Java Script

- Java script is a client side as well server side language.
- It is introduced in year 1995 by a person by name "Brendon EICH".
- Java Script is maintained by ECMA (European Computer Manufacture Association) from the year 1997.
- We have different version of JS like ES-1 to ES-6.
- With respect to front end JS is used for the following reason...
  1. To make the pages dynamic
  2. Validation
- Java Script code will be executed by JAVA SCRIPT ENGINE which is integrated with all browser's.

  Chrome -> v8 engine
  I.E -> chakra
  Firefox -> spyder monkey

NOTE:-

- JS is a scripting language
- Node JS is a JS library which is used to run the JS code in server.
- Mongo DB is used to store data
- Express JS is a framework is used to write business logic
- Angular, React, Vue are the framework of JS which are used to get front end
- MEAN, MERN, MEVN

Contents:

Types of Java Script:

Based on the place where java Script is written we have **2 types of JS**

1. **Internal Java Script:**

   If the Java Script code is written in the same html page using Script tag. We call it has internal Java Script

   Ex: <script>----JS code----

2. **External Java Script:**

   If the Java Script code is written in a separate file with .js extension we called it as External Java Script.

   To link External JS following code will be written

   <script src="---path---"></script>

Java & Java Script are independent languages (No-relations)

Output Statements:

- document.write(); - print in same line
- document.writeln(); - print in same line & giving space
- console.log(); - just for debug

NOTE:

- Semicolon is optional to end the Statements.
- It is not an error free language.
- Java Script is case Sensitive language & we can see error in console.

Concatenation can be done by using **(+) & (,)**

- + - This operator the concat the content as it is.
- , - This Operator will append space between 2 operands & concats

Keywords:

- All the keywords are written in lower case
- This are reserved words whose meaning will known to the Java Script engine
- Ex: let, if, else, continue, break etc…

Variables:

Variables are the container to hold some data.

Keyword:

- var – basic keyword from version 1
- let & const – keyword from version ES-6

Syntax: var/let/const varname; //syntax

Ex:

```
var a;          // declaration
a=10;           //initialization
a=20;           //re- initialization
a=25.36         //re- initialization
a="hai"         //re- initialization
var a;          //re-declaration is also possible
```

NOTE:

- Java Script is dynamically type checked language.
- If a variable is capable of storing different type of data then it is called as dynamically type checked language.

Java Script Features:

- Client side language
- Server side language it is used in server
- It is a scripting language
- It is case sensitive language
- Dynamically type checked language

let keyword:

```
let b;      //declaration
b=20;       //initialization
b=30.21     //re-initialization
b='a';      //re-initialization
b=true      //re-initialization
let b;      //re-initialization is not possible (we get error in console)
```

const keyword:

```
const c=10;   //declaration & initialization
```

- Both declaration & initialization has to be done in same line **const c=20;**
- In this keyword there is no re-initialization & re-declaration.

	Declaration	**initialization**	**Re-initialization**	**Re-declaration**
Var	Yes	yes	yes	Yes
Let	Yes	yes	yes	No
Const	Yes	yes	No	No

Operators:

1. **Arithmetic Operator: (+ , - , * , /, %)**
   - This are used to perform the arithmetic operations
   - In EXPRESSION evaluation +,- has to be given least priority compare to *,/,%
   - If same priority operators are present in an expression than we should follow left to right associativity.

```
let res = 10+20*2/4;
        document.write(res+"<br>");
```

   - **Ex:** 10+20/2*4
     10+10*4
     10+40
     50

NOTE:

- Division operator (/) will give complete result along with decimal values
  Ex: 10/2; //5
  10/3; //3.33333
- Modulus operator gives the remainder

2. **Relational Operator:(< , > , <= , >= , == , != , === , !==)**
   - This operators are used to compare any 2 operands
   - Relational operator always results in Boolean outputs(true/false)
   - Equality Operator: (= =) It will check only for data
     10==10; //true
     10==”10”; //true

```
document.writeln("<b>Normality relational operators</b>"+"<br>");
        document.writeln(10==10);
        document.writeln(10!=11);
```

   - Strict Equality Operator: (= = =) It will check for both data & type of the data
     10===10; //true
     10===”10”; //false

```
document.writeln("<b>Strictly relational operators</b>"+"<br>");
        document.writeln(10===10);
        document.writeln(10!==11);
```

3. **Logical Operators: (&& , ||)**
   - This operators are used to check more than 1 condition
   - Both input & output of logical operators is Boolean

Operand 1	Operand 2	&&	||
True	True	True	True
True	False	False	True
False	True	False	True
False	False	False	False

   - If all the conditions are true than “**logical &**” will be evaluated to true

- If any one of the conditions is true for logical or operations than it will be evaluated true
  - **Ex:** (10>20) && (10<20) || 5<20
    F && T || T
    F || T

4. **Bitwise Operators: (& , |)**
   - It will convert Operands to Binary values & perform the operations, Result will converted back to decimal.

5. **Unary Operators: (++ , --)**
   - **++(inc)**
     - Post Increment: (a++) (use value 1st , later inc)
     - Pre Increment: (++a) (1st inc , later use the value)
   - **--(dec)**
     - Post Decrement:(a--) (use value 1st , later dec)
     - Pre Decrement:(--a) (1st dec , later use the value)

   NOTE:
   - Unary operators it has to be used only on variables declared using var or let, we should not used in const.

6. **Assignment Operators: (= , += , -= , *= , /= , %=)**
   - a += 5; //a = a+5;
   - a -= 5; //a = a-5;
   - a *= 5; //a = a*5;

```
let a=10;
        document.write("a = "+a+"<br>");
    a += 15;
        document.write("a = "+a+"<br>");
```

7. **Turnery Operator:**
   - (code) ? true : false;

```
let b = (10 < 20)
        b ? document.write("b = "+"stmt 1 : true") : document.write("b = "+"stmt 2 : false");
        document.write("<br>");
let c = (10 > 20)
        c ? document.write("c = "+"stmt 1 : true") : document.write("c = "+"stmt 2 : false");
        document.write("<br><br>");
```

8. **typeof Operator:**
   - It is used to check what type of data variable is holding

```
 s = 10;
        document.write("S = "+s+" = "+typeof(s));
        document.write("<br>");
```

Control Statements:

It is used to control the flow of Execution

Control Statements

Branching Statements	Looping Statements
• If • if else • nested if • if else ladder • switch	• for • while • do while • for-in • for-of

Branching Statements:

```
//if else ladder
        let x = 0
        if(x > 0)
        {
            document.write(x+" = +ve Number");
        }
        else if(x < 0)
        {
            document.write(x+" = -ve Number");
        }
        else
        {
            document.write(x+" = neither +ve nor -ve");
        }
```

```
//nested if
        let a = 75;
        if(a > 0)
        {
            document.write(a+" = +ve");
            document.write("<br>");
            if(a % 2 == 0)
                document.write(a+" is even");
            else
                document.write(a+" is odd");
        }
        else if(a < 0)
        {
            document.write(a+" = -ve");
            document.write("<br>");
            if(a % 2 == 0)
                document.write(a+" is even");
            else
                document.write(a+" is odd");
        }
        else
        {
            document.write(a+" is neither +ve nor -ve");
        }
```

```
//switch
let ch='A';
        switch(ch)
        {
            case 1 : document.write("Int");
                break;
            case 'A' : document.write("Char");
                break;
            case "Hai" : document.write("String");
                break;
            case true : document.write("Boolean");
                break;
            default : document.write("default");
        }
```

Looping Statements:

For Loop:

```
for(initialization ; condition ; inc / dec )
{
        body of the loop
        -----
        -----
}
```

```
 //for loop
        for(let i=1 ; i<=5 ; i++)
        {
            document.write("hello"+"<br>");
        }
```

```
//sum of 1-10
        let sum = 0;
        for(let i=1 ; i<=10 ; i++)
        {
            document.write(i+" + ")
            sum += i;
        }
        document.write("<br>"+"Sum = "+sum);//55
```

While Loop:

```
while(condition)
{
        -----
        -----
}
```

```
//while loop
        let m = 1;
        while(m <= 5)
        {
            document.writeln("Hello"+"<br>");
            m++;
        }
```

NOTE:

For Loop	While Loop
• If the number of iteration known use for loop	• If the number of iteration are not known use while loop

```
//find number of digits in given number
        let n = 75384;
        let count=0;
        let add=0;
        while(n != 0) //or while(n)
        {

            let lastDigit = n % 10;    //To print last digit
            document.writeln(lastDigit+"<br>");   // 4 8 3 5 7
            add += lastDigit; //add the digits

            let q = n / 10;     //quotient
            n = Math.floor(q);
            count++;
        }
        document.write("sum = "+add+"<br>"); //27
        document.write("num of digits = "+count);//5
```

Functions:

Functions are set of instructions to perform some task

Advantages:

- Code re-usability
- Modularity(Structure way of writing the program)

