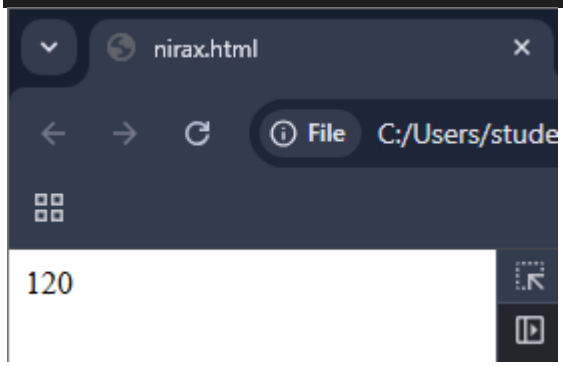
Recursion and stack:

Task 1:

Implement a function to calculate the factorial of a number using recursion.

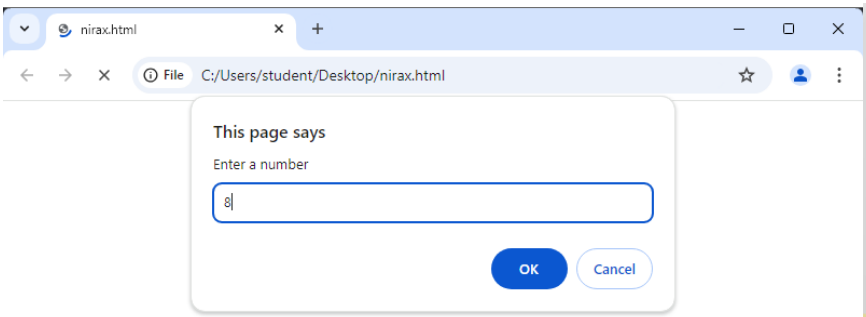
```
<html>
   <body>
    <script>
        function fun(x){
            if(x===0)return 1;
            return x*fun(x-1);
        }
        document.writeln(fun(5));
    </script>
   </body>
</html>
```

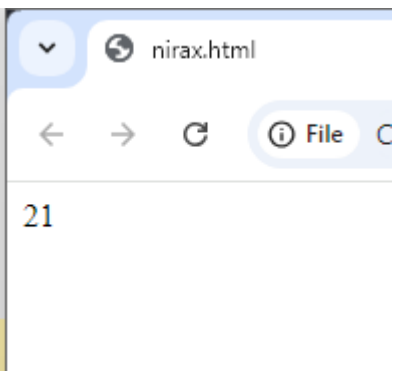


Task 2:

Write a recursive function to find the nth Fibonacci number.

```
<html>
   <body>
    <script>
        function fibo(n){
            if(n <= 1)
                return n;
            return fibo(n-1)+fibo(n-2);
        }
        let n=parseInt(prompt("Enter a number"));
        document.writeln(fibo(n))

    </script>
   </body>
</html>
```

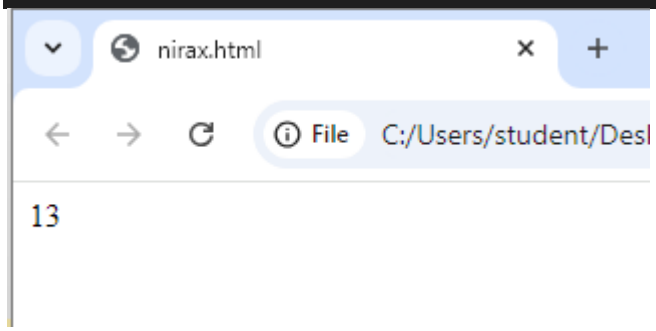




Task 3:

Create a function to determine the total number of ways one can climb a staircase with 1, 2, or 3 steps at a time using recursion.

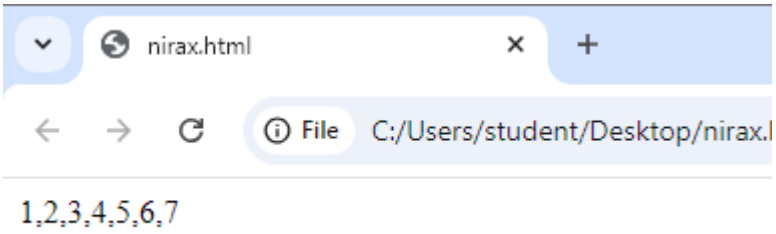
```
<html>
   <body>
    <script>
        function climb(x){
            if(x===0) return 1;
            if(x< 0) return 0;
            return climb(x-1)+climb(x-2)+climb(x-3);
        }
        document.writeln(climb(5));
    </script>
   </body>
</html>
```



Task 4:

Write a recursive function to flatten a nested array structure.

```
<html>
   <body>
    <script>
        function flatten(arr) {
            let result = [];

            for (let element of arr) {
              if (Array.isArray(element)) {
                result = result.concat(flatten(element));
              } else {
                result.push(element);
              }
            }

            return result;
        }
        document.writeln(flatten([1,2,[3,4,5],6,7]));
    </script>
   </body>
</html>
```

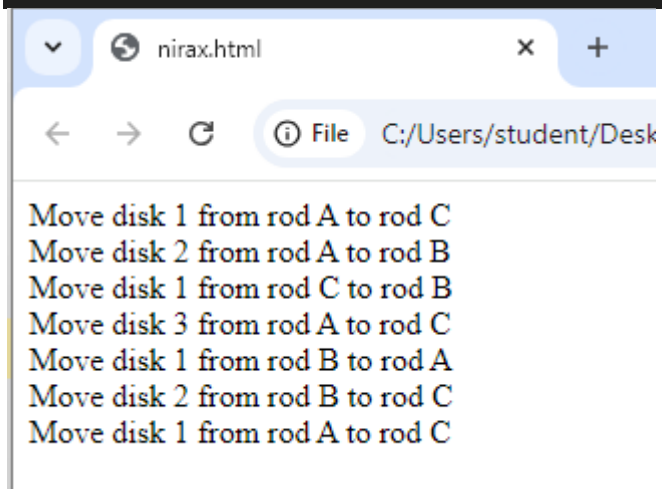


1,2,3,4,5,6,7

Task 5:

Implement the recursive Tower of Hanoi solution.

```
<html>
   <body>
    <script>
        function towerOfHanoi(n, from_rod,  to_rod,  aux_rod)
        {
        if (n == 0)
        {
            return;
        }
        towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);
        document.write("Move disk " + n + " from rod " + from_rod +
        " to rod " + to_rod+"<br/>");
        towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
    }
    var N = 3;
    towerOfHanoi(N, 'A', 'C', 'B');
</script>
   </body>
</html>
```

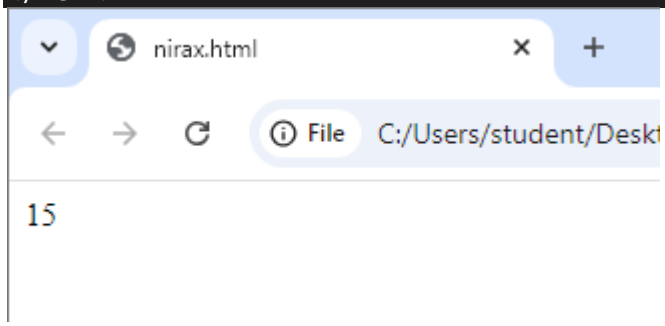


JSON and variable length arguments/spread syntax:

Task 1:

Write a function that takes an arbitrary number of arguments and returns their sum.

