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How Var, let and const keywords works in Javascript

Earlier, pre-ES6 era, only var keyword was introduced for declaration of variable

With ES6, the let and const keyword introduced.

How to declare Variables in JavaScript

```
// without keywords. It is same as var
   and not allowed in 'strict' mode.

name = 'Jack';

// using var
var price = 100;

// using let
let isPermanent = False;

// using const
const PUBLICATION = 'Jack';
```

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We'll disuss
- Scope
- Reassigning New Value
- When you access a variable before declaring it.

Variable Scope in JavaScript

The variable may exist in a block, inside function or outside function.

A block is section of code inside { }

Eg →
```
{
    let name = 'deepa';
}
```

* It has block Scope

A function is bunch of code you want to place logicall together.
It is declared using function keyword

```
function test() {
    let name = 'deep';
}
```

* It has function scope
* Everything declared outside block and function is global Scope

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So there are three types of Scope

* Block Scope
* Function Scope
* Global Scope

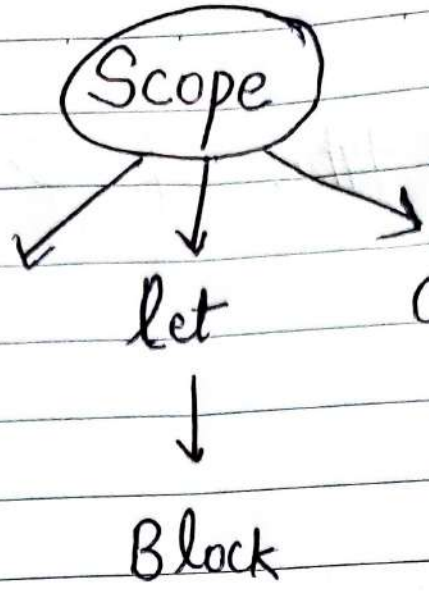
The three keyword var, let and const work around these scopes.

How to Use Javascript Variable in Global Scope

We can use var, let and const to declare global variable.
But it is recommended not to do it.
By doing this, variable are accessible everywhere.

So to restrict scope of variable using var, let and const keywords, here's order of accessiblity in scope starting with lowest:

- var : The functional Scope level
- let : The block Scope level
- const : The block Scope level



How to Reassign a New value to Variable in Javascript

You can reassign var or let variables, but you cannot reassign a new value to const variable

Const — (Constant) — ~~Always same, cannot change~~

One Tricky part
When object is declared and assigned value with const, you CAN STILL CHANGE VALUE OF ITS PROPERTIES

But you cannot reassign any object value to same variable

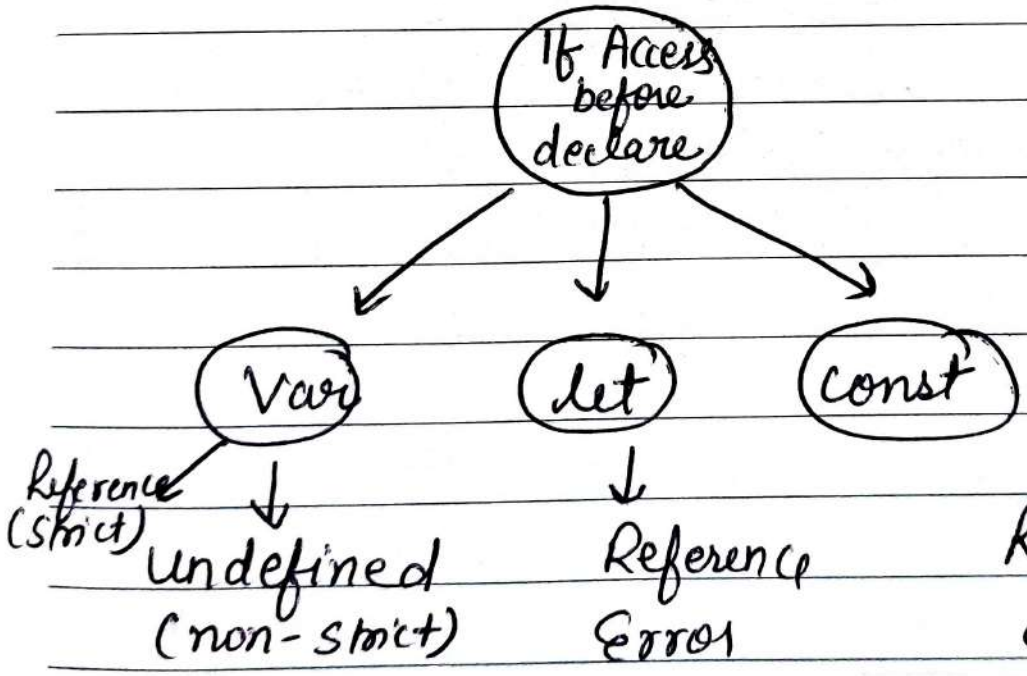
When You Access a Variable before declaring

With var in non-strict mode, the variable will have an undefined value.