Syntax of declaring the functions:

```
Function nameOfTheFunction(parameter1, parameter2, ….)
{
        ------
        ------
}
```

```
<head>
   <script>
       function fun1()     //declaration of the Function
       {
           //body of the function
           document.write("function1 is executing...!")
       }
       fun1();     //invoke/call the function
       fun1();
    </script>
</head>
<body>
    <h1>Functions Demo</h1>
</body>
```

or

```
<head>
    <script>
        function fun1()     //declaration of the Function
        {
            //body of the function
            document.write("function1 is executing...!")
        }
    </script>
</head>
<body>
    <h1>Functions Demo</h1>
    <script>
        fun1();     //invoke/call the function
        fun1();
    </script>
</body>
```

- NOTE: Functions will not be executed unless it will invoke or call

Functions with Parameters:

```
<script>
        function fun2(a)
        {
            document.write("a = "+a+"<br>")
            document.write("function-2 is executed <br>")
        }
        fun2(10);       //a = 10
        fun2(10.12);    //a = 10.12
        fun2(true);     //a = true
        fun2("hai");    //a = hai
        fun2();         //a = undefined
</script>
```

NOTE:

- For a function with parameter we can call the function without passing arguments
- If we are not passing the arguments it will take the default value which is undefined
- We can change default value by assigning some value to the parameters
  function fun(a=100)

```
<script>
        function fun3(a=100)
        {
            document.write("a = "+a+"<br>")
            document.write("function-3 is executed <br>")
        }
        fun3();   //a=100
</script>
```

```
<script>
         function fun4(a=1,b=2,c=3)
        {
            document.write("a = "+a+"<br>")
            document.write("b = "+b+"<br>")
            document.write("c = "+c+"<br>")
            document.write("function-4 is executed <br>")
        }
         fun4(10,20,30)            //a=1 b=2 c=3
</script>
```

```
<script>
//factorial program
         function factorial(num =0)
        {
            let fact = 1;
            while(num)
            {
                fact = fact * num;
                num--;
            }
            document.writeln(fact);
        }
         factorial(5);     //120
</script>
```

Functions some return values:

```
<script>
          function fac5()
        {
            document.write("function-5 is executed<br>");
            return 100;
        }
        let x = fun5();
        document.writeln(x)
</script>
```

Functions some parameters & some return values:

```
<script>
         function fac6(a)
        {
            document.write("function-6 is executed<br>");
            return 10;
        }
         let y = fun6();

        document.writeln(y);
</script>
```

NOTE: A function can return only one value where as accepts many parameters

Anonymous Function:

A function without any name

Syntax:

Function( )
{

}

Uses:

- To declare the method inside the object
- To make call back functions
-

NOTE:

- An anonymous function has to be stored in a variable, to call or invoke the anonymous function use the variable name.

4 Scenarios of Anonymous Functions:

```
<script>
 //anonymous Function no parameters & no return value
    let a = function()
            {
                document.writeln("Anonymous function execution");
            }
    a();
</script>
```

```
//anonymous function with Parameters
    let b = function(m)
            {
                document.writeln("Anonymous function with parameter<br>"); //m = undefined
                document.writeln("m = "+m);//m = 10
            }
        b();
        b(10);
```

```
 //anonymous functions with some return value
    let myname = function()
                {
                    document.writeln("Myname = ");
                    return "Sheeraz";
                }
    let nm = myname()
    document.writeln(nm);
```

```
 //anonymous function with parameters & return value
    let x = function(name)
            {
                return "hello"+name
            }
    let msg = x("Bye");
    document.writeln(msg);
```

NOTE:

- If a function is stored in a variable we call it as **function expression**.

Arrow Functions: (ES-6 features)

Arrow function are used to call backs (passing function as an argument)

Syntax:

(para1, para2, …) => { //body of the function };

```
<script>
        //Arrow Function
        let MyArrowFun1 = () => {document.write("Arrow function Executed...!")};
        MyArrowFun1();
</script>
```

```
//Arrow functions with Parameters
        let MyArrowFun2 = (a) => {document.write("a = "+a+"<br>Arrow function with 1 parameter Executed...!")};
        MyArrowFun2(true);
        document.write("<br>----------------------------------<br>");
```

NOTE:

- In Arrow Function if the function has only one parameter then parenthesis is optional, In all the other cases parenthesis is mandatory

```
//conclusions
        let arrow1 = (a) => {document.write("arrow 1 is executed...!")};
        arrow1(10);

        let arrow2 = b => {document.write("arrow 2 is executed...!")};
        arrow2(10);

        let arrow3 = ( ) => {document.write("arrow 3 is executed...!")};
        arrow3();

        let arrow4 = _ => {document.write("arrow 4 is executed...!")};
        arrow4();

        let arrow5 = (a,b) => {document.write("arrow 5 is executed...!")};
        arrow5();
```

```
let arrow => { };          //error
let arrow = a,b => { };    //error
```

- In arrow functions if you have only return statements than flower braces are optional, return key is optional

```
        let arrow6 = (a,b) => { return a+b;};
        let sum = arrow6(10,20);
        document.write("Sum = "+sum+"<br>");

        let arrow7 = (a,b) => a+b;
        let add = arrow7(10,20);
        document.write("Sum = "+add);
```

- If the function name is printed it will give you the implementation of the function

```
        document.writeln(MyArrowFun1); //() => {document.write("Arrow function Executed...!")}
```

Programs:

1. Power of a number

```
// Power of a number
    let exp=3, base=2, res=1;
    for(let i=1 ; i<=exp ; i++)
    {
        res = res*base;
    }
    document.writeln(res+"<br>"); //8
```

```
// Power of a number
    function power(base=1,exp=1)
    {
        let power = 1;
        for(let i=1 ; i<=exp ; i++)
        {
            power = power * base;
        }
        return power;
    }
    let result = power(2,3);
    document.writeln(result);   //8
```

STRINGS:

String and Methods:

- To store a group of characters we will use strings
- To declare the strings we will follow these ways ' '/" "/` `
    i. toLowerCase()
    ii. toUpperCase()
    iii. SubString(para1,para2)
    iv. substr(para1,para2)
    v. startswith(para1)//boolean value
    vi. endsWith(para1)//boolean value
    vii. charAt(para1)
    viii. charCodeAt(para1)
    ix. split(para1)
    x. slice(para1,para2)
    xi. indexOf()
    xii. lastIndexOf()
    xiii. trim()
- NAN=NOt a Number
- sub String- in main string to get a part of string start index,ending index
- starting index,ending index-1

```
<body>
    <h1>String Demo</h1>
    <script>
        let str1 = 'javascript ';
        let str2 = "jspiders";

//strings
        document.write("<b>Strings</b><br>");
        document.write("str1 = "+str1+"<br>")
        document.write("str2 = "+str2+"<br>")

        document.write("-----------------------------------<br>");

//position @ string
        document.write("<b>postion of string</b><br>");
        document.write("@ pos 1 char in str1 = "+str1[1]+"<br>");
        document.write("@ pos 4 char in str1 = "+str1[4]+"<br>");

        document.write("-----------------------------------<br>");

//string length
        document.write("<b>string length</b><br>");
        document.write("str1 length = "+str1.length+"<br>")
        document.write("str2 length = "+str2.length+"<br>")

        document.write("-----------------------------------<br>");

//to upper case
        document.write("<b>Upper case</b><br>");
        let ustr1 = str1.toUpperCase()
        document.write("to upper case = "+ustr1+"<br>");

        let ustr2 = str2.toUpperCase()
        document.write("to upper case = "+ustr2+"<br>");
                            //not effect main string (ex : str1/str2)

        document.write("-----------------------------------<br>");
```

```
//to lower case
        document.write("<b>lower case</b><br>");
        let lstr1 = ustr1.toLowerCase()
        document.write("to lower case = "+lstr1+"<br>");

        let lstr2 = ustr2.toLowerCase()
        document.write("to lower case = "+lstr2+"<br>");

        document.write("------------------------------------<br>");

//starts with
        document.write("<b>starts with</b><br>");
        document.write(str1.startsWith('j')+"<br>");
        document.write(str2.startsWith('s')+"<br>");

//ends with
        document.write("<b>ends with</b><br>");
        document.write(str1.endsWith('r')+"<br>");
        document.write(str1.endsWith('t')+"<br>");

        document.write("------------------------------------<br>");

//char @ position
        document.write("<b>character @ position</b><br>");
        document.write("char = "+str1.charAt(1)+"<br>");// character @ position
        document.write("char code(ASCII) = "+str1.charCodeAt(1)+"<br>");// character code @ position(ASCII value)
        document.write("char not present  = "+str1.charCodeAt(10)+"<br>");
                            // character code @ position(ASCII value) not present(NaN)
                                                //Nan - not a number

        document.write("------------------------------------<br>");

//index of & last index of
        document.write("<b>index of & last index of</b><br>");
        document.write("index of = "+str1.indexOf('s')+"<br>"); // char index of (present)
        document.write("last index of = "+str1.lastIndexOf('a')+"<br>");  //last index of
        document.write("not present = "+str1.indexOf('z')+"<br>"); //(not present)

        document.write("------------------------------------<br>");

//substring
        document.write("<b>sub string</b><br>");
        document.write("substring(0,4) = "+str1.substring(0,4)+"<br>");
        document.write("substring(3,15) = "+str1.substring(3, 15)+"<br>");
        document.write("substring(5) = "+str1.substring(5)+"<br>");
        document.write("substring( )"+str1.substring()+"<br>");

        document.write("------------------------------------<br>");

//substr
        document.write("<b>sub str</b><br>");
        document.write("substr(1,5) = "+str1.substr(1,5)+"<br>");
        document.write("substr(4,3) = "+str1.substr(4,3)+"<br>");

        document.write("------------------------------------<br>");

//slice : same as sub string in this we have -ve index
        document.write("<b>slice : same as sub string, in this we have -ve index</b><br>");
        document.write("slice(0,4) = "+str1.slice(0,4)+"<br>");
        document.write("slice(3,8) = "+str1.slice(3, 8)+"<br>");
        document.write("slice(-8,-1) = "+str1.slice(-8,-1)+"<br>");

        document.write("------------------------------------<br>");

//reapeat
        document.write("<b>repeat</b><br>");
        document.write("2 time string is repeting = "+str1.repeat(2)+"<br>");

        document.write("------------------------------------<br>");

        let s = "   this   is  javascript   class   ";
        document.write("String = "+s+"<br>");
        document.write("string length = "+s.length+"<br>");
```

```
//trim : trim starting space & ending space
        let s1 = s.trim();
        document.write("trim = "+s1+"<br>");
//split
        document.write("split = "+s1.split(" ")+"<br>");

        document.write("-----------------------------------<br>");

    </script>
</body>
```

