CSC-336
Web Technologies

Lecture 11

Topics:

- Event Listener, Annonymous Functions, Higher Order Functions
- JS Object, Switch, Methods , this operator
- Constructor functions, Call Back Functions

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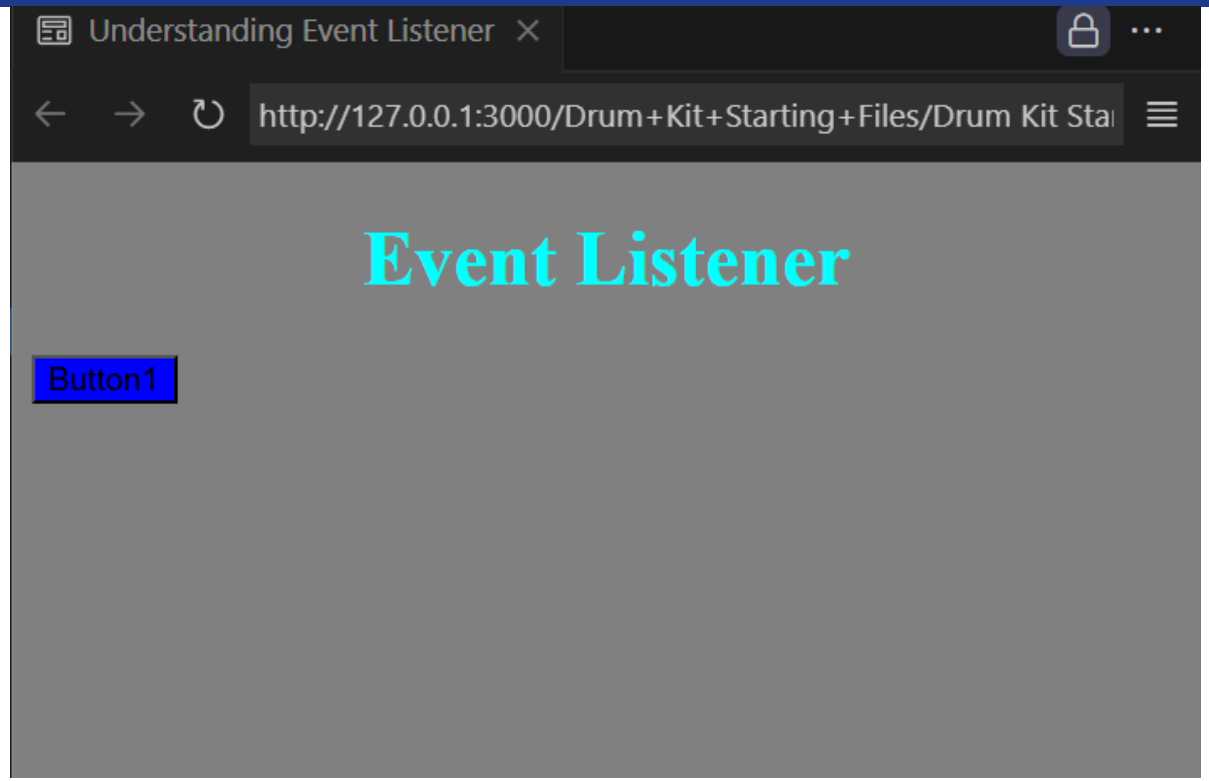
Understanding Event Listener

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>Understanding Event Listener</title>
   <link rel="stylesheet" href="style2.css">
</head>
<body>
   <H1>Event Listener</H1>
   <BUtton>Button1</BUtton>
</body>
</html>
```



- UI is ready.
- But interaction is missing!
- We need to add an event listener for click actions.”

Event Listeners

- The addEventListener() method is used to attach an event handler to a specified element (or event target). This allows you to execute a function whenever a certain type of event occurs on that element.

target.addEventListener(type, listener);

- Type: A **case-sensitive string** representing the event type to listen for (e.g., "click", "mouseover", "keydown").
- Listener: The function or object that will be called when the event occurs.
  - This can be:
    - A function: function(event) { /* code */ }
    - An object with a handleEvent() method
    - null, which effectively does nothing.

```
var obj = {
   handleEvent: function(event) {
      console.log("Event handled");
   }
};
element.addEventListener("click", obj);
```

Understanding Event Listener

```
<!DOCTYPE html>
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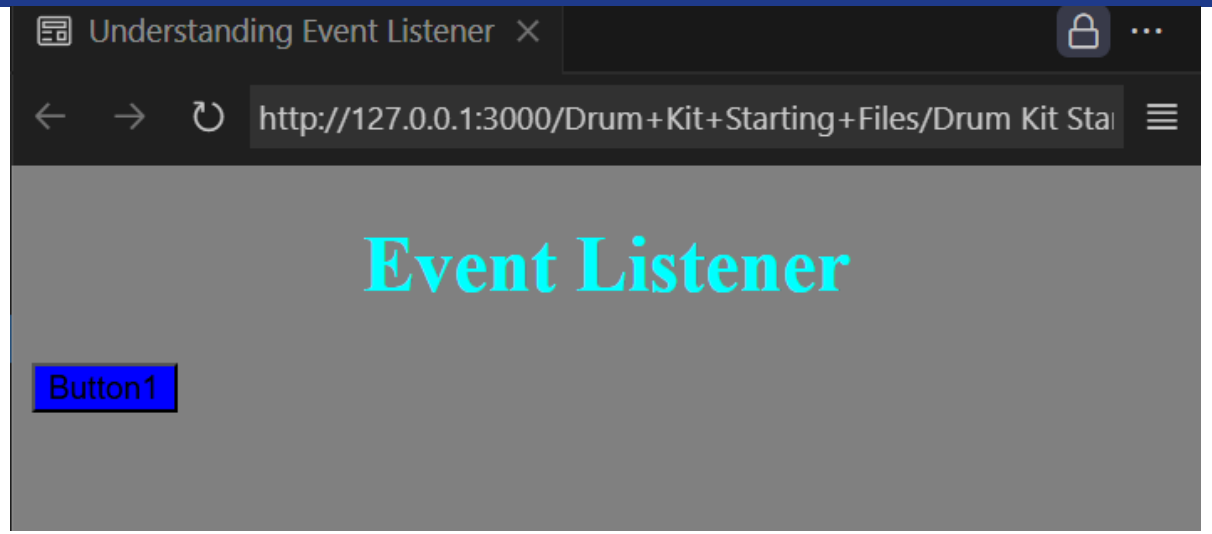
<head>
    <title>Understanding Event Listener</title>
   <link rel="stylesheet" href="style2.css">
</head>
<body>
   <H1>Event Listener</H1>
   <BUtton>Button1</BUtton>
<script src="index.js”></script>
</body>
</html>
```




```
document.querySelector("button").addEventListener("click",handleClick)
function handleClick() {
   alert("I got Clicked");
}
```

Understanding Event Listener

```
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   <link rel="stylesheet" href="style2.css">
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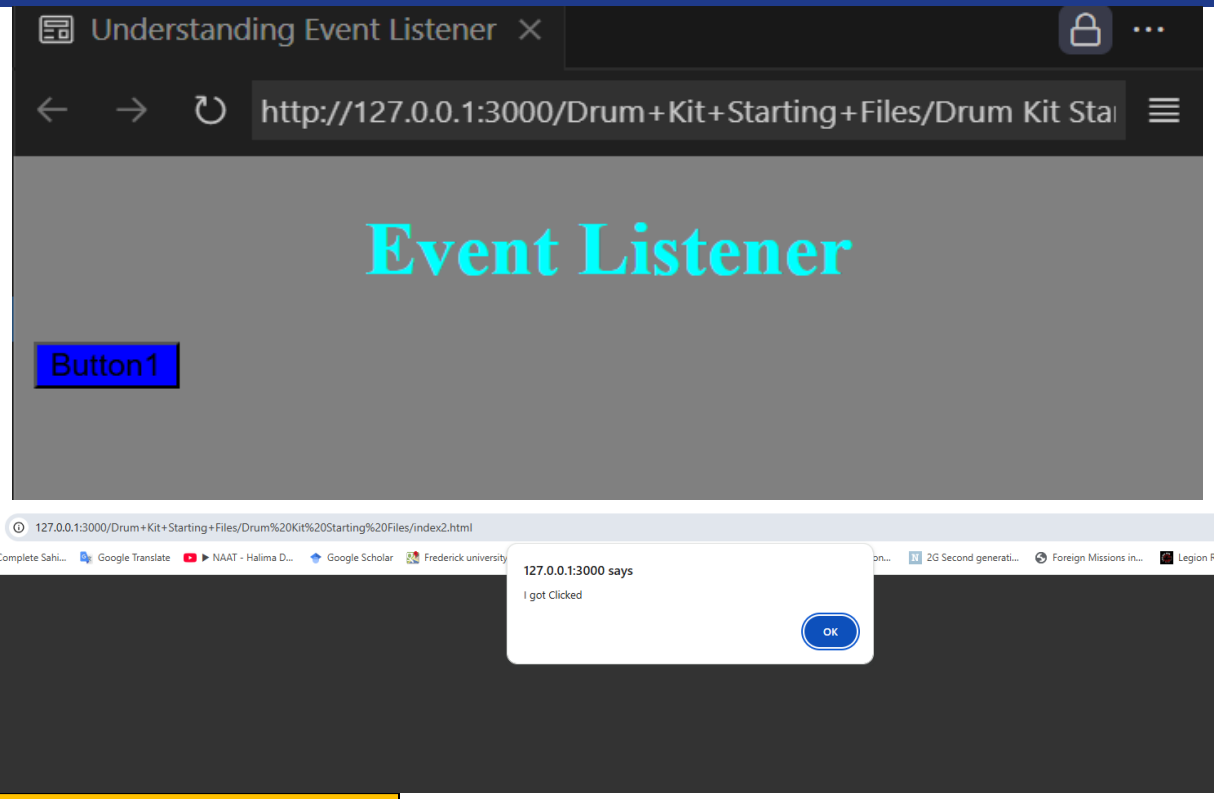


```
document.querySelector("button").addEventListener("click",handleClick)
function handleClick() {
   alert("I got Clicked");
}
```

