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| **[Reading Assingnment on Based on Lecture 04]** |
| The assignment is based on lecture 04(Java script). It contains 5 questions with good explanations of the questions. |

Table of Contents

[**Question No 1** 3](#_Toc62375555)

[**Interpreted Languages** 4](#_Toc62375556)

[The term hoisting is confusing 7](#_Toc62375557)

[How is JavaScript code interpreted? 7](#_Toc62375558)

[Compilation 8](#_Toc62375559)

[Execution 9](#_Toc62375560)

[Are variables declared with let and const hoisted? 9](#_Toc62375561)

[Where can I reference let and const? 10](#_Toc62375562)

[**The rules of JavaScript Automatic Semicolon Insertion** 11](#_Toc62375563)

1. Is Java script Interpreted Language in it entirety ? :

Before deciding whether java script is interpreted entirely or not first let’s see some points about java script.

JavaScript is primarily a client-side language. JavaScript started at Netscape, a web browser developed in the 1990s. A webpage can contain embedded JavaScript, which executes when a user visits the page. The language was created to allow web developers to embed executable code on their web pages, so that they could make their web pages interactive, or perform simple tasks. Today, browser scripting remains the main use-case of JavaScript.

JavaScript’s syntax is heavily inspired by C++ and Java. If you have experience in C++ or Java, JavaScript’s syntax will seem familiar to you. However, the inner workings of JavaScript is closer to a dynamically-typed, interpreted language such as Python or Ruby.

Now let’s see the difference between interpreted and compiled programming languages

**Compiled Languages**

Compiled languages are converted directly into machine code that the processor can execute. As a result, they tend to be faster and more efficient to execute than interpreted languages. They also give the developer more control over hardware aspects, like memory management and CPU usage.

Compiled languages need a “build” step – they need to be manually compiled first. You need to “rebuild” the program every time you need to make a change. In our hummus example, the entire translation is written before it gets to you. If the original author decides that he wants to use a different kind of olive oil, the entire recipe would need to be translated again and resent to you.

Examples of pure compiled languages are C, C++, Erlang, Haskell, Rust, and Go.

**Interpreted Languages**

Interpreters run through a program line by line and execute each command. Here, if the author decides he wants to use a different kind of olive oil, he could scratch the old one out and add the new one. Your translator friend can then convey that change to you as it happens.

Interpreted languages were once significantly slower than compiled languages. But, with the development of [just-in-time compilation](https://guide.freecodecamp.org/computer-science/just-in-time-compilation), that gap is shrinking.

Examples of common interpreted languages are PHP, Ruby, Python, and JavaScript.

Some say “JavaScript is an interpreted language, not a compiled language. A program such as C++ or Java needs to be compiled before it is run. The source code is passed through a program called a compiler, which translates it into byte code that the machine understands and can execute. In contrast, JavaScript has no compilation step. Instead, an interpreter in the browser reads over the JavaScript code, interprets each line, and runs it. More modern browsers use a technology known as Just-In-Time (JIT) compilation, which compiles JavaScript to executable byte code just as it is about to run.”

2.The history of “type of null”

The null value is technically a primitive, the way "object" or "number" are primitives. This would typically mean that the type of null should also be "null". Null in java script is actually value and type created to stimulate errors and keywords common in other programming languages However, this is not the case because of a peculiarity with the way JavaScript was first defined.

In the first implementation of JavaScript, values were represented in two parts - a type tag and the actual value. There were 5 type tags that could be used, and the tag for referencing an object was 0. The null value, however, was represented as the NULL pointer, which was 0x00 for most platforms. As a result of this similarity, null has the 0 type tag, which corresponds to an object.

Null and undefined in JavaScript are actually values and types created to simulate errors and keywords common in other programming languages.

When a variable is `undefined`, or unitialized, in most programming languages it means that a space in memory has been assigned to a variable name, but the programmer has not yet done anything with that space in memory. This usually results in a compile time error.

When a variable is `null` in other programming languages, null is typically a keyword to indicate the space in memory is a pointer (reference), and that pointer is pointing to an invalid memory address (usually 0x0). This is usually used when a programmer is done using the value of a variable and wants to purposefully clear it by literally pointing it to nothing.

In JavaScript, `null` and `undefined` are values and types. Just like numbers and characters, `null` has a specific configuration of 1’s and 0’s that indicates it’s type is `null` and that it’s value is `null`. Same with `undefined`. These are used in JavaScript to act as placeholders to let the programmer know when a variable has no value.