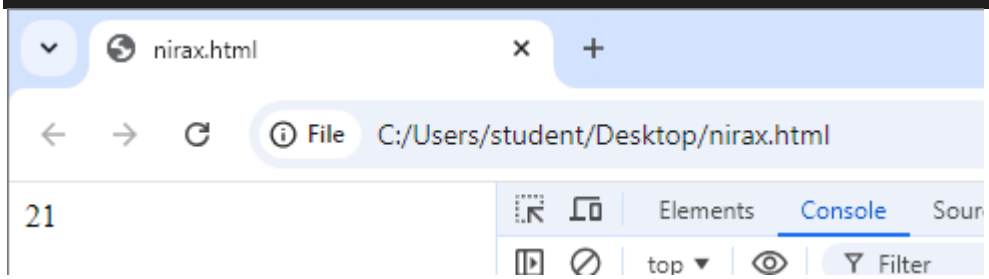
```
<html>
   <body>
    <script>
        function add(...arr){
            return arr.reduce((sum,cur)=>sum+cur,0);
        }
        document.writeln(add(1,2,3,4,5));
</script>
   </body>
</html>
```



Task 2:

Modify a function to accept an array of numbers and return their sum using the spread syntax.

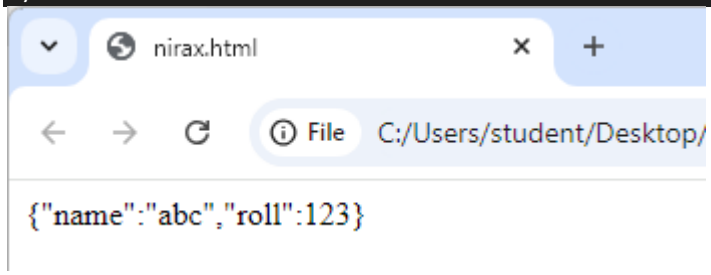
```
<html>
   <body>
    <script>
        function add(...arr){
            return arr.reduce((sum,cur)=>sum+cur,0);
        }
        function num(nums){
            return add(...nums);
        }
        document.writeln(num([1,2,3,4,5,6]));
</script>
   </body>
</html>
```



Task 3:

Create a deep clone of an object using JSON methods

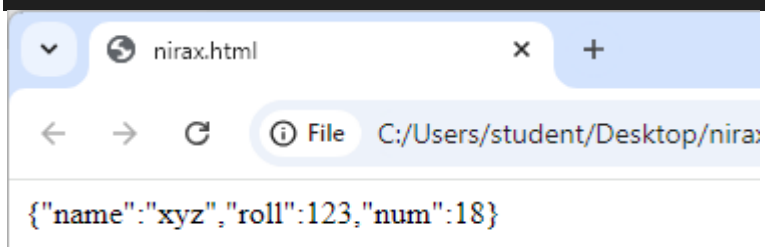
```
<html>
   <body>
    <script>
        const std={
            name:"abc",
            roll:123
        };
        const p={...std};
        document.writeln(JSON.stringify(p));
    </script>
   </body>
</html>
```



Task 4:

Write a function that returns a new object, merging two provided objects using the spread syntax.

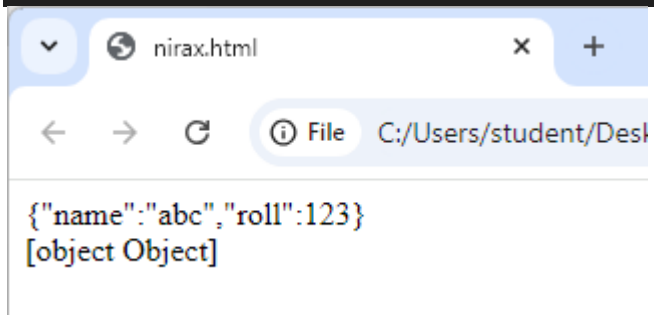
```
<<html>
   <body>
    <script>
        const std={
            name:"abc",
            roll:123
        };
        const player={
            name:"xyz",
            num:18
        }
        const p={...std,...player};
        document.writeln(JSON.stringify(p));
    </script>
   </body>
</html>
```



Task 5:

Serialize a JavaScript object into a JSON string and then parse it back into an object.

```
<html>
   <body>
    <script>
        const std={
            name:"abc",
            roll:123
        };
        const p=JSON.stringify({...std});
        document.writeln(p+"<br>");
        const x=JSON.parse(p);
        document.writeln(x);
    </script>
   </body>
</html>
```

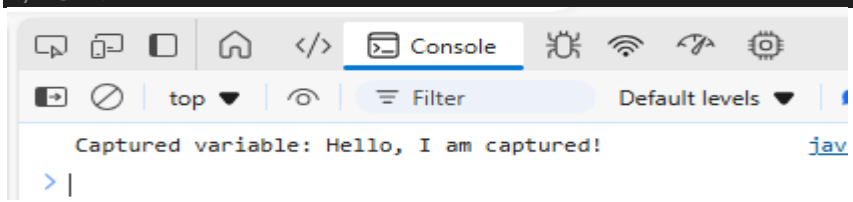


Closure:

Task 1:

Create a function that returns another function, capturing a local variable.

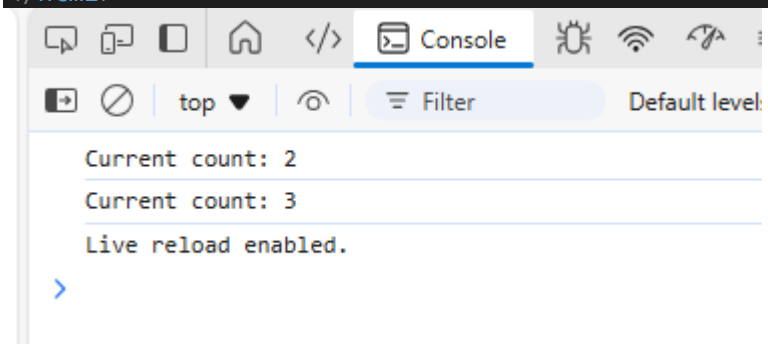
```
<!DOCTYPE html>
<html>
<head>
    <title>Document</title>
</head>
<body>
    <script>
        function outer(outerVar) {
        return function inner() {
        console.log(`Captured variable: ${outerVar}`);
    };
}
const closure = outer("Hello, I am captured!");
closure();

    </script>
</body>
</html>
```



Task 2:

Implement a basic counter function using closure, allowing incrementing and displaying the current count.

```
<!DOCTYPE html>
<html>
<head>
    <title>Document</title>
</head>
<body>
    <script>
        function createCounter() {
    let count = 0;
    return {
        increment: function() {
            count++;
        },
        getCount: function() {
            console.log(`Current count: ${count}`);
        }
    };
}

const counter = createCounter();
counter.increment();
counter.increment();
counter.getCount();

counter.increment();
counter.getCount();

    </script>
</body>
</html>
```

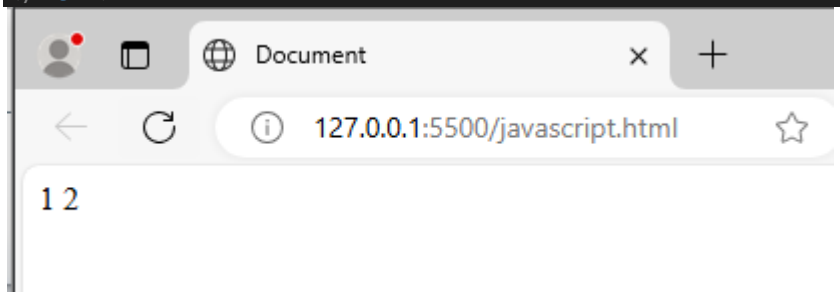


Task 3:

Write a function to create multiple counters, each with its own separate count

```
<!DOCTYPE html>
<html>
<head>
    <title>Document</title>
</head>
<body>
    <script>
        function counter(){
            let cnt=0;
            return {
                inc:function(){
```

```
                cnt++;
            },
            getcnt:function (){
                return cnt;
            }
        };
    }
    const c1=counter();
    const c2=counter();

    c1.inc();
    document.writeln(c1.getcnt());
    c2.inc();
    c2.inc();
    document.writeln(c2.getcnt());

</script>
</body>
</html>
```

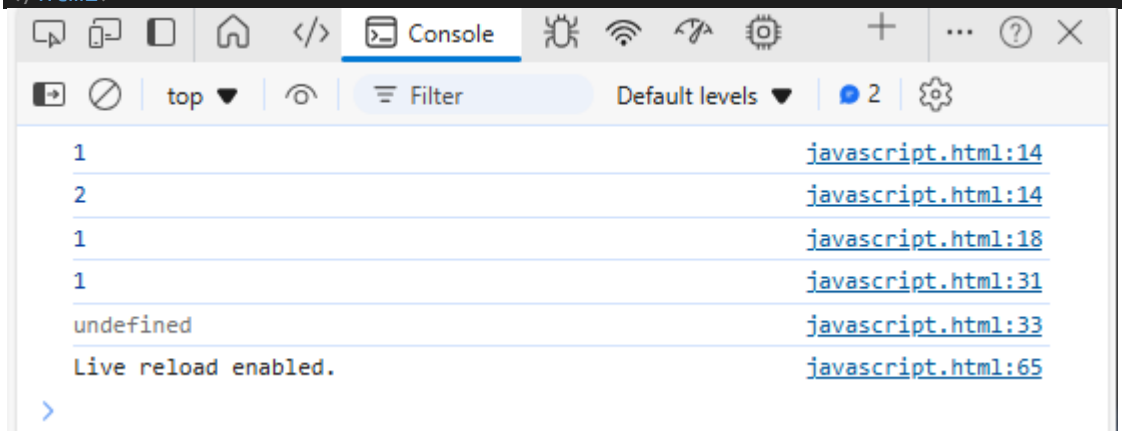


Task 4:

Use closures to create private variables within a function.

```
<!DOCTYPE html>
<html>
<head>
    <title>Document</title>
</head>
<body>
    <script>
        function createCounter() {
  let count = 0;

  return {
    increment: function() {
      count++;
      console.log(count);
    },
    decrement: function() {
      count--;
      console.log(count);
    },
    getCount: function() {
      return count;
    }
  };
}
```

```
const counter = createCounter();

counter.increment();
counter.increment();
counter.decrement();
console.log(counter.getCount());

console.log(counter.count);



    </script>
</body>
</html>
```

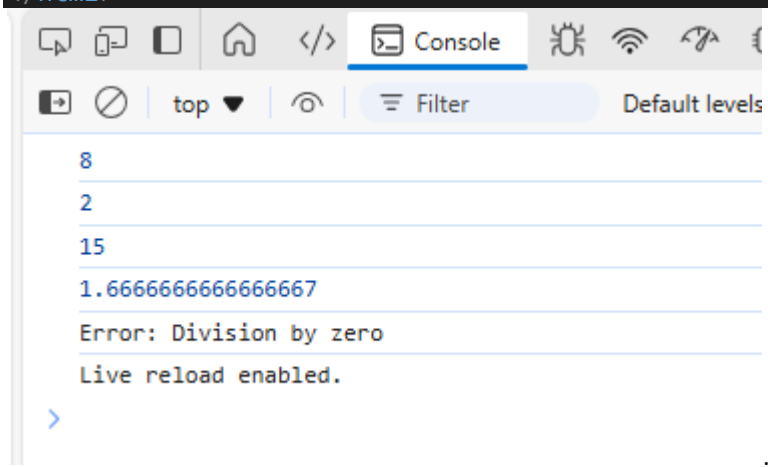


Task 5:

Build a function factory that generates functions based on some input using closures

```
<!DOCTYPE html>
<html>
<head>
    <title>Document</title>
</head>
<body>
    <script>
        function createOperation(operator) {
  return function(a, b) {
    switch (operator) {
      case 'add':
        return a + b;
      case 'subtract':
        return a - b;
      case 'multiply':
        return a * b;
      case 'divide':
        if (b === 0) {
          return 'Error: Division by zero';
        }
        return a / b;
      default:
        return 'Invalid operator';
    }
  };
}
```

```
const add = createOperation('add');
const subtract = createOperation('subtract');
const multiply = createOperation('multiply');
const divide = createOperation('divide');

console.log(add(5, 3));
console.log(subtract(5, 3));
console.log(multiply(5, 3));
console.log(divide(5, 3));
console.log(divide(5, 0));


    </script>
</body>
</html>
```

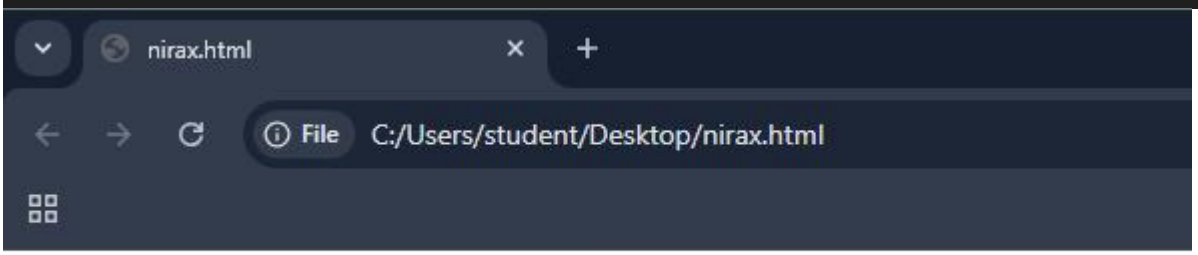


Promise, Promises chaining:

Task 1:

Create a new promise that resolves after a set number of seconds and returns a greeting

```
<html>
   <body>
    <script>
        function greetings(){
            return new Promise(()=>{
                setTimeout(()=>{
                    document.writeln("Good afternoon");
                },3000)
            })
        }
        let gd1=greetings();
    </script>
   </body>
</html>
```

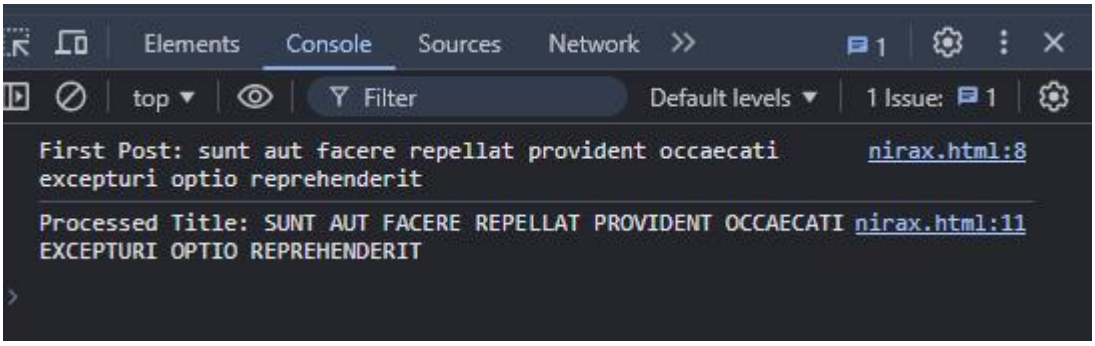


Good afternoon

Task 2:

Fetch data from an API using promises, and then chain another promise to process this data