Anonymous Functions

```
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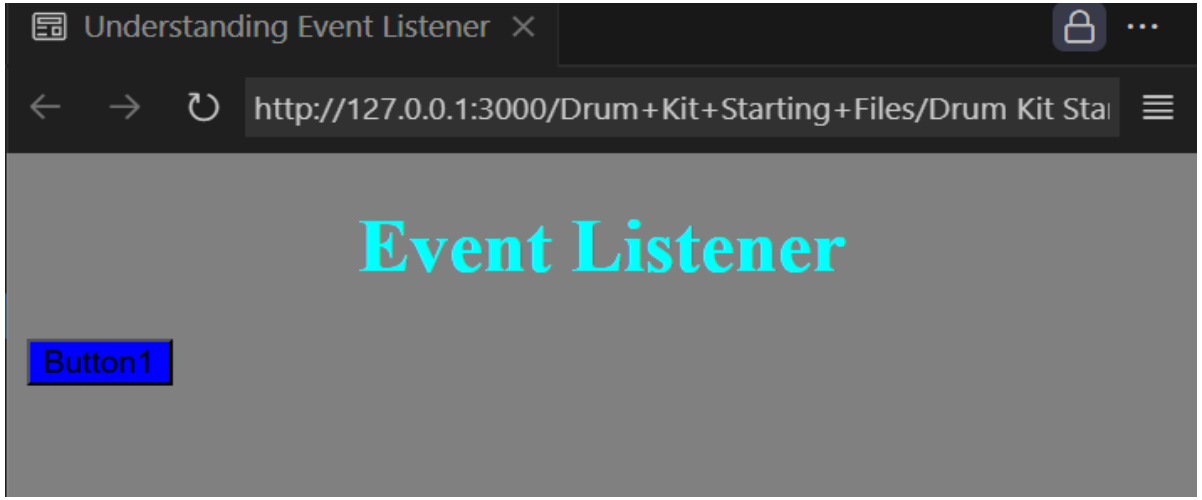
<script src="index.js”></script>
</body>
</html>
```




```
document.querySelector("button").addEventListener("click", function () {
   alert("I got Clicked");
})
```

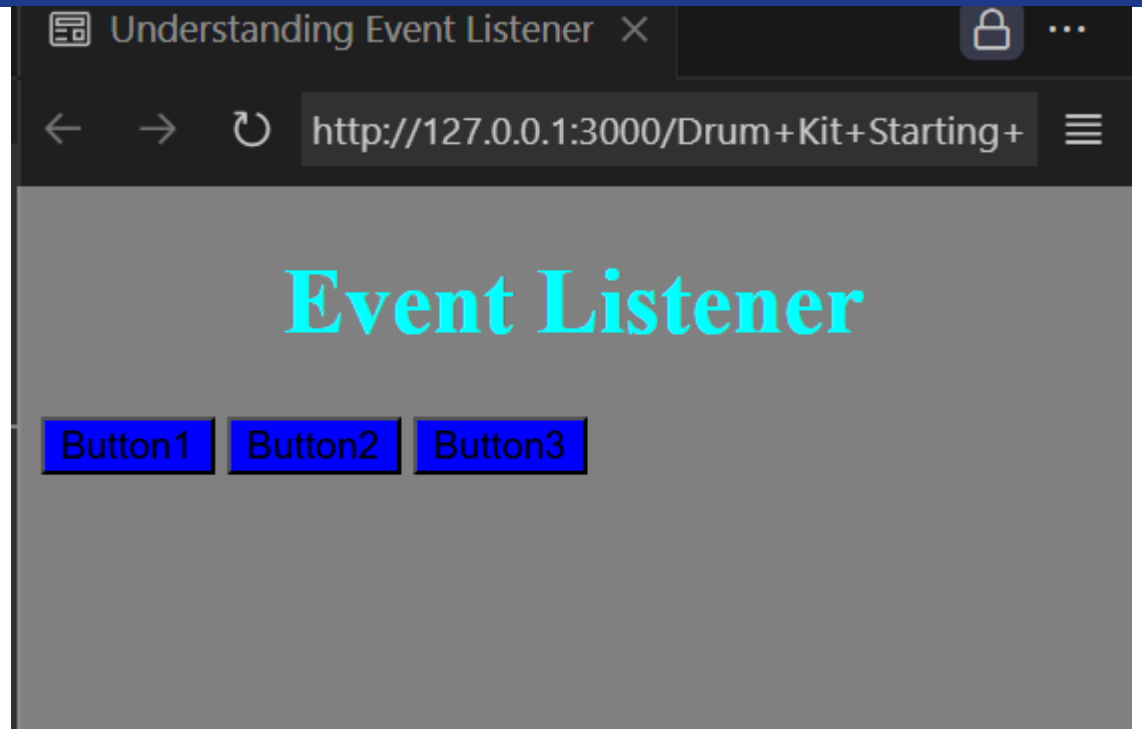
```
document.querySelector("button").addEventListener("click",handleClick)
function handleClick() {
   alert("I got Clicked");
}
```

Dealing with multiple Event Listeners

```
<body>

   <h1>Event Listener</h1>
  <button>Button1</button>
  <button>Button2</button>
  <button>Button3</button>
  <script src="index2.js" charset="utf-8">

  </script>
</body>
```




```
document.querySelector("button").addEventListener("click", function () {
   alert("I got Clicked");
})
```

Can you modify this JS code to apply it to multiple buttons

Dealing with multiple Event Listeners

```
<body>

   <h1>Event Listener</h1>
  <button>Button1</button>
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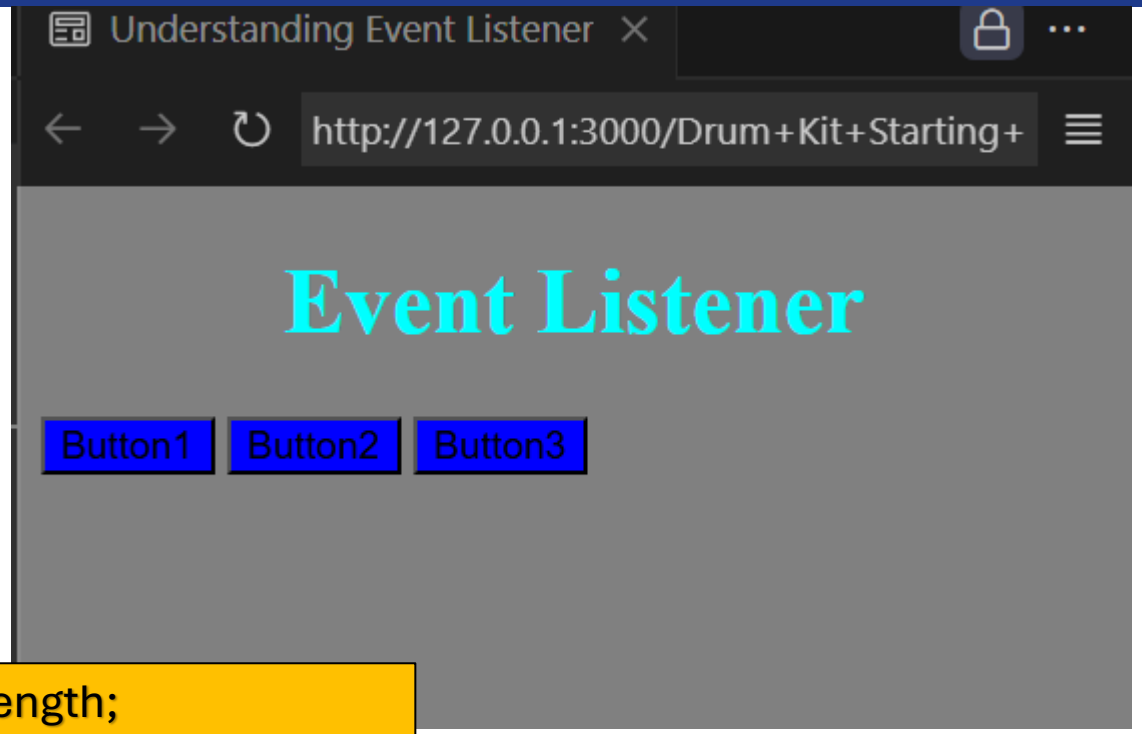
  <button>Button3</button>
  <script src="index2.js" charset="utf-8">

  </script>
</body>
```




```
numberOfButtons = document.querySelectorAll("button").length;
for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListener("click", function (){
   alert("I got Clicked");
})
}
```