3.Explain in detail why  hoisting is different with let and const

# The term hoisting is confusing

I believe that one of the first and foremost reasons people struggle to understand hoisting is because the term itself is somewhat misleading. The Merriam-Webster definition of the word hoist is “an act of raising or lifting”.

This might lead one to assume that hoisting involves written code being physically rearranged somehow. This is not true.

Instead, the term hoisting is used as a kind of simile to describe a process that occurs while the JavaScript engine interprets written JavaScript code.

# How is JavaScript code interpreted?

All written JavaScript is interpreted within the **Execution Context**that it is written in. When you open up your text editor and create a new JavaScript file, you create what is called a **Global Execution Context**.

The JavaScript engine interprets the JavaScript written within this Global Execution Context in two separate phases; **compilation** and **execution**.

## Compilation

During the compilation phase, JavaScript parses the written code on the lookout for all function or variable declarations. This includes:

-let  
-const  
-class  
-var  
-function

When compiling these keywords, JavaScript creates a unique space in memory for each declared variable it comes across. This process of “lifting” the variable and giving it a space in memory is called hoisting.

Typically, hoisting is described as the moving of variable and function declarations to the top of their (global or function) scope.

However, the variables **do not** move **at all**.

What actually happens is that during the compilation phase declared variables and functions are stored in memory before the rest of your code is read, thus the illusion of “moving” to the top of their scope.

## Execution

After the first phase has finished and all the declared variables have been hoisted, the second phase begins; execution. The interpreter goes back up to the first line of code and works its way down again, this time assigning variables values and processing functions.

# Are variables declared with let and const hoisted?

Yes, variables declared with let and const are hoisted. Where they differ from other declarations in the hoisting process is in their initialization.

During the compilation phase, JavaScript variables declared with var and function are hoisted and automatically initialized to undefined.

console.log(name) // undefined  
var name = "Andrew";

In the above example, JavaScript first runs its compilation phase and looks for variable declarations. It comes across var name, hoists that variable and automatically assigns it a value of undefined.

Contrastingly, variables declared with let, const, and class are hoisted but remain uninitialized:

console.log(name); // Uncaught ReferenceError: name is not defined  
let name = "Andrew";

These variable declarations only become initialized when they are evaluated during runtime. The time between these variables being declared and being evaluated is referred to as the **temporal dead zone**. If you try to access these variables within this dead zone, you will get the reference error above.

To walk through the second example, JavaScript runs its compilation phase and sees let name, hoists that variable, but does not initialize it. Next, in the execution phase, console.log() is invoked and passed the argument name.

Because the variable has not been initialized, it has not been assigned a value, and thus the reference error is returned stating that name is not defined.

# Where can I reference let and const?

Again, variables declared with let and const are only initialized when their assignment (also known as lexical binding) is evaluated during runtime by the JavaScript engine.

It’s not an error to reference let and const variables in code above their declaration as long as that code is not executed before their declaration.

Semicolons in JavaScript: To Use or Not to Use?

Semicolons in JavaScript are optional. Some prefer to use them always, no matter what. Others like to avoid them.

It can be removed from a code, unless there is a particular code construct that requires them. When semicolons are avoided the code looks better and it’s cleaner to read. This is all possible because JavaScript does not strictly require semicolons. When there is a place where a semicolon was needed, it adds it behind the scenes.

The process that does this is called **Automatic Semicolon Insertion**.

It’s important to know the rules that power semicolons, to avoid writing code that will generate bugs because does not behave like you expect.

**The rules of JavaScript Automatic Semicolon Insertion**

The JavaScript parser will automatically add a semicolon when, during the parsing of the source code, it finds these particular situations:

1. when the next line starts with code that breaks the current one (code can spawn on multiple lines)
2. when the next line starts with a }, closing the current block
3. when the end of the source code file is reached
4. when there is a return statement on its own line
5. when there is a break statement on its own line
6. when there is a throw statement on its own line
7. when there is a continue statement on its own line

Expression Vs  Statement in Java script ?

JavaScript distinguishes *expressions* and *statements*.

An expression produces a value and can be written wherever a value is expected, for example as an argument in a function call. Each of the following lines contains an expression:

myvar

3 + x

myfunc("a", "b")

Roughly, a statement performs an action. Loops and if statements are examples of statements. A program is basically a sequence of statements (we’re ignoring declarations here). Wherever JavaScript expects a statement, you can also write an expression. Such a statement is called an *expression statement*. The reverse does not hold: you cannot write a statement where JavaScript expects an expression. For example, an if statement cannot become the argument of a function.

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