This means variable declared but not assigned

In strict mode, you will get Reference Error that variable is not declared.

With let and const, you will always get Reference Error



* Don't use Var
* Use let or const
* Use const more often.
* Use let, when you need to reassign

Hoisting In JavaScript

Hoisting simply gives higher specificity to javascript declarations. Thus, it makes the computer read and process declarations first before analyzing other code in program

Note → Hosting does not mean Javascript rearranges or move code above one another

Eg →
```
Console.log(name) // Uncaught Reference Error
let name = 'Deepa';
```

Variables declared with let and const are hoisted but not initialized with a default value.

Accessing let or const before it's declared will give :-

Uncaught Reference Error : cannot access before initialization

Remember the Error message tells variable is initialized somewhere

Variable hoisting with var

When interpreter hoists a variable declared with var, it initialized its value to undefined, unlike let or const.

Eg →
```
Console.log(name);   // undefined
var name = 'deepa';
console.log(name);   // 'deepa'
```

Now let's analyze this behaviour:

```
var name;
console.log(name);   // undefined
name = 'deepa';
console.log(name);   // deepa
```

Remember, the first console.log(name) outputs undefined becoz name is hoisted, and given a default value (not becoz variable is never declared).

Using undeclared variable will throw Reference Error

```
console.log(name);   // Uncaught ReferenceError: name is not defined
```

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Now let's see if we donot declare var what happens

```
console.log(name); // Uncaught ReferenceError
name = 'deepa';
```

↓

Assigning a variable that's not declared is valid

Javascript let us access variable before they're declared. This behaviour is an unusual part of javascript and can lead to errors.

Using variable before it's declaration is not desirable

The Temporal Dead Zone

The reason why we get reference Error when we try to access let or const before its declaration is

Temperal Dead Zone.

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The TDZ starts at begining of the variables enclosing scope and ends when it is declared.

Accessing variable in TDZ gives Reference Error.

Eg
```
{  // start of foo's TDZ
    let bar = 'bar'
    console.log(bar); // 'bar'

    console.log(foo); // Reference Error
                      becoz we're in TDZ
    let foo = 'foo';
}  // End of foo's TDZ.
```

type of TDZ for let or const → Reference Error
for var ⇒ undefined

Functional Hoisting

Function declarations are hoisted too.
Function hoisting allows us to call function before it is declared or defined.

foo(); // 'Foo'

```
Function foo() {
    console.log('foo');
}
```

Note only function declaration are hoisted not function Expressions.

Eg
```
foo();  // Uncaught Type Error:
var foo = function() {}
```

Uncaught Type Error: foo is not a function

```
bar();  // Uncaught Type Error
let bar = function() {}
```

Uncaught Reference Error: cannot access 'bar' before initialization

Similarly for const.

For function that is never declared:

```
foo();  // Uncaught Reference Error:
        foo is not defined
```

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Closures in JavaScript

```
function sayWord (word) {
    return () => console.log(word);
}
const sayHello = SayWord ("hello");

SayHello(); // "hello"
```

There's 2 interesting point to notice :-

→ The returned function from sayWord can access the word parameter

→ The returned function maintain the value of word when SayHello is called outside scope of word.

The first point can be explained by Lexical Scope. :

Lexical Scope - The returned function can access word before it exists in its outer scope

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The second point becoz of Closures

A closure is a function combined with references to variables define outside of it.

Closure maintain the variable references, which allow function to access variables outside of their scope.

They "enclose" the function and variable in its environment

Example of Closures In JavaScript

Callbacks - It is common for a callback to reference a variable declared outside of itself

eg → function getCars By Make (make) {
return cars.filter(x => x.make === make);
}

make is available in callback because of lexical Scoping and make is persisted when filter called becoz of closure

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Storing state → We can use closures from functions that store states

Let's say a fn which returns an object that can store and change name.

```
function makePerson(name) {
    let _name = name;

    return {
        setName: (newName) => (_name = newName),
        getName: () => _Name,
    };
}

const me = makePerson("deepa");
console.log(me.getName()); // "deepa"

me.setName("Deepa Chaurasia");
console.log(me.getName());
                // "Deepa Chaurasia");
```

It shows how closure do not freeze values of variables from function's outer scope during creation. Instead they maintain the references throughout closure's lifetime.

