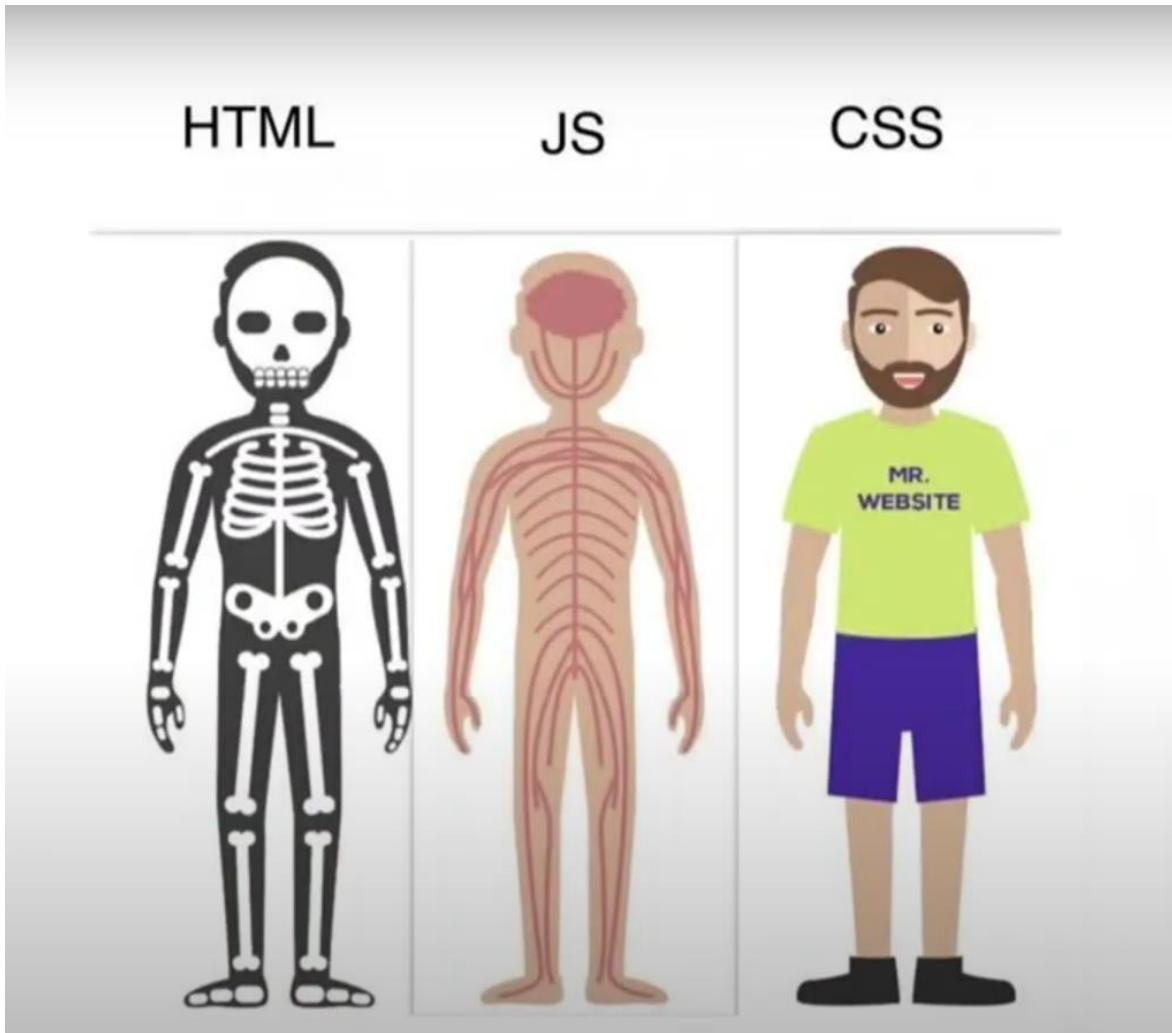


Java Script

1. why we need java script?

Developers use JavaScript in web development to add interactivity and features to [improve the user experience](#) and make the internet much more enjoyable.



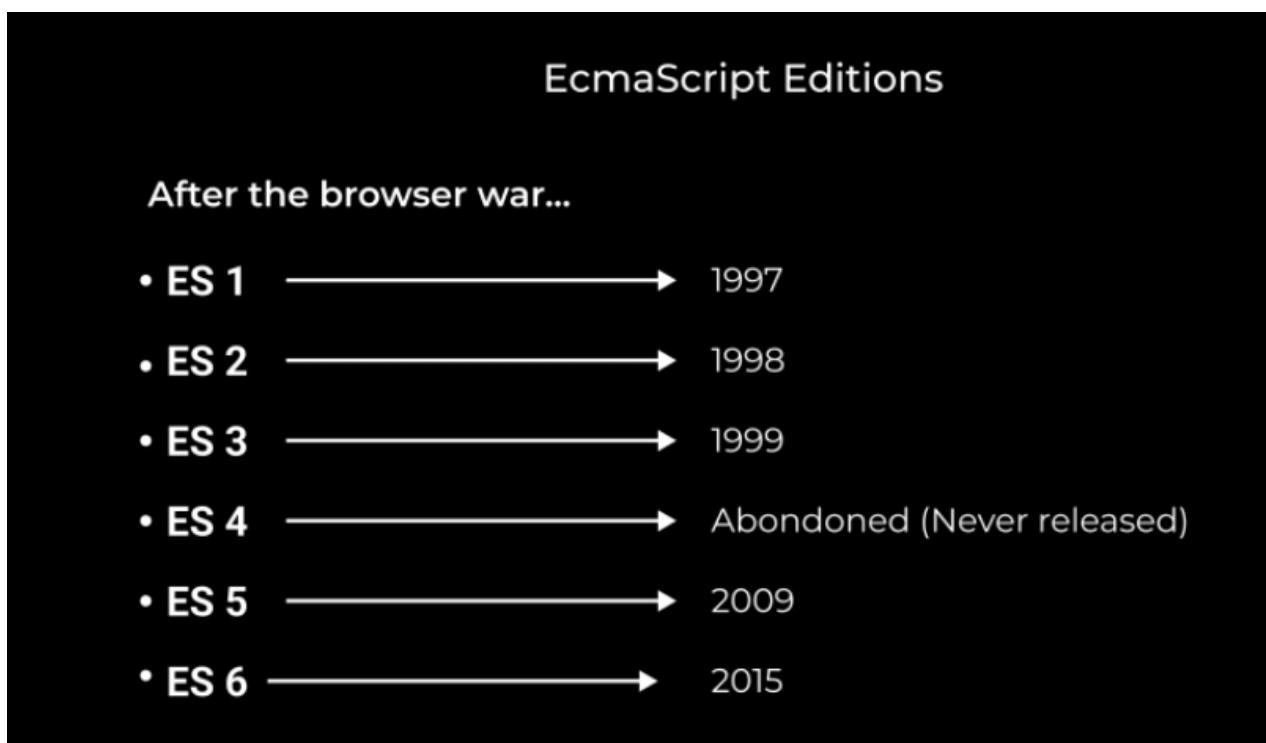
2. History of java script?

Netscape programmer named **Brendan Eich** developed a new scripting language in just **10 days**. It was originally called **Mocha**, but quickly became known as **LiveScript** and, later, **JavaScript**.

What Is ECMAScript?

When JavaScript was first introduced by Netscape, there was a war going on between all the browser vendors on the market at the time. Microsoft and several other browser vendors implemented their own versions of JavaScript (with different names and syntax) in their respective browsers. This created a huge headache for developers, as code that worked fine on one browser was a total waste on another. This went on for a while till they all agreed to use the same language (JavaScript) in their browsers.

As a result, Netscape submitted JavaScript to the [European Computer Manufacturers Association](#) (ECMA) for standardization in order to ensure proper maintenance and support of the language. Since JavaScript was standardized by ECMA, it was officially named ECMAScript.



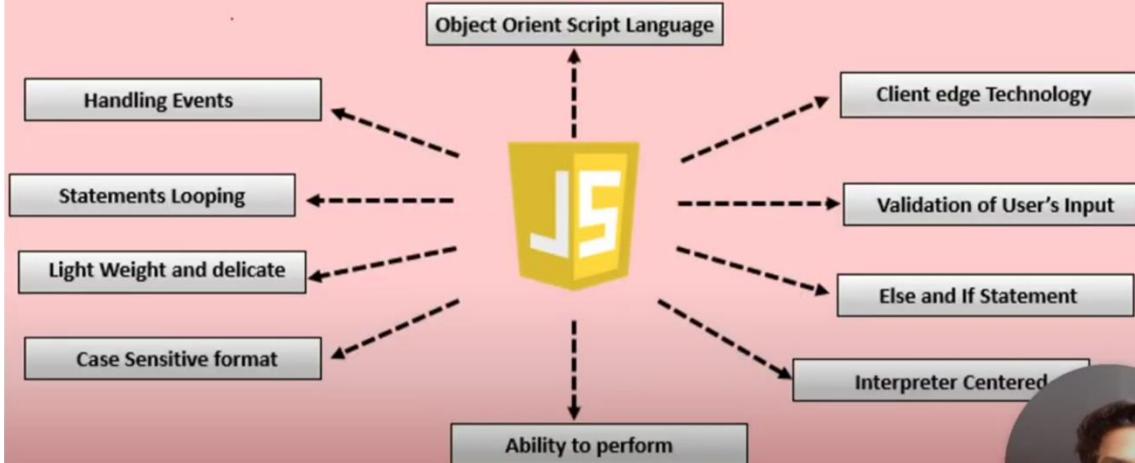
Originally, the name ECMAScript was just the formalization of JavaScript, but now languages like JScript and ActionScript are also based on the ECMAScript standard.

3. What is java script?

Java Script is a High level Programming Language that is primarily used to enhance the interactivity and dynamic behaviour of web sites

Java Script is also a light weight, cross platforms, Single threaded and High level Interpreted compiled programming language. It is knowns as Scripting Languages for websites.

Features of JavaScript



➤ High-Level Language

High-level languages are programming languages that are used for writing programs or software that can be understood by humans and computers.

High-level languages are easier to understand for humans because they use a lot of symbols letters phrases to represent logic and instructions in a program. It contains a high level of abstraction compared to low-level languages.

➤ Cross-platform

It is a software or applications that can operate on multiple operating system

➤ Single-threaded

It is the only programming language that can run natively in a browser, making it an instrumental part of web development. However, one critical feature of JavaScript is that it is single-threaded. This means that it can only execute one task at a time.

➤ Asynchronous

how it can be used to effectively handle potential blocking operations, such as fetching resources from a server.

