Topic: callback hell and promises

Callback hell

Callback hell, also known as "**Pyramid of Doom,**" is a term used in JavaScript programming to describe a situation where multiple nested callbacks make the code difficult to read, understand, and maintain. This usually happens when dealing with asynchronous operations, such as making API requests or reading files.

Syntax:

```
step1(function() {
  step2(function() {
    step3(function() {
      console.log("All steps completed");
    });
  });
});
```

Example:1

```
function first(callback) {
  console.log("first");
  callback();
}

function second(callback) {
  console.log("second");
  callback();
}

function third(callback) {
  console.log("third");
  callback();
}

function fourth(callback) {
  console.log("fourth");
}

first(() => {
  second(() => {
    third(() => {
      fourth();
    });
  });
});
```

Example:2

```
function add(val, callback) {
  callback(val + 10);
}

function sub(val, callback) {
  callback(val - 5);
}

function mul(val, callback) {
  callback(val * 2);
}

function div(val, callback) {
  callback(val / 5);
}

add(10, (address) => {
  sub(addres, (subres) => {
    mul(subres, (mulres) => {
      div(mulres, (finalres) => {
        console.log(finalres);
      });
    });
  });
});
```

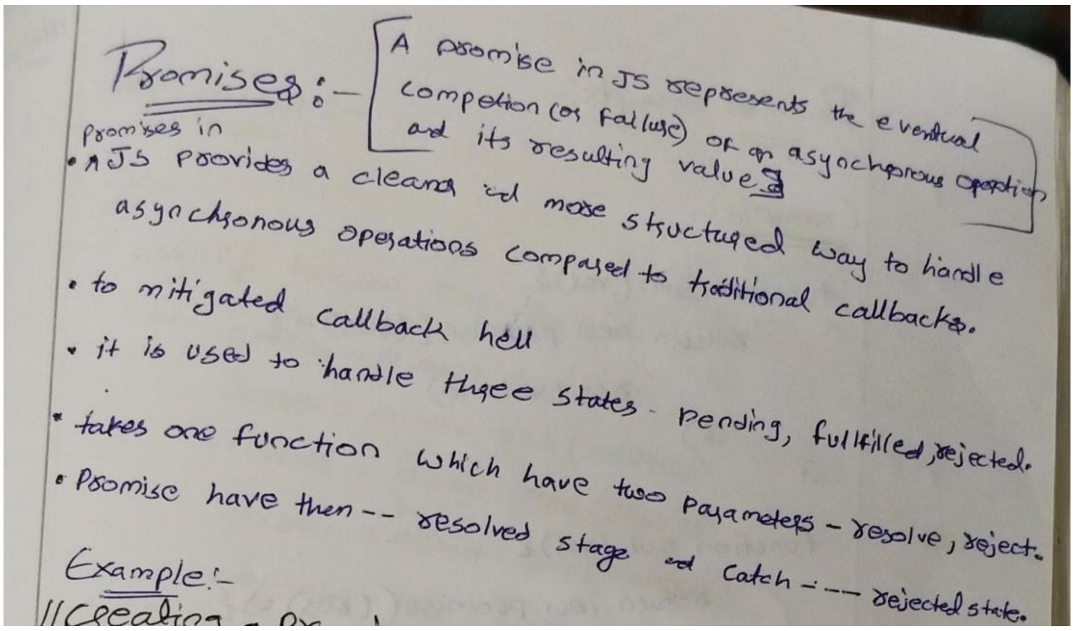
Example:3

```
function wakeUp(callback) {
    setTimeout(() => {
        console.log("1. Woke up");
        callback();
    }, 1000);
}

function eatBreakfast(callback) {
    setTimeout(() => {
        console.log("2. Ate breakfast");
        callback();
    }, 1000);
}

function study(callback) {
    setTimeout(() => {
        console.log("3. Studied");
        callback();
    }, 1000);
}

function goToSleep(callback) {
    setTimeout(() => {
        console.log("4. Went to sleep");
        callback();
    }, 1000);
}

// The callback hell part starts here
wakeUp(() => {
    eatBreakfast(() => {
        study(() => {
            goToSleep(() => {
                console.log("Finished all tasks!");
            });
        });
    });
});
```

To mitigate callback hell, several approaches have been developed:
Named functions
Promises
Async/await

Promises

Promises in JavaScript provide a cleaner and more structured way to handle asynchronous operations compared to traditional callbacks.It has three states: pending, fulfilled, or rejected.