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Private methods

So In oops concept, In a class we have private state and expase getter and setter methods public.

We can extend this oops.

```
function makePerson(name) {
    let _name = name;

    function PrivateSetName(newName){
        _name = newName;
    }

    return {
        setName: (newName) => privateSetName
                              (newName),
        getName: () => _name,
    };
}
```

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PrivateSetName is not directly accessible to consumers and it can access the private state variable - name through closure.

Closures make it possible for:

functions to maintain connections with outer variables, even outside scope of the variables

(like LinkedIn maybe :))

There are many uses of closures from creating class like structures that store state and implement private methods to passing callback to event handlers.

Object and it's Method in JavaScript

How to Create objects in JavaScript?

```
Const person = {
    name : 'Deepa'
};
```

This is simple and most popular way

* you can also use new keyword

```
const person = new Object();
person.name = 'Deepa';
```

* you can also use 'new' with user defined constructor function

Eg →

```
function Person (name) {
    this.name = name;
}
```

Now anytime you want Person object

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```
const personOne = new Person('deepa');
```

* Using Object.create() to create new Objects

The Object.create() methods creates a new object, using an existing object as prototype of the newly created object

It contains 2 parameter:

- First parameter is mandatory that serves prototype of new object to be created
- Second is optional, it contains properties to be added to new object

Eg →

```
const orgObject = { company: 'ABC' };

const employee = Object.create(orgObject,
                 { name: { value: 'EmpOne' } });

console.log(employee); // { company: 'ABC' }
console.log(employee.name); // 'EmpOne'
```

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* Using Object.assign() to create new obj.

The Object.assign() method is used to copy all enumerable own properties value from one or more sources objects to target object.

It will return target object.

Eg → const orgObject = { company: 'ABC' }
const carObject = { carName: 'Ford' };

const employee = Object.assign({}, orgObject, carObject);

Now you can get employee object that has company and carName as its property

```
console.log(employee);
// { carName: 'Ford', company: 'ABC' }
```

* Using Object.defineProperties()

This method defines new or modify existing property on object

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```
const object1 = {};

Object.defineProperties(object1, {
    property1: {
        value: 42,
    },
});

console.log(object1.property1); // 42
```

Similarly we also have .Object.defineProperty()

* Using Object.Entries()

It returns an array of object's key value pairs.

The order of array is same as provided by a For...in loop

```
const Object1 = {   a: 'something'
                    b: 'nothing'
                };
```

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```
for (const [key, value] of Object.entries(object1))
  {
  console.log (`${key}: ${value}`);
  }

// "a": something"
   "b: nothing"
```

Object.freeze()

It freezes an object
No longes can be changed

```
Eg-  cons obj = {
        prop: 42
     };
     Object.freeze(obj);
     console.log(obj)

     obj.prop = 43;
     console.log(obj.prop);

        // output 42
```

It can no longes be change due to freeze

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Object.fromEntries()

It transforms a list of key-value pairs into an object

Eg →

```
Const entries = new Map([
    ['foo', 'bar'],
    ['baz', 42]
]);

Const obj = Object.fromEntries(entries);
Console.log(obj);

// Object { foo: "bar", baz: 42 }
```

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Callback Functions

A Callback function is function that is performed after another function has completed its execution.

It is typically supplied as an input to other function.

Callbacks are critical to understand, as they are used in array methods (such as map(), filter(), and so on), setTimeout, eventlistners (such as click, scroll)

Eg→
```
Function orderPizza (type, name, callback){
    console.log('Pizza ordered..');
    console.log('Pizza is on preparation');
    setTimeout (function(){
    let msg = `Your ${type} ${name}
            Pizza is ready`;
    callback (msg);
    }, 3000);
}
```

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Now Invocation of orderPizza

```
orderPizza ('veg', 'cheese', function(message)
  {
    console.log(message);
  });
```

· Imp points to Note

→ Javascript fn can accept other fn as arg.

→ passing fn as arguement is powerful programming concept that can be used to notify caller that something happened.
It is also known as callback function.

→ Nesting too many callback fn is not a great idea and it creates Callback hell.

JavaScript Map

The Array.Map() allows you to iterate over array using loop.

This method allows you to iterate and modify its elements using a callback function.

The callback function will then be executed on each of array's element.

For. eg let arr = [2, 3, 4, 5, 6];

Now Imagine you have to multiply each element of array by 3

you can use for loop also like this

```
let arr = [2, 3, 4, 5, 6];
for (let i = 0; i < arr.length; i++) {
    arr[i] = arr[i] * 3; }
console.log(arr);

// [6, 9, 12, 15, 18]
```

By using map it will look like this!