➤ Synchronous

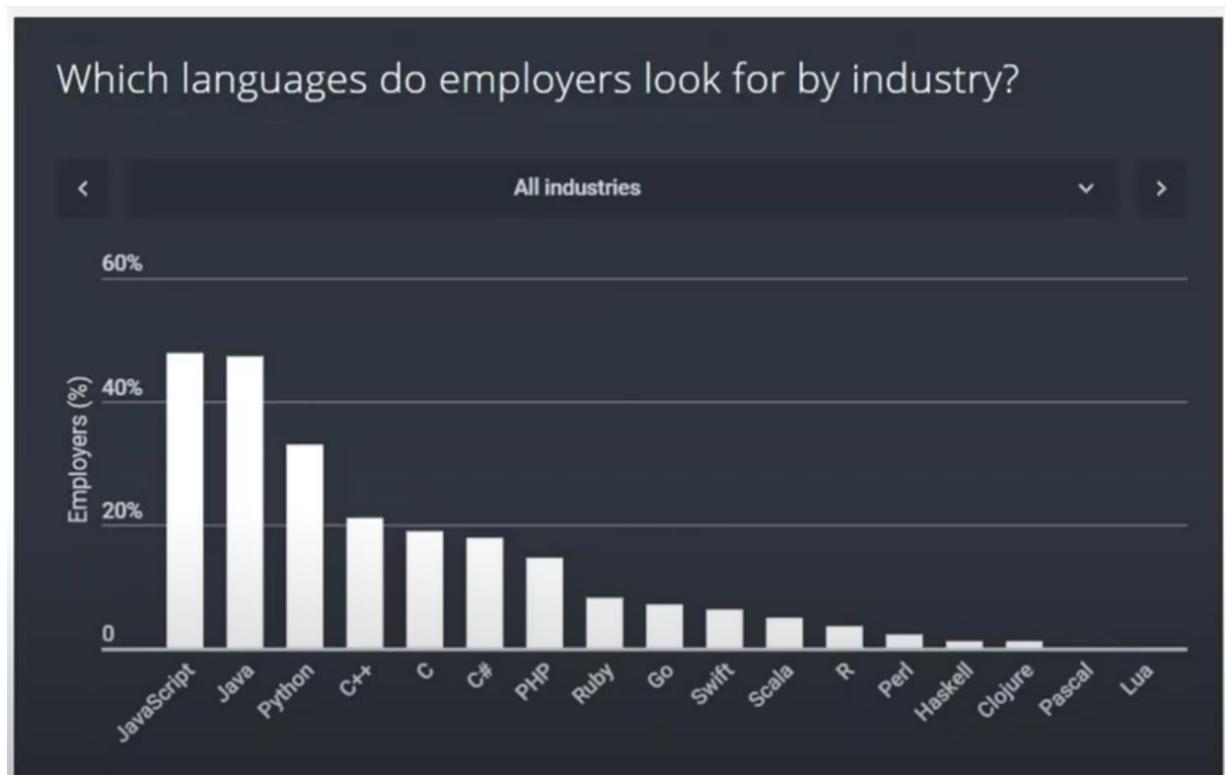
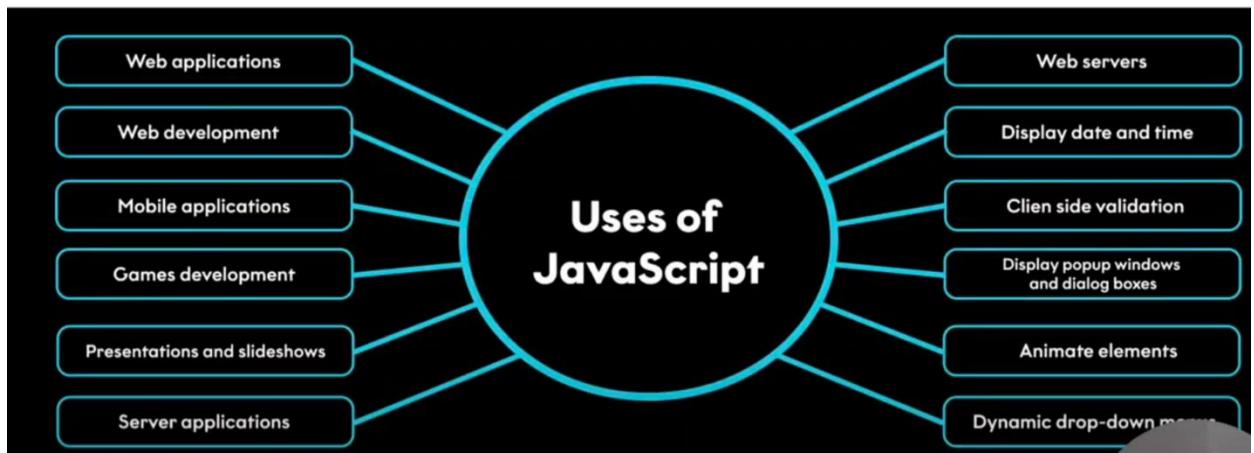
Synchronous means the code runs in a particular sequence of instructions given in the program. Each instruction waits for the previous instruction to complete its execution.

➤ Object Oriented

It provides an overview of the basic concepts of OOP.

➤ Scripting

Scripting is used to automate tasks on a website. It can respond to any specific event, like button clicks, scrolling, and form submission. It can also be used to generate dynamic content. and JavaScript is a widely used scripting language.



4. What is Vanilla JavaScript

The term **vanilla script** is used to refer to the pure JavaScript (or we can say plain JavaScript) without any type of additional library. Sometimes people often used it as a joke "nowadays several things can also be done without using any additional JavaScript libraries".

The vanilla script is one of the lightest weight frameworks ever. It is very basic and straightforward to learn as well as to use. You can create significant and influential applications as well as websites using the vanilla script.

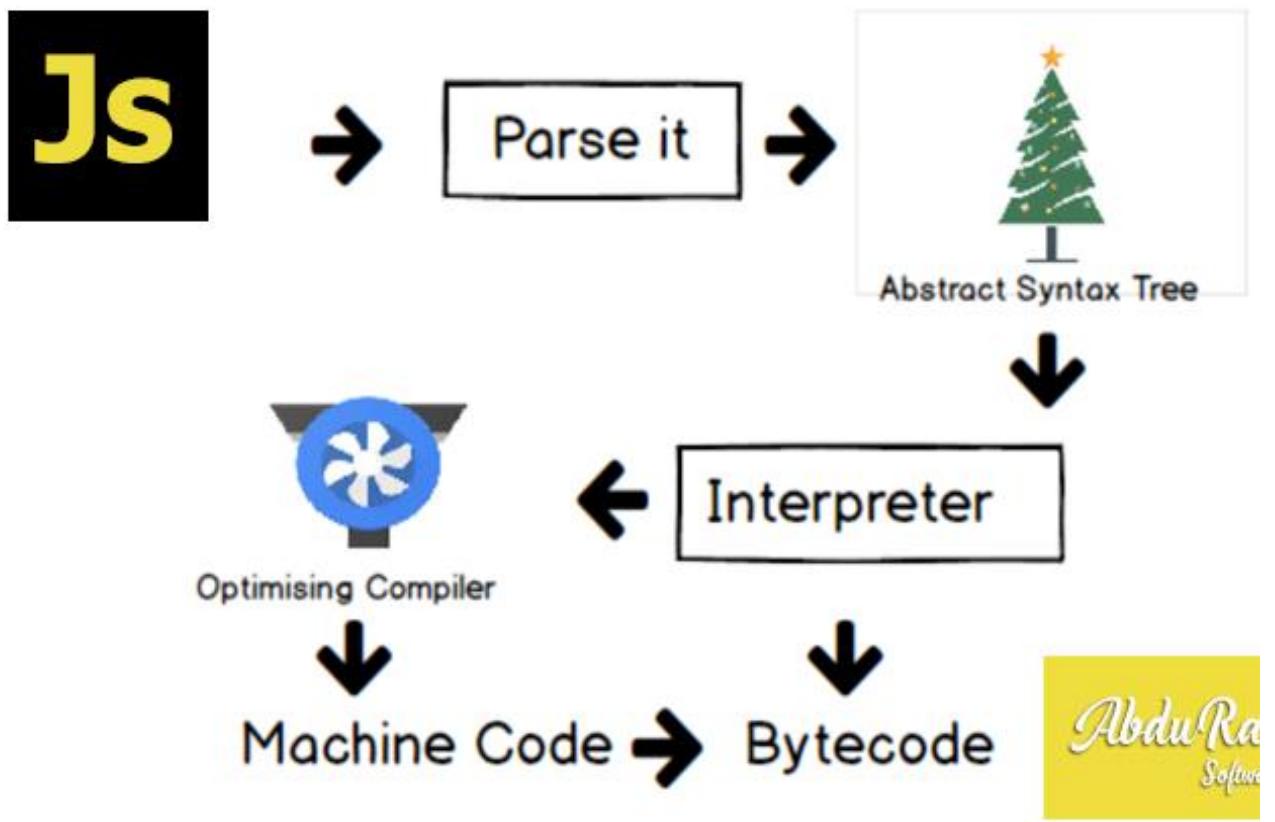
The team of developers that created the vanilla JavaScript is continuously working on it to improve it and make it more useful for the web-developers.

5. why JavaScript programming language?

It supplies objects relevant to running JavaScript on a server. For if the server-side extensions allow an application to communicate with a database, and provide continuity of information from one invocation to another of the application, or perform file manipulations on a server. The useful framework which is the most famous these days is [node.js](#).

6. What is a JavaScript Engine?

A JavaScript engine is a program that compiles JavaScript code and executes it. It is a software that runs inside a web browser or on a server that interprets JavaScript code and executes it. The engine is responsible for parsing the JavaScript code, compiling it into machine code, and executing it.



Parsing

The first stage of a JavaScript engine is parsing. It is the process of breaking down the source code into its individual components, such as keywords, variables, and operators. The parser creates a tree structure called the Abstract Syntax Tree (AST), which represents the structure of the code.

Compilation

The next stage is compilation. The compiler takes the AST and converts it into machine code. The machine code is optimized to run efficiently on the target platform. The compilation process includes several optimizations, such as inlining, loop unrolling, and dead code elimination.

Execution

The final stage is execution. The compiled code is executed by the JavaScript engine. The engine executes the code line by line, keeping track of variables and function calls. It also manages memory allocation and deallocation.

7. Java script Run time environment?

JavaScript works on a environment called **JavaScript Runtime Environment**. To use JavaScript you basically install this environment and than you can simply use JavaScript.

So in order to use JavaScript you install a **Browser** or **NodeJS** both of which are JavaScript Runtime Environment.

call stack:

The call stack is used to store information about function calls, including local variables, parameters, and the point of execution.

Heap:

The heap is a region of memory used for dynamic memory allocation. It stores objects, arrays, and other complex data structures that are created and managed at runtime.

Web API:

A Web API (Application Programming Interface) is a set of rules and tools that allows different software applications to communicate with each other over the web. It acts as an intermediary, enabling one application to interact with another application's data or functionality using standard web protocols, usually HTTP.

Event loop:

The event loop is a fundamental concept in asynchronous programming, especially in environments like JavaScript. It enables non-blocking operations, allowing code to execute asynchronously while ensuring that tasks are handled in an orderly manner. Here's a closer look at how synchronous and asynchronous operations interact with the event loop:

Synchronous vs. Asynchronous

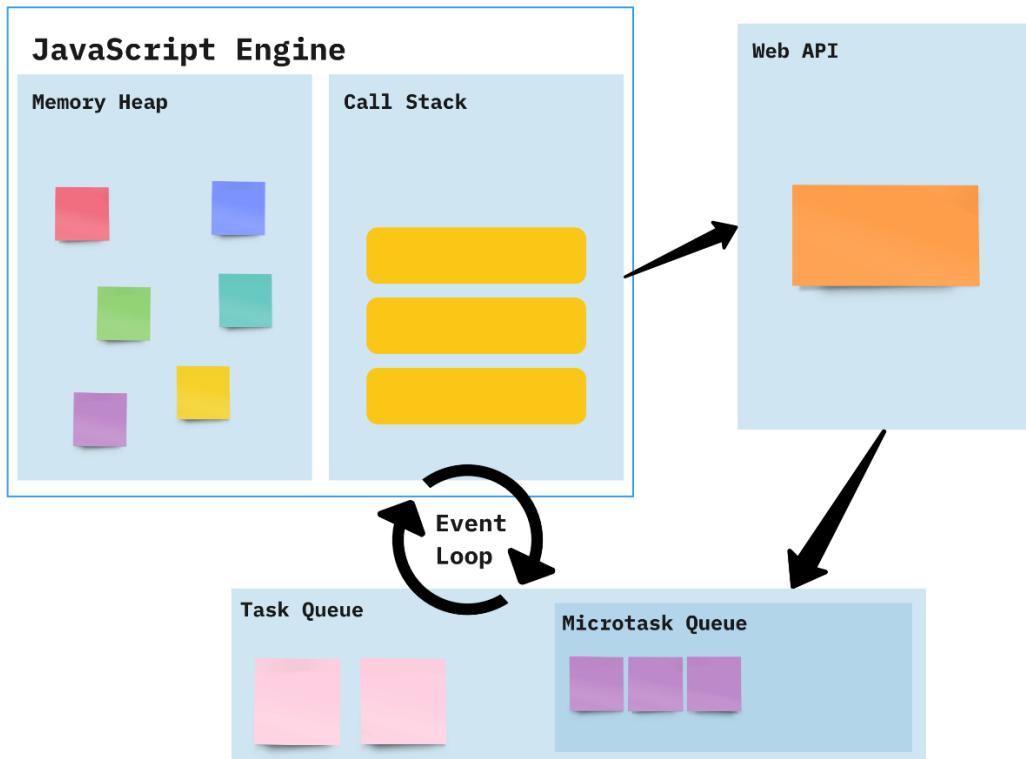
1. Synchronous:

Synchronous operations are executed sequentially, one after the other. Each operation must complete before the next one begins.

2. Asynchronous:

Asynchronous operations allow code to execute without waiting for previous operations to complete. This is useful for tasks that involve waiting, such as network requests or timers.

JavaScript Runtime Environment



How it Works:

- Constantly checks whether or not the call stack is empty
- When the call stack is empty, all queued up Microtasks from Microtask Queue are popped onto the callstack
- If both the call stack and Microtask Queue are empty, the event loop dequeues tasks from the Task Queue and calls them
- Starved event loop

Difference Between Compiler and Interpreter

Compiler	Interpreter
Steps of Programming: <ul style="list-style-type: none">• Program Creation.• Analysis of language by the compiler and throws	Steps of Programming: <ul style="list-style-type: none">• Program Creation.• Linking of files or generation of Machine Code is not required by Interpreter.

