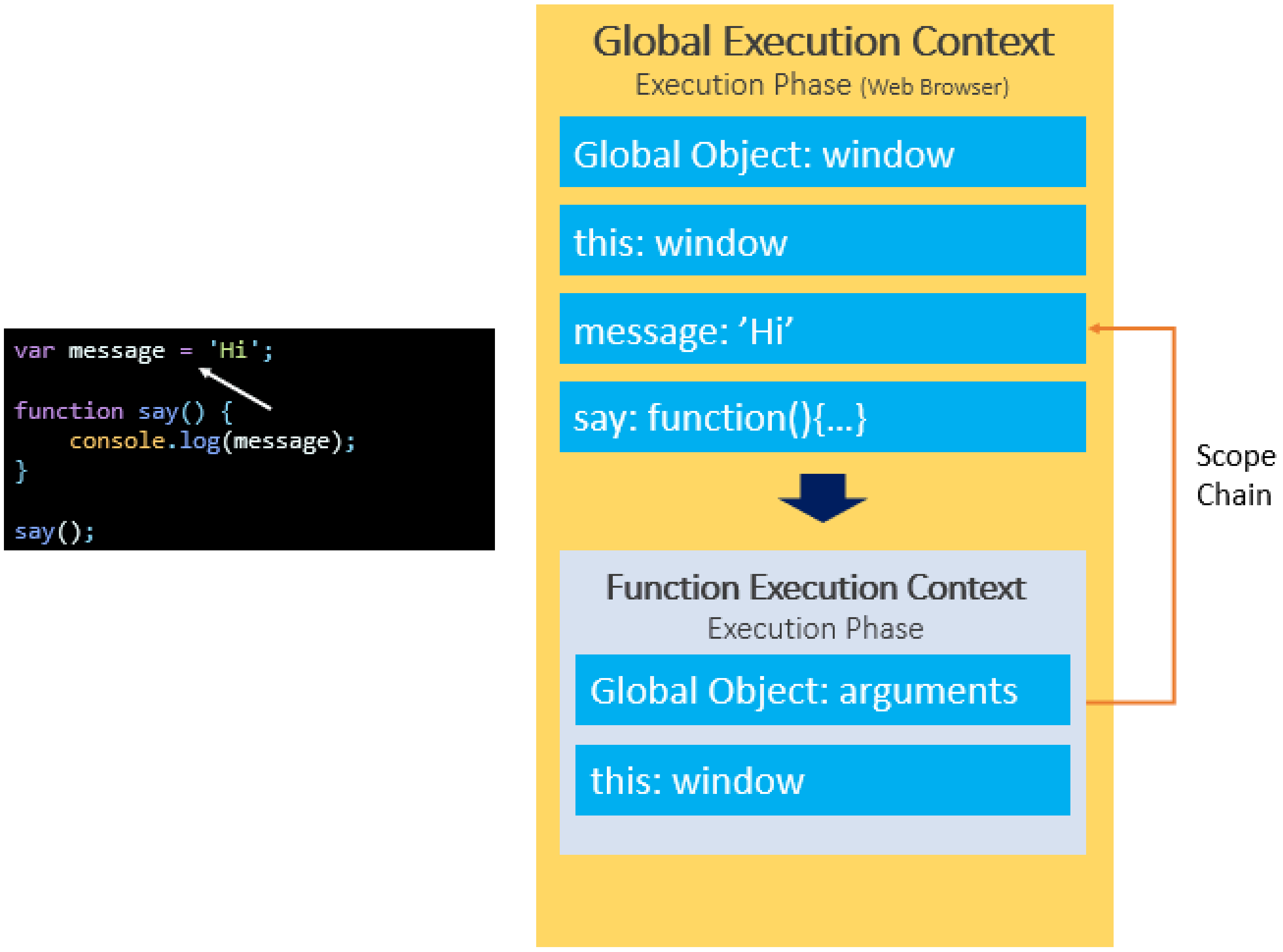
Output:

```
Hi
```

In this example, we reference the variable `message` inside the `say()` function. Behind the scenes, JavaScript performs the following:

- Look up the variable `message` in the current context (function execution context) of the `say()` function. It cannot find any.
- Find the variable `message` in the outer execution context which is the global execution context. It finds the variable `message`.

The way that JavaScript resolves a variable is by looking at it in its current scope, if it cannot find the variable, it goes up to the outer scope, which is called the scope chain.



```
var message = 'Hi';

function say() {
    console.log(message);
}

say();
```

More scope chain example

Consider the following example:

```
var y = 20;
```

```
function bar() {
    var y = 200;

    function baz() {
        console.log(y);
    }

    baz();
}

bar();
```

Output:

```
200
```

In this example:

- First, the JavaScript engine finds the variable y in the scope of the `baz()` function. It cannot find any. So it goes out of this scope.
- Then, the JavaScript engine finds the variable y in the `bar()` function. It can find the variable y in the scope of the `bar()` function so it stops searching.

Global variable leaks: the weird part of JavaScript

See the following example:

```
function getCounter() {
    counter = 10;
    return counter;
}

console.log(getCounter());
```

Output:

```
10
```

In this example, we assigned 10 to the `counter` variable without the `var`, `let`, or `const` keyword and then returned it.

Outside the function, we called the `getCounter()` function and showed the result in the console.

This issue is known as the leaks of the global variables.

Under the hood, the JavaScript engine first looks up the `counter` variable in the local scope of the `getCounter()` function. Because there is no `var`, `let`, or `const` keyword, the `counter` variable is not available in the local scope. It hasn't been created.

Then, the JavaScript engine follows the scope chain and looks up the `counter` variable in the global scope. The global scope also doesn't have the `counter` variable, so the JavaScript engine creates the `counter` variable in the global scope.

To fix this "weird" behavior, you use the `'use strict'` at the top of the script or at the top of the function:

```
'use strict'

function getCounter() {
    counter = 10;
    return counter;
}

console.log(getCounter());
```

Now, the code throws an error:

```
ReferenceError: counter is not defined
```

The following shows how to use the `'use strict'` in the function:

```
function getCounter() {
    'use strict'
    counter = 10;
    return counter;
}

console.log(getCounter());
```

Block scope

ES6 provides the `let` and `const` keywords that allow you to declare variables in block scope.

Generally, whenever you see curly brackets `{}`, it is a block. It can be the area within the `if`, `else`, `switch` conditions or `for`, `do while`, and `while` loops.

See the following example:

```
function say(message) {
    if(!message) {
        let greeting = 'Hello'; // block scope
        console.log(greeting);
    }
    // say it again ?
    console.log(greeting); // ReferenceError
}

say();
```

In this example, we reference the variable `greeting` outside the `if` block that results in an error.

In this tutorial, you have learned about the JavaScript variable scopes including function scope, global scope, and block scope.