Promises :- [A promise in JS represents the eventual compeltion (or failure) of an asynchronous operation and its resulting values]

- promises in JS provides a cleaner and more structured way to handle asynchronous operations compared to traditional callbacks.
- to mitigated callback hell
- it is used to handle three states - pending, fullfilled, rejected.
- takes one function which have two parameters - resolve, reject.
- Promise have then -- resolved stage and catch - -- rejected state.

Example:-
//Creating

Creating a Promise(producing) : You create a new Promise object using the Promise constructor. This constructor takes a function as an argument, which in turn takes two parameters: resolve and reject. Inside this function, you perform your asynchronous operation, and when it's completed, you call resolve with the result or reject with an error if it fails.

```
//promises creation
var promises=new Promise(function (resolve,reject){
var a=100;
if(a==10){
resolve("a is 10")
}
else{
reject("a is not 10")
}
});
```

Consuming a Promise: You consume a promise using the then method, which takes two optional parameters: a callback function to handle the resolved value, and a callback function to handle any errors.

```
//print the response
promises.then((val)=>{
console.log(val)
}).catch((err)=>{
console.log(err)
})
```

Promises also forming chain method which inturns make code readability difficult in order to avoid this

```
let add = (val) =>
  new Promise((resolve, reject) => {
    resolve(val + 10);
  });

let sub = (val) =>
  new Promise((resolve, reject) => {
    resolve(val - 10);
  });

let mul = (val) =>
  new Promise((resolve, reject) => {
    resolve(val * 5);
  });

let div = (val) =>
  new Promise((resolve, reject) => {
    resolve(val / 2);
  });

add(10)
  .then((addres) => sub(addres))
  .then((subres) => mul(subres))
  .then((mulres) => div(mulres))
  .then((divres) => console.log(divres))
  .catch((error) => console.error(error));
```

Promises aysnchronous

```
 let promise1= new Promise((resolve,reject)=>{
  console.log("promise 1");
  setTimeout(resolve, 2000, "promise 1 success")
})

let promise2= new Promise((resolve,reject)=>{
  console.log("promise 2");
  setTimeout(resolve, 1500, "promise 2 success")
})

let promise3= new Promise((resolve,reject)=>{
  console.log("promise 3");
  setTimeout(resolve, 1800, "promise 3 success")
})

let promise4= new Promise((resolve,reject)=>{
  console.log("promise 4");
  setTimeout(resolve, 500, "promise 4 success")
})


promise1.then((resolve)=>{console.log(resolve)})
promise2.then((resolve)=>{console.log(resolve)})
promise3.then((resolve)=>{console.log(resolve)})
promise4.then((resolve)=>{console.log(resolve)})
```

```
//convert synchronous to aynchronous
   promise1
     .then((result) => {
       console.log(result);
       return promise2;
     })
     .then((result) => {
       console.log(result);
       return promise3;
     })
```

```
.then((result) => {
  console.log(result);
  return promise4;
})
.then((result) => {
  console.log(result);
});
```

Async/Await

Async/await is a modern feature in JavaScript that simplifies working with asynchronous code, especially when dealing with Promises. It allows you to write asynchronous code in a synchronous-like manner, making it easier to read, write, and maintain.

1. **Async Functions**: An async function is a function that operates asynchronously via the event loop. You declare an async function by prefixing the function declaration with the **async** keyword.

```
async function myAsyncFunction() {
  // Asynchronous code here
}
```

2. **Await Keyword:** The await keyword is used inside an async function to pause the execution of the function until a Promise is settled (resolved or rejected). It allows you to write code that looks synchronous but behaves asynchronously.

```
async function myAsyncFunction() {
  const result = await somePromise;
  // Code here executes after somePromise is resolved
}
```

Example

```
//promise is created
   function apromise() {
     return new Promise(function (res, rej) {
       var a = 20;
       if (a % 2 == 0) {
         res("num is even");
       } else {
         rej("num is odd");
       }
     });
   }

//resolving the promise value using async/await
   async function asyncfun() {
     var v = await apromise();
     console.log(v);
   }
   asyncfun();
```