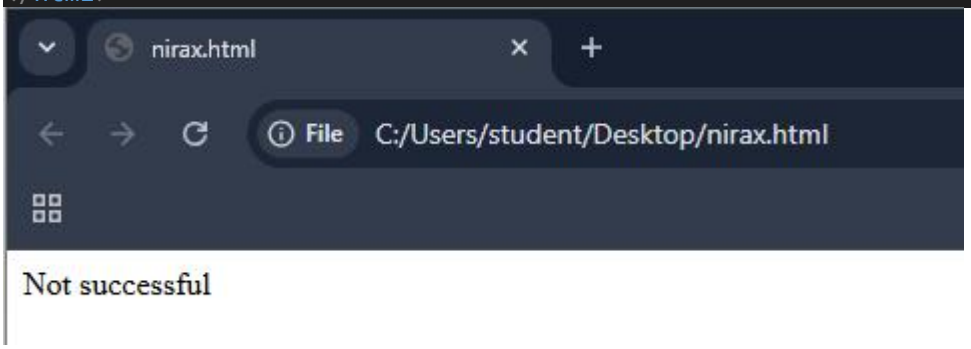
```
<html>
   <body>
    <script>
        fetch('https://jsonplaceholder.typicode.com/posts')
        .then(response => response.json())
        .then(data => {
        const firstPost = data[0];
        console.log('First Post:', firstPost.title);
        return firstPost.title.toUpperCase();  })
        .then(upperCaseTitle => {
        console.log('Processed Title:', upperCaseTitle);
        })
        .catch(error => {
        console.error('Error fetching data:', error);
        });

    </script>
   </body>
</html>
```



Task 3:

Create a promise that either resolves or rejects based on a random number.

```
<html>
   <body>
    <script>
        let prom=new Promise((resolve,reject)=>{
            const x=0;
            if(x==0) resolve("Success");
            else resolve("Not successful");
        });
        prom.then(result=>{
            document.writeln(result);
        })
        .catch(error=>{
            document.writelnerror(error);
        });

    </script>
   </body>
</html>
```

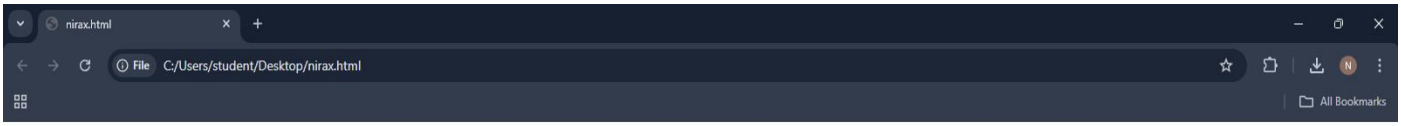


Task 4:

Use Promise.all to fetch multiple resources in parallel from an API.

```
<html>
   <body>
    <script>
        const urls = [
  'https://jsonplaceholder.typicode.com/todos/1',
  'https://jsonplaceholder.typicode.com/todos/2',
  'https://jsonplaceholder.typicode.com/todos/3'
];

function fetchData(url) {
  return fetch(url)
```

```
    .then(response => {
      if (!response.ok) {
        throw new Error(`HTTP error! Status: ${response.status}`);
      }
      return response.json();
    })
    .catch(error => {
      document.writeln(`Error fetching ${url}:`, error);
      throw error;
    });
}
Promise.all(urls.map(fetchData))
  .then(results => {
    document.writeln('All resources fetched:<br>', JSON.stringify(results));
  })
  .catch(error => {
    document.writeln('Error fetching resources:<br>', JSON.stringify(error));
  });
    </script>
   </body>
</html>
```



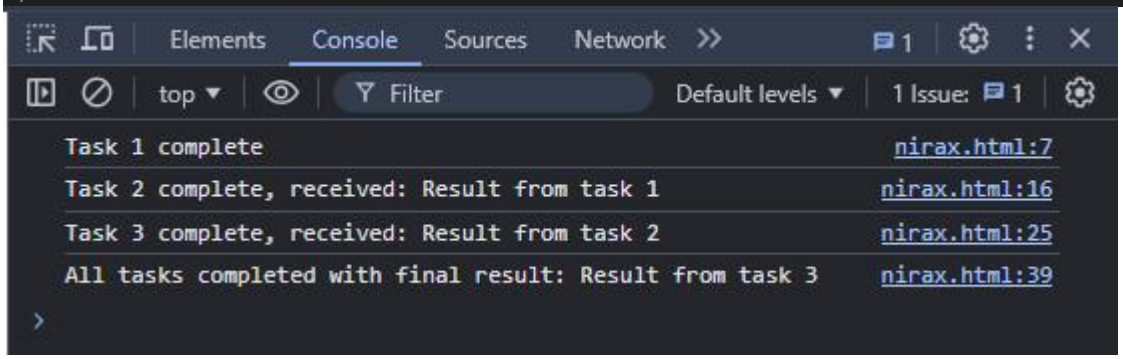
All resources fetched:
[{"userId":1,"id":1,"title":"delectus aut autem","completed":false},{"userId":1,"id":2,"title":"quis ut nam facilis et officia qui","completed":false},{"userId":1,"id":3,"title":"fugiat veniam minus","completed":false}]

Task 5:

Chain multiple promises to perform a series of asynchronous actions in sequence.

```
<html>
   <body>
    <script>
        function task1() {
            return new Promise((resolve, reject) => {
              setTimeout(() => {
                console.log("Task 1 complete");
                resolve("Result from task 1");
              }, 1000);
            });
          }

          function task2(resultFromTask1) {
            return new Promise((resolve, reject) => {
              setTimeout(() => {
                console.log("Task 2 complete, received:", resultFromTask1);
                resolve("Result from task 2");
              }, 1000);
            });
          }

          function task3(resultFromTask2) {
            return new Promise((resolve, reject) => {
              setTimeout(() => {
```

```
            console.log("Task 3 complete, received:", resultFromTask2);
            resolve("Result from task 3");
          }, 1000);
        });
      }

      task1()
        .then(result => {
          return task2(result);  // Pass result from task1 to task2
        })
        .then(result => {
          return task3(result);  // Pass result from task2 to task3
        })
        .then(result => {
          console.log("All tasks completed with final result:", result);
        })
        .catch(error => {
          console.error("An error occurred:", error);
        });

    </script>
  </body>
</html>
```



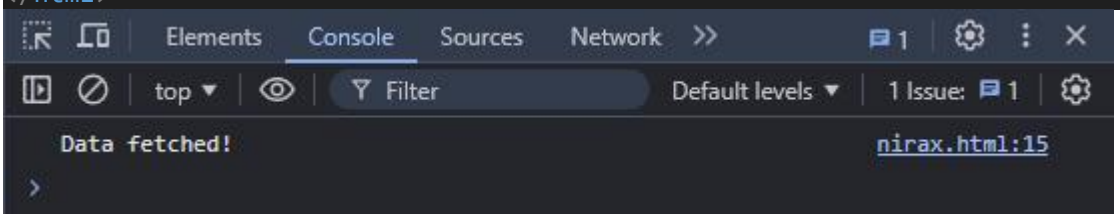
Async/await:

Task 1:

Rewrite a promise-based function using async/await

```
<html>
  <body>
    <script>
        async function fetchData() {
            return new Promise((resolve, reject) => {
              setTimeout(() => {
                resolve('Data fetched!');
              }, 2000);
            });
          }

          async function getData() {
            try {
              const result = await fetchData();
              console.log(result);
```