Immutability:

- String is immutable
- On the string if we perform some changes using inbuilt methods, all the changes will be effected on new string, Original string will be unchanged this behavior is called as immutability

```
//immutability
        let x1 = "abc";
        let x2 = x1.toUpperCase()
        if(x1 == x2)
            document.write("Immutable");
        else
            document.write("not Immutable"); // not Immutable
```

- If we convert string which has other than digits to number we will get NaN(not a number)

<u>Example Programs:</u>

1. Print A to Z (lower case & upper case)

```
//print A to Z
             document.write("<b>Print A to Z </b><br>");
        for(let i=65 ; i<=90 ; i++)
        {
            document.write(String.fromCharCode(i));//ABCDEFGHIJKLMNOPQRSTUVWXYZ
        }
//print a to z
        for(let i=97 ; i<=122 ; i++)
        {
            document.write(String.fromCharCode(i));//abcdefghijklmnopqrstuvwxyz
        }
```

ARRAY'S & It's Methods:

- Arrays are to store the data into single entity.
- Arrays are heterogeneous & grow able in nature.

```
//Example
        let arr1 = [10,10.23,true,"Hello"]
            document.write(arr1+"<br>");    //10,10.23,true,Hello
            document.write(arr1[0]+"<br>"); //10
            document.write(arr1[1]+"<br>"); //10.23
            document.write(arr1[2]+"<br>"); //true
            document.write(arr1[3]+"<br>"); //Hello
            document.write(arr1[4]+"<br>"); //undefined
```

```
//we can change the values
        arr1[0]=100;
        document.write(arr1[0]+"<br>")  //100
        arr1[4]=500;
        document.write(arr1[4]+"<br>")  //500
        document.write(arr1+"<br>");    //100,10.23,true,Hello,500

        arr1[6]=50;
        document.write(arr1[6]+"<br>"); //50
        document.write(arr1+"<br>");    //100,10.23,true,Hello,500,undefined,50

        document.write("array length = "+arr1.length);  //7
```

```
//Display all the arrays
        for(let i=0 ; i<arr1.length ; i++)
        {
            document.writeln("arr1["+i+"] = "+arr1[i]+"<br>");
        }
            // arr1[0] = 100
            // arr1[1] = 10.23
            // arr1[2] = true
            // arr1[3] = Hello
            // arr1[4] = 500
            // arr1[5] = undefined
            // arr1[6] = 50
```

```
//Display only Integer
            for(let i=0 ; i<arr1.length ; i++)
            {
                if(typeof(arr1[i])=='number')
                {
                    document.writeln("arr1["+i+"] = "+arr1[i]+"<br>");
                }
            }
                // arr1[0] = 100
                // arr1[1] = 10.23
                // arr1[4] = 500
                // arr1[6] = 50
```

```
//Display only String
            for(let i=0 ; i<arr1.length ; i++)
            {
                if(typeof(arr1[i])=='string')
                {
                    document.writeln("arr1["+i+"] = "+arr1[i]+"<br>");
                }
            }
                //Hello
```

Methods of Arrays:

- push(para1,para2,…)
- pop()
- unshift(para1,para2,…)
- shift()
- splice(para1,para2,para3…..ParaN)
    - para1 : index
    - para2 : no of elements to be removed
    - para3..paraN : elements to be added
- indexOf|(para1)
- slice(arg1, arg2)
- join(para1)

Push: Push Method will add the elements at the last & written new length

```
//Push Method example
            arr1.push(1000,2000);
            document.write("After push method  = "+arr1+"<br>");   //100,10.23,true,Hello,500, ,50,1000,2000
            document.write("array length = "+arr1.length+"<br>");   //9
```

Pop: Pop method will remove the element present in last

```
//pop Method
            arr1.pop();
            document.write("After pop method  = "+arr1+"<br>");     //100,10.23,true,Hello,500,,50,1000
            document.write("array length = "+arr1.length+"<br>");   //8
```

Unshift: add the elements at the 1st & written new length

```
        //un-shift
            arr1.unshift("hai","hello")
            document.write("After <b><u>unshift</u></b> method  = "+arr1+"<br>");
                     //hai,hello,100,10.23,true,Hello,500,,50,1000
            document.write("array length = "+arr1.length+"<br>");   //10
```

Shift: Remove the elements at the 1st.

```
//shift
        arr1.shift()
        document.write("After <b><u>shift</u></b> method  = "+arr1+"<br>");  //hello,100,10.23,true,Hello,500,,50,1000
        document.write("array length = "+arr1.length+"<br>");   //9
```

Splice: Adding & removing the elements in between

```
//splice
            let removeEle = arr1.splice(1,2,'new1','new2','new3')
            document.write("After <b><u>splice</u></b> method  = "+arr1+"<br>");
                //hello,new1,new2,new3,true,Hello,500,,50,1000
            document.write("Removed elements are = "+removeEle+"<br>")  //100,10.23
            document.write("array length = "+arr1.length+"<br>");   //10
```

```
            let removeEle1 = arr1.splice(4,0,'new4','new5','new6')
            document.write("After <b><u>splice</u></b> method  = "+arr1+"<br>");
                // hello,new1,new2,new3,new4,new5,new6,true,Hello,500,,50,1000
            document.write("Removed elements are = "+removeEle1+"<br>"); //not removed
            document.write("array length = "+arr1.length+"<br>");//13
```

```
            let removeEle2 = arr1.splice(3,4);
            document.write("After <b><u>splice</u></b> method  = "+arr1+"<br>");
            // hello,new1,new2,true,Hello,500,,50,1000
            document.write("Removed elements are = "+removeEle2+"<br>"); //new3,new4,new5,new6
            document.write("array length = "+arr1.length+"<br>");//9
```

IndexOf:

- If value present it will return index value or else it will return -1 value

```
 //indexof
            document.write(arr1.indexOf('new2'+"<br>")); //2
            document.write(arr1.indexOf(2000+"<br>")); //-1
```

Slice:

```
//Slice
          document.write("<b><u>slice</u></b> method  = "+arr1.splice(2,5)+"<br>");    //new2,true,Hello
          document.write("After <b><u>splice</u></b> method  = "+arr1+"<br>");
              //hello,new1,new2,true,Hello,500,,50,1000
```

Joins:

```
//joins
            document.write("<b><u>joins</u></b> method  = "+arr1.join(' & '));
                //hello & new1 & new2 & true & Hello & 500 & & 50 & 1000
```

Ex Program:

```
//Example Program
    document.writeln("<h2> Ex Program:</h2>")
        let arr5 = [10,20,30,40,50,80];
        document.write("Array Elemets = "+arr5+"<br>");
        let newElem = 500;
        let index = arr5.indexOf(newElem);
        if(index === -1)
        {
            document.write("Element "+newElem+" is not Present : <br>");
            arr5.splice("Adding = "+3,0,newElem)
        }
        else
        {
            document.write("Element "+newElem+" is present : ");
            arr5.splice(index,1)
        }
        document.write("After Adding : "+arr5)
        /*  Array Elemets = 30,20,10,70,40,50,80,60
            Element 500 is not Present :
            After Adding : 500,30,20,10,70,40,50,80,60
        */
```

Sort:

```
 //sort
        function myOwnSort(a,b)
        {
            return a-b;
        }
        document.write("After sorting in assending = "+arr5.sort(a,b)+"<br>");//10,20,30,40,50,60,70,80,500
```

Objects:

- Objects are real world entities which has its own states and behavior
- Here states represent the properties of objects which can be represented using Data members.
- Behavior represents functionality of an object using methods
  Ex: car (States: - name, color, max & min Speed etc…)
  (Behavior: - Start engine, apply break, apply gear etc…)
- In java script we can create the objects using following 3 types
  - Direct literals
  - New Keyword
  - Constructor functions
- In the Objects the data will be stored in the form of name & value pairs.