Compiler

- errors in case of any incorrect statement.
- In case of no error, the Compiler converts the source code to Machine Code.
- Linking of various code files into a runnable program.
- Finally runs a Program.

The compiler saves the Machine Language in form of Machine Code on disks.

Compiled codes run faster than Interpreter.

The compiler generates an output in the form of (.exe).

Errors are displayed in Compiler after Compiling together at the current time.

Interpreter

- Execution of source statements one by one.

The Interpreter does not save the Machine Language.

Interpreted codes run slower than Compiler.

The interpreter does not generate any output.

Errors are displayed in every single line.

How Many Ways To Insert JS

JavaScript, also known as JS, is one of the scripting (client-side scripting) languages, that is usually used in web development to create modern and interactive web-pages. The term "script" is used to refer to the languages that are not standalone in nature and here it refers to JavaScript which run on the client machine.

1. internal JS:

By using script tag at the bottom of the document

Syntax:

```
<body>
    <script>
        Console.log("hello world");
    </script>
</body>
```

2. inline JS:

we can apply inline js within the element.

Syntax:

```
<body>
    <button onclick="alert('hello world')">click</button>
</body>
```

3. external JS:

By creating a js file with .js extention we can insert js file into the html document. That js file is linked in the script tag.

Syntax:

```
<body>
    <script src="js file with .js extention"></script>
</body>
```

Variables:

Variables are used to store data in JavaScript. Variables are used to store reusable values. The values of the variables are allocated using the assignment operator(“=”).

Variable is used to Store Data



JavaScript Variables can be declared in 4 ways:

- **Automatically**
- **Using var**
- **Using let**
- **Using const**

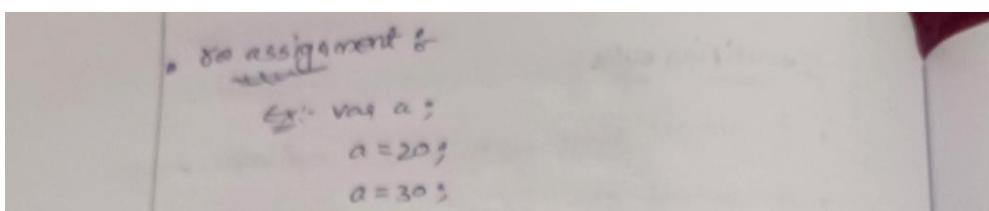
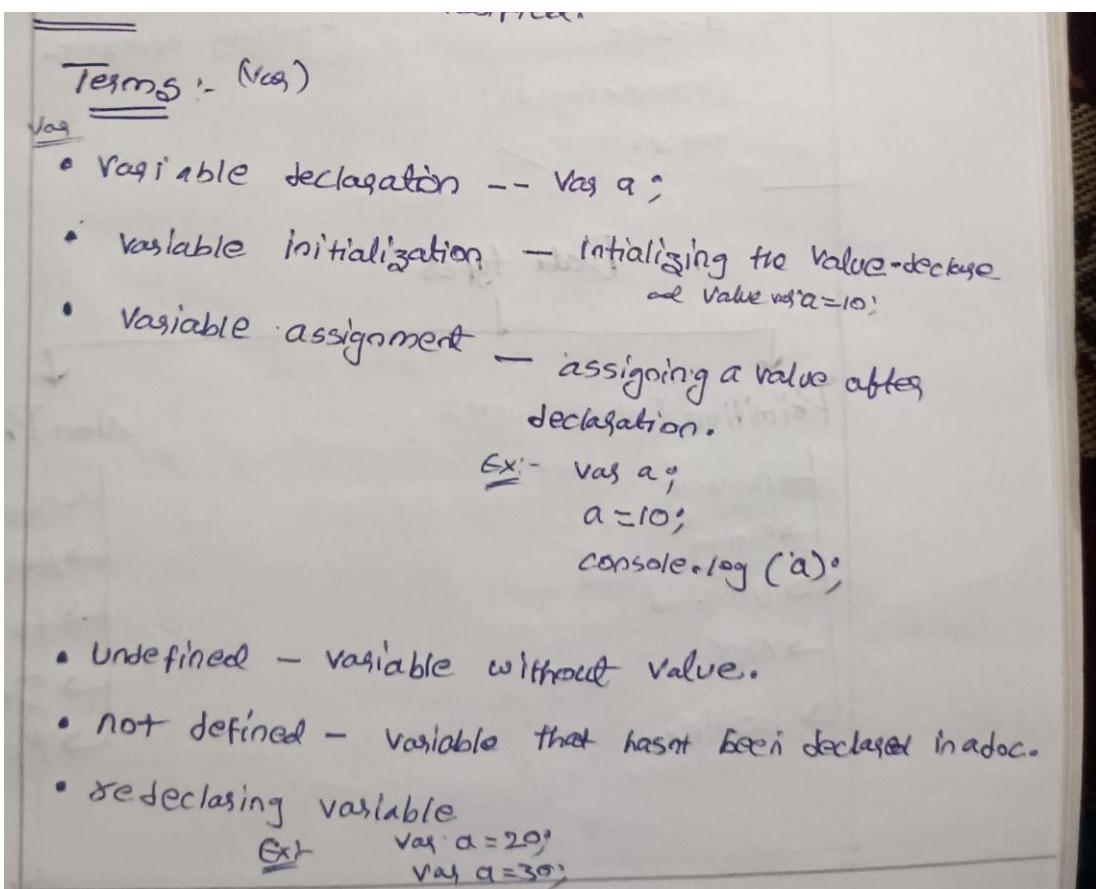
Example:

```
a=10;  
Var b=20;  
let c=5;  
Const d=15;  
console.log(a); //10  
console.log(a); //20  
console.log(a); //5  
console.log(a); //15
```

Rules for Identifiers:

- Names can contain letters, digits, underscores, and dollar signs
- Identifier should not start with number
- Names must begin with a letter or _ or \$
- Names are case-sensitive
- Reserved words cannot be used as Identifier.

Terms:



Dynamic typing:

Js is a dynamically typed, meaning you do not have to specify the datatype of the variable when declared. The Data type of the variable is determined automatically in a runtime.

Hoisting

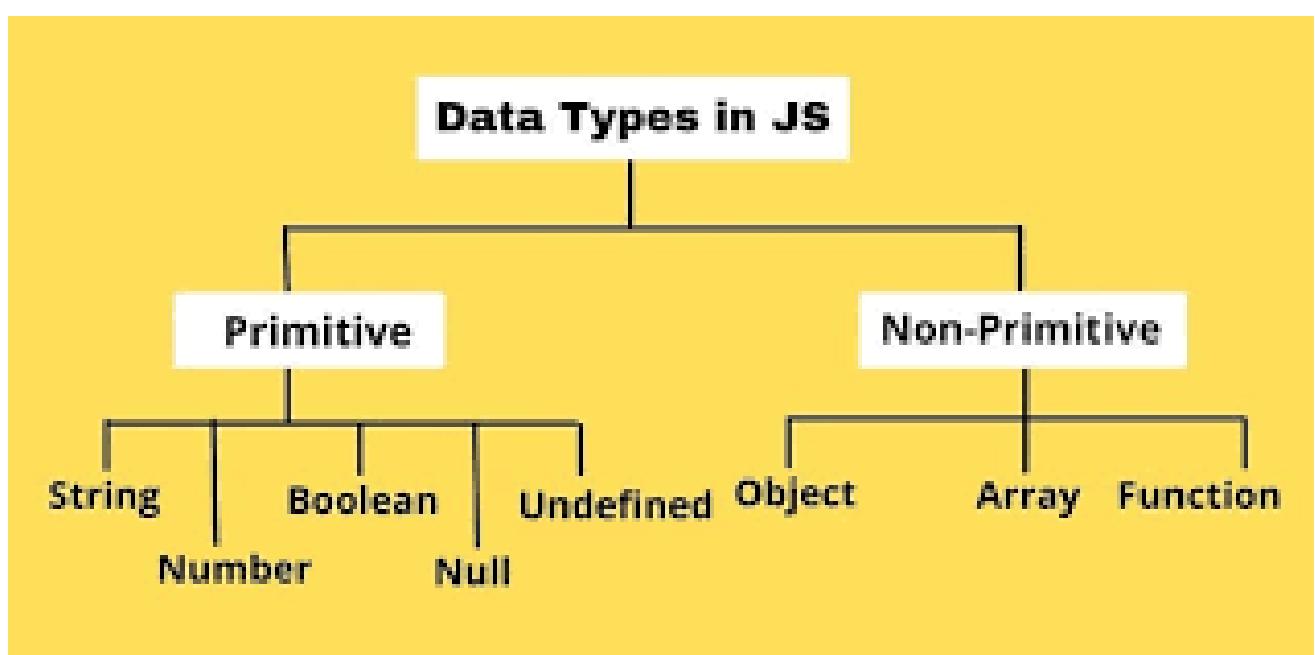
- It is a behaviour where the declaration of the variable and functions are moved to the top even before the execution.
- Only Declaration is hoisted not the Initialization
- Only works in `var` remaining `let` and `const` goes to temporary deadzone

Example:

```
a=20;  
Console.log(a); //20  
var a;
```

Data types

JavaScript provides different **data types** to hold different types of values. There are two types of data types in JavaScript.



Primitive Data Types:-

Primitive data types are the fundamental building blocks used to represent single values.

- Primitive data types which is stored in stack. (call by value and pass by reference)
- Which are immutable. We can access the data but cannot change.

Non Primitive Data types:- (or) Composite data type

- Used to represent multiple values
- Non primitive data types are stored in heap. (call by reference and pass by reference)
- Which are mutable (we can change data).

Primitive

- Number :- represents numeric values

Eg:- var a = 100;

- String :- represents Group of characters

Eg:- var b = "Hello"

- Boolean :- represents boolean value either

true - 1 or false - 0

- NULL :- represents null, ie. no value at all
(Intentionally Empty Value)

- Undefined :- variable with out value (declared but not assigned value)

Non primitive

- array :- represents group of Siminal Elements
- Objects :- represents instance through which we can access members.
- functions :- it is a block of code to perform Particular task and it is reusable.
- date
- reg exp :- represents regular expressions.

Examples :-

Primitive

```
var a = 20; //number
```

```
var b = 'hello'; //string
```

```
var c = true; //boolean
```

```
var d = false
```

```
var e = null
```

```
var f = undefined
```

```
console.log(c+f); //NaN
```

non primitive

arrays (Number index)

```
var a = [20, 'hello', true];
```

```
a[0] = 30;
```

```
= console.log(a); // [30, 'hello', true]
```

```
console.log(a[-1]);
```

objects (Named index)

```
var b = {
```

```
id: 1201,
```

```
name: 'Abhi',
```

```
age: 20.
```

```
console.log(b.age); //20
```

date :-

```
var c = new Date();
console.log(c);
```

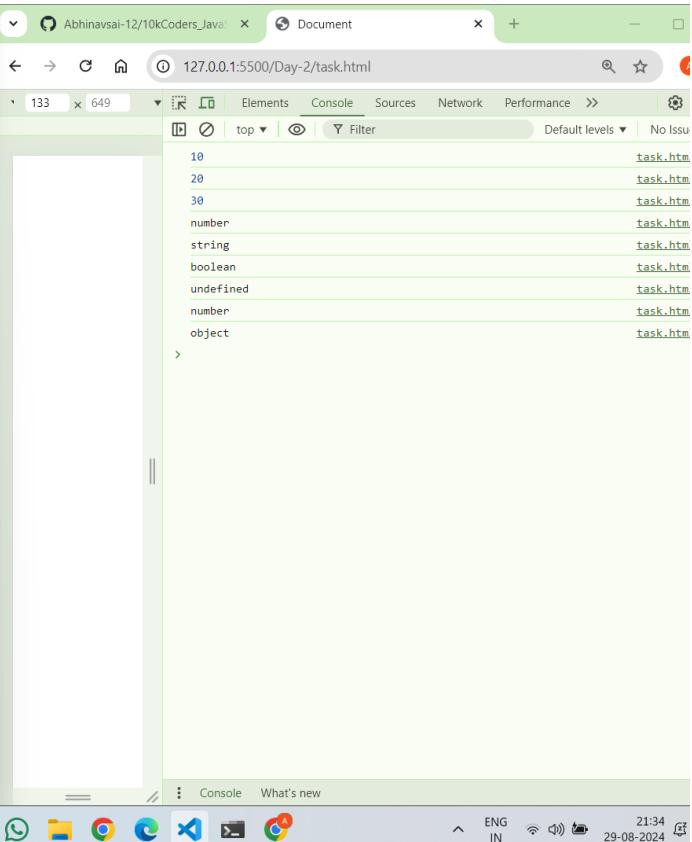
Function :-

```
var d = function() {
    console.log('Hello World');
}
d();
```

Typeof:

The typeof operator returns the data type of a variable.