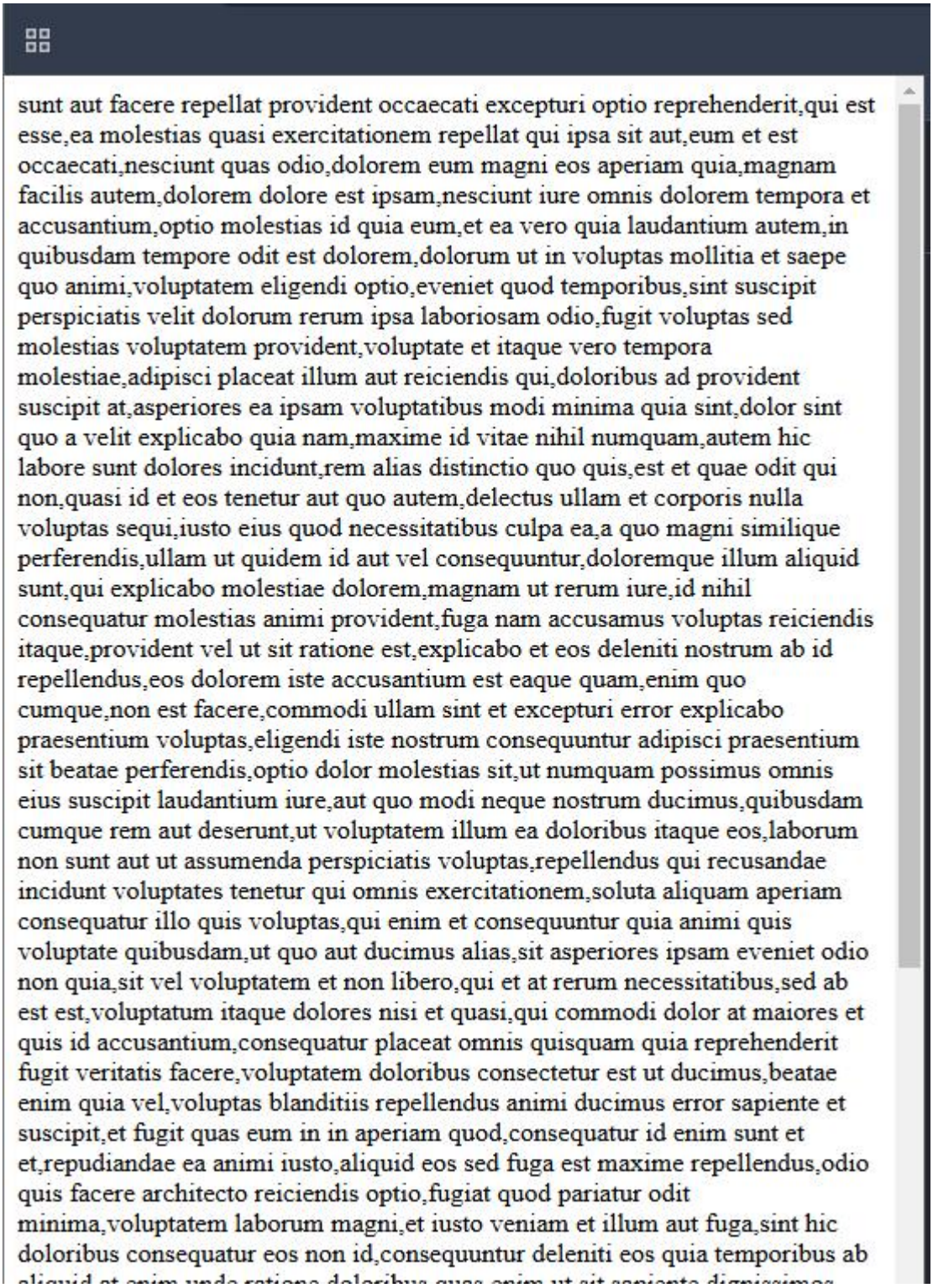
```
            } catch (error) {
              console.error(error);
            }
          }

          getData();


    </script>
   </body>
</html>
```



Task 2:

Create an async function that fetches data from an API and processes it.

```
<html>
   <body>
    <script>
        async function fetchAndProcessData() {
            try {
              const response = await fetch('https://jsonplaceholder.typicode.com/posts');
              const data = await response.json();
              const processedData = data.map(post => post.title); // Example processing:
extracting titles
              document.writeln(processedData);
            } catch (error) {
              document.writeln('Error fetching data:', error);
            }
          }

          fetchAndProcessData();
    </script>
   </body>
</html>
```



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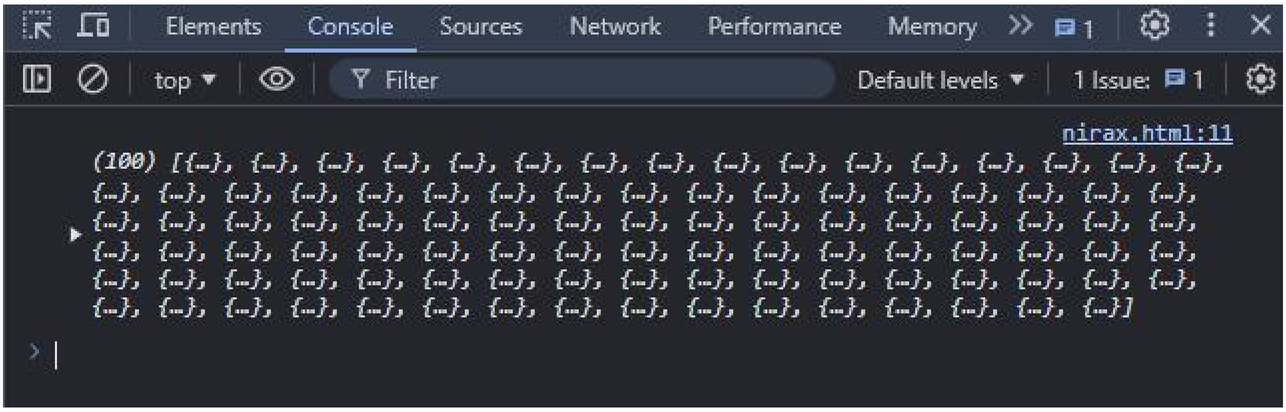
Task 3:

Implement error handling in an async function using try/catch.

```
<html>
   <body>
    <script>
        async function fetchDataWithErrorHandling() {
            try {
              const response = await fetch('https://jsonplaceholder.typicode.com/posts');
              if (!response.ok) {
                throw new Error('Network response was not ok');
              }
```

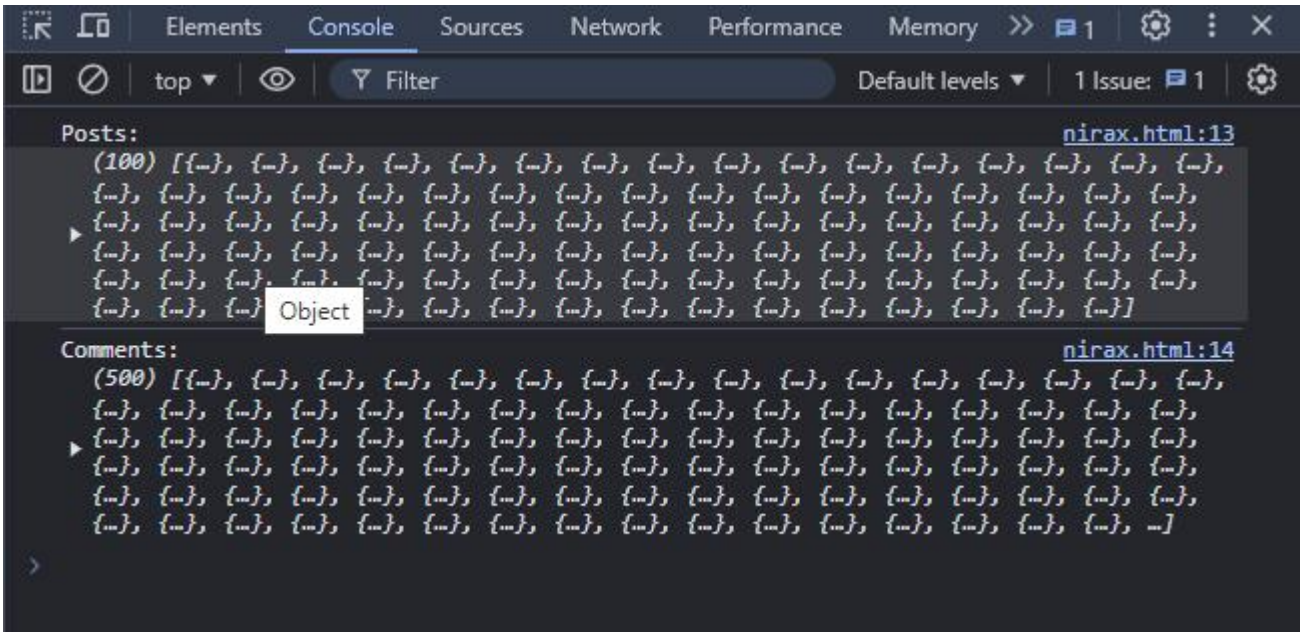
```
            const data = await response.json();
            console.log(data);
          } catch (error) {
            document.writeln('There was an error:', error.message);
          }
        }

        fetchDataWithErrorHandling();

    </script>
   </body>
</html>
```