Direct Literals:

```
let/var/const = {
                    property 1 : value 1,
                    property 2 : value 2,
                    -----
                    property n : value n,
                 };
```

```
//Direct Literals
        let car1 =
        {
            name : "KIA",
            model : 2020,
            color : "black red",
            milage : 15
        };
        console.log(typeof(car1)); //object
        console.log(car1); //name: 'KIA', model: 2020, color: 'black red', milage: 15
```

- To access the data from the object we use following 2 ways
  - Dot operator (.)
  - Sub Script operator([ ])

```
//dot operator
        console.log(car1.name);     //KIA
        console.log(car1.color);    //black red
        console.log(car1.model);    //2020
        console.log(car1.milage);   //15
```

```
//sub script operator
        console.log(car1["name"]);  //KIA
        console.log(car1["color"]); //black red
        console.log(car1["model"]); //2020
        console.log(car1["milage"]);//15
```

```
//change some property
        car1.milage = 13.5;
        console.log(car1);   //name: 'KIA', model: 2020, color: 'black red', milage: 13.5
```

```
//add some property
        car1["regNo"] = 'KA 00 AB 0000';
        console.log(car1);    //name: 'KIA', model: 2020, color: 'black red', milage: 13.5, regNo: 'KA 00 AB 0000'
```

```
//delete/remove the property
        delete car1.color;
        console.log(car1);  //name: 'KIA', model: 2020, milage: 13.5, regNo: 'KA 00 AB 0000'
```

New Keyword:
Constructor functions:

```
//constructor functions
       let student1 =
        {
           firstname :"dinesh",
           lastname:"reddy",
           marks:76

       }

       console.log(typeof(student1));
       console.log(student1);

       //object creation using the new keyword

     let car2 = new Object();

     console.log(typeof(car2));

     car2.name = "skoda";
     car2.model = 2021;
     car2.color = "blue";

     let person = new Object();
     console.log(typeof(person));
     console.log("<br>");
     person.name = "hari";
     person.age = 20;
     person.weight = 30;
     console.log(person["name"]);
     console.log("<br>");
     console.log(person["age"]);
     console.log("<br>");
     console.log(person["weight"]);
     console.log("<br>");

       function Car()
       {
           this.name="KIA";
           this.color="White";
           this.model=2019;
       }

       let car3=new Car();
       console.log(typeof(car3));
       console.log(car3);

       let car4=new Car();
       console.log(car4);

       function Car(nm,color,model)
       {
           this.name=nm;
           this.color=color;
           this.model=model;
       }

       let car5=new Car("BMW",'black',1997);
       console.log(car5)

       function Movies(name,LeadRole,YearOfRelease,HasWatched,rating)
       {
           this.name =name;
           this.LeadRole=LeadRole;
           this.YearOfRelease=YearOfRelease;
           this.HasWatched=HasWatched;
           this.rating=rating;
       }
```

```
        let MoviesDB=[];
        let movie1=new Movies("Maharshi","Mahesh Babu",2019,true,9.9);
        MoviesDB.push(movie1);


        let movie2=new Movies("RRR","NTR RAM CHARAN",2022,false,10);
        MoviesDB.push(movie2);

        let movie3=new Movies("Love Story","Naga Chaitanya",2021,true,9.9);
        MoviesDB.push(movie3);

        let movie4=new Movies("Most Eligible Bachelor","Akhil Akineni",2021,true,9.8);
        MoviesDB.push(movie4);

        let movie5=new Movies("Sarkaru Vari Pata","Mahesh Babu",2022,false,10);
        MoviesDB.push(movie5);


       console.log(MoviesDB);

   for( let i=0; i<MoviesDB.length;i++)


   {
        let message="Movie Name is ";
        message=message+MoviesDB[i].name;
        message=message+", LeadRole is";
        message=message+MoviesDB[i] .LeadRole+"which is released in the year";
        message=message+MoviesDB[i].YearOfRelease;
        if(MoviesDB[i].HasWatched)
        {
            message=message+" I have Watched the movie";
        }
        else
        {
            message=message+" I have  not Watched the movie" ;
        }

        message=message+"and the rating is "+MoviesDB[i].rating;
            console.log(message);
    }
```

For in loop & For of loop:

```
for(let variablename in objname/arrayname)
{
     //body of loop
}
```

```
//for in loop
    let arr1 = [10,20,30,40,50];
    for(let key in arr1)
    {
        document.write(key) //only keys (0 1 2 3 4)
    }
```

```
for(let variablename of objname/arrayname)
{
     //body of loop
}
```

```
//for of loop
    for(let key of arr1)
    {
        document.write(key+" ") //only values(10 20 30 40 50)
    }
```

NOTE:

- For in loop will give keys of an object.
- For of loop will give values of iterable object hence, for of loop must be used on iterable object like arrays & sets

```
//for in loop(ex)
    let movie6 = new Movies("salaga","vijay",2021,false,8.5)
    for(let key in movie6)
    {
        document.writeln(key+"<br>");
    }
            // name
            // LeadRole
            // YearOfRelease
            // HasWatched
            // rating
```

```
//for in of loop
    for(let key in movie6)
    {
        document.writeln(key+" : "+movie6[key]+"<br>");
    }
            // name : salaga
            // LeadRole : vijay
            // YearOfRelease : 2021
            // HasWatched : false
            // rating : 8.5
```

```
 //obj
    let khanObj =
    {
        name: "khan",
        color: "wheat",
        gender: "male",
        eating: function()
        {
            document.writeln("Eating<br>");
        },
        sleeping: () =>
        {
            document.writeln("Sleeping<br>");
        }
    };
    khanObj.eating();//Eating
    khanObj.sleeping();//Sleeping
```

```
//obj
    let khanObj =
    {
        name: "khan",
        color: "wheat",
        gender: "male",
        YOB: 1996,
        eating: function()
        {
            document.writeln(this.name+" is Eating<br>"); //this keyword used in function
        },
        sleeping: () =>
        {
            document.writeln(" is Sleeping<br>"); //this keyword behave diffrently in arrow function
        },
    };
    khanObj.eating(); //khan is Eating
    khanObj.sleeping(); //sleeping
```

```
 //calculate age
        calculateAge: function()
        {
            let age = 2021 - this.YOB;
            document.write(age);
        }
     khanObj.calculateAge(); //25
```

Date Object Demo:

Math Function:

Generate OTP:

```
<script>
//Generate 4 Digit OTP
        function generate4DigitOTP()
        {
            let randomNum = Math.floor(Math.random()*10000);
            if(randomNum >= 1000 && randomNum <= 9999)
            {
                document.write("4 Digit OTP = "+randomNum);
            }
            else
            {
                generate4DigitOTP();
            }
        }
        generate4DigitOTP();
        document.write("<br>")

//Generate 6 Digit OTP
        function generate6DigitOTP()
        {
            let randomNum = Math.floor(Math.random()*1000000);
            if(randomNum >= 100000 && randomNum <= 999999)
            {
                document.write("6 Digit OTP = "+randomNum);
            }
            else
            {
                generate6DigitOTP();
            }
        }
        generate6DigitOTP();
</script>
```

Generate Random Color:

```
<script>
//Generate Random Color
        function generateRandomColor()
        {
            let randomColor = '#';
            let arr = [0,1,2,3,4,5,6,7,8,9,'a','b','c','d','e','f'];

            for(let i=0; i<=6 ; i++)
            {
                let index = Math.floor(Math.random()*15)
                randomColor = randomColor + arr[index];
            }
            document.write(randomColor);
        }
        generateRandomColor();
</script>
```

Events:

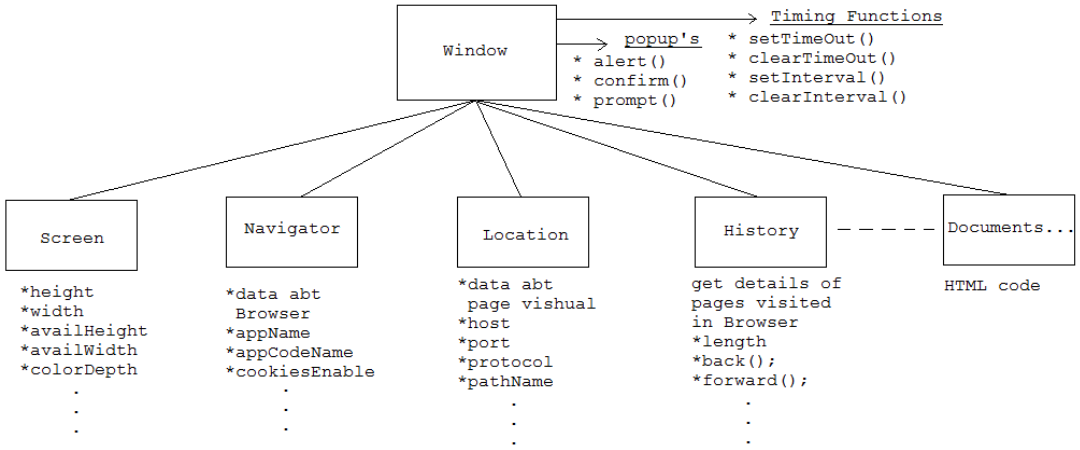
- Events are the Operations performed on web page like clicking, selecting, coping etc…
- Always Events has to be used as a attributes on HTML elements.