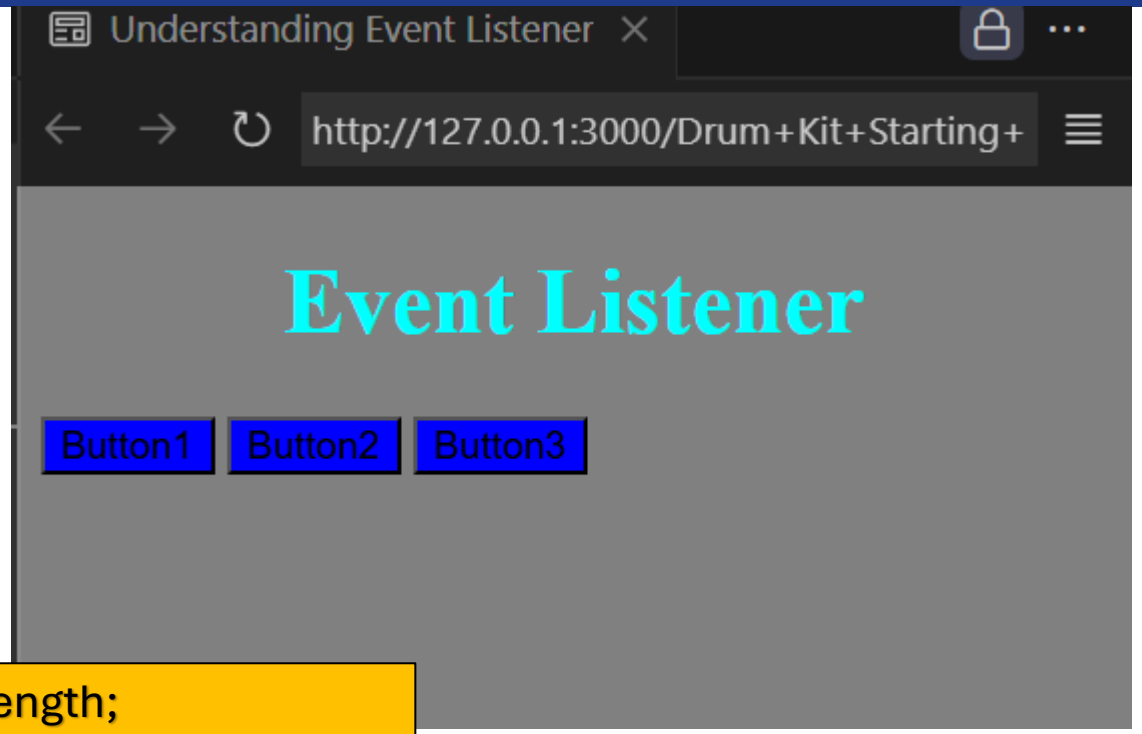
Dealing with multiple Event Listeners

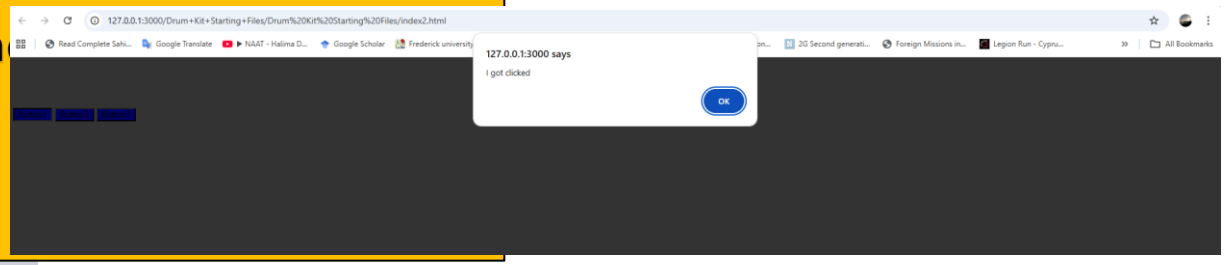
```
<body>

   <h1>Event Listener</h1>
  <button>Button1</button>
  <button>Button2</button>
  <button>Button3</button>
  <script src="index2.js" charset="utf-8">

  </script>
</body>
```

```
numberOfButtons = document.querySelectorAll("button").length;
for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListen
   alert("I got Clicked");
})
}
```





Two Inputs of addEventListener()

- Event Type → What to listen for (e.g., "click")
- Event Handler → Function to run (e.g., handleClick)
- element.addEventListener("click", handleClick);
- Passing function as input to another function
  - Higher Order Functions

Why We Pass Functions into Event Listeners?

- Functions can be passed as inputs to .addEventListener()
- The function becomes an event handler
- It runs only when the event actually happens (e.g., user click)
- Helps reuse code for different elements and events
- Makes websites interactive and efficient

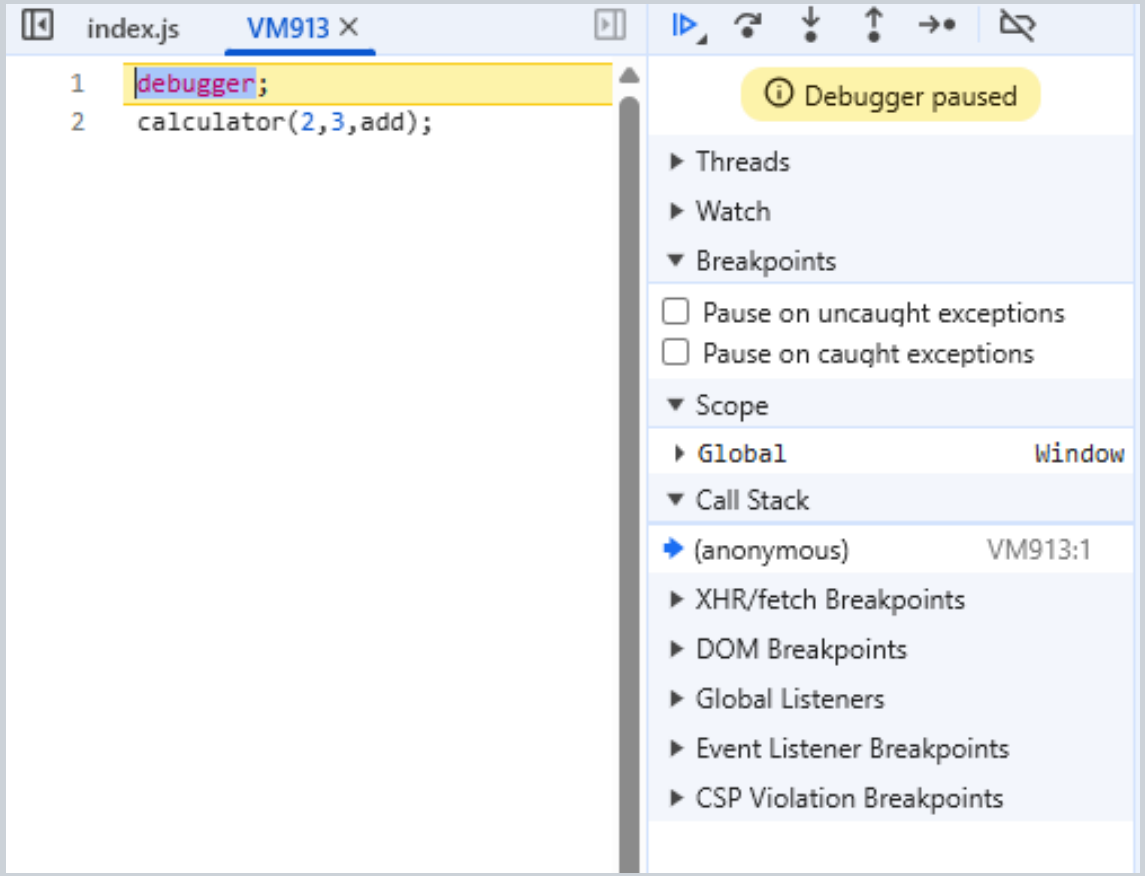
Example of Higher Order Functions

- calculator(2, 3, add); // returns 5
- calculator(3, 4, multiply); // returns 12

- function add(a,b) {
  return a+b; }
- function multiply (a,b) {
  return a*b; }
- function calculator (a,b, operator) {
  return operator (a,b);}

Debugging Step-by-Step

- Type in Debugger in console
  - And, call the function that you want to debug:



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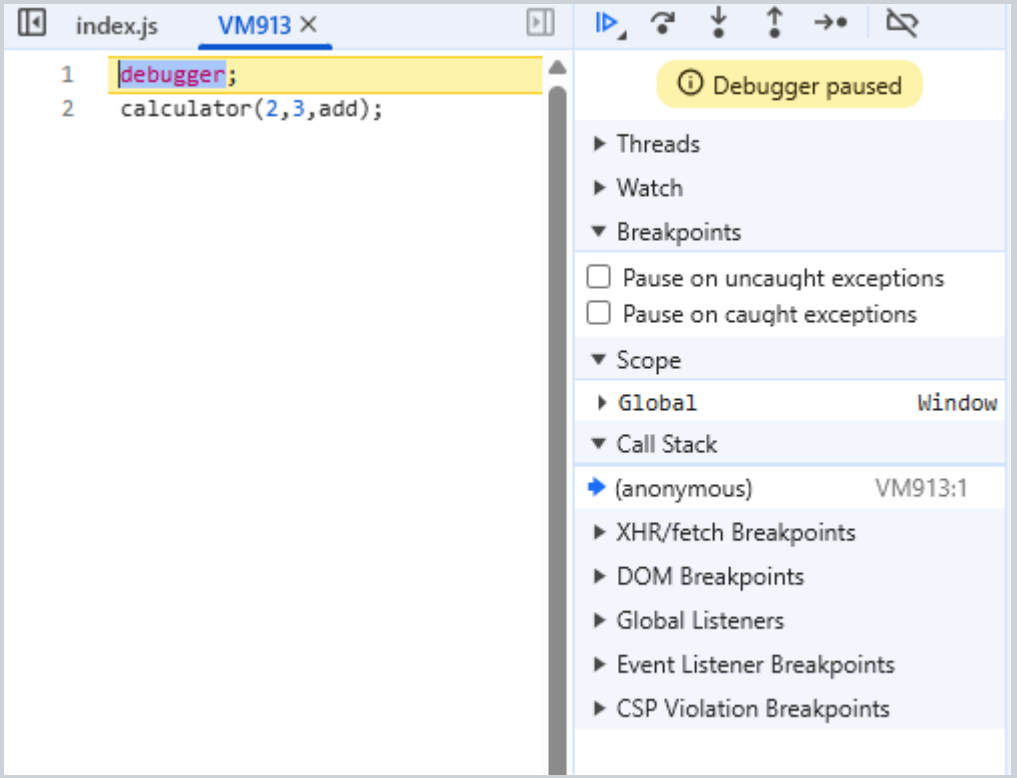

Debugging Step-by-Step

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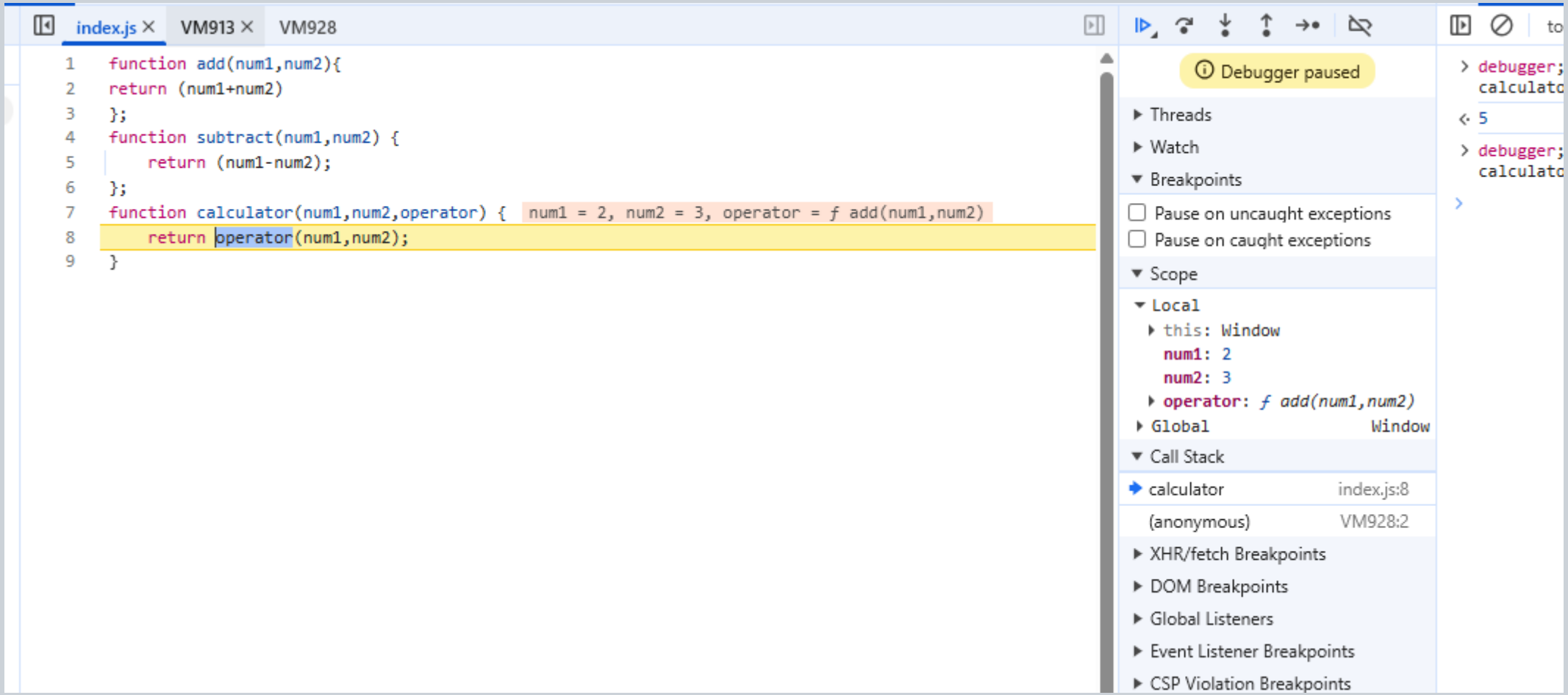
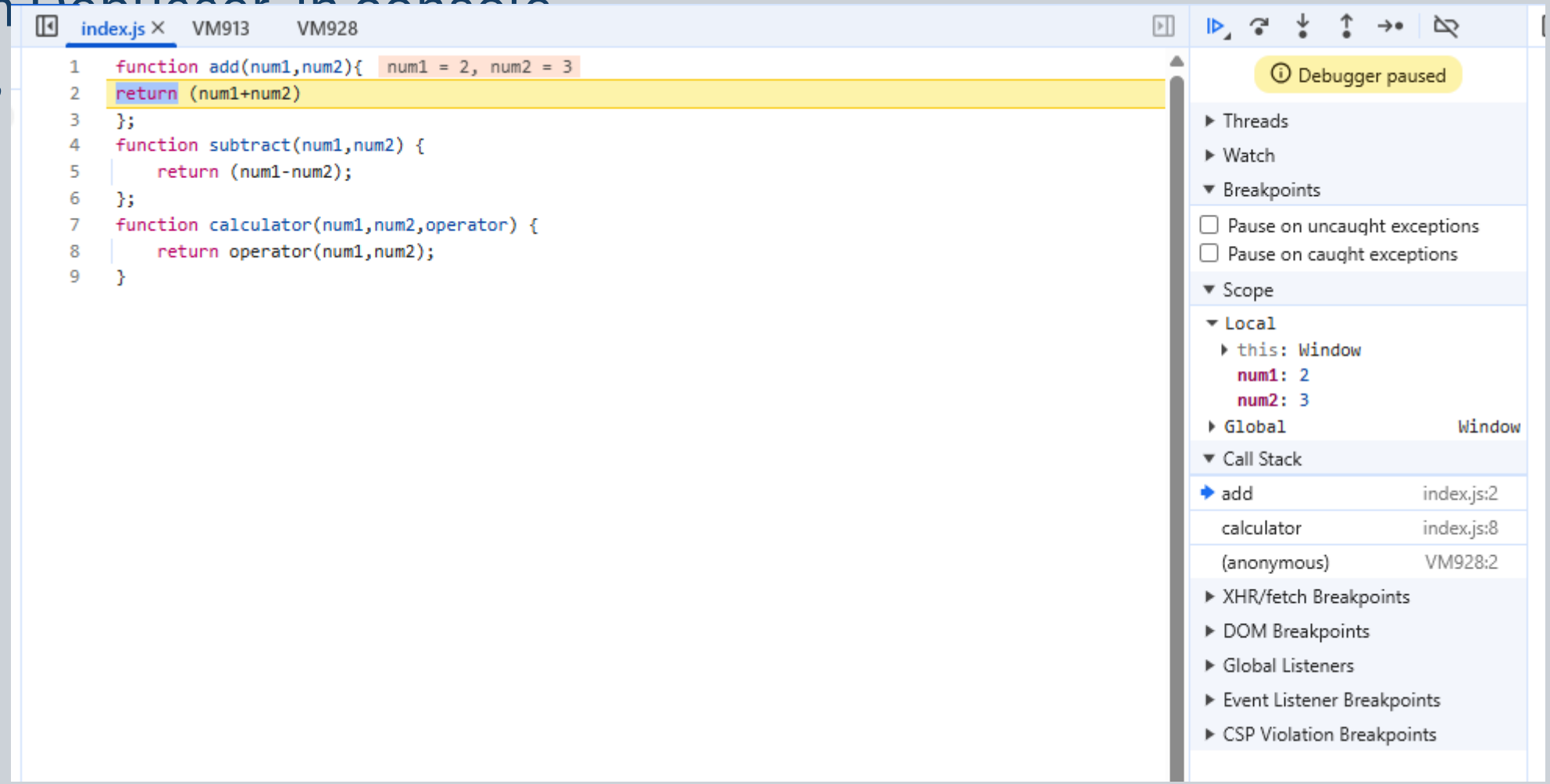
  - And, call the function that you want to debug:



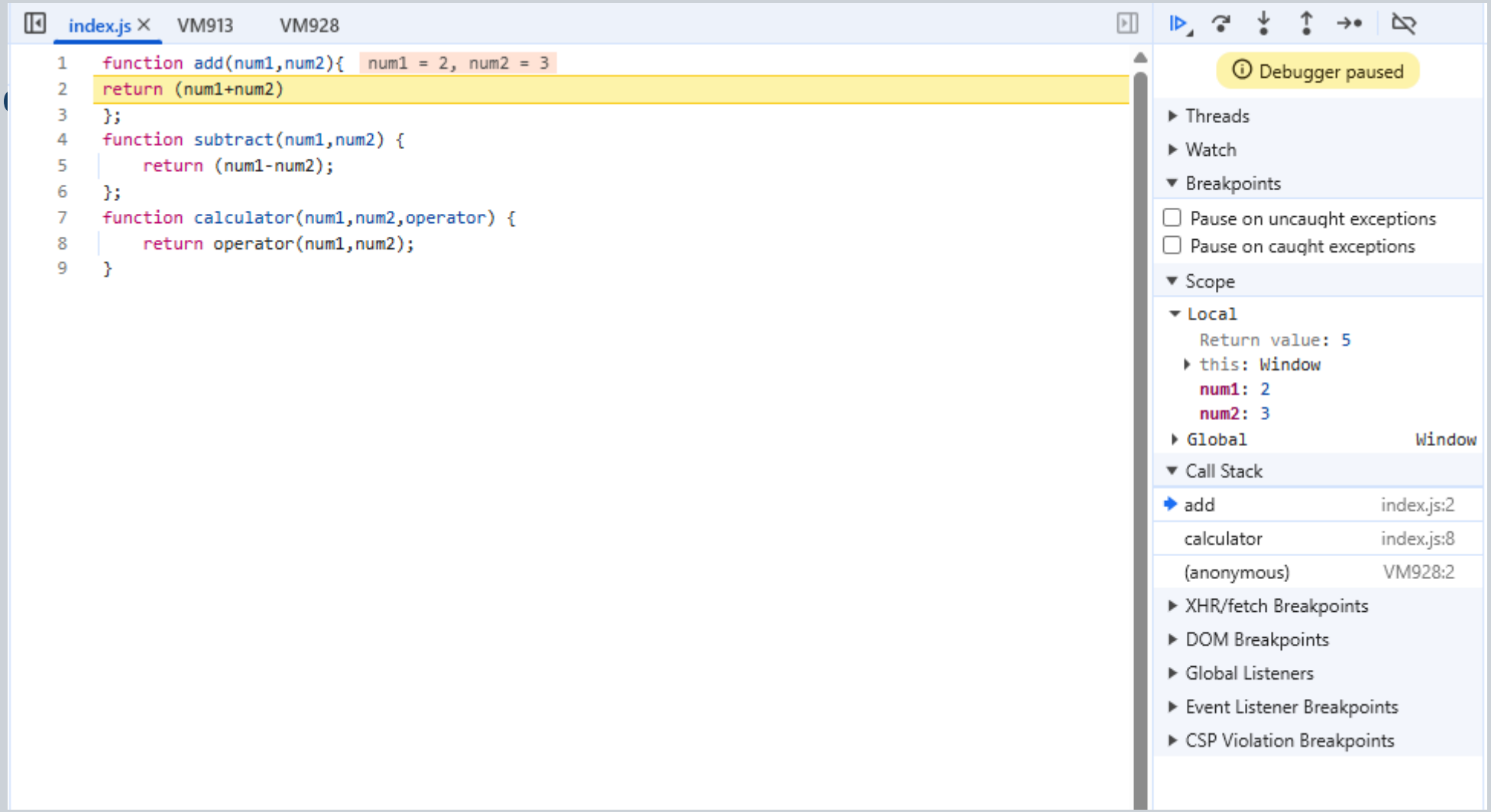
Debugging Step-by-Step

- Type in Debugger in console
  - And,



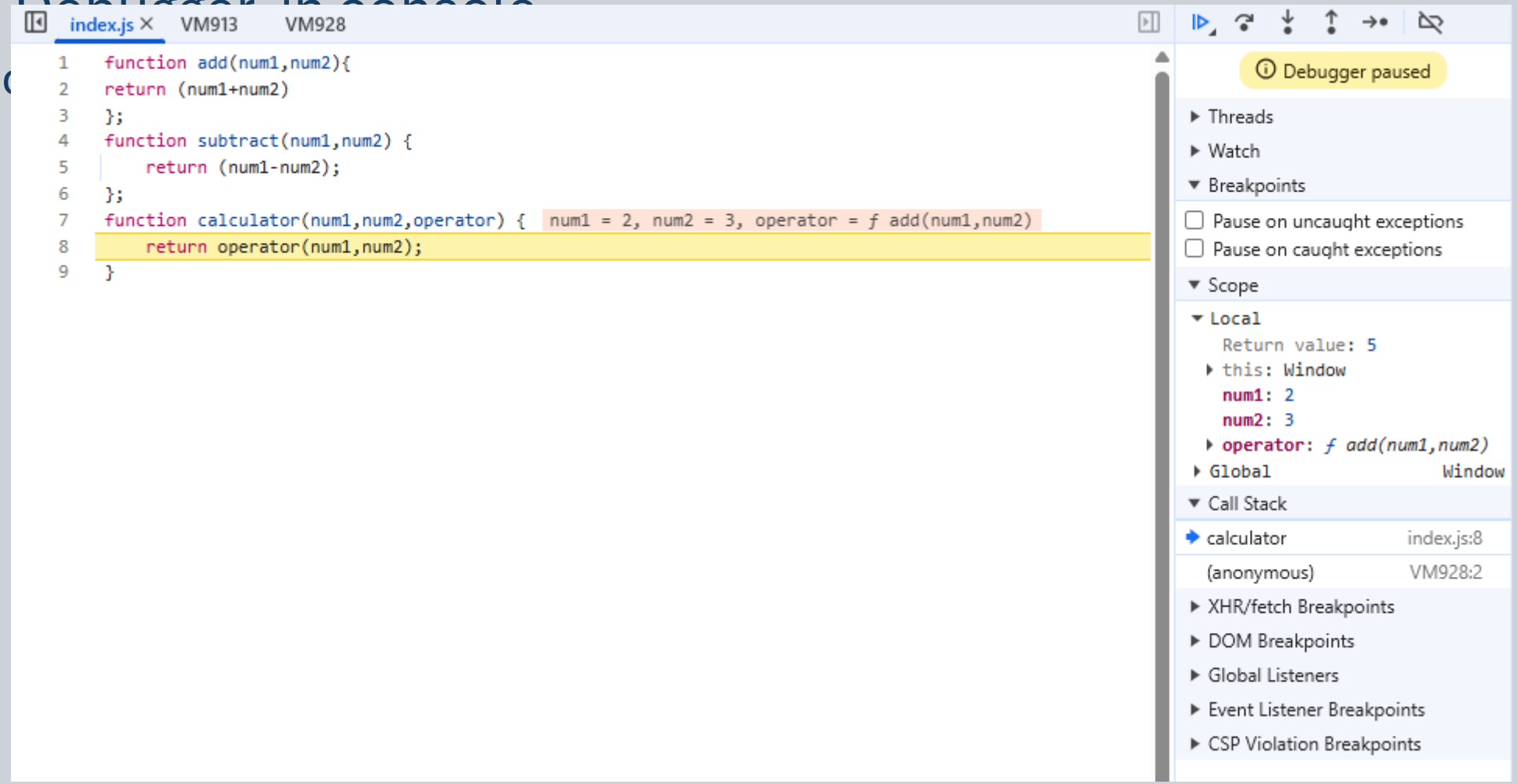
Debugging Step-by-Step

- Type in
  - And,



Debugging Step-by-Step

- Type in Debugger in console
  - And, c

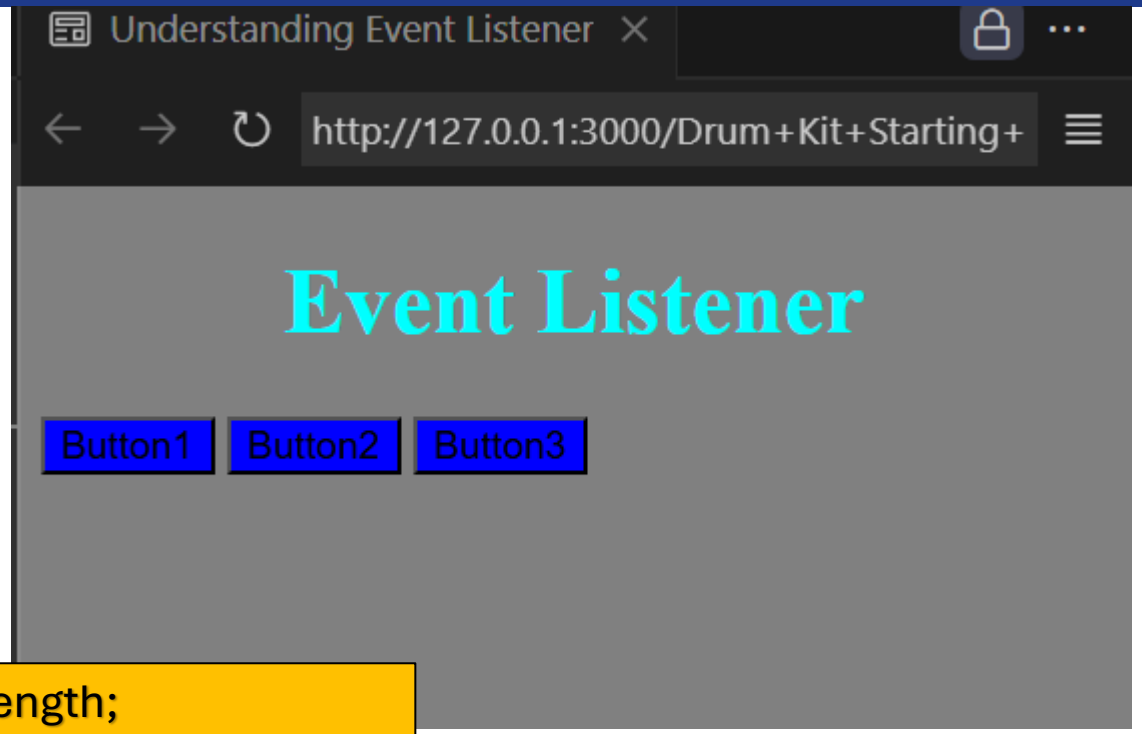


JavaScript this Keyword

```
<body>

   <h1>Event Listener</h1>
  <button>Button1</button>
  <button>Button2</button>
  <button>Button3</button>
  <script src="index2.js" charset="utf-8">

  </script>
</body>
```




```
numberOfButtons = document.querySelectorAll("button").length;
for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListener("click", function (){
    console.log(this);
})
}
```