The JavaScript typeof operator returns the data type of a variable or expression. It's a unary operator placed before its operand and returns a string indicating the data type, such as "number", "string", "boolean", "object", "undefined", "function", or "symbol".



The screenshot shows a browser window with developer tools open. On the left, a code editor displays a script with various declarations and log statements. On the right, the browser's developer tools console shows the results of these logs. The console output is as follows:

```
10          task.htm
20          task.htm
30          task.htm
number      task.htm
string      task.htm
boolean     task.htm
undefined   task.htm
number      task.htm
object      task.htm
>
```

Scopes

A Scope in JS defines the Accessibility or life or Visibility of Variables and Functions.

1. Global Scope:

Variable declared globally (out side function) have global scope means can be accessed from anywhere.

Var have global Scope and Function Scope.

2. Block Scope:

Variables declared in a block have block scope means that can't be accessed outside of the block.

Only var have global scope the remaining let and const have block scope.

3. Local Scope:

Variables declared within the function have local scope. They can only be accessed within the function.

Example :-

Global :-

```
var a=10;
console.log(a); // 10
```

block :-

```
{ var a=10;
  console.log(a); // 10 }
```

block :-

```
{ let a=10;
  console.log(a); // not defined }
```

Block :-

```
{ let a=10;
  console.log(a); // 10 }
```

-

```
{ let a=10;
  console.log(a); // not defined }
```

-

```
{ let a=10;
  console.log(a); // 10 }
```



```
var a=10;
let b=20;
const c=30; } block scope
```

Debugger

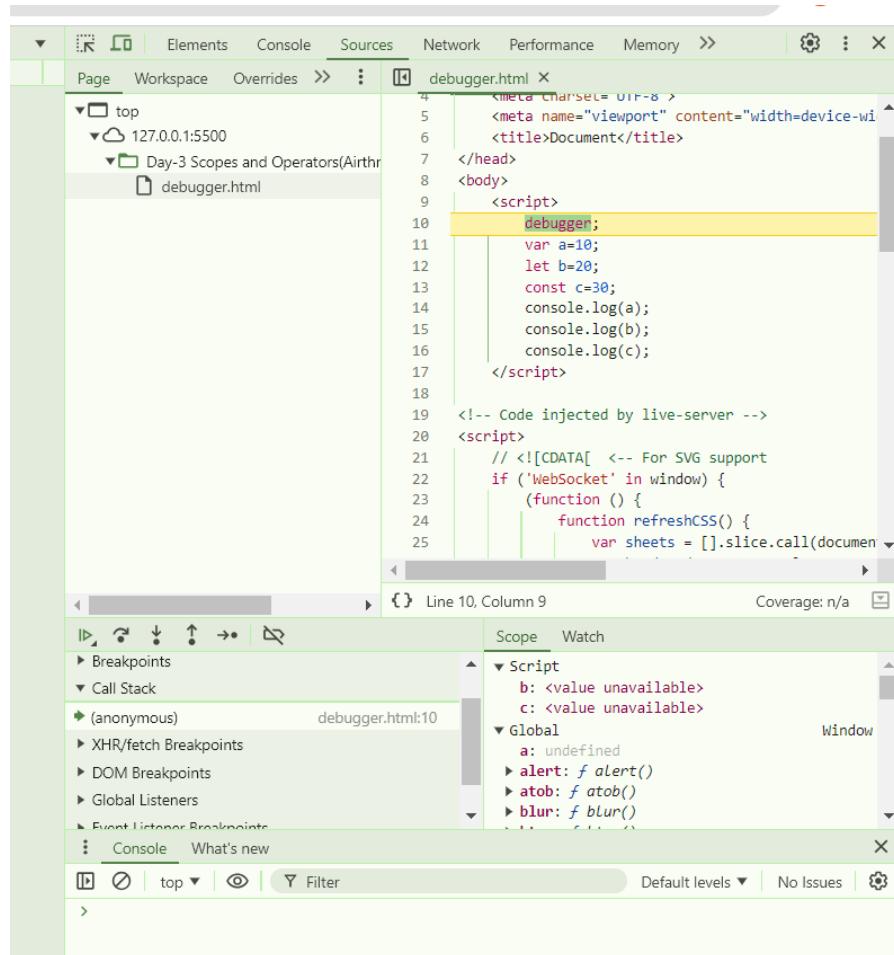
We can check Execution line by line by using keyword debugger followed by semi colon (:)

syntax:

```
debugger;
```

Example:

```
<script>  
    debugger;  
    var a=10;  
    let b=20;  
    const c=30;  
    console.log(a);  
    console.log(b);  
    console.log(c);  
</script>
```



Variable Difference:

1) Scope

var has global scope

Let and const have block scope

2) Re declaration

Var can be re declared

Let and const can't be re declared

3) Re assignment

Var and let can be re assigned

Const can't be re assigned

Operators

Javascript operators are used to perform different types of mathematical and logical computations.

(or)

In JavaScript, an **operator** is a symbol that performs an operation on one or more operands, such as variables or values, and returns a result. Let us take a simple expression **4 + 5** is equal to 9. Here 4 and 5 are called **operands**, and '+' is called the **operator**.

Types:

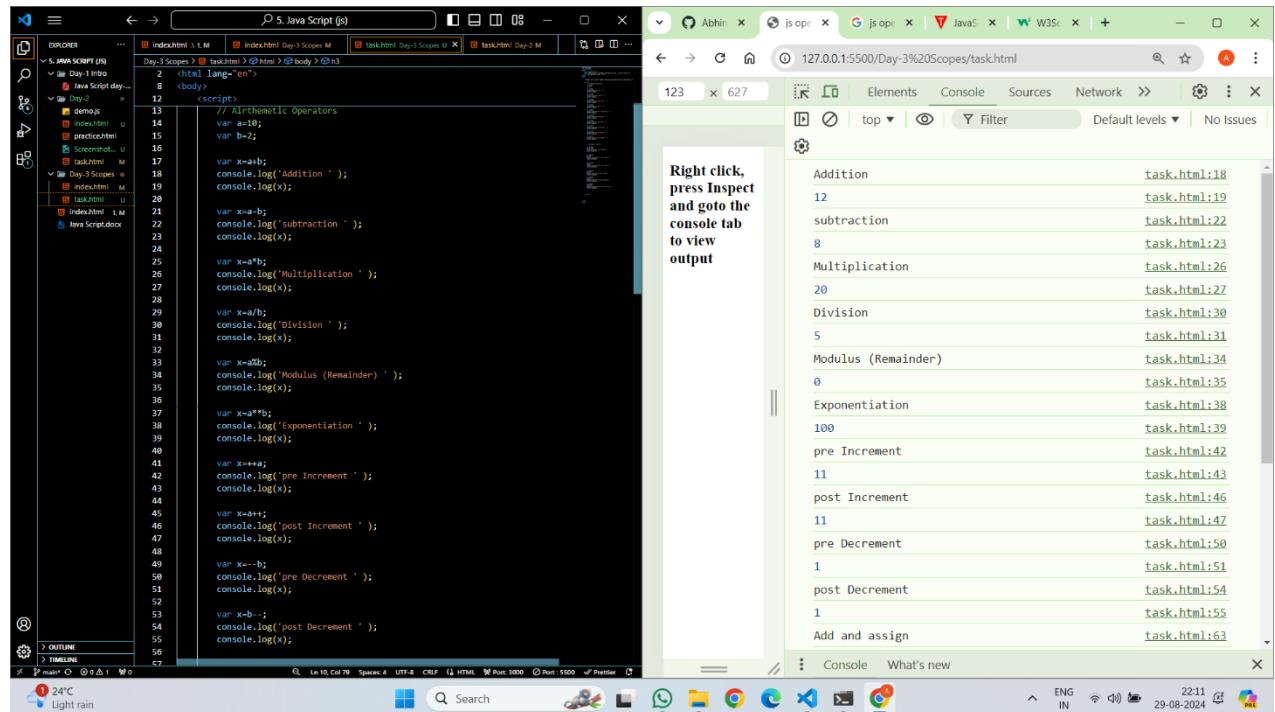
1. Airthmetic Operators
2. Assignment Operator
3. Comparision Operator
4. Logical Operator
5. Ternary Operator
6. Bitwise Oberator
7. String Operator
8. Typeof Operator

Arithmetic operators

Arithmetic operators are used to perform **arithmetic operations** between variables or values.

Operator	Name	Example
+	Addition	<code>3 + 4 // 7</code>
-	Subtraction	<code>5 - 3 // 2</code>
*	Multiplication	<code>2 * 3 // 6</code>
/	Division	<code>4 / 2 // 2</code>
%	Remainder	<code>5 % 2 // 1</code>
++	Increment (increments by 1)	<code>++5 or 5++ // 6</code>
--	Decrement (decrements by 1)	<code>--4 or 4-- // 3</code>
**	Exponentiation (Power)	<code>4 ** 2 // 16</code>

Example:



The screenshot shows a browser window with developer tools open. The left pane is the code editor with a script file containing arithmetic operations. The right pane is the developer tools console tab, which displays the results of these operations. A tooltip in the center-right area instructs: "Right click, press Inspect and go to the console tab to view output".

```
// Arithmetic Operators
var a=10;
var b=2;
var x=a+b;
console.log("Addition ");
console.log(x);
var x=a-b;
console.log("Subtraction ");
console.log(x);
var x=a*b;
console.log("Multiplication ");
console.log(x);
var x=a/b;
console.log("Division ");
console.log(x);
var x=a%b;
console.log("Modulus (Remainder) ");
console.log(x);
var x=a**b;
console.log("Exponentiation ");
console.log(x);
var x+=a;
console.log("pre Increment ");
console.log(x);
var x+=a;
console.log("post Increment ");
console.log(x);
var x-=b;
console.log("pre Decrement ");
console.log(x);
var x-=b;
console.log("post Decrement ");
console.log(x);
```

Output in the console tab:

- Addition
- Subtraction
- Multiplication
- Division
- Modulus (Remainder)
- Exponentiation
- 100
- pre Increment
- 11
- post Increment
- 11
- pre Decrement
- 1
- post Decrement
- 1
- Add and assign

Assignment Operators:

We use assignment operators to **assign** values to variables.

Operator	Name	Example
=	Assignment Operator	a = 7;
+=	Addition Assignment	a += 5; // a = a + 5
-=	Subtraction Assignment	a -= 2; // a = a - 2
*=	Multiplication Assignment	a *= 3; // a = a * 3
/=	Division Assignment	a /= 2; // a = a / 2
%=	Remainder Assignment	a %= 2; // a = a % 2
=	Exponentiation Assignment	a **= 2; // a = a2

Example:

The screenshot shows a browser window with developer tools open. The left pane is an IDE-like interface with code snippets for various assignment operators. The right pane is a browser console showing the results of running those snippets. A tooltip on the right side of the console says: "Right click, press Inspect and goto the console tab to view output".

Code in the IDE:

```
// Assignment Operators
var a1=10;
a1 += 10;
console.log('Add and assign');
console.log(a1);

var a2=10;
a2 -= 10;
console.log('Subtract and assign');
console.log(a2);

var a3=10;
a3 *= 2;
console.log('Multiply and assign');
console.log(a3);

var a4=10;
a4 /= 2;
console.log('Divide and assign');
console.log(a4);

var a5=10;
a5 %= 2;
console.log('Modulus and assign');
console.log(a5);

var a6=10;
a6 **= 2;
console.log('Exponential and assign');
console.log(a6);
```

Console Output:

Operation	Value
Add and assign	task.html:63
120	task.html:64
Subtract and assign	task.html:69
0	task.html:70
Multiply and assign	task.html:75
20	task.html:76
Divide and assign	task.html:81
0.8333333333333334	task.html:82
Modulus and assign	task.html:86
10	task.html:87
Exponential and assign	task.html:91
10000000000	task.html:92

Comparision Operators

Comparison operators are used in logical statements to determine equality or difference between variables or values.