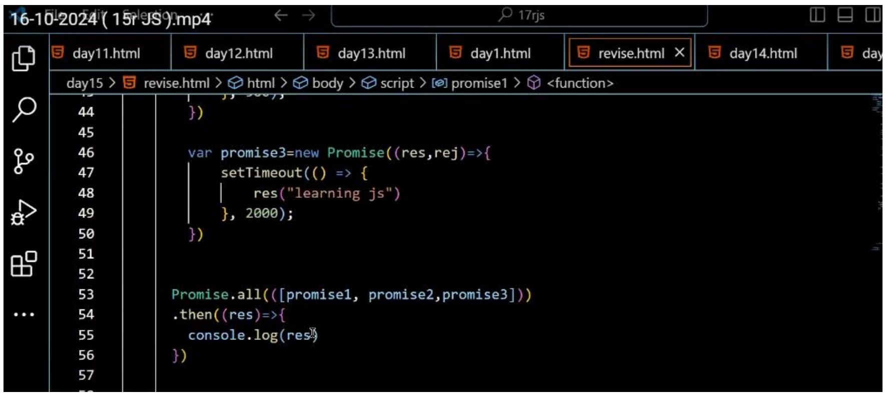
//callback hell

```
     async function executor(){
       var addres=await add(10);
       var subres=await sub(addres);
```

```
    var mulres=await mul(subres);
    var divres=await div(mulres);
    console.log(divres);
  }
  executor()
```

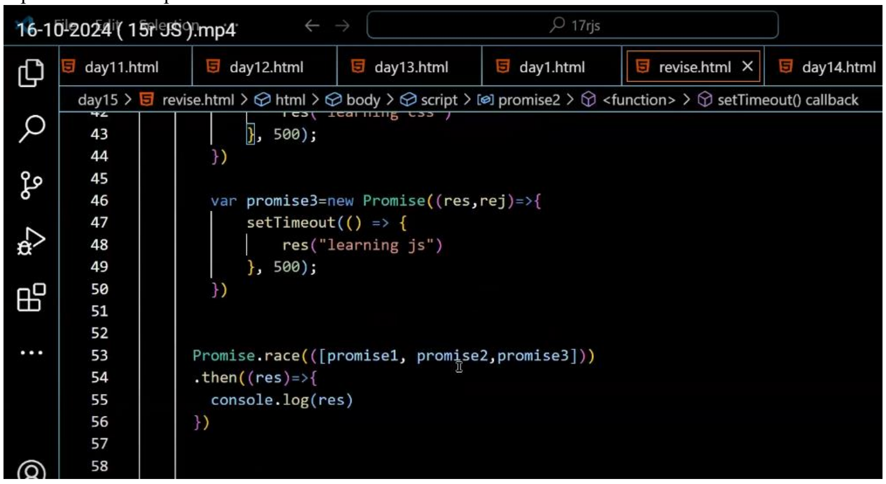
//asynchronous

```
async function executor() {
  let result1 = await promise1;
  console.log(result1);

  let result2 = await promise2;
  console.log(result2);

  let result3 = await promise3;
  console.log(result3);

  let result4 = await promise4;
  console.log(result4);
}
executor();
```


16-10-2024 (15r JS).mp4
17rjs
day11.html
day12.html
day13.html
day1.html
revise.html
day14.html
day15 > revise.html > html > body > script > promise1 > <function>

```
        })

        var promise3=new Promise((res,rej)=>{
            setTimeout(() => {
                res("learning js")
            }, 2000);
        })


      Promise.all(([promise1, promise2,promise3]))
      .then((res)=>{
        console.log(res)
      })
```

// promise.all   --> print all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17rjs
day11.html
day12.html
day13.html
day1.html
revise.html
day14.html
day15 > revise.html > html > body > script > promise2 > <function> > setTimeout() callback

```
            }, 500);
        })

        var promise3=new Promise((res,rej)=>{
            setTimeout(() => {
                res("learning js")
            }, 500);
        })


      Promise.race(([promise1, promise2,promise3]))
      .then((res)=>{
        console.log(res)
      })
```

//race – it declares the winner