  Ex:
  - onclick = “ ”
  - onkeyup = “ ”
  - onkeydown = “ ”
  - onkeypress = “ ”
  - ondblclick = “ ”
  - oncopy = “ ”
  - onpaste = “ ”

```
<body>
    <h1>Demo on Events</h1>
    <button onclick="document.write('button 1 is clicked')">Button 1</button><br><br>
    <button onclick="document.write('button 2 is clicked')">Button 2</button><br><br>

    <button ondblclick="document.write('Doubled clicked')">Double click on here</button><br><br>

    <input type="text" onkeydown="console.log('Pressed a key Down')"><br><br>
    <input type="text" onkeyup="console.log('released a key')"><br><br>
    <input type="text" onkeypress="console.log('pressed key')">
</body>
```

Browser Object Model (BOM):

- Browser is represented in the form of window java script object.
- In depth study of Browser is called as Browser Object Model(BOM)
- To work with Browser using Java Script we will use window Object.
- Window object has many Methods, Properties & Objects inside it.

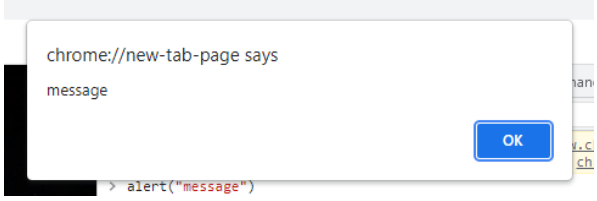


NOTE:

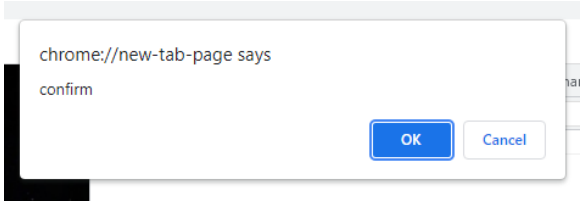
- Window is the default object in java script
- All the variables & Methods defined by User will be under the control of window object.
- Using window object name to access the properties of window object is optional.
- window.navigator (or) navigator in (console)

popup's:

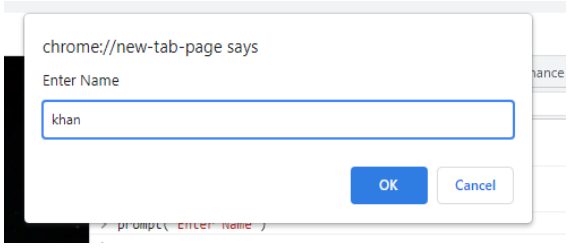
- alert();
  - It is used to display message to end user.



- confirm();
  - It is used to take additional confirmation from the user
  - Confirm method will return boolean values
  - If OK button is pressed it will return true if CANCLE button is pressed it will return false values.



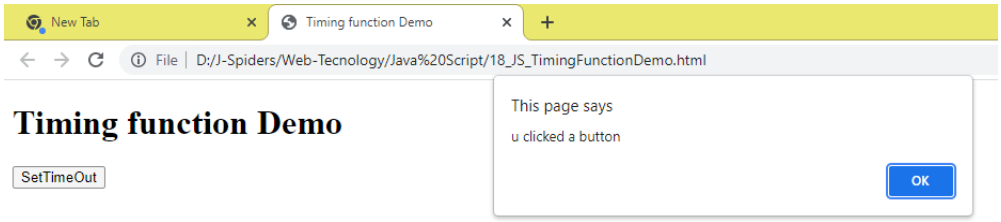
- prompt();
  - It is used to take the input from the user.
  - It will return the value entered in the input field in the form of string if OK is pressed else it will return NULL



```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Popup's Demo</title>
    <script>
        function popupsDemo()
        {
            let name = prompt("Enter Name");

            if(name === null)
            {
                let isTrue = confirm("Name value is empty Do you want to continue...!")
                if(isTrue)
                {
                    alert("They didn't give anyname");
                }
                else
                {
                    popupsDemo();
                }
            }
            else
            {
                alert("Name is "+name);
            }
        }
    </script>
</head>
<body>
    <h1>Demo on PopUp's</h1>

    <button onclick="popupsDemo()">Click Here</button>
</body>
</html>
```

Timing Function Demo:

```
<body>
    <h1>Timing function Demo</h1>

    <button onclick="alert('u clicked a button')">SetTimeOut</button>
</body>
```



- Set Time Out
    - This method is used to give delay
    - Set time out function will return some unique value which helps to stop the execution of set time out method

```
<script>
        function fun1()
        {
            console.log("Fun1 is Executed...!")
        }
</script>

<!-- SetTimeOut -->
    <button onclick="setTimeout(fun1,2000)">SetTimeOut</button> <!-- 2000=2ms -->
```

- Clear Time Out
    - It is used to stop the execution of set Time out
    - It will take one argument & the argument is returned value of set Timed out

```
<!-- SetTimeOut -->
    <button onclick="a = setTimeout(fun1,2000)">SetTimeOut-2</button> <!-- 2000=2ms -->

<!-- ClearTimeOut -->
    <button onclick="clearTimeout(a);">stop setTimeout</button> <!-- a = variable -->
```

- Set Interval
    - It is used to execute the function @ regular interval of time

```
<script>
        function fun2()
        {
            console.log("Fun2 is Executed...!");
            console.log("hai");
        }
</script>
<!-- setInterval -->
    <button onclick="setInterval(fun2,2000)">Start Interval</button>
```

- Clear Interval

```
<!-- setInterval -->
    <button onclick="b = setInterval(fun2,2000)">Start Interval</button>

<!-- clearInterval -->
    <button onclick="clearInterval(b)">Stop setInterval</button>
```

Programs:

1. Print Numbers

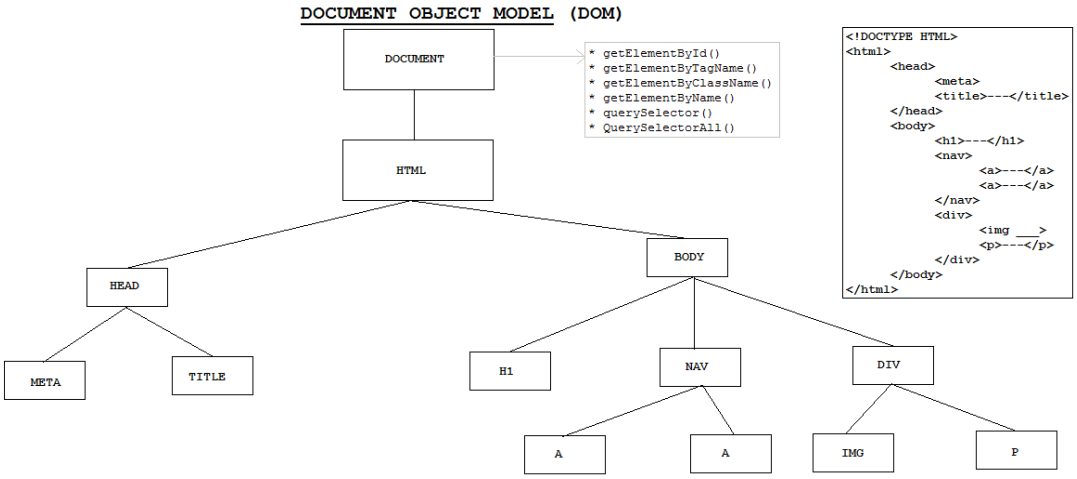
```
<!-- Print Number -->
    <script>
        var num = 1;
        function printNum()
        {
            console.log(num);
            num++;
        }
    </script>
<!-- print Number  -->
    <button onclick="c = setInterval(printNum,1000)">Print Num</button>
    <button onclick="clearInterval(c)">Stop Print Num</button>
```

2. Take Number From User where to start and end. Print the Number

```
<!-- Print Number -->
    <script>
        var StartNum = prompt("Enter Start Number");
        var EndNum = prompt("Enter End Number");
        function printNum()
        {
            if(StartNum <= EndNum)
            {
                console.log(StartNum);
                StartNum++;
            }
            else
            {
                clearInterval(c);
            }
        }
    </script>

<!-- print Number  -->
    <button onclick="c = setInterval(printNum,1000)">Print Num</button><!-- 1000=1ms -->
```

Document Object Model: (DOM)

- Under the window object we have document object which helps to control HTML document
- Under document Object according to HTML code a structure will be created which is called as DOM
- Whenever HTML page loads DOM is created by Browser.