Task 4:

Use async/await in combination with Promise.all.

```
<html>
   <body>
    <script>
        async function fetchMultipleResources() {
            try {
              const urls = [
                'https://jsonplaceholder.typicode.com/posts',
                'https://jsonplaceholder.typicode.com/comments'
              ];

              const [posts, comments] = await Promise.all(urls.map(url =>
fetch(url).then(response => response.json())));

              console.log('Posts:', posts);
              console.log('Comments:', comments);
            } catch (error) {
              console.error('Error fetching resources:', error);
            }
          }

        fetchMultipleResources();

    </script>
   </body>
</html>
```

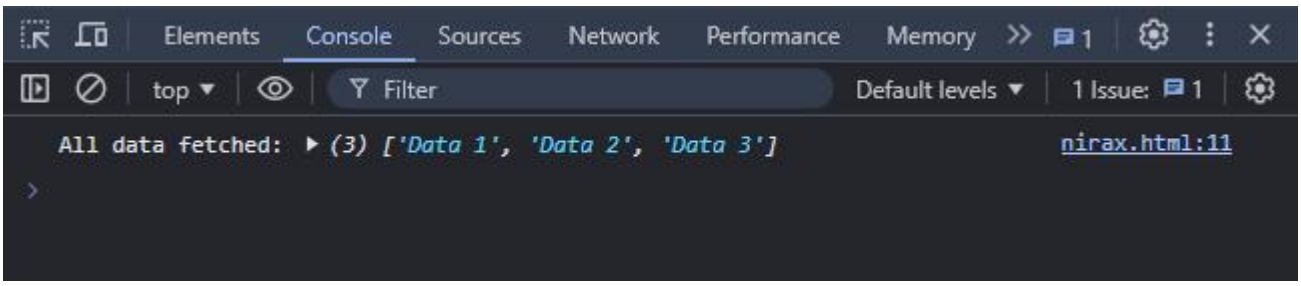


```
Posts:                                                                         nirax.html:13
▸ (100) [{…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}]
Comments:                                                                      nirax.html:14
▸ (500) [{…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…},
  {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, {…}, …]
>
```

Task 5:

Create an async function that waits for multiple asynchronous operations to complete before proceeding

```
<html>
   <body>
    <script>
        async function waitForAll() {
            const fetchData1 = new Promise(resolve => setTimeout(() => resolve('Data 1'),
2000));
            const fetchData2 = new Promise(resolve => setTimeout(() => resolve('Data 2'),
3000));
            const fetchData3 = new Promise(resolve => setTimeout(() => resolve('Data 3'),
1000));

            const results = await Promise.all([fetchData1, fetchData2, fetchData3]);

            console.log('All data fetched:', results);
          }

          waitForAll();
    </script>
   </body>
</html>
```



```
All data fetched: ▸ (3) ['Data 1', 'Data 2', 'Data 3']                        nirax.html:11
>
```

Modules introduction, Export and Import:

Task 1:

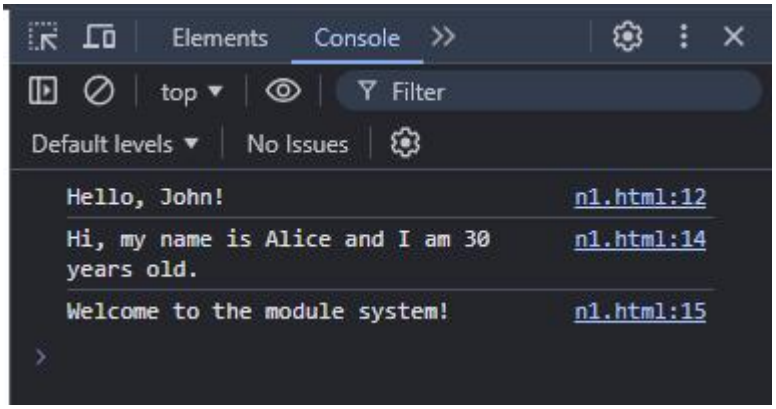
Create a module that exports a function, a class, and a variable.

```
export default function sayHello(name) {
  return `Hello, ${name}!`;
}

export class Person {
  constructor(name, age) {
      this.name = name;
      this.age = age;
  }
  greet() {
      return `Hi, my name is ${this.name} and I am ${this.age} years old.`;
  }
}
export const greetingMessage = 'Welcome to the module system!';
```

Task 2:

Import the module in another JavaScript file and use the exported entities

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <script type="module">
        import sayHello, { Person, greetingMessage } from './module.js';

        console.log(sayHello('John'));
        const person = new Person('Alice', 30);
        console.log(person.greet());
        console.log(greetingMessage);
    </script>
</body>
</html>
```



Task 3:

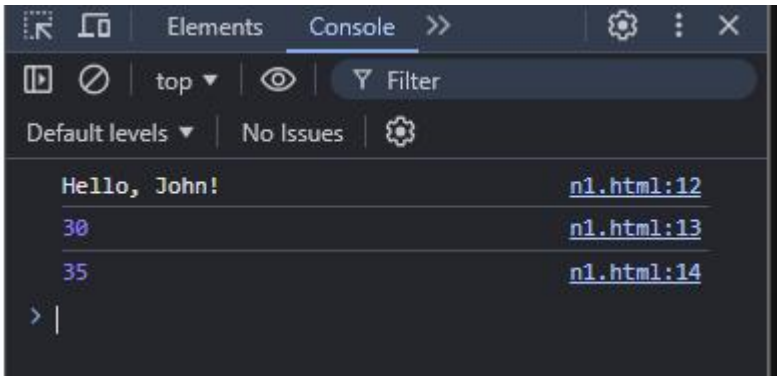
Use named exports to export multiple functions from a module.