```
let arr = [2, 3, 4, 5, 6];

let modifiedArr = arr.map(function(el) {
        return el * 3;
});
console.log(modifiedArr);
        // [6, 9, 12, 15, 18]
```

How to Use Map over ARRAY of OBJECT

```
let users = [
  { firstName: 'Deepa', lastName: 'chaurasia' },
  { firstName: 'Devesh', lastName: 'chaurasia' },
  { firstName: 'Jyoti', lastName: 'chaurasia' },
];
```

You can iterate as follow

```
let userFullnames = users.map(function(el) {
    return `${el.firstName} ${el.lastName}`;
})
console.log(userFullnames);
// ['Deepa chaurasia', 'Devesh chaurasia', 'Jyoti Chaura
```

The Complete map() method syntax

The syntax of map() as follows

```
arr.map(function(element, index, array{}, this);
```

The callback function() is called on each array element, and the map() method always passes the current element, the index of current element and whole array object to it.

The this argument will be used inside callback function.

By default it's value is undefined.

Eg- let arr = [2, 3, 5, 7]

```
arr.map(function(element, index, array){
    console.log(this) // 80
}, 80);
```

Here you can see this value is 80 which is default value

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Reduce Method In JavaScript

Use it When: you have array of numbers, you want to add them all.

For eg – const nos = [29, 40, 30];
const sum = nos.reduce ((total, amount) ⇒ total + amount);
sum // 99

Filter() and Find() in JS

Fiter() provides new array depending on certain criteria.

Unlike map(), it can alter size of new Array, whereas find() return just a single instance.

Foreg → let users = [
{ firstName : 'Ram' age : 14 },
{ firstName : 'shyam' age : 17 },
{ firstName : 'Jacob' age : 25 }
];

You could choose to sort these data by age groups, such as young (1-15) adult (15-50)

Like this:

```
const youngPeople = users.filter((person)=>{
        return person.age <= 15;
});
```

```
const adult = users.filter((person) => {
        return person.age >= 50});
```

```
console.log(youngPeople);
console.log(adult);
```

And The Example of Find goes like this

```
const Ram = users.find((person) =>
        person.firstName === 'Ram');
```

```
Console.log(Ram);
```

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Unique Value - Set() in JS

```
let animals = [
  { animal
    name : 'Lion',
    category : 'wild'
  },
  { name : 'dog'
    Category : 'pet'
  },
  { name : 'cat'
    category : 'pet'
  }.
]
```

If we loop through map, we will get repeated value

But we don't want repeated value here.

So we will use Unique value - Set()

Foreg - let category = [...new Set (animals.map((animal) => animal.category))];

console.log (category); // [wild, pet]

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What is Destructuring in JavaScript *

Destructuring is act of unpacking elements in an array or object.

It not only allow you to unpack but also manipulate and switch elements acc to your demand

Destructuring in Arrays

Eg

* Const [var1, var2, ...Var3] = ~~array name~~ (Rest operator)
["Deepa", "Jyoti", "Devesh", "Ram"]

```
Console.log(var1);  // 'Deepa'
Console.log(var2);  // 'Jyoti'
Console.log(var3);  ['Devesh', 'Ram']
```

Javascript allows you to use rest operator with a destructing array to assign the rest of regular array to variable

As you have noticed ["Devesh", "Ram"] remaining both get stored in Var3

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Eg
* cons [, , website] = ['Google', 'yahoo', 'Firefox'];
console.log(website); // 'Firefox'

Here we use ',' to skip variables at destructing array's first and second index positions

How Default value work in an Array Destructing Assignment

Eg
Const [FirstName = 'Deepa', lastName = 'chaurasia']
= ["Deepa Chaurasia"];

console.log (FirsName) // Deepa Chaurasia
console.log (lastName) // chaurasia.

Here 'Deepa' and 'chaurasia' are default value of 'FirstName' and 'lastName' Variables.

∴ In our attempt to extract first index value from right side of array, the computer defaulted to "chaurasia" - becoz. Only zeroth index value exists in ["Deepa chaurasia"]

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Object destructing In JavaScript

Object destructing is unique technique that allows you to neatly extract an object's value to new variables.

