UNIT 4
JAVASCRIPT

Client-side scripting is source code that is executed on the **client's** browser instead of the web-**server**, and allows for the creation of faster and more responsive web applications.

Client-side scripting languages:

- **HTML**: It is the fundamental building blocks of web programming which provides the frame to the website. It describes the arrangement of the content.

- **CSS**: CSS provides the way to design the graphic elements which help in making the appearance of the web application more attractive.

- **JavaScript**: It is also a client-side scripting language which essentially devised for the specific purpose, but currently there are various JavaScript frameworks used as server-side scripting technology.

Server-side scripting is a technique of programming for producing the code which can run software on the server side, in simple words any scripting or programming that can run on the web server is known as server-side scripting.

Server-side scripting languages:

After the advent of CGI, multiple programming languages were evolved such as PHP, Python, Ruby.

BASIS FOR COMPARISON	SERVER-SIDE SCRIPTING	CLIENT-SIDE SCRIPTING
Basic	Works in the back end which could not be visible at the client end.	Works at the front end and script are visible among the users.
Processing	Requires server interaction.	Does not need interaction with the server.
Languages involved	PHP, ASP.net, Ruby on Rails, ColdFusion, Python, etcetera.	HTML, CSS, JavaScript, etc.
Affect	Could effectively customize the web pages and provide dynamic websites.	Can reduce the load to the server.

BASIS FOR COMPARISON	SERVER-SIDE SCRIPTING	CLIENT-SIDE SCRIPTING
Security	Relatively secure.	Insecure

Introduction to JavaScript:

JavaScript is an object-based scripting language which is lightweight and cross-platform.

JavaScript is not a compiled language, but it is a translated language. The JavaScript Translator (embedded in the browser) is responsible for translating the JavaScript code for the web browser.

Since then, it has been adopted by all other graphical web browsers. With JavaScript, users can build modern web applications to interact directly without reloading the page every time.

Features of JavaScript

There are following features of JavaScript:

1. *All popular web browsers support JavaScript as they provide built-in execution environments.*
2. *JavaScript follows the syntax and structure of the C programming language. Thus, it is a structured programming language.*
3. *JavaScript is a weakly typed language, where certain types are implicitly cast (depending on the operation).*
4. *JavaScript is an object-oriented programming language that uses prototypes rather than using classes for inheritance.*
5. *It is a light-weighted and interpreted language.*
6. *It is a case-sensitive language.*
7. *JavaScript is supportable in several operating systems including, Windows, macOS, etc.*
8. *It provides good control to the users over the web browsers.*

History of JavaScript

In 1993, **Mosaic**, the first popular web browser, came into existence. In the **year 1994**, **Netscape** was founded by **Marc Andreessen**. He realized that the web needed to become more dynamic. Thus, a 'glue language' was believed to be provided to HTML to make web designing easy for designers and part-time programmers. Consequently, in 1995, the company recruited **Brendan Eich** intending to implement and embed Scheme programming language to the browser. But, before Brendan could start, the company merged with **Sun Microsystems** for adding Java into its Navigator so that it could compete with Microsoft over the web technologies and platforms. Now, two languages were there: Java and the scripting language. Further, Netscape decided to

give a similar name to the scripting language as Java's. It led to 'Javascript'. Finally, in May 1995, Marc Andreessen coined the first code of Javascript named '**Mocha**'. Later, the marketing team replaced the name with '**LiveScript**'. But, due to trademark reasons and certain other reasons, in December 1995, the language was finally renamed to 'JavaScript'. From then, JavaScript came into existence.

Application of JavaScript

JavaScript is used to create interactive websites. It is mainly used for:

- *Client-side validation,*
- *Dynamic drop-down menus,*
- *Displaying date and time,*
- *Displaying pop-up windows and dialog boxes (like an alert dialog box, confirm dialog box and prompt dialog box),*
- *Displaying clocks etc.*

JavaScript Example

```
<script>
document.write("Hello JavaScript by JavaScript");
</script>
```

Complete Code:

```
<html>
<body>
<h2>Welcome to JavaScript</h2>
<script>
document.write("Hello JavaScript by JavaScript");
</script>
</body>
</html>
```

Output:

Java-script example is easy to code. JavaScript provides 3 places to put the JavaScript code: ***within body tag, within head tag and external JavaScript file.***

The **script** tag specifies that we are using JavaScript.