JavaScript this Keyword

```
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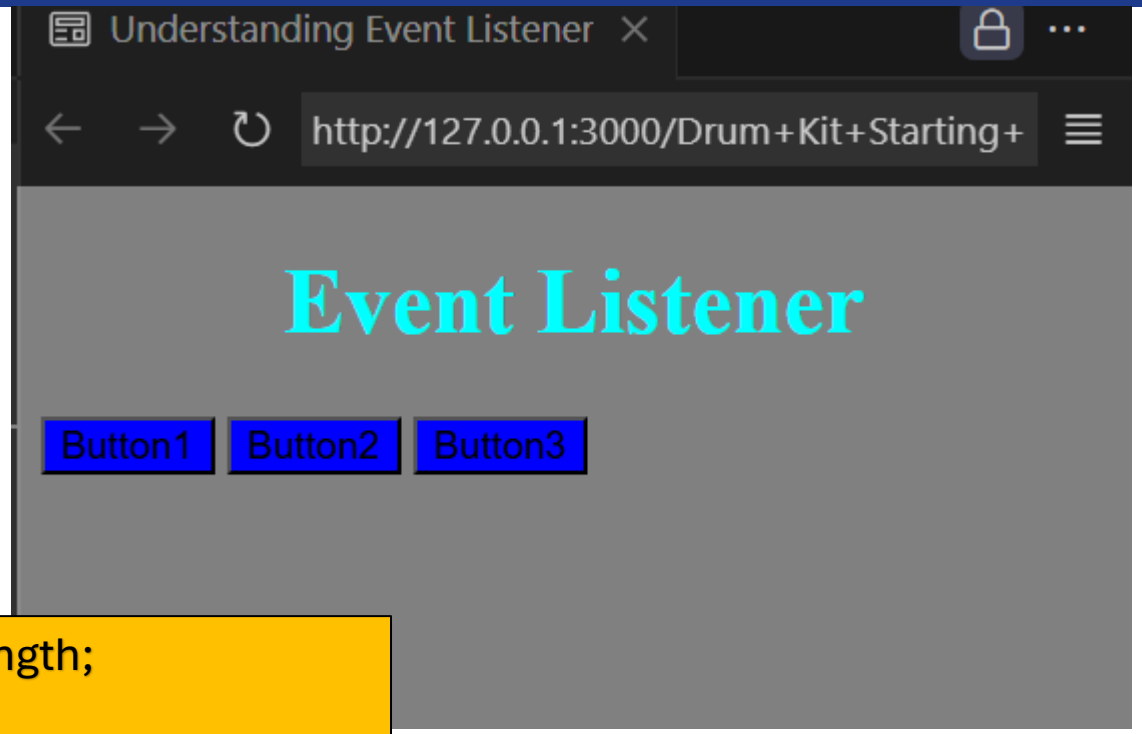


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    console.log(this);
})
}
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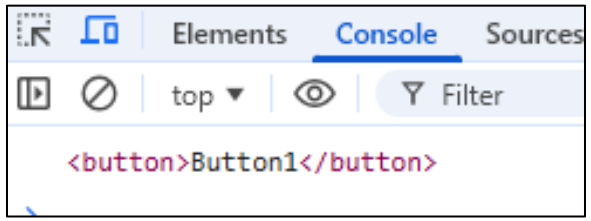

This is the output in console if Button1 is pressed

JavaScript this Keyword

```
<body>

   <h1>Event Listener</h1>
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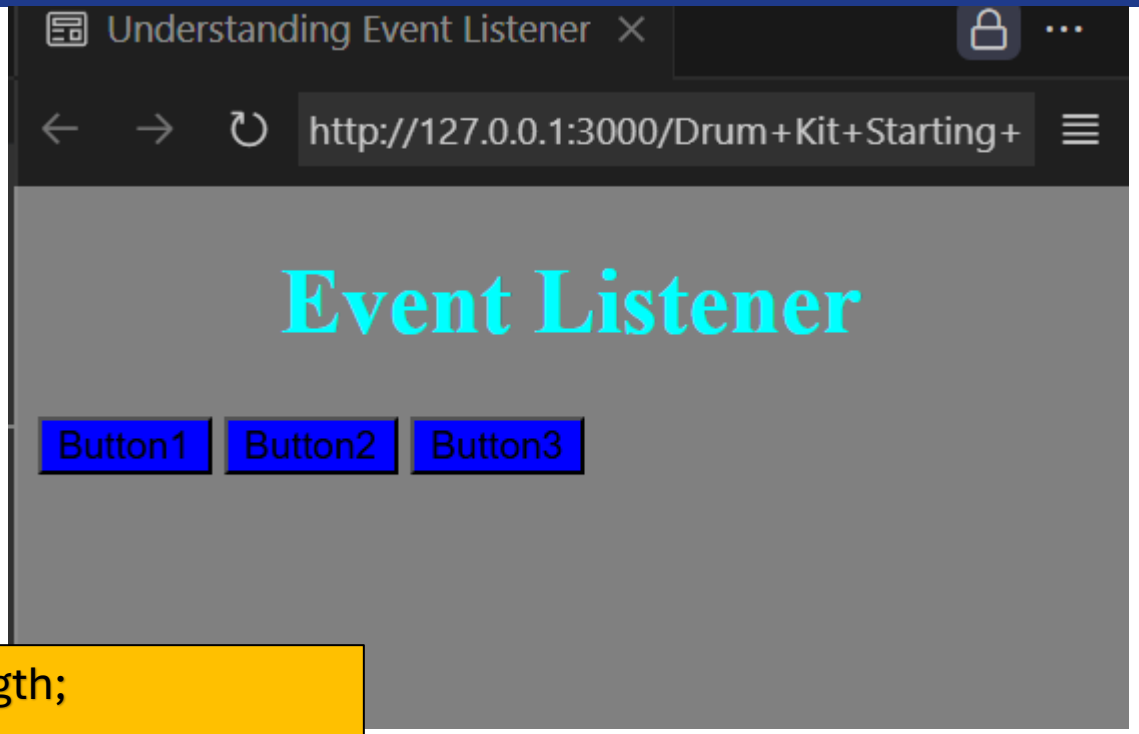


```
numberOfButtons = document.querySelectorAll("button").length;
for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListener("click", function (){
    console.log(this.innerHTML);})
}
```