```
export function sayHello(name) {
  return `Hello, ${name}!`;
}

export function add(a,b) {
  return a+b;
}
export function mul(a,b) {
  return a*b;
}
```

Task 4:

Use named imports to import specific functions from a module.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <script type="module">
        import {sayHello,add,mul} from './module.js';

        console.log(sayHello('John'));
        console.log(add(10,20));
        console.log(mul(5,7));
    </script>
</body>
</html>
```

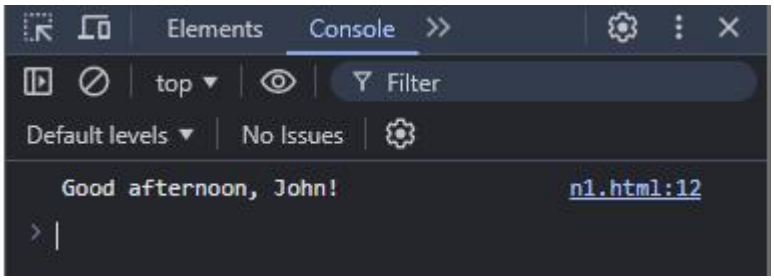


Task 5:

Use default export and import for a primary function of a module.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <script type="module">
        import Greetings from './module.js';

        console.log(Greetings('John'));
    </script>
</body>
</html>
```

```
export default function Greetings(name) {
  return `Good afternoon, ${name}!`;
}
```



Browser: DOM Basics:

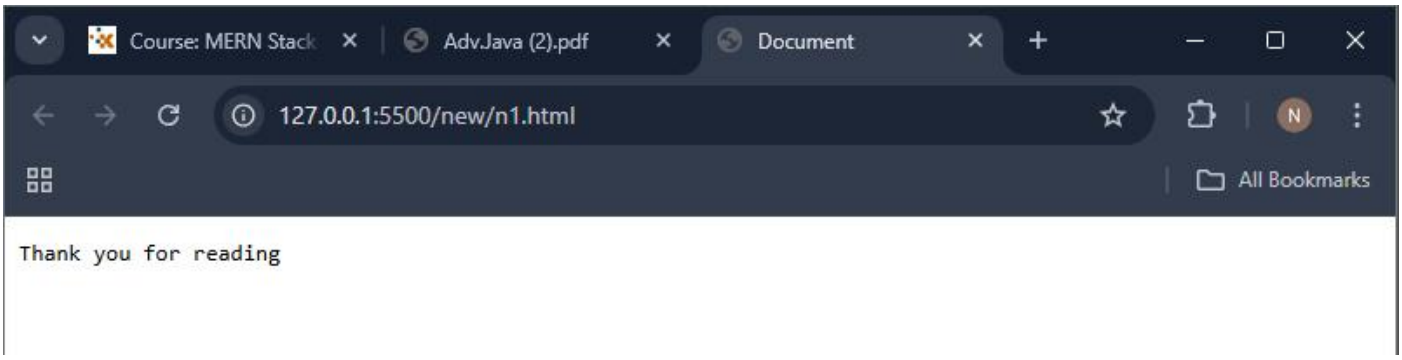
Task 1:

Select an HTML element by its ID and change its content using JavaScript.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <pre id="parah">
A paragraph is a series of related sentences developing a central idea, called the topic.
    </pre>
    <script src="module.js">
    </script>
</body>
</html>
```

Module.js file

```
document.getElementById("parah").innerHTML="Thank you for reading"
```



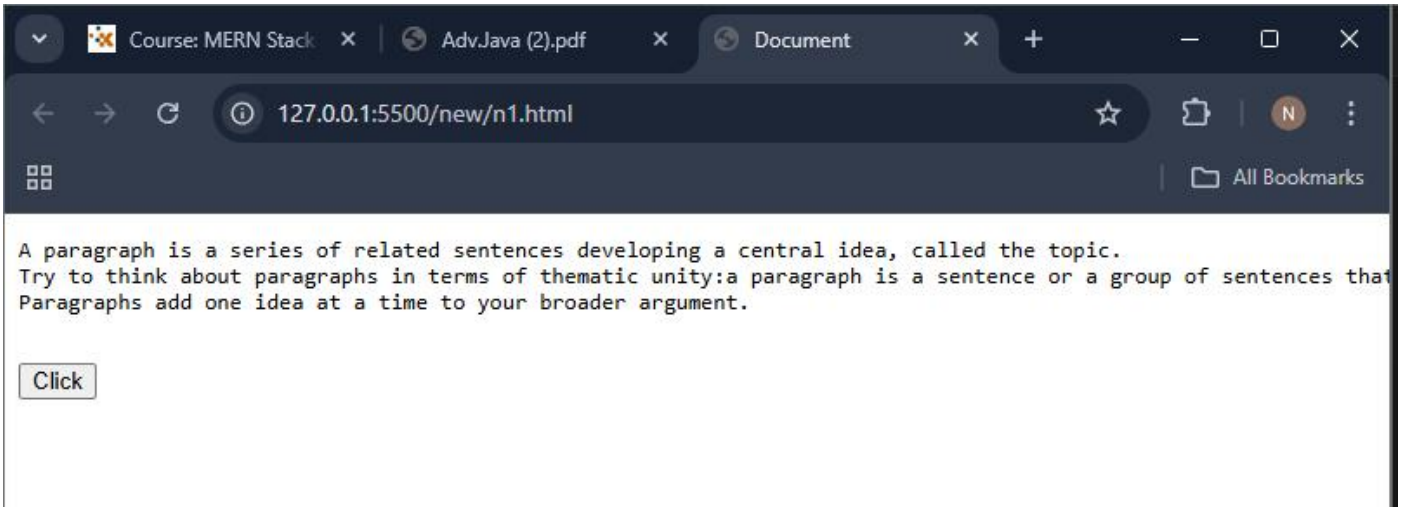
Task 2:

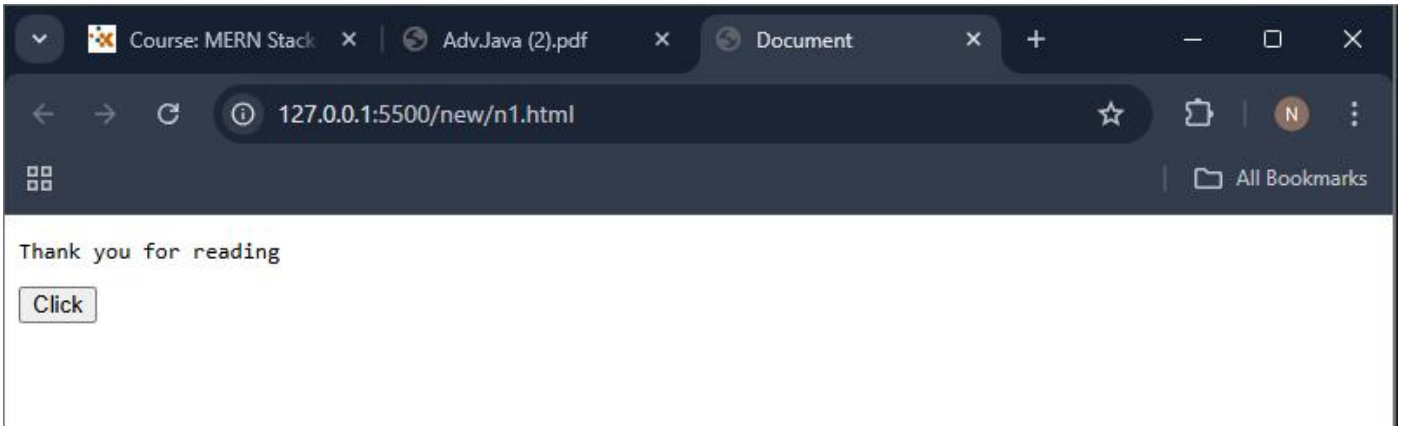
Attach an event listener to a button, making it perform an action when clicked.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <pre id="parah">
A paragraph is a series of related sentences developing a central idea, called the topic.
Try to think about paragraphs in terms of thematic unity:a paragraph is a sentence or a
group of sentences that supports one central, unified idea.
Paragraphs add one idea at a time to your broader argument.
    </pre>
    <script src="module.js">
    </script>
</body>
</html>
```

Module.js file