```
const profile = {
    firstName : 'Deepa';
};

Destructing object
const { firstName : firstName } = profile;
```

This key references the profile object's firstName key

This value represents your new variable.

The destructing object's key references its profile objects property name.

And destructing object's value represents your new variable.

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Eg → const profile {
firstName : 'Deepa',
lastName : 'Chaurasia',
};

const { firstName, lastName } = profile;

console.log (firstName); // 'Deepa'
console.log (lastName); // 'Chaurasia'

How to Use object Destructing to Swap Value

let firstName = 'Deepa';
let lastName = 'chaurasia';

({ firstName, lastName } = { firstNam: lastName,
lastName : firstName });

console.log (firstName.); // 'chaurasia'
console.log (lastName); // 'Deepa'

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Promises In Javascript

1.

A promise is a javascript object that allows you to make asynchoonous calls.
It produces a value when async operation completes successfully or produces an error if it doesn't complete.

You can create promise using constructor

```
let promise = new Promise (Function(resolve, reject
{
});
```

↑ Executor function

Executor fn takes 2 arguments :-

→ resolve — indicate successful completion
→ reject — indicates an error

The Promise objects and states

The promise object should be capable of informing consumers when execution has been started, completed or returned with an error

1. State → pending - When execution fn starts

fulfilled - When promise resolved successfully

rejected - When the promise rejects

2. result →

undefined - Initially when state value is pending

value - When promise is resolved

Error When the promise is rejected

A promise that is either resolved or rejected are settled

Handling Promises by Consumer

Three important handler methods

- then()
- catch()
- Finally

These methods helps us create a link between executor and consumer

The .then() Promise Handler

It is used to let consumer know outcome of promise. It accept 2 arguements
- result
- error.

```
Eg- promise.then (
    (result) => {
        console.log (result);
    },
    (error) => {
        console.log (error);
    }
);
```

The catch Promise Handler

To handle Error (rejections) from Promises. It's better syntax to handle Error than handling it with :then().

```
Eg→ promise.catch (function (Error) {
        console.log (Error);
    });
```

The .finally() Promise Handler

The finally() handler method performs cleanups like stopping a loader, closing a live connection and so on

Irrespective of whether promise resolve or rejects, the finally() method will run

Eg - promise.finally(() => {

    console.log("Promise settled");
}).then((result) => {
        console.log({result});
});

Imp point to note,
the finally() method passes through result or error to the next handler which can call a .then() or .catch() again.

Synchronous Vs Asynchronous

Synchronous : Every statement of code get executed one by one

So basically, a statement has to wait for earlier statement to get executed

Eg - console.log ("I");

console.log("eat");

console.log("ice-cream");

It will print I first,
then eat,
after that ice-cream

Asynchronous; It allows program to be executed immediately without blocking the code. Unlike the Synchronous method It doesn't wait for earlier statement to get executed first.

Each task execute completed independently.

Eg- console.log ("I");

setTimeout (() => {
console.log ("eat"); }, 2000)

Console.log ("Ice Cream")

It will print

"I"

"Ice Cream" (will execute immediately)

"eat" (will print after 2s)

Asynchronous Functions

→ It contains async keyword.

How to use in Normal Function declaration

async function name (arg) {
}

How to use in an arrow function

Cons functionName = async (arg) => {
}

Asynchronous functions always return promises

It doesn't matter what you return. The returned value will always be promise.

Eg →

```
const getOne = async () => {
    return 1;
}

const promise = getOne();
console.log(promise)
```

The await keyword

The await keyword lets you wait for promise to resolve. Once promise is resolved it returns the parameter passed into then call.

Eg -

Eg →

```
const getOne = async _ => {
    return 1; }

getOne().then(value => {
                console.log(value.) }); //1
```

Now use of await keyword

```
const test = async _ => {
    const one = await getOne();
    Console.log (one);
}

test()
```

We can only use await when we have async.

Let's implement the fetch API code using asynct/await :

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```
const FetchData = async () => {
const qoutes = await Fetch ("http://--/quotes");
const response = await qoutes.json();

console.log(response);

}

  FetchData();
```

We can also handle errors in async/await by using try and catch.

```
const FetchData = async () => {
try {
  const quotes = await Fetch ("http://__");
  const response = await quotes.json();
    console.log (response);
}
  catch (error) {
      console.log(error);
  }

};
  FetchData();
```