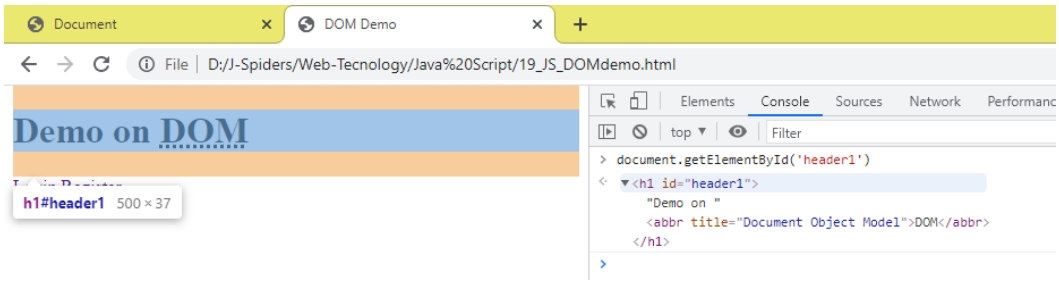
- In DOM html elements will be treated as Java Script Objects, Attributes of HTML elements will become properties of that object
- DOM is used for Dynamically changing the HTML pages by doing some manipulation

DOM Manipulation:

- To make the pages as Dynamic we will change the DOM which is turned as DOM Manipulation
- To do DOM Manipulation fallowing steps as to be used:
  - Select the HTML element which has to be changed
    - To select the HTML elements fallowing methods will be used which are present in Document object.
      - ✓ getElementById( )
      - ✓ getElementByTagName( )
      - ✓ getElementByClassName( )
      - ✓ getElementByName( )
      - ✓ querySelector( )
      - ✓ querySelectorAll( )
  - Do the Changes
    - ✓ Changes the content
    - ✓ Change the CSS Style
    - ✓ Add & remove the class
    - ✓ Change the Attributes
    - ✓ Add & remove HTML elements.

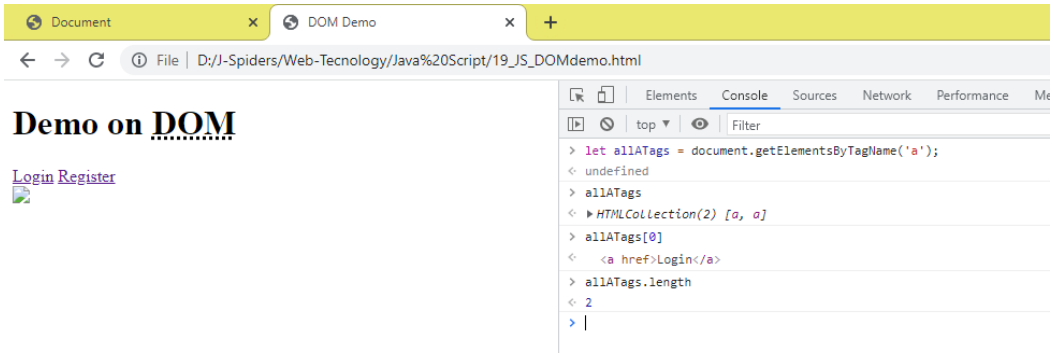
❖ <u>getElementById Method:</u>

- This method is used to select HTML elements based on the ID name.
- ID name has to be passed as an argument for this method.
- This method will return an element with whatever the ID name we have been passed.
- This method will write only one element since ID's are Unique.



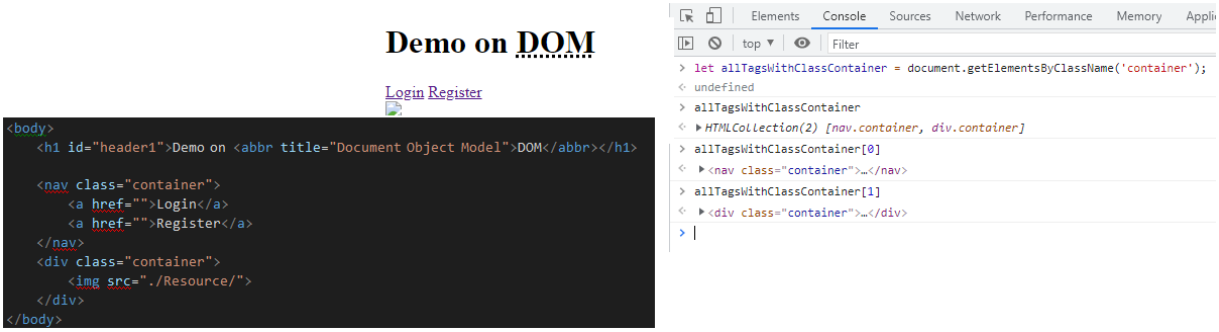
❖ <u>getElementsByTagName( )</u>

- This method is used to select HTML
- To select the elements using tag name pass tag name as a argument for this method in the form of string
- This method will return an array of Tags



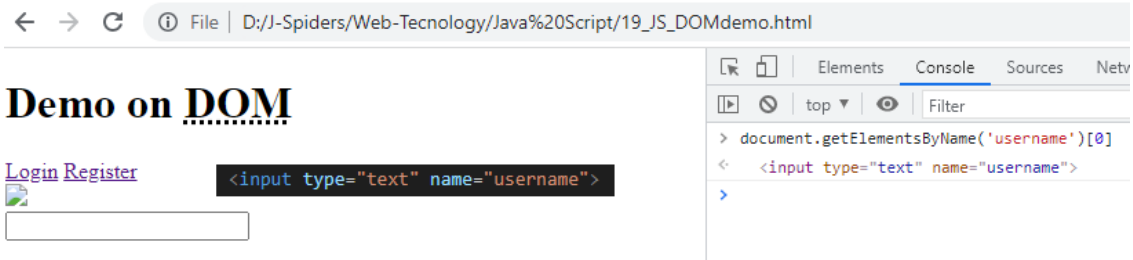
❖ <u>getElementByClassName( )</u>

- This Method Helps to select HTML elements Based on the Class Name
- To Select the Elements Pass Class Name as an Argument in the form of Strings.
- This Method will return all the Matched elements in the form of Array



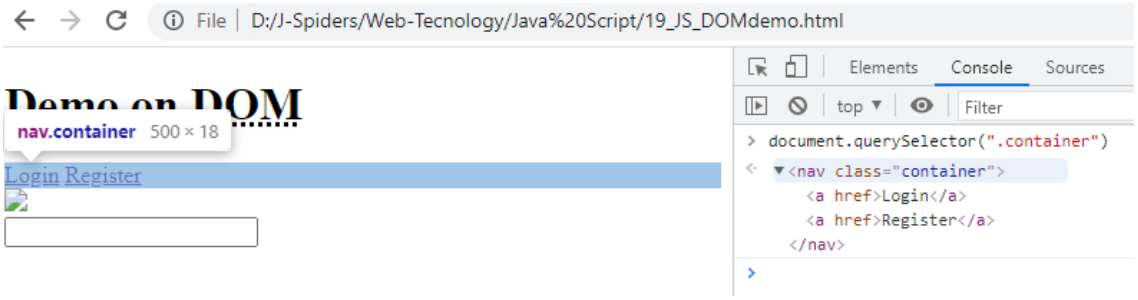
❖ <u>getElementByName:</u>

- This method helps to select HTML elements based on Name Attribute.
- This method takes name as Arguments in the form of String.
- This method will return all the selected HTML elements in the form of array



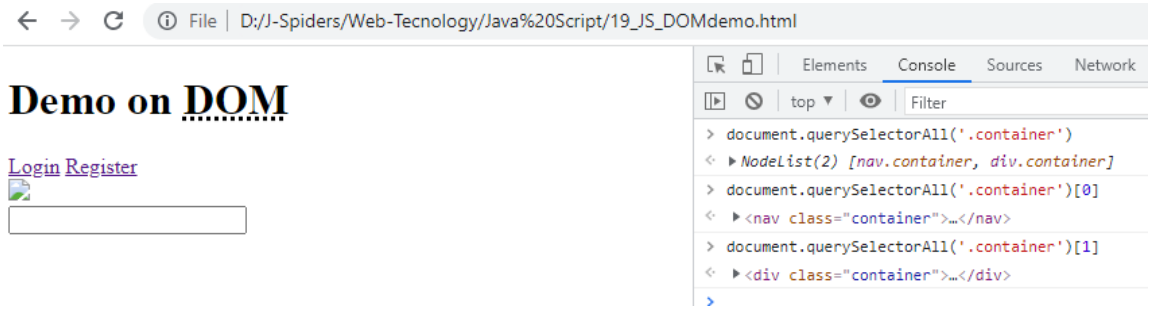
❖ <u>querySelector:</u>

- This method helps to select HTML elements based on CSS Selectors.
- We can pass class selector(.classname), id selector(#idname), Element Selector(Tagname), Attribute Selector etc…
- This method will return Only the 1st match