JavaScript this Keyword

```
<body>

   <h1>Event Listener</h1>
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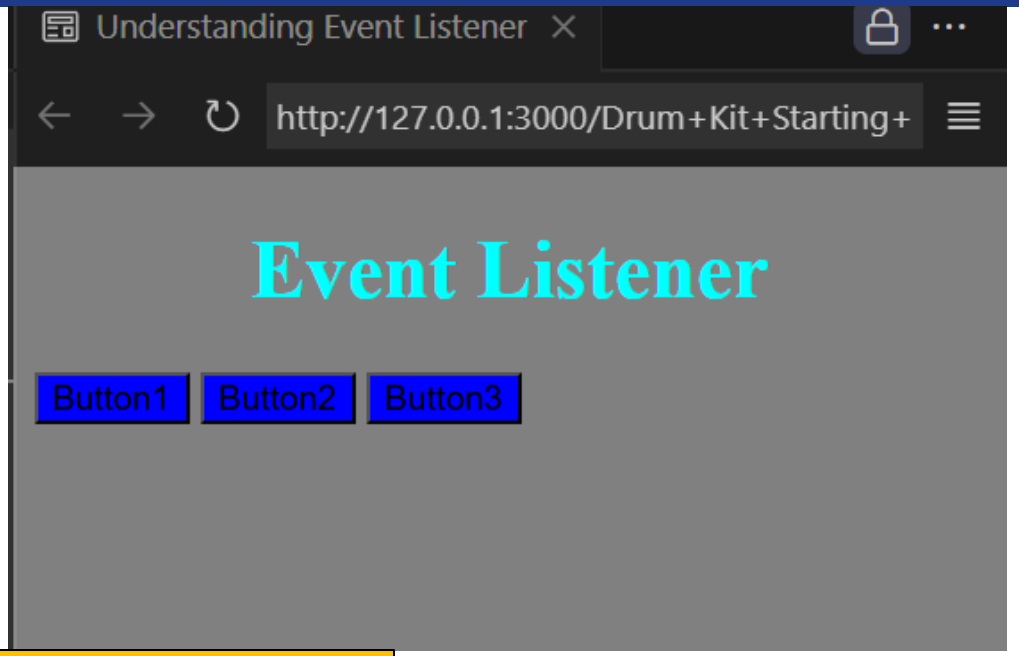


```
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for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListener("click", function (){
    console.log(this.innerHTML);})
}
```

This is the output in console

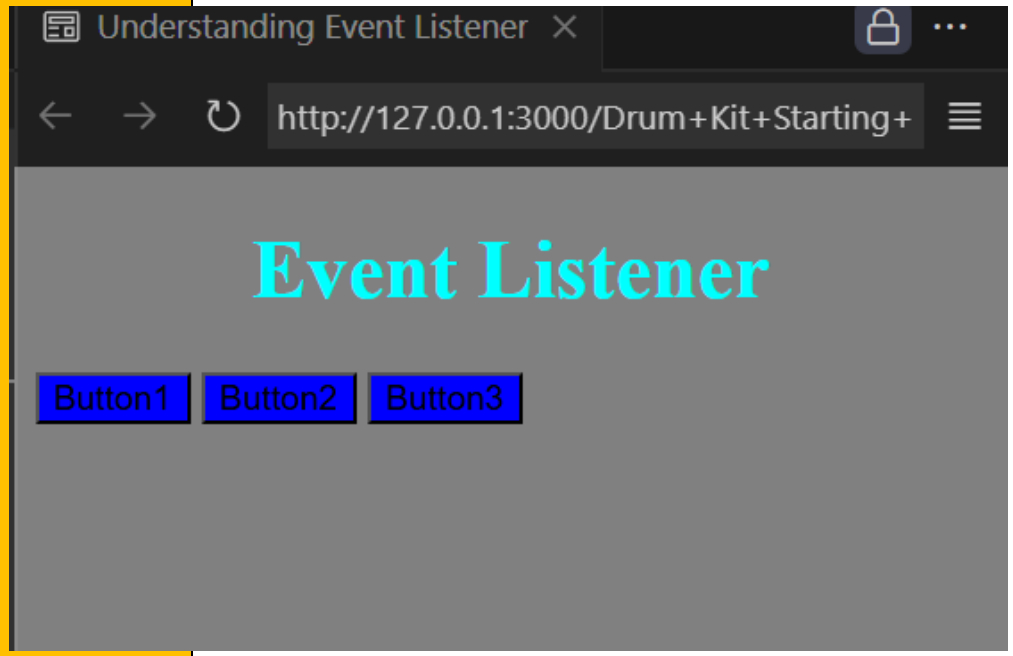
```
Button2
Button3
Button2
Button1
```

Switch statement

```
numberOfButtons = document.querySelectorAll("button").length;
for (var i=0;i<numberOfButtons;i++) {
document.querySelectorAll("button")[i].addEventListener("click", function (){
   var selectedButton = this.innerHTML;
   switch (selectedButton) {
      case "Button1":
         alert("You have pressed "+selectedButton);
         break;
      case "Button2":
         alert("You have pressed "+selectedButton);
         break;

      default:

         break;
   }
})
}
```



Switch statement

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      case "Button1":
         alert("You have pressed "+selectedButton);
         break;
      case "Button2":
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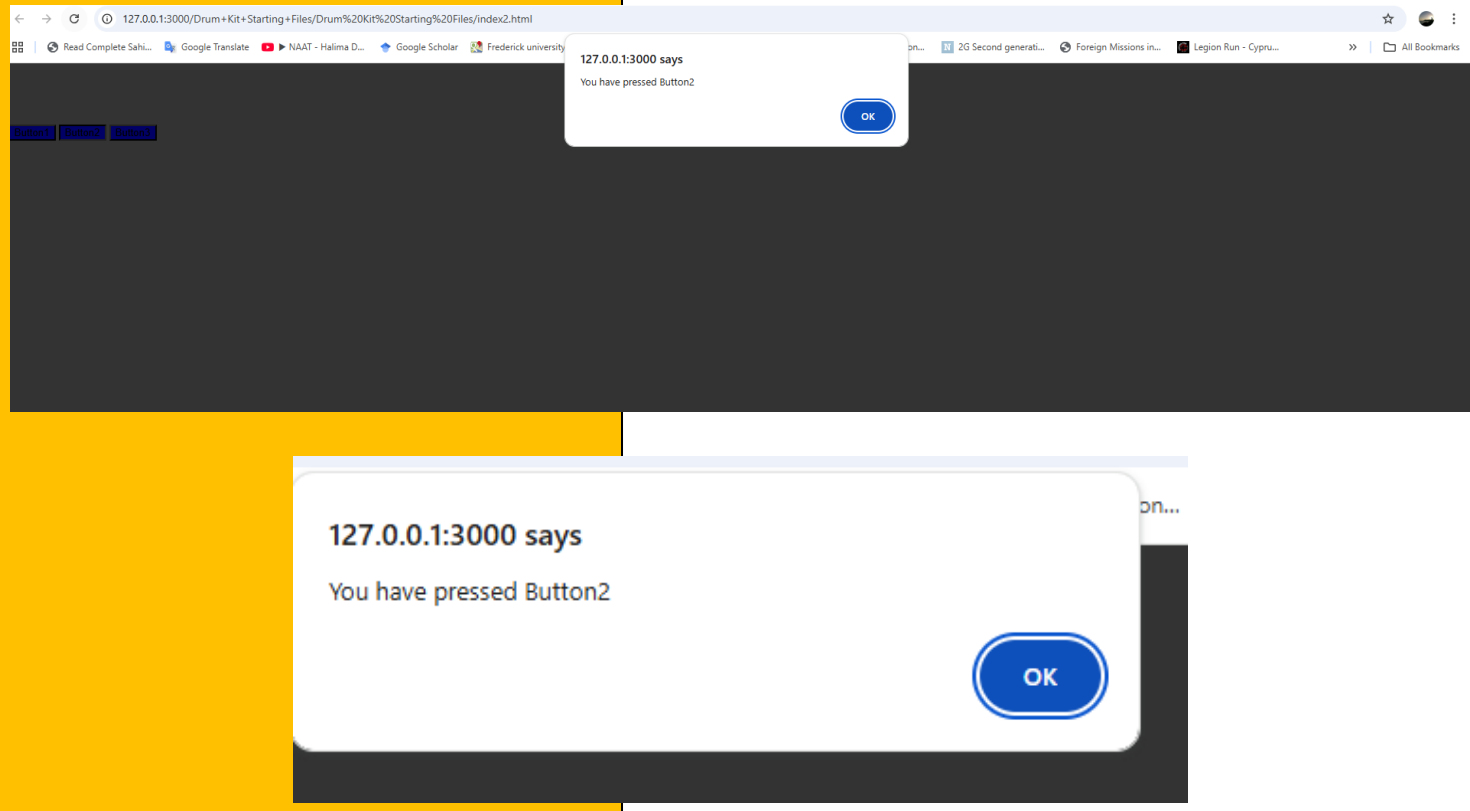
         break;

      default:

         break;
   }
})
}
```



JavaScript Objects

Organizing Data the Smart Way

Way 1: Variables (Not Recommended)

```
var studentName = 'Abid';
var studentAge = 21;
var studentSemester = 7;
var studentHobbies = ['Cycling', 'Driving', 'Hiking'];
var studentDepartment = 'Computer Engineering';
var studentUniversity = 'CUI ATD';
```

- Hard to manage
- Scattered & difficult to update

Way 2: Object Literal (Recommended)

```
var student = {
  name: 'Abid',
  age: 21,
  semester: 7,
  hobbies: ['Cycling', 'Driving', 'Hiking'],
  department: 'Computer Engineering',
  university: 'CUI ATD'
};
```

- All related data together
- Simple & clean structure

What is an Object?