```
const myb=document.createElement("button");
myb.textContent="Click";
myb.onclick=()=>{
document.getElementById("parah").innerHTML="Thank you for reading"
}
document.body.append(myb);
```





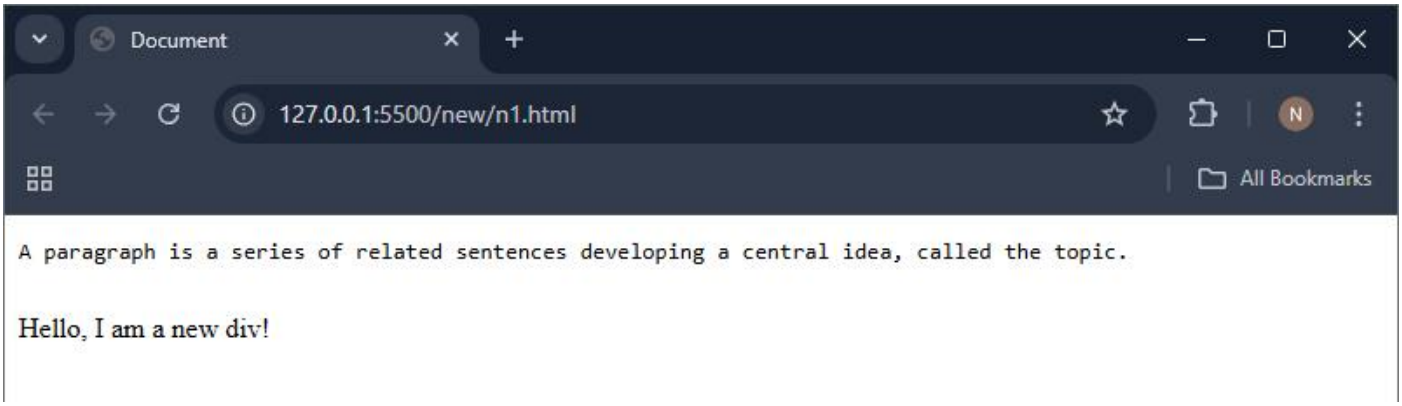
Task 3:

Create a new HTML element and append it to the DOM.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <pre id="parah">
A paragraph is a series of related sentences developing a central idea, called the topic.
    </pre>
    <script src="module.js">
    </script>
</body>
</html>
```

Module.js file

```
const newDiv = document.createElement("div");
newDiv.textContent = "Hello, I am a new div!";
document.body.appendChild(newDiv);
```



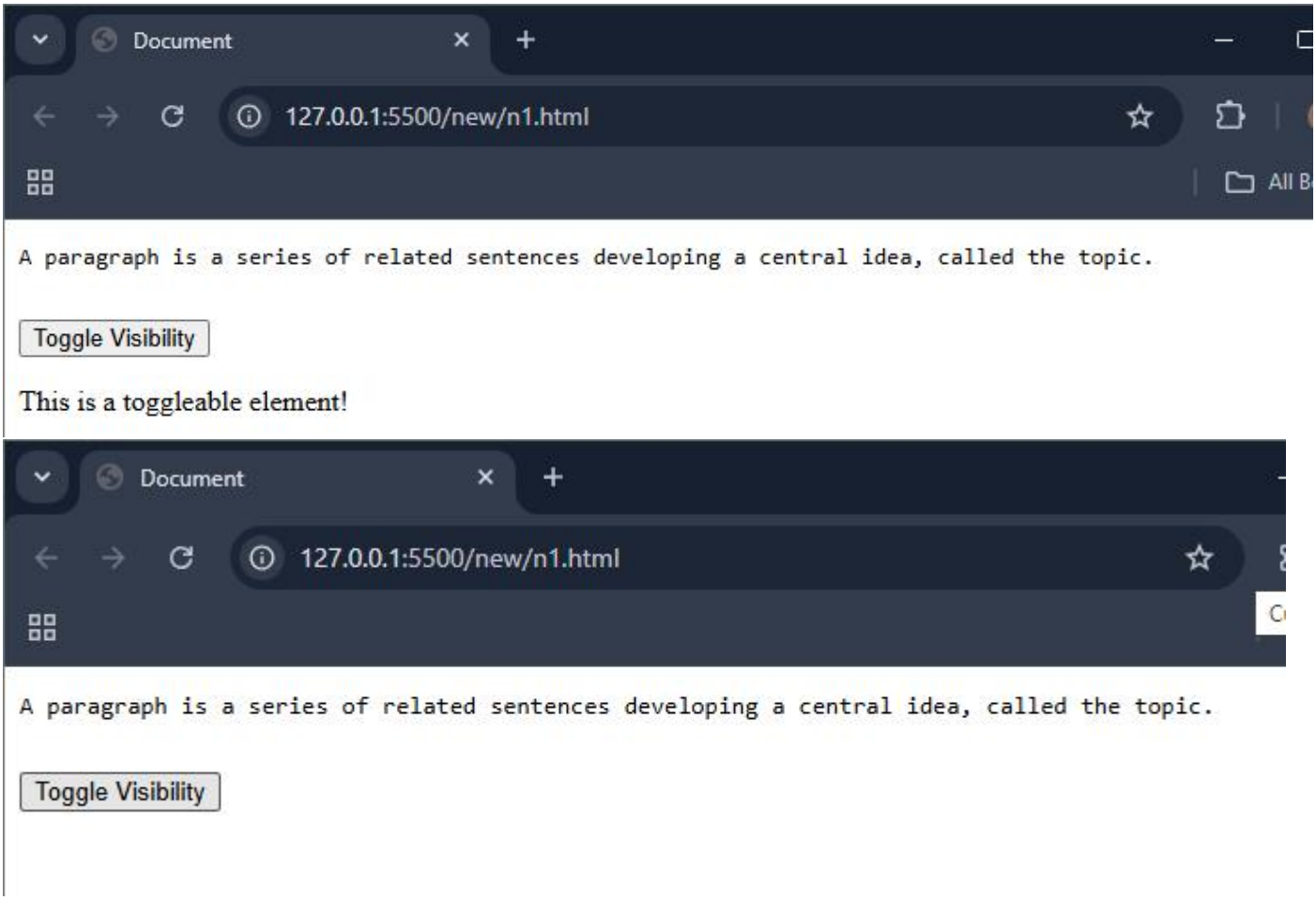
Task 4:

Implement a function to toggle the visibility of an element

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <pre id="parah">
A paragraph is a series of related sentences developing a central idea, called the topic.
    </pre>
    <button onclick="toggleVisibility('myDiv')">Toggle Visibility</button>
    <div id="myDiv">
        <p>This is a toggleable element!</p>
    </div>

    <script src="module.js">

    </script>
</body>
</html>
```

Module.js file

```
function toggleVisibility(elementId) {
  const element = document.getElementById(elementId);
  if (element.style.display === "none") {
      element.style.display = "block";
  } else {
      element.style.display = "none";
  }
}
```



Task 5:

Use the DOM API to retrieve and modify the attributes of an element.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>DOM Attribute Example</title>
</head>
<body>
    <button id="myButton" class="btn" data-info="1234">Click Me</button>

    <script>
        const button = document.getElementById('myButton');
        button.addEventListener('click', function() {
            console.log('Current Class:', button.getAttribute('class'));
            if (button.getAttribute('class') === 'btn') {
                button.setAttribute('class', 'newClass');
                button.textContent = 'You clicked me!';
            } else {
                button.setAttribute('class', 'btn');
                button.textContent = 'Click Me';
            }
            console.log('Data-info:', button.getAttribute('data-info'));
            if (button.getAttribute('data-info') === '1234') {
                button.setAttribute('data-info', '5678');
            } else {
```

```
                button.setAttribute('data-info', '1234');
            }
            console.log('Updated Data-info:', button.getAttribute('data-info'));
        });
    </script>
</body>
</html>
```