❖ <u>querySelectorAll:</u>

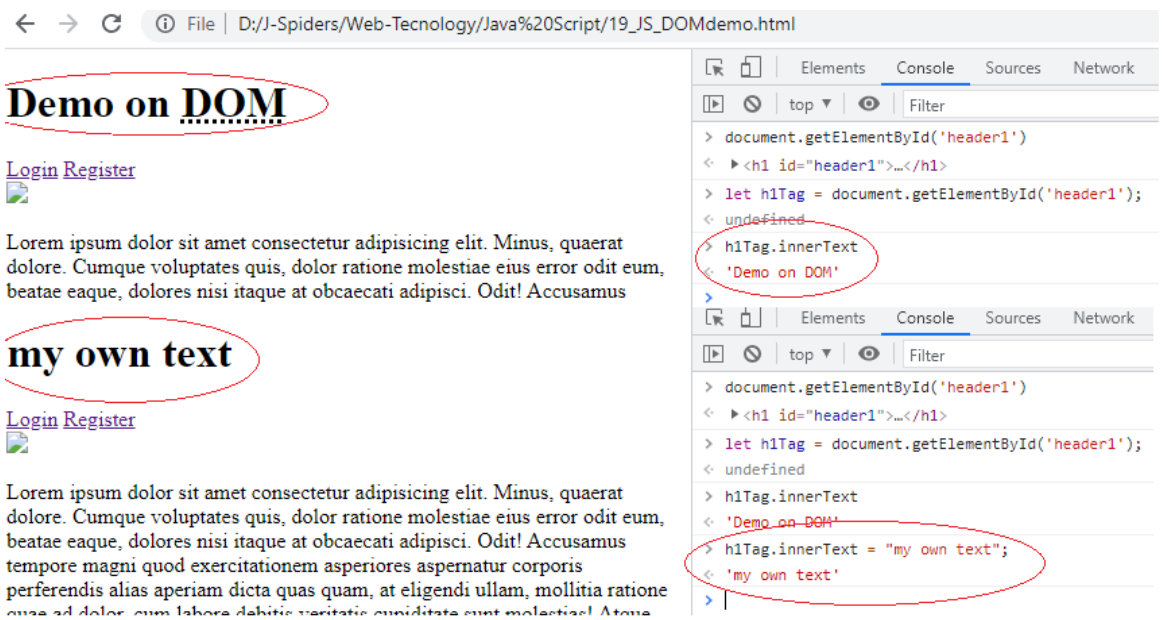
- This method is same that as query selector but this method will return all the matches in the form of array



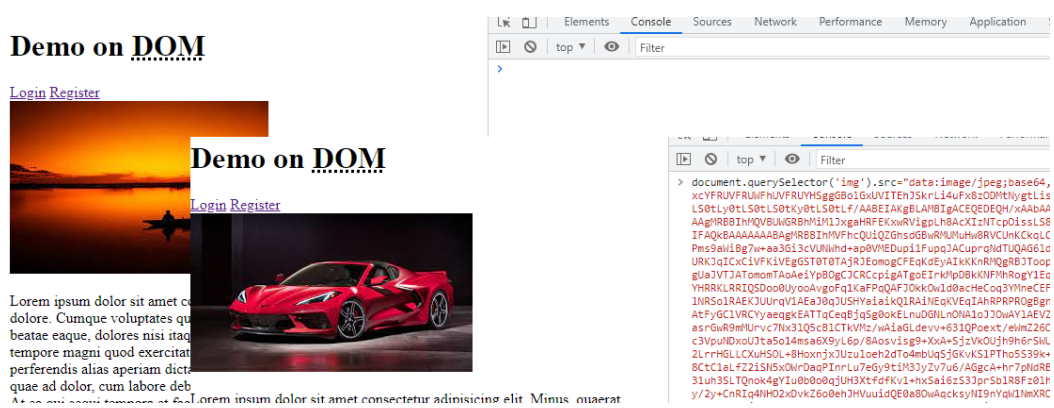
Manipulation:

- ✓ Changing the contents
  selectedElement.innerText.
  selectedElement.innerHTML.

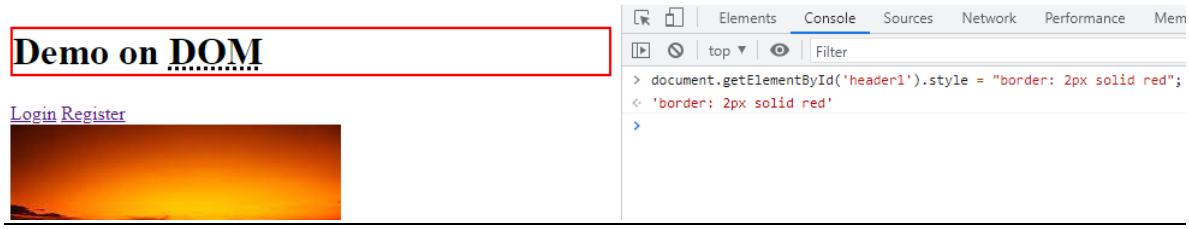
```
<body>
    <h1 id="header1">Demo on <abbr title="Document Object Model">DOM</abbr></h1>

    <nav class="container">
        <a href="">Login</a>
        <a href="">Register</a>
    </nav>
    <div class="container">
        <img src="./Resource/">
        <p>----------------------------------</p>
    </div>

    <input type="text" name="username">
</body>
```

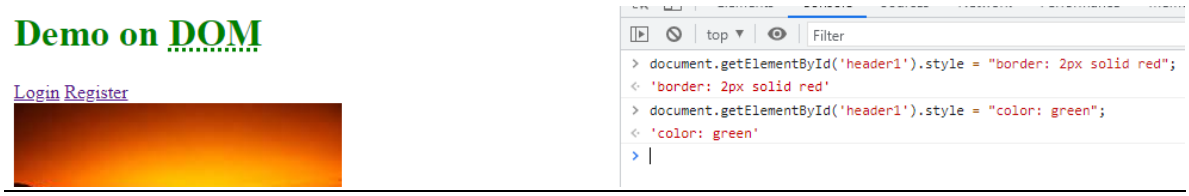


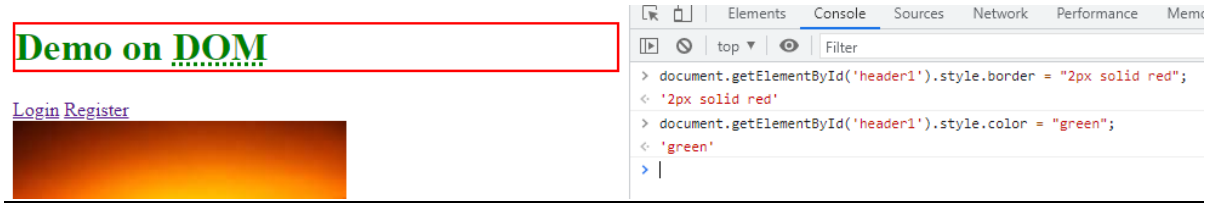
- To change the Image:
  - Attribute → selectedElement.attributeName = “newvalue”;



- To change the Style:
  - Style → selectedElement.style = “css code”;
  - selectedElement.style.cssPropertyName = “value”;

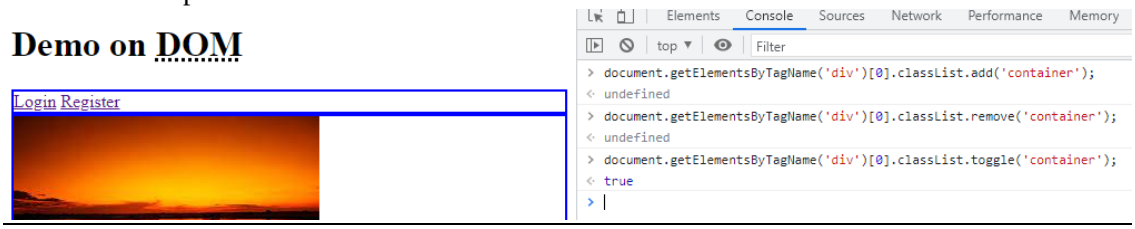




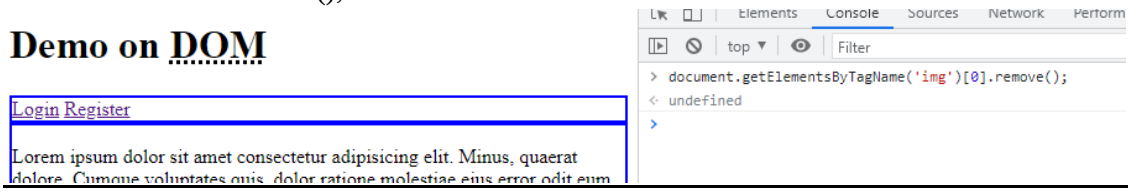


- Add & Remove CSS Class
  - Element.classList.add(“ClassName”);
  - Element.classList.remove(“ClassName”);
  - Element.classList.toggle(“ClassName”);