- Collection of key-value pairs
- Represents real-world entities
- Stores properties + behaviors/methods

Example: Student, Car, Mobile Phone

Why Use Objects?

- Group related data
- Avoid too many variables
- Easy to manage & reuse
- Foundation of OOP & Web Apps

Accessing Object Properties

- student.name // Dot notation
- student['age'] // Bracket notation

```
var student = {
  name: 'Abid',
  age: 21,
  semester: 7,
  hobbies: ['Cycling', 'Driving', 'Hiking'],
  department: 'Computer Engineering',
  university: 'CUI ATD'
};
```

```
> student.name
< 'Abid'
> student['name']
< 'Abid'
```

Accessing Object Properties

Brackets allow dynamic property names

- **Bracket notation** allows you to access object properties **using variables**, not just fixed text.

```
var student = {
  name: 'Abid',
  age: 21,
  semester: 7,
  hobbies: ['Cycling', 'Driving', 'Hiking'],
  department: 'Computer Engineering',
  university: 'CUI ATD'
};
```

```
> var abc ="name";
< undefined
```

Accessing Object Properties

Brackets allow dynamic property names

- **Bracket notation** allows you to access object properties **using variables**, not just fixed text.

```
var student = {
  name: 'Abid',
  age: 21,
  semester: 7,
  hobbies: ['Cycling', 'Driving', 'Hiking'],
  department: 'Computer Engineering',
  university: 'CUI ATD'
};
```

```
> var abc ="name";
< undefined
```

```
> student.abc
< undefined
```

Accessing Object Properties

Brackets allow dynamic property names

- **Bracket notation** allows you to access object properties **using variables**, not just fixed text.

```
var student = {
  name: 'Abid',
  age: 21,
  semester: 7,
  hobbies: ['Cycling', 'Driving', 'Hiking'],
  department: 'Computer Engineering',
  university: 'CUI ATD'
};
```

```
> var abc ="name";
< undefined
```

```
> student.abc
< undefined
```

```
> student[abc]
< 'Abid'
```

Updating Object Properties

Objects are mutable

- **Mutable** means:
- Objects can be **changed after they are created**.

- This includes:

✓ Adding new properties
✓ Updating existing properties
✓ Deleting properties

Updating Object Properties (Adding New Property)

Objects are mutable

- **Mutable** means:
- Objects can be **changed after they are created**.

- This includes:
  ✓ Adding new properties
  ✓ Updating existing properties
  ✓ Deleting properties

```
> student
<· ▸ {name: 'Abid', age: 20, hobbies: Array(3), department: 'Computer Engineering'}
> student.cgpa =3.0
<· 3
> student
<· ▸ {name: 'Abid', age: 20, hobbies: Array(3), department: 'Computer Engineering', cgpa: 3}
```

Updating Object Properties (Updating Existing Property)

Objects are mutable

- **Mutable** means:
- Objects can be **changed after they are created**.

- This includes:

✓ Adding new properties
✓ Updating existing properties
✓ Deleting properties

```
> student
<· ▸ {name: 'Abid', age: 21, hobbies: Array(3), department: 'Computer Engineering'}
> student.age =20;
<· 20
> student
<· ▸ {name: 'Abid', age: 20, hobbies: Array(3), department: 'Computer Engineering'}
```

Updating Object Properties (Deleting Property)

Objects are mutable

- **Mutable** means:
- Objects can be **changed after they are created**.

- This includes:
  ✓ Adding new properties
  ✓ Updating existing properties
  ✓ Deleting properties

```
> student
<- ▸ {name: 'Abid', age: 20, hobbies: Array(3), department: 'Computer Engineering', cgpa: 3}
> delete student.department
<- true
> student
<- ▸ {name: 'Abid', age: 20, hobbies: Array(3), cgpa: 3}
```

Nested Objects

```
var student = {
  name: 'Abid',
  address: {
    city: 'Abbottabad',
    country: 'Pakistan'
  }
};
```

```
> student.address.city
< 'Abbottabad'
> student.address.country
< 'Pakistan'
```

Creating Multiple Objects

- var student1 = { name: 'Abid', age: 21 };
- var student2 = { name: 'Ali', age: 22 };

- ✓ Good but not scalable

Constructor Function

```
function StudentCreator(name, age, semester) {
  this.name = name;
  this.age = age;
  this.semester = semester;
}
```

- var s1 = new StudentCreator('Abid',21,7);
- var s2 = new StudentCreator('hamza',22,6);

Constructor Function

```
function StudentCreator(name, age, semester) {
  this.name = name;
  this.age = age;
  this.semester = semester;
}
```

```
> var s1= new StudentCreator("hamza",20,6)
< undefined
> s1
< ▼ StudentCreator {name: 'hamza', age: 20, semester: 6}
    age: 20
    name: "hamza"
    semester: 6
  ▶ [[Prototype]]: Object
```

- var s1 = new StudentCreator('Abid',21,7);
- var s2 = new StudentCreator('hamza',22,6);

Object Methods

- This object has:
- A property ➔name
- A function ➔ greet() (this is called a **method**)

```
var student = {
  name: 'Abid',
  greet() {
    console.log('Hello '+ this.name);
  }
};
```

```
> student.greet()
```

- this → refers to the same object

Object Methods

- This object has:
- A property ➔name
- A function ➔ greet() (this is called a **method**)

```
var student = {
  name: 'Abid',
  greet() {
    console.log('Hello ' + this.name);
  }
};
```

```
> student.greet()
Hello Abid
```

- this → refers to the same object

Constructor Function with Method ()

```
function StudentCreator(name, age, semester) {
        this.name = name;
        this.age = age;
        this.semester = semester;
        this.greet =function() { alert("Hello"+this.name);
                }
}
```

```
> var s1= new StudentCreator("hamza",20,6)
< undefined
> s1.greet()
```

Constructor Function with Method ()

```
function StudentCreator(name, age, semester) {
        this.name = name;
        this.age = age;
        this.semester = semester;
        this.greet =function() { alert("Hello"+this.name);
                }
}
```

```
> var s1= new StudentCreator("hamza",20,6)
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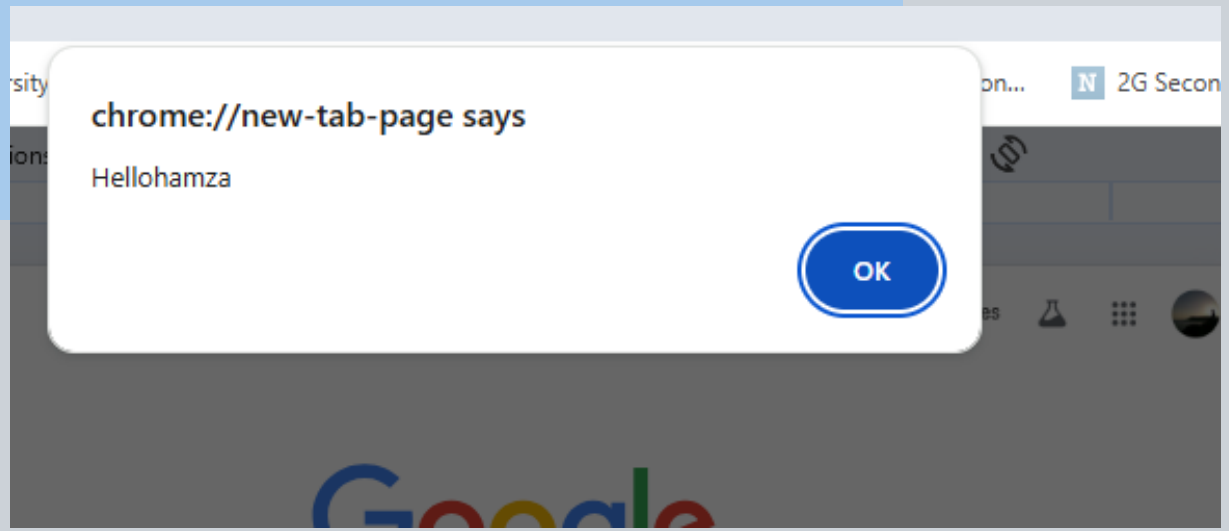
< undefined
```



Callback Functions

- A **function passed as an argument** to another function
- It **runs later** when the event or task completes
- Helps in **asynchronous** programming and event handling
- Common in:
  - Buttons click
  - keydown events
  - Timers
  - AJAX responses

```
button.addEventListener("click", function() {
   console.log("Button clicked!");
});
```

- Here, the anonymous function is a *callback*, executed only when click happens.

Why Use Callback Functions?

- Make code **responsive** to user actions
- Allow **reuse** of functions
- Avoid running code too early
- Foundation of **jQuery** and **JavaScript events**
- Used for:
  - Animations
  - API calls
  - Timing (setTimeout)

```
setTimeout(() => {
  console.log("Runs after 2 seconds");
}, 2000);
```