Operator	Meaning	Example
<code>==</code>	Equal to	<code>3 == 5 // false</code>
<code>!=</code>	Not equal to	<code>3 != 4 // true</code>
<code>===</code>	Strictly equal to	<code>3 === "3" // false</code>
<code>!==</code>	Strictly not equal to	<code>3 !== "3" // true</code>
<code>></code>	Greater than	<code>4 > 4 // false</code>
<code><</code>	Less than	<code>3 < 3 // false</code>
<code>>=</code>	Greater than or equal to	<code>4 >= 4 // true</code>
<code><=</code>	Less than or equal to	<code>3 <= 3 // true</code>

The screenshot shows a Microsoft Edge browser window with the title bar "J 5. Java Script (js)". The address bar contains the URL "comparison.html". The page content displays a comparison of various JavaScript operators through a script block. The script uses console.log() to output results for each operator. The operators compared include equality (==, !=), strict equality (===, !==), less than (**a**<**b**), greater than (**a**>**b**), less than or equal (**a**<=**b**), greater than or equal (**a**>=**b**), and the not equal operator (**a****=****b**). The browser interface includes a navigation bar with back, forward, and search buttons, as well as a status bar at the bottom showing "Ln 12, Col 13, Spaces: 4, UTF-8, CRLF, HTML, Port: 5500, Prettier". The bottom left corner shows the Windows taskbar with icons for File Explorer, Task View, and Start.

```
index.html \ t, M index.html Day-4-Operators, t, U task.html comparison.html x age_major.html U odd_even.html
Day-4-Operators comparison.html > @http://localhost:5500/comparison.html
2 <html lang="en">
3   <body>
4     <script>
5       // Comparision Operators
6       var a=10;
7       var b=12;
8       a!=a-b;
9       console.log('Equal to');
10      console.log(a);
11
12      a<b;
13      console.log('less than');
14      console.log(a);
15
16      a>b;
17      console.log('Greater than');
18      console.log(a);
19
20      a<=b;
21      console.log('Less than or Equal operator');
22      console.log(a);
23
24      a>=b;
25      console.log('greater than or equal operator');
26      console.log(a);
27
28      a!=a+b;
29      console.log('not equal operator');
30      console.log(a);
31
32      f=4;
33      g=4;
34      a!=f==g;
35      console.log('Strictly equal to');
36      console.log(a);
37
38      x="15";
39      y=15;
40      a!=x==y;
41      console.log('Strictly equal to');
42      console.log(a);
43
44      x="15";
45      y=15;
46      a!=x=y;
47      console.log('Strictly equal to');
48      console.log(a);
49
50      x="15";
51      y=15;
52      a!=x==y;
53      console.log('Strictly equal to');
54      console.log(a);
55
56
```

Logical Operator:

Logical operators return a boolean value by evaluating boolean expressions.

1. **Logical And Operator:** The logical AND operator `&&` returns `true` if both the expressions are `true`.
2. **Logical OR Operator:** The logical OR operator `||` returns true if at least one expression is true.
3. **Logical Not Operator:** The logical NOT operator `!` returns true if the specified expression is false and vice versa.

Operator	Syntax	Description
<code>&&</code> (Logical AND)	<code>expression1 && expression2</code>	<code>true</code> only if both <code>expression1</code> and <code>expression2</code> are <code>true</code>
<code> </code> (Logical OR)	<code>expression1 expression2</code>	<code>true</code> if either <code>expression1</code> or <code>expression2</code> is <code>true</code>
<code>!</code> (Logical NOT)	<code>!expression</code>	<code>false</code> if <code>expression</code> is <code>true</code> and vice versa

The screenshot shows a browser window with developer tools open. The left pane displays a portion of a JavaScript file named 'logicalop.html' containing code for demonstrating logical operators. The right pane shows the browser's developer tools console tab, which has the following output:

```
your are a Child      logicalop.html:27
false                logicalop.html:33
false                logicalop.html:36
```

The code in the file includes examples for Logical AND, Logical OR, and Logical NOT operators, along with comments explaining their usage.

```
2 <html lang="en">
8   <body>
10  <html lang="en">
16    <body>
17      <h3>Right click, press Inspect and goto the console tab to view output</h3>
18      <script>
20        // Comparison Operators
21
22        //Logical And
23        var age=+prompt('Enter Your age:')
24        var ac=(age>=0 && age<18) ? "Child":"Adult";
25        window.alert("your are a "+ac); // output in alert box
26        console.log("your are a "+ac); // output in console tab
27
28        //Logical OR
29        var x=5;
30        var or=( (x<4) || (4>x) );
31        window.alert(or); // output in alert box
32        console.log(or); // output in console tab
33
34        //Logical Not
35        console.log(!(2 < 3)); //false
36
37
```

Ternary operator:

The Ternary Operator in JavaScript is a shortcut for writing simple if-else statements. It's also known as the Conditional Operator because it works based on a condition. The ternary operator allows you to quickly decide between two values depending on whether a condition is true or false.

Syntax:

condition ? trueExpression : falseExpression

Example:

The screenshot shows a browser's developer tools console tab. The code being run is:

```
2 l lang="en">
8 y>
10 l lang="en">
16 y>
19 <script>
20 // Ternary Operator
21
22 var age=+prompt('Enter Your age:')
23 var ac=(age<=0 || age>18) ? "Child": "Adult";
24 window.alert("your are a "+ac); // output in alert box
25 console.log("your are a "+ac); // output in console tab
26
27
28
```

The console output shows the result of the ternary operator: "your are a Adult". The status bar at the bottom indicates the file is `ternaryop.html:25`.

Nullish coalescing operator (??)

is a logical operator that returns its right-hand side operand when its left-hand side operand is null or undefined, and otherwise returns its left-hand side operand. It's commonly used to provide default values for variables.

Example:

```
<script>
    //Nullish Coalescing Operator
    var a=null;
    var b=a ?? "Some Content";
    console.log(b); // Some Content
</script>
```

Unary Operator:

- Unary operators in JavaScript are unique operators that consider a single input and carry out all possible operations.
 - The Unary plus, unary minus, prefix increments, postfix increments, postfix decrements, and prefix decrements are examples of these operators. These operators are either put before or after the operand.
 - The unary operators are more effective in executing functions than JavaScript; they are more popular. Unary operators are flexible and versatile since they cannot be overridden.

Unary Operators	Operator's Name	Operators Description
+x	Unary Plus	The operator converts an input value into a number
-x	Unary Minus	The operator converts a value into a number and negates it
++x	Increment Operator (Prefix)	The operator uses to inserts one value before the incremental value by one
--x	Decrement Operator (Prefix)	The operator Subtracts one value from the given input value before
x++	Increment Operator (Postfix)	The operator uses to inserts one value after the incremental value by one
x--	Decrement Operator (Postfix)	The operator subtracts one value before the incremental value by one.

Example:

```
<script>
    // Using unary plus to convert string to number
    let str1 = "12";
    let num = +str1;
    console.log(num);
    console.log(typeof (num)) // Here we are using typeof operator

    // "Abhinav" cannot be converted to a number
    let str2 = +"Abhinav";
    console.log(str2);
    console.log(typeof (str2))

    let s1='2'
    let n1 = -s1;
    console.log(n1);
    console.log(typeof (n1))

    let s2='3'
    let n2 = ++s2;
    console.log(n2);
    console.log(typeof (n2))

    let s3='5'
    let n3 = s3++;
    console.log(n3);
    console.log(typeof (n3))
</script>
```

The screenshot shows the Chrome DevTools interface with the 'Console' tab selected. The console output is as follows:

```
12              unary.html:16
number          unary.html:17
NaN             unary.html:21
number          unary.html:22
-2              unary.html:26
number          unary.html:27
4               unary.html:31
number          unary.html:32
5               unary.html:36
number          unary.html:37
```

Type Coercion

Type coercion refers to the automatic or implicit conversion of values from one data type to another.

In programming, type conversion is the process of converting data of one [type](#) to another. For example, converting [string](#) data to [number](#).

There are [two types of type conversion](#) in JavaScript:

- [Implicit Conversion](#) - Automatic type conversion.
- [Explicit Conversion](#) - Manual type conversion.

Explicit Type Conversion

JavaScript type conversion, allowing you to convert values from one data type to another.

1. [String\(\)](#): Converts a value to a string.

```
let num = 123;
let str = String(num);
console.log(str);
// Output: "123"
```

2. [Number\(\)](#): Converts a value to a number.

```
let str = "123";
let num = Number(str);
console.log(num); // Output: 123
```

3. Boolean(): Converts a value to a boolean.

```
let num = 0;  
let bool = Boolean(num);  
console.log(bool); // Output: false
```

Example:

The screenshot shows a browser window with developer tools open. The left panel displays a portion of an HTML file with embedded JavaScript code. The right panel is a developer tools console showing the output of `console.log` statements. The log entries are:

Output	Source
5 '-' 'number'	explicity_type_Conversion.html:17
true - string	explicity_type_Conversion.html:21
false '-' 'boolean'	explicity_type_Conversion.html:25

How to take or get input from Users:

```
Var a= +prompt('Enter Your Data');
```

In JavaScript, values are categorized as either "truthy" or "falsy"

Falsy Values:

1. **false**: The boolean value false itself.
2. **0**: The number zero.
3. **""**: Empty string.
4. **null**: The absence of any value.
5. **undefined**: A variable that has not been assigned a value or a property that does not exist.
6. **NaN**: Not-a-Number.

Truthy Values:

1. **true**: The boolean value true itself.
2. **Non-zero numbers**: Any number other than 0 (including negative numbers and decimals).
3. **Non-empty strings**: Any string with at least one character.
4. **Non-empty arrays**: Arrays with at least one element.

5. **Objects:** Any object (including functions and arrays) is truthy, even if it's empty.

6. **Functions:** Any function is truthy, even if it doesn't return anything.

Check Truthy, Falsy values using ternary operator:

The screenshot shows a browser window with the URL `127.0.0.1:5500/Day-4%20Operators/truthy_falsy.html`. On the left, the code editor displays a script that demonstrates the ternary operator for various types of values. On the right, the browser's developer tools console tab shows the output of the script, which consists of a series of `false` and `true` entries, each followed by the file name `truthy_falsy.html`.

```
Day-4 Operators > truthy_falsy.html > html > body > script
2 <html lang="en">
8 <body>
11   <script>
12     // Falsy Values
13     var a = '';
14     var b = a ? true : false;
15     console.log(b);
16
17     var a = false;
18     var b = a ? true : false;
19     console.log(b);
20
21     var a = 0;
22     var b = a ? true : false;
23     console.log(b);
24
25     var a = null;
26     var b = a ? true : false;
27     console.log(b);
28
29     var a = undefined;
30     var b = a ? true : false;
31     console.log(b);
32
33
34   //Truthy Values
35   var a = true;
36   var b = a ? true : false;
37   console.log(b);
38
39   var a = 5;
40   var b = a ? true : false;
41   console.log(b);
42
43   var a = 'Abhinav';
44   var b = a ? true : false;
45   console.log(b);
46
47   var a = ['abhi','null','sai'];
48   var b = a ? true : false;
49   console.log(b);
50
51   </script>
52 </body>
53 </html>
```

Output	File
false	truthy_falsy.html
true	truthy_falsy.html

Tasks:

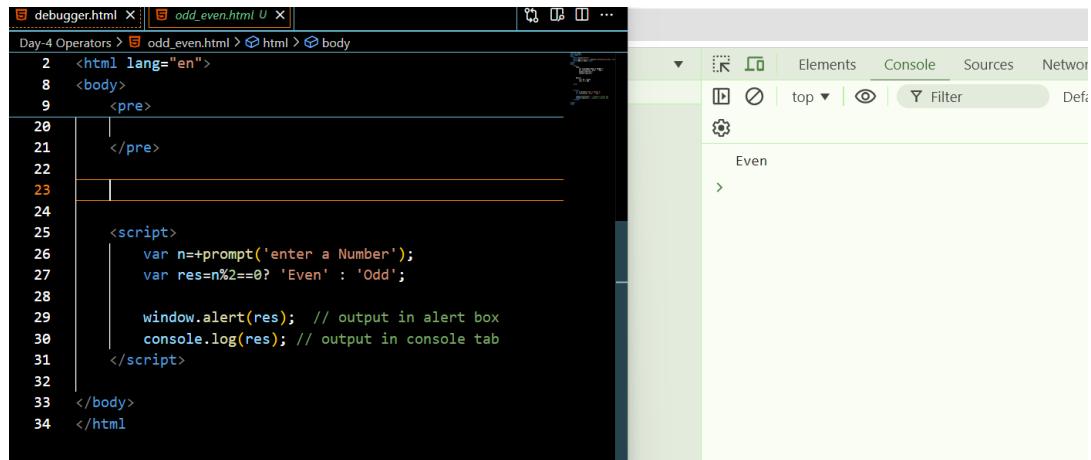
1. Write a JavaScript script that compares two variables using different comparison operators (`==`, `=====`, `!=`, `!==`, `>`, `<`, `>=`, `<=`) and prints the results.