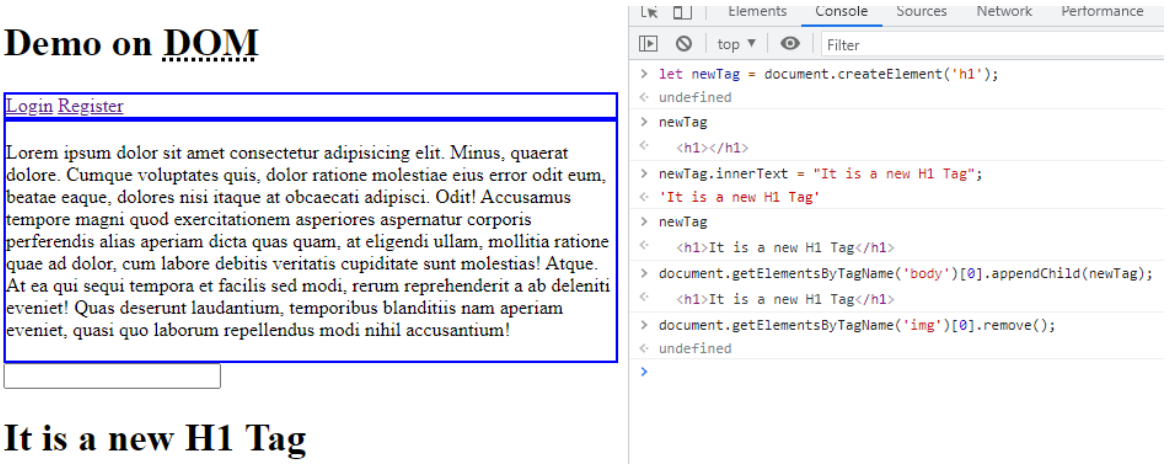
    Toggle method it will be add when it is not present & it will remove when it will present



- Add & Remove HTML Elements:
  - Element.remove();



- Element.appendChild(---);



Validations:

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Validation</title>
    <script>
        function validate()
        {
            let fnm = document.getElementsByName('fnm')[0].value;
            let lnm = document.getElementsByName('lnm')[0].value;
            if(fnm === "" || fnm === null)
            {
                alert("please fill first name")
                document.getElementsByName('fnm')[0].style = "border: 1px solid red";
                document.getElementsByClassName('msz')[0].innerText = "This Field can't be empty";
                document.getElementsByClassName('msz')[0].style = "color: red";
                return false;
            }
            else if(lnm === "" || lnm === null)
            {
                alert("please fill last name")
                document.getElementsByName('lnm')[0].style = "border: 1px solid red";
                document.getElementsByClassName('msz')[1].innerText = "This Field can't be empty";
                document.getElementsByClassName('msz')[1].style = "color: red";
                return false;
            }
        }
    </script>
</head>
<body>
    <form onsubmit="return validate()">
        <label>First Name : </label>
        <input type="text" name="fnm">
            <span class="msz"></span>
        <br><br>
        <label>Last Name : </label>
        <input type="text" name="lnm">
            <span class="msz"></span>
        <br><br>
        <label>Phone Number : </label>
        <input type="number" name="phnm">
        <input type="submit">
    </form>
</body>
</html>
```

Random Color:

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Random Color</title>
    <script>
        function generateRandomColor()
        {
            let arr = [0,1,2,3,4,5,6,7,8,9,'a','b','c','d','e','f'];
            let randomColor = '#';

           for(let i=1 ; i<=6 ; i++)
           {
            let index = Math.floor(Math.random()*16);
            randomColor += arr[index];
           }
           console.log(randomColor);
           document.getElementsByTagName('body')[0].style.backgroundColor = randomColor;

        }
    </script>
</head>
<body>
    <h1>Generate Random Color</h1>
    <button onclick="generateRandomColor()">Get Random Color</button>
</body>
</html>
```

Digital Clock:

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Digital Clock</title>
    <style>
        body
        {
            background: #aeaeae;
            font-family: Arial, Helvetica, sans-serif;
        }
        .container
        {
            border: 2px solid #fff;
            width: 50%;
            text-align: center;
            margin: 15px auto;
        }
    </style>
    <script>
        function displayDateAndTime()
        {
            let curDateObj = new Date();

            let curHours = curDateObj.getHours();
            let curMin = curDateObj.getMinutes();
            let curSec = curDateObj.getSeconds();

            let curYear = curDateObj.getFullYear();
            let curMon = curDateObj.getMonth() + 1;
            let curDate = curDateObj.getDate();

            document.getElementById('hours').innerText = curHours;
            document.getElementById('min').innerText = curMin;
            document.getElementById('sec').innerText = curSec;

            document.getElementById('date').innerText = curDate;
```

```
            document.getElementById('month').innerText = curMon;
            document.getElementById('year').innerText = curYear;

            let curDay = curDateObj.getDay();

            switch(curDay)
            {
                case 0: curDay = "SUNDAY"
                break;
                case 1: curDay = "MONDAY"
                break;
                case 2: curDay = "TUESDAY"
                break;
                case 3: curDay = "WEDNESDAY"
                break;
                case 4: curDay = "THURESDAY"
                break;
                case 5: curDay = "FRIDAY"
                break;
                case 6: curDay = "SATURDAY"
                break;
            }
            document.getElementById('day').innerText = curDay;
        }
    </script>
</head>
<body onload="setInterval(displayDateAndTime,1000)">
    <h1 style="text-align: center;">Digital clock</h1>
    <div class="container">
        <h1>
            <span id="hours">00</span> :
            <span id="min">00</span> :
            <span id="sec">00</span>
        </h1>
    </div>

    <div class="container">
        <h1>
            <span id="date">00</span> :
            <span id="month">00</span> :
            <span id="year">0000</span>
        </h1>
        <h2 id="day">some day</h2>
    </div>
</body>
</html>
```

Calculator

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Calculator</title>
    <style>
        body
        {
            padding: 0;
            margin: 0;
            font-family: Arial, Helvetica, sans-serif;
        }
        #calci
        {
            background-image: linear-gradient(white,white,white,gray,black,black);
            border: 5px solid black;
            width: 30%;
            height: auto;
            margin: 20px auto;
        }
        h1
```

```
        {
            text-align: center;
            margin: 15px;
        }
        input[type='text'] /*Simple Attribute Selector*/
        {
            color: black;
            background-image: linear-gradient(gray,white);
            width: 99%;
            height: 60px;
            border-color: black;
            font-size: 30px;
            font-family: cursive;
            border: 1px solid black;
        }

        #OnOff
        {
            font-family: fantasy;
            font-size: 15px;
            /* border: 1px solid black;
            border-bottom: white;
            background-image: linear-gradient(black,white,white); */
        }
        #ce
        {
            text-align: right;
        }


        button
        {
            background-image: radial-gradient(white,gray);
            border-radius: 10%;
            height: auto;
            width: 23%;
            margin: 2px;
            font-family: serif;
            font-size: 30px;
            font: bold;
        }

        button:hover
        {
            background-image: radial-gradient(white,black);
            color: black;
        }
    </style>
    <script>
        var isTurnOn = false;
        function turnOn()
        {
            isTurnOn = true;
            document.getElementById('display').disabled=false;
        }
        function turnOff()
        {
            isTurnOn = false;
            document.getElementById('display').value="";
            document.getElementById('display').disabled=true;
        }

        function displayInInput(clickedElement)
        {
            if(isTurnOn)
            {
                let clickedValue =  clickedElement.innerText;
                console.log(clickedValue);

                let curValue = document.getElementById('display').value;
                document.getElementById('display').value = curValue + clickedValue;
            }
            else
            {
```

```
                alert("please Turn ON calculator")
            }
        }

        function calculate()
        {
            let expression = document.getElementById('display').value;
            let result = eval(expression);
            document.getElementById('display').value = result;
        }

        function clearAll()
        {
            document.getElementById('display').value = '';
        }

        function clearOneChar()
        {
            let expression = document.getElementById('display').value;
            let size = expression.length;
            expression = expression.substring(0, size-1);
            document.getElementById('display').value = expression;
        }

    </script>
</head>
<body>
    <h1>Calculator</h1>
    <div id="calci">
        <input type="text" id="display">

        <div class="row"id="OnOff">
            <input type="radio" name="turnon" onclick="turnOn()"><label>ON</label>
            <input type="radio" name="turnon" onclick="turnOff()"><label>OFF</label>
        </div>

        <div class="row" id="ce">
            <button onclick="clearOneChar()">C</button>
            <button onclick="clearAll()">CE</button>
        </div>
        <div class="row">
            <button onclick="displayInInput(this)">1</button>
            <button onclick="displayInInput(this)">2</button>
            <button onclick="displayInInput(this)">3</button>
            <button onclick="displayInInput(this)">+</button>
        </div>
        <div class="row">
            <button onclick="displayInInput(this)">4</button>
            <button onclick="displayInInput(this)">5</button>
            <button onclick="displayInInput(this)">6</button>
            <button onclick="displayInInput(this)">-</button>
        </div>
        <div class="row">
            <button onclick="displayInInput(this)">7</button>
            <button onclick="displayInInput(this)">8</button>
            <button onclick="displayInInput(this)">9</button>
            <button onclick="displayInInput(this)">*</button>
        </div>
        <div class="row">
            <button onclick="displayInInput(this)">0</button>
            <button onclick="displayInInput(this)">.</button>
            <button onclick="displayInInput(this)">/</button>
            <button onclick="calculate()">=</button>
        </div>

    </div>
</body>
</html>
```