The screenshot shows a browser window with the URL `127.0.0.1:5500/Day-4%20Operators/comparison.html`. On the left, the code editor displays a script that uses various comparison operators (`<`, `<=`, `>`, `>=`, `==`, `!=`, `===`, `!==`) to compare variables and log the results to the console. On the right, the browser's developer tools console tab shows the output of the script, which includes comparisons like "Equal to", "less than", "Greater than", etc., along with the file name `comparison.html`.

```
Day-4 Operators > comparison.html > html > body > script
2 <html lang="en">
8 <body>
10   <h3>Right click, press Inspect and goto the console tab to view output</h3>
11
12   <script>
13
14     // Comparison Operators
15     var a=10;
16     var b=12;
17     a1=ab;
18     console.log("Equal to");
19     console.log(a1);
20
21     a2=aa;
22     console.log("less than");
23     console.log(a2);
24
25     a3=ab;
26     console.log("Greater than");
27     console.log(a3);
28
29     a4=ac;
30     console.log("Less than or Equal operator");
31     console.log(a4);
32
33     a5=bb;
34     console.log("Greater than or equal operator");
35     console.log(a5);
36
37     a6=a1b;
38     console.log("not equal operator");
39     console.log(a6);
40
41     f=4;
42     g=4;
43     a7(f==g);
44     console.log('Strictly equal to');
45     console.log(a7);
46
47     x="15";
48     y=15;
49     a7(x==y);
50     console.log('Strictly equal to');
51     console.log(a7);
52
53   </script>
54 </body>
55 </html>
```

Output	File
Equal to	comparison.html:19
false	comparison.html:20
less than	comparison.html:23
true	comparison.html:24
Greater than	comparison.html:27
false	comparison.html:28
Less than or Equal operator	comparison.html:31
true	comparison.html:32
Greater than or equal operator	comparison.html:35
true	comparison.html:36
not equal operator	comparison.html:39
true	comparison.html:40
Strictly equal to	comparison.html:45
true	comparison.html:46
Strictly equal to	comparison.html:51
false	comparison.html:52
Live reload enabled.	comparison.html:93

2. Write a JavaScript script that uses the ternary operator to determine if a number is even or odd.

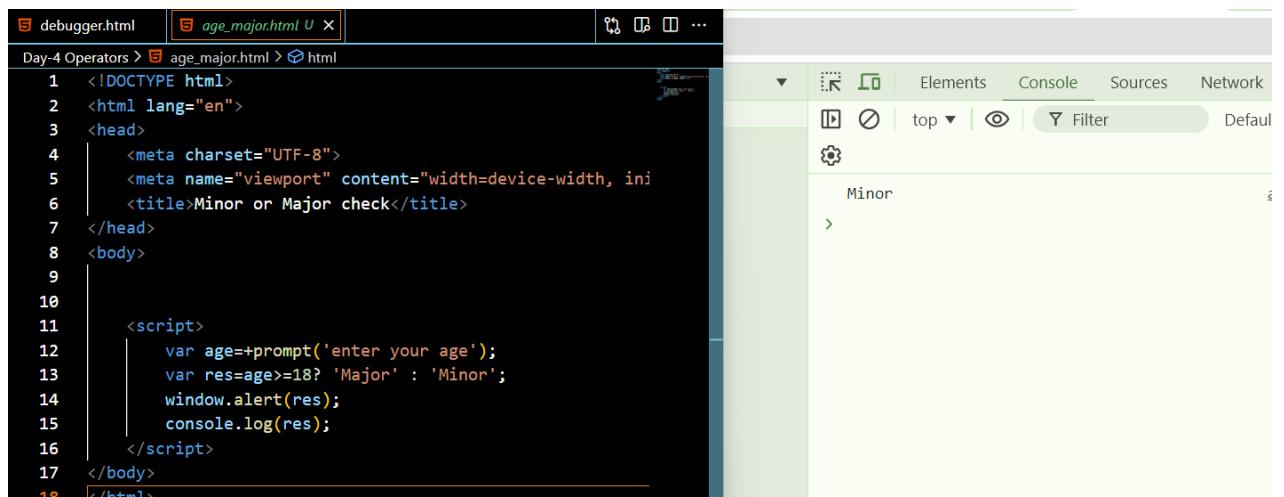


```

1 <!DOCTYPE html>
2 <html lang="en">
3 <body>
4 <pre>
5
6 <script>
7     var n=+prompt('enter a Number');
8     var res=n%2==0? 'Even' : 'Odd';
9
10    window.alert(res); // output in alert box
11    console.log(res); // output in console tab
12 </script>
13 </body>
14 </html>

```

3. Expand the script to include a ternary operation that checks if a user is an adult (18+) or a minor.

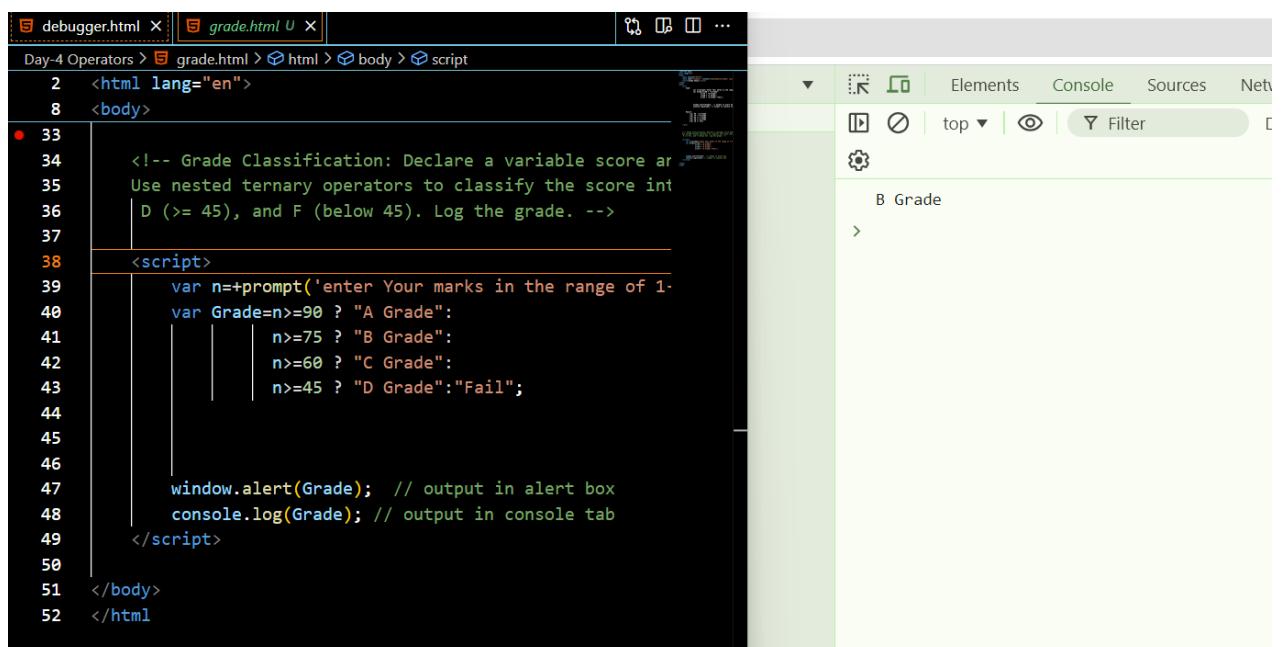


```

1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4     <meta charset="UTF-8">
5     <meta name="viewport" content="width=device-width, ini
6     <title>Minor or Major check</title>
7 </head>
8 <body>
9
10
11 <script>
12     var age=+prompt('enter your age');
13     var res=age>=18? 'Major' : 'Minor';
14     window.alert(res);
15     console.log(res);
16 </script>
17 </body>
18 </html>

```

4. Grade Classification: Declare a variable score and set it to a value between 0 and 100. Use nested ternary operators to classify the score into grades: A (≥ 90), B (≥ 75), C (≥ 60), D (≥ 45), and F (below 45). Log the grade.



```

1 <!DOCTYPE html>
2 <html lang="en">
3 <body>
4
5     <!-- Grade Classification: Declare a variable score ar
6     Use nested ternary operators to classify the score int
7     D ( $\geq 45$ ), and F (below 45). Log the grade. -->
8
9 <script>
10    var n=+prompt('enter Your marks in the range of 1-
11    var Grade=n>=90 ? "A Grade":
12        |   | n>=75 ? "B Grade":
13        |   | n>=60 ? "C Grade":
14        |   | n>=45 ? "D Grade":"Fail";
15
16    window.alert(Grade); // output in alert box
17    console.log(Grade); // output in console tab
18 </script>
19
20 </body>
21 </html>

```

5. Temperature Check: Declare a variable temperature and use nested ternary operators to categorize it as "Hot" (above 30), "Warm" (20-30), "Cool" (10-19), and "Cold" (below 10). Log the result.

```

1 debugger.html
2 temperature_check.html U X
3 Day-4 Operators > temperature_check.html > html > body > script
4
5   <html lang="en">
6     <body>
7       <script>
8         var n=+prompt('enter Temperature for Temperature C');
9         var temp=n>30 ? "HOT":
10            |   n>=20 ? "Warm":
11            |   n>=10 ? "Cool":"cold";
12
13           window.alert(temp); // output in alert box
14           console.log(temp); // output in console tab
15
16       </script>
17
18     </body>
19   </html>

```

6. Age Group: Declare a variable age and use the ternary operator to classify the age into "Child" (0-12), "Teen" (13-19), "Adult" (20-64), and "Senior" (65 and above). Log the result.

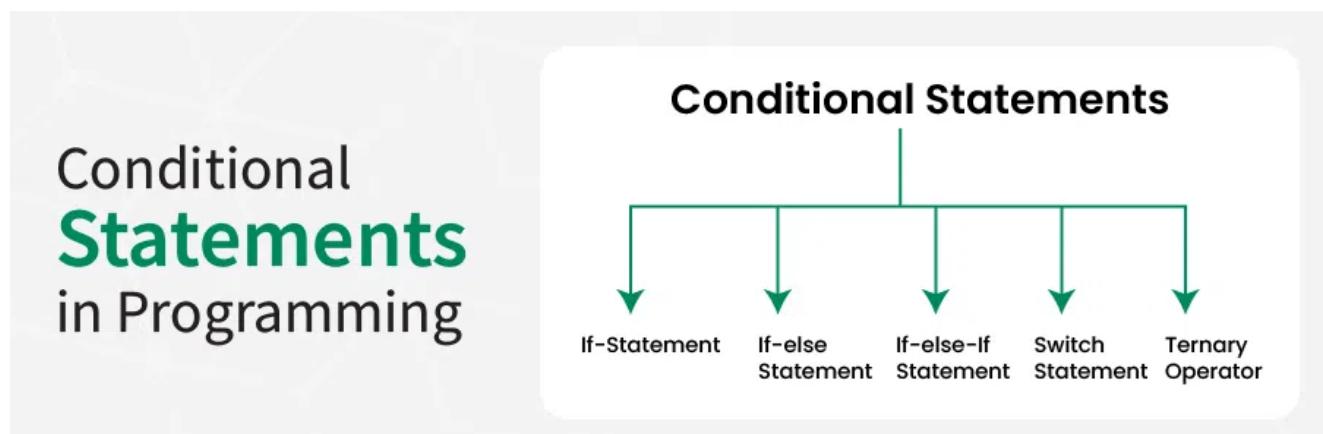
```

1 debugger.html X
2 age_check.html U X
3 Day-4 Operators > age_check.html > html > body > pre > ? > ? > ? > script
4
5   <html lang="en">
6     <body>
7       <pre>
8         var ac=(age>=0 && age<=12) ? "Child":
9             (age>=13 && age<=19) ? "Teen":
10
11           </pre>
12
13
14           <!-- Age Group: Declare a variable age and
15           use the ternary operator to classify the age into "Child" (0-12), "Teen" (13-19)
16           "Adult" (20-64), and "Senior" (65 and above). Log the result. -->
17
18
19       <script>
20         var age=+prompt('enter Your age to known which age group you are');
21         var ac=(age>=0 && age<=12) ? "Child":
22             (age>=13 && age<=19) ? "Teen":
23             (age>=20 && age<=64) ? "Adult":"Senior";
24
25
26
27         window.alert(ac); // output in alert box
28         console.log(ac); // output in console tab
29
30       </script>
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50

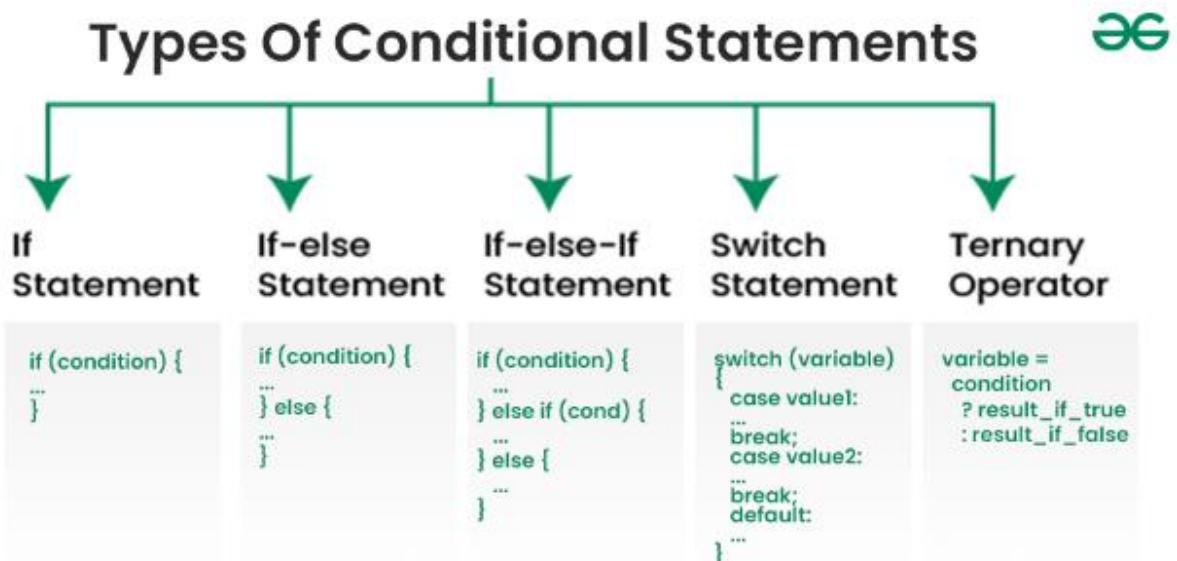
```

Conditional Statements

Conditional statements in programming are used to **control the flow of a program** based on certain conditions. These statements allow the execution of different code blocks depending on whether a specified condition evaluates to true or false, providing a fundamental mechanism for **decision-making** in algorithms. In this article, we will learn about the basics of Conditional Statements along with their different types.



Conditional Statements in Programming



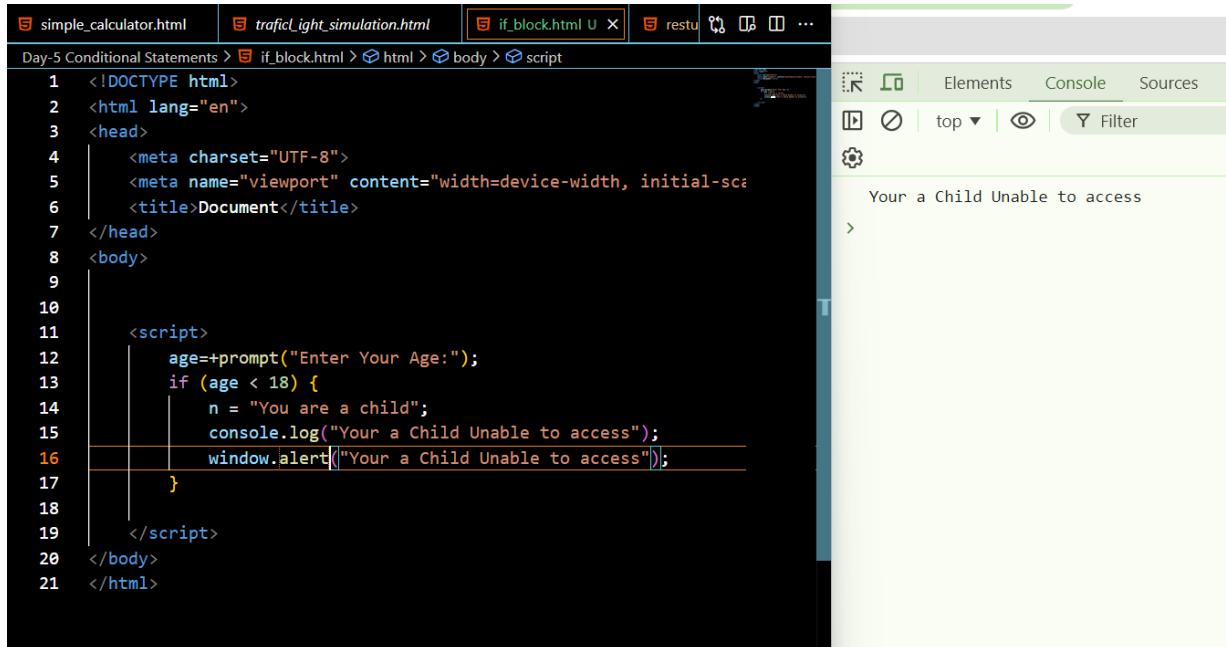
1. if Statement:

The **if** statement executes a block of code if a specified condition is true.

Syntax:

```
if (condition) {  
    // Code to execute if condition is true  
}
```

Example:



The screenshot shows a browser window with several tabs open. The active tab is 'if_block.html'. The code in the editor is as follows:

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta name="viewport" content="width=device-width, initial-scale=1.0">
6   <title>Document</title>
7 </head>
8 <body>
9
10
11   <script>
12     age+=prompt("Enter Your Age:");
13     if (age < 18) {
14       n = "You are a child";
15       console.log("Your a Child Unable to access");
16       window.alert("Your a Child Unable to access");
17     }
18
19   </script>
20 </body>
21 </html>
```

In the developer tools' console tab, the output is:

```
Your a Child Unable to access
```

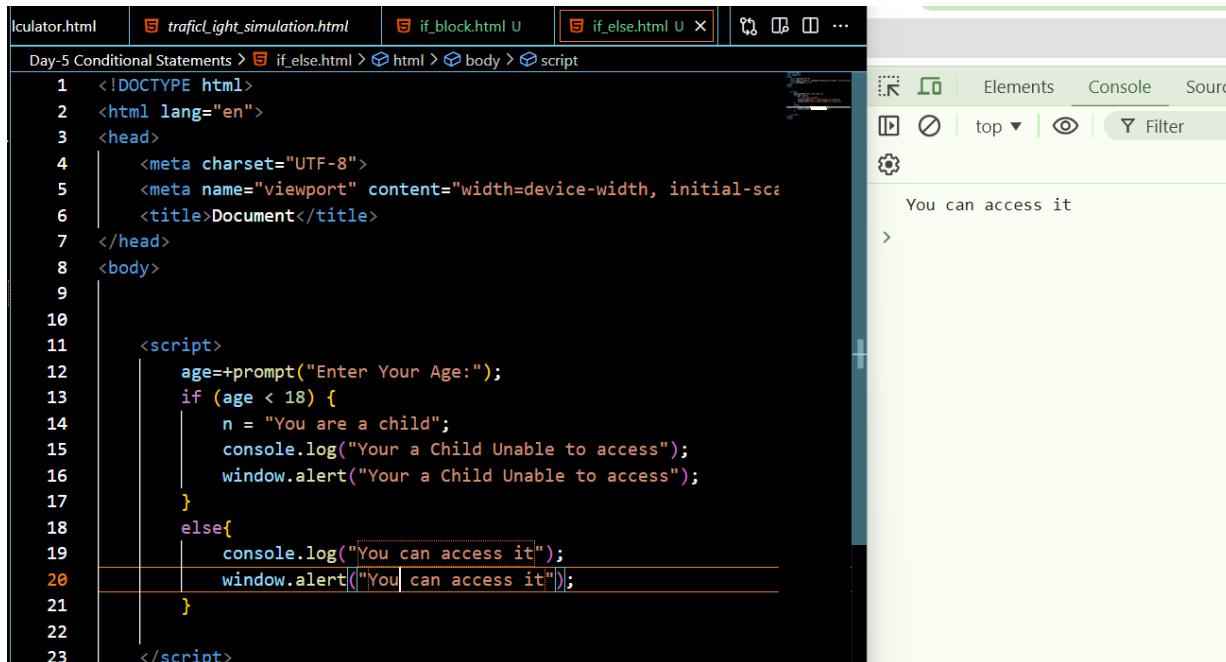
2. if...else Statement:

The **if...else** statement executes one block of code if a specified condition is true and another block if the condition is false.

Syntax:

```
if (condition) {
  // Code to execute if condition is true
} else {
  // Code to execute if condition is false
}
```

Example:



The screenshot shows a browser window with several tabs open. The active tab is 'if_else.html'. The code in the editor is as follows:

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta name="viewport" content="width=device-width, initial-scale=1.0">
6   <title>Document</title>
7 </head>
8 <body>
9
10
11   <script>
12     age+=prompt("Enter Your Age:");
13     if (age < 18) {
14       n = "You are a child";
15       console.log("Your a Child Unable to access");
16       window.alert("Your a Child Unable to access");
17     }
18     else{
19       console.log("You can access it");
20       window.alert("You can access it");
21     }
22
23   </script>
```

In the developer tools' console tab, the output is:

```
You can access it
```

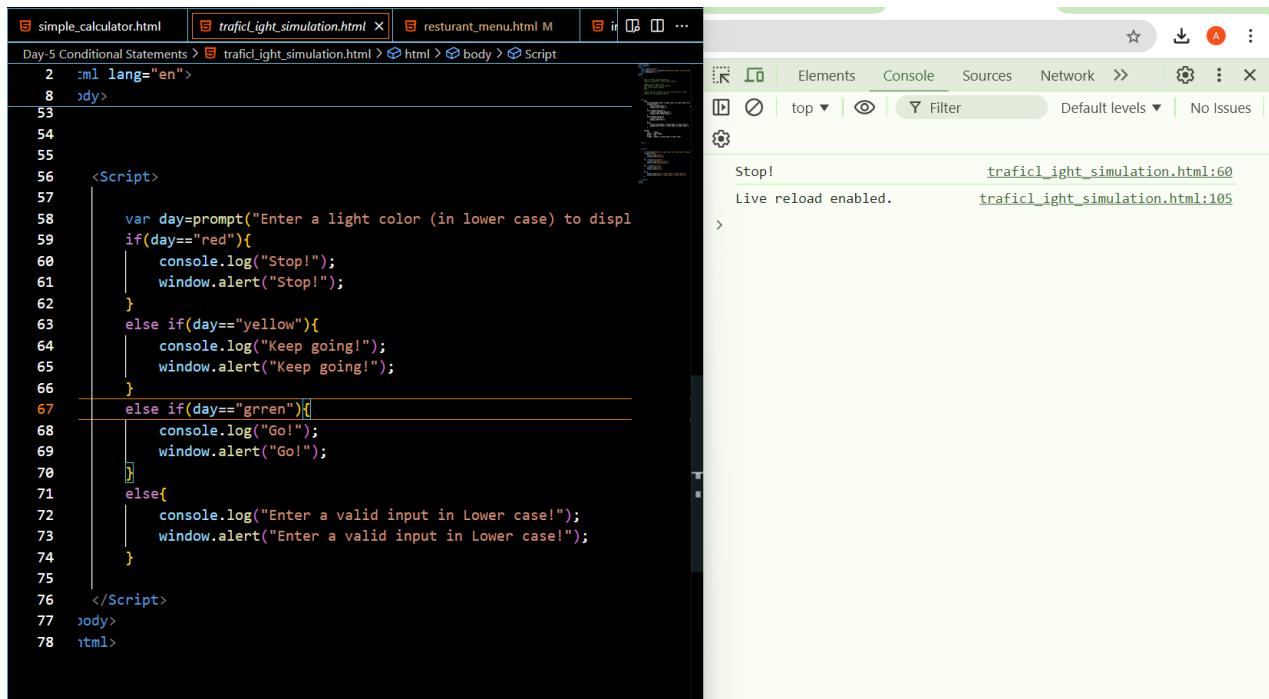
3)if...else if...else Statement:

The **if...else if...else** statement allows you to specify multiple conditions and execute different code blocks based on the outcome of those conditions.

Syntax:

```
if (condition1) {  
    // Code to execute if condition1 is true  
} else if (condition2) {  
    // Code to execute if condition2 is true  
} else {  
    // Code to execute if none of the conditions are true  
}
```

Example:



The screenshot shows a browser developer tools window with the 'Console' tab selected. It displays the following log entries:

```
Stop!          traficlight_simulation.html:60  
Live reload enabled.  traficlight_simulation.html:105
```

To the left of the console, there is a code editor window showing the source code for `traficlight_simulation.html`. The code contains an `if` statement with three branches: `red`, `yellow`, and `green`. Each branch logs a message to the console and displays an alert. If none of the conditions are met, it logs an error message and displays an alert.

```
2 <html lang="en">  
8   <body>  
53  
54  
55  
56   <Script>  
57  
58     var day=prompt("Enter a light color (in lower case) to displ  
59     if(day=="red"){  
60       console.log("Stop!");  
61       window.alert("Stop!");  
62     }  
63     else if(day=="yellow"){  
64       console.log("Keep going!");  
65       window.alert("Keep going!");  
66     }  
67     else if(day=="grren"){  
68       console.log("Go!");  
69       window.alert("Go!");  
70     }  
71     else{  
72       console.log("Enter a valid input in Lower case!");  
73       window.alert("Enter a valid input in Lower case!");  
74     }  
75   </Script>  
76 </body>  
78 </html>
```

4)Nested if:

You can have if statements inside if statements, this is called a nested if.

Syntax

```
if condition1 {  
    // code to be executed if condition1 is true  
    if condition2 {  
        // code to be executed if both condition1 and condition2 are true  
    }  
}
```

Example:

The screenshot shows a browser developer tools interface with the 'Console' tab selected. The code being run is a script that prompts for an age, then uses a nested if block to check if the age is less than 18. If true, it logs a message and alerts the user they are a child. If false, it logs a message and alerts the user they can access it. An else block at the bottom handles negative numbers by logging and alerting them.

```
1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta name="viewport" content="width=device-width, initial-scale=1.0">
6   <title>Document</title>
7 </head>
8 <body>
9
10
11   <script>
12     age=+prompt("Enter Your Age:");
13     if(age >0){
14       //nested if block
15       if (age < 18) {
16         n = "You are a Child";
17         console[methodName](message?: any): void;
18         window.alert("Your a Child Unable to access");
19       }
20       else{
21         console.log("You can access it");
22         window.alert("You can access it");
23       }
24     }
25     else{
26       console.log("You entered a -ve number");
27     }
28   </script>

```

You entered a -ve number

Switch statements

A switch statement in JavaScript is a control flow statement that allows you to execute a block of code among many options based on the value of an expression.

Key Points

- Expression Evaluation:** The **expression** inside the switch statement is evaluated once.
- Case Matching:** The result of the expression is compared with the values specified in each **case** clause using strict equality (`==`).
- Code Execution:** If a match is found, the code block associated with that **case** is executed.
- Break Statement:** The **break** statement is used to terminate the switch statement. If omitted, execution will continue to the next **case** clause (fall-through behavior).
- Default Case:** The **default** clause is optional and executes if no matching **case** is found. It acts like the **else** in an if-else structure.

Syntax:

```
switch (expression) {
  case value1:
    // Code to run if expression === value1
    break;
  case value2:
    // Code to run if expression === value2
    break;
```

```

// More cases...
default:
    // Code to run if no case matches
}

```

Example:

```

index.html | simple_calculator.html | restaurant_menu.html M | index | ⚡ ⌂ ⌂ ...
Day-5 Conditional Statements > restaurant_menu.html > html > body > Script
2   <html lang="en">
8     <body>
51       </pre>
52
53     <Script>
54
55       var dish=prompt("Enter a name of the dish(only Biriyani
56       switch(dish){[
57         case "biriyani":
58           console.log("Cost of Biriyani is 180/-");
59           window.alert("Cost of Biriyani is 180/-");
60           break;
61
62         case "shawarma":
63           console.log("Cost of Shawarma is 80/-");
64           window.alert("Cost of Shawarma is 80/-");
65
66         case "fried rice":
67           console.log("Cost of Fried Rise is 100/-");
68           window.alert("Cost of Fried Rise is 100/-");
69
70         case "veg pulav":
71           console.log("Cost of veg pulav is 220/-");
72           window.alert("Cost of veg pulav is 220/-");
73
74       default:
75         console.log("Enter a valid name as shown alert box
76         window.alert("Enter a valid input in Lower case!");
77
78       }
79

```

Cost of Biriyani is 180/-

restaurant_menu.html:58

TASKS

Task 1: Day of the Week Message

Scenario: Develop a webpage that displays a special message based on the current day of the week.

“Start your week strong!” for Monday.

“Keep going!” for Tuesday.

“Halfway there!” for Wednesday.

“Almost the weekend!” for Thursday.

“Happy Friday!” for Friday.

“Enjoy your weekend!” for Saturday and Sunday.

Task:

Get the current day of the week.

Display the corresponding message.

```

55
56
57
58 var day=prompt("Enter a day in Week in lower case");
59 if(day=="monday"){
60   console.log("Start your week strong!"); // output in console tab
61   window.alert("Start your week strong!"); // output in console tab
62 }
63 else if(day=="tuesday"){
64   console.log("Keep going!");
65   window.alert("Keep going!");
66 }
67 else if(day=="wednesday"){
68   console.log("Halfway there!");
69   window.alert("Halfway there!");
70 }
71 else if(day=="thursday"){
72   console.log("Almost the weekend!");
73   window.alert("Almost the weekend!");
74 }
75 else if(day=="friday"){
76   console.log("Happy Friday!");
77   window.alert("Happy Friday!");
78 }
79 else if(day=="saturday"){
80   console.log("Enjoy your weekend!");
81   window.alert("Enjoy your weekend!");
82 }
83 else if(day=="sunday"){
84   console.log("Ready for monday :)");
85   window.alert("Ready for monday :)");
86 }
87 else{
88   console.log("Enter a valid input :( ");
89   window.alert("Enter a valid input :( ");
90 }

```

Task 2: Traffic Light Simulation

Scenario: Simulate a traffic light system.

“Stop” if the light is red.

“Get Ready” if the light is yellow.

“Go” if the light is green.

Task:

Prompt the user to enter the color of the traffic light.

Display the corresponding action.

```

2 <html lang="en">
3   <body>
4     <Script>
5
6       var day=prompt("Enter a light color (in lower case) to displ
7       if(day=="red"){
8         console.log("Stop!");
9         window.alert("Stop!");
10      }
11      else if(day=="yellow"){
12        console.log("Keep going!");
13        window.alert("Keep going!");
14      }
15      else if(day=="green"){
16        console.log("Go!");
17        window.alert("Go!");
18      }
19      else{
20        console.log("Enter a valid input in Lower case!");
21        window.alert("Enter a valid input in Lower case!");
22      }
23
24    </Script>
25  </body>
26 </html>

```

Task 3: Discount Calculator

Scenario: Calculate the discount based on the total purchase amount.

“No discount” if the amount is less than \$50.

“5% discount” if the amount is between \$50 and \$100.

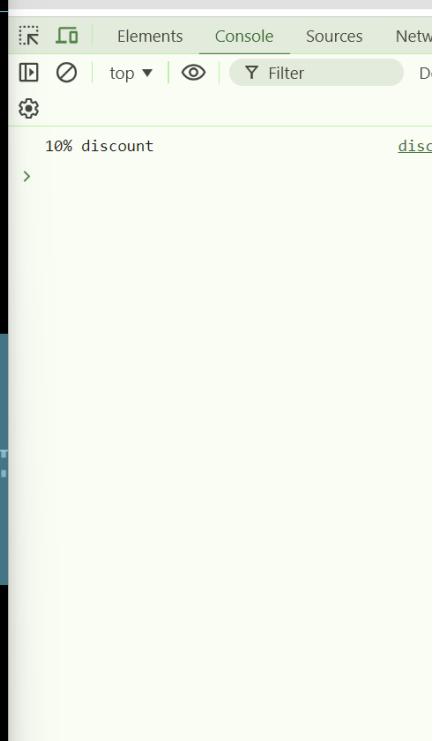
“10% discount” if the amount is between \$101 and \$200.

“15% discount” if the amount is above \$200.

Task:

Prompt the user to enter the total purchase amount.

Display the discount percentage.



The screenshot shows a browser window with several tabs at the top: nested_if.html, restaurant_menu.html, index.html Day-5 Conditional Statements 1, discount_percent.html, and another tab that is partially visible. The main area displays a block of JavaScript code. The code prompts the user for a total purchase amount and then uses nested if statements to calculate a discount based on the amount. The output of the code is visible in the browser's developer tools console, which shows the message "10% discount".

```
2 <html lang="en">
8 <body>
22   <pre>
29     else if(amt>=50 && amt<=100){
34       else if(amt>=101 && amt<=200){
56
57     </pre>
58     <Script>
59
60       var amt=+prompt("Enter a total purchase amount");
61       if(amt<50 && amt>=0){
62         console.log("No discount!"); // output in console tab
63         window.alert("No discount!"); // output in console tab
64       }
65       else if(amt>=50 && amt<=100){
66         console.log("5% discount");
67         window.alert("5% discount");
68       }
69       else if(amt>=101 && amt<=200){
70         console.log("10% discount");
71         window.alert("10% discount");
72       }
73       else if(amt > 201){
74         console.log("15% discount");
75         window.alert("15% discount");
76       }
77       else{
78         console.log("Enter a valid amt :( ");
79         window.alert("Enter a valid amt :( ");
80       }
81     </Script>
83   </body>
84 </html>
```

Task 4: Restaurant Menu

Scenario: You are developing a restaurant menu system that provides the price of a dish based on the dish name.

Task:

Assume a variable dish holds the name of the dish as a string (e.g., "Biryani", "shawarma", "Fried rice", "veg pulao").
Print the price.

```

nested_if.html U restaurant_menu.html M index.html Day-5 Conditional Statements 1 discount_percent.js ...
Day-5 Conditional Statements > restaurant_menu.html > html > body > Script
2 <html lang="en">
8 <body>
53 <Script>
54     var dish=prompt("Enter a name of the dish(only Biriyani, shawarma, Fried rice");
55     switch(dish){
56         case "biriyani":
57             console.log("Cost of Biriyani is 180/-");
58             window.alert("Cost of Biriyani is 180/-");
59             break;
60
61         case "shawarma":
62             console.log("Cost of Shawarma is 80/-");
63             window.alert("Cost of Shawarma is 80/-");
64             break;
65
66         case "fried rice":
67             console.log("Cost of Fried Rise is 100/-");
68             window.alert("Cost of Fried Rise is 100/-");
69             break;
70
71         case "veg pulav":
72             console.log("Cost of veg pulav is 220/-");
73             window.alert("Cost of veg pulav is 220/-");
74             break;
75
76     default:
77         console.log("Enter a valid name as shown alert box in Lower case!");
78         window.alert("Enter a valid input in Lower case!");
79
80
81
82
83     }

```

Task 5: Simple Calculator

Scenario: You are developing a simple calculator that performs basic arithmetic operations.

Task:

Assume variables num1 and num2 hold two numbers, and operator holds the arithmetic operator as a string (e.g., "+").

Use a switch case statement to perform the operation and store the result in a variable result.

Print the result.

```

simple_calculator.html M if_block.html U if_else.html U nested_if.html U restaurant_menu.html ...
Day-5 Conditional Statements > simple_calculator.html > html > body > Script
2 <html lang="en">
8 <body>
79 <Script>
80     var a=+prompt("Enter First Number");
81     var b=+prompt("Enter Second Number");
82     var op=prompt("Enter operation in b/w (+, -, /, *, **)");
83     console.log(a);
84     console.log(b);
85     console.log(op);
86     switch(op){
87         case "+":
88             var c=a+b;
89             console.log(c);
90             window.alert(c);
91             break;
92
93         case "-":
94             var c=a-b;
95             console.log(c);
96             window.alert(c);
97             break;
98
99         case "*":
100            var c=a*b;
101            console.log(c);
102            window.alert(c);
103            break;
104
105        case "/":
106            var c=a/b;
107            console.log(c);
108            window.alert(c);
109            break;
110
111        case "%":
112            var c=a%b;
113            console.log(c);
114            window.alert(c);
115            break;
116

```

Operator	Result	Source
12	simple_calculator	
15	simple_calculator	
-	simple_calculator	
-3	simple_calculator	