The **text/javascript** is the content type that provides information to the browser about the data.

The **document.write()** function is used to display dynamic content through JavaScript.

3 Places to put JavaScript code

1. ***Between the body tag of html***
2. ***Between the head tag of html***
3. ***In .js file (external javaScript)***

1) JavaScript Example : code between the body tag

In the above example, we have displayed the dynamic content using JavaScript. Let's see the simple example of JavaScript that displays alert dialog box.

```
<script type="text/javascript">
 alert("Hello Javatpoint");
</script>
```

2) JavaScript Example : code between the head tag

Let's see the same example of displaying alert dialog box of JavaScript that is contained inside the head tag.

In this example, we are creating a function msg(). To create function in JavaScript, you need to write function with function_name as given below.

To call function, you need to work on event. Here we are using onclick event to call msg() function.

```
<html>
<head>
<script type="text/javascript">
function msg(){
 alert("Hello Javatpoint");
}
</script>
</head>
<body>
<p>Welcome to JavaScript</p>
<form>
<input type="button" value="click" onclick="msg()"/>
</form>
</body>
</html>
```

3) External JavaScript file

We can create external JavaScript file and embed it in many html page.

It provides **code re usability** because single JavaScript file can be used in several html pages.

An external JavaScript file must be saved by .js extension. It is recommended to embed all JavaScript files into a single file. It increases the speed of the webpage.

Let's create an external JavaScript file that prints Hello Javatpoint in a alert dialog box.

message.js

```
function msg(){
 alert("Hello Javatpoint");
}
```

Let's include the JavaScript file into html page. It calls the JavaScript function on button click.

index.html

```
<html>
<head>
<script type="text/javascript" src="message.js"></script>
</head>
<body>
<p>Welcome to JavaScript</p>
<form>
<input type="button" value="click" onclick="msg()"/>
</form>
</body>
</html>
```

Advantges of External JavaScript

There will be following benefits if a user creates an external javascript:

1. *It helps in the reusability of code in more than one HTML file.*
2. *It allows easy code readability.*
3. *It is time-efficient as web browsers cache the external js files, which further reduces the page loading time.*
4. *It enables both web designers and coders to work with html and js files parallelly and separately, i.e., without facing any code conflictions.*
5. *The length of the code reduces as only we need to specify the location of the js file.*

Disadvantages of External JavaScript

There are the following disadvantages of external files:

1. *The stealer may download the coder's code using the url of the js file.*
2. *If two js files are dependent on one another, then a failure in one file may affect the execution of the other dependent file.*
3. *The web browser needs to make an additional http request to get the js code.*
4. *A tiny to a large change in the js code may cause unexpected results in all its dependent files.*
5. *We need to check each file that depends on the commonly created external javascript file.*
6. *If it is a few lines of code, then better to implement the internal javascript code.*

JavaScript Comment

The **JavaScript comments** are meaningful way to deliver message. It is used to add information about the code, warnings or suggestions so that end user can easily interpret the code.

The JavaScript comment is ignored by the JavaScript engine i.e. embedded in the browser.

Advantages of JavaScript comments

There are mainly two advantages of JavaScript comments.

1. **To make code easy to understand** It can be used to elaborate the code so that end user can easily understand the code.
2. **To avoid the unnecessary code** It can also be used to avoid the code being executed. Sometimes, we add the code to perform some action. But after sometime, there may be need to disable the code. In such case, it is better to use comments.

Types of JavaScript Comments

There are two types of comments in JavaScript.

1. Single-line Comment
2. Multi-line Comment

JavaScript Single line Comment

It is represented by double forward slashes (//). It can be used before and after the statement.

<script>

```
// It is single line comment
document.write("hello javascript");
</script>
```

JavaScript Multi line Comment

It can be used to add single as well as multi line comments. So, it is more convenient.

It is represented by forward slash with asterisk then asterisk with forward slash. For example:

```
/* your code here  */
```

It can be used before, after and middle of the statement.

```
<script>
/* It is multi line comment.
It will not be displayed */
document.write("example of javascript multiline comment");
</script>
```

JavaScript Variable

A **JavaScript variable** is simply a name of storage location. There are two types of variables in JavaScript : local variable and global variable.

There are some rules while declaring a JavaScript variable (also known as identifiers).

1. Name must start with a letter (a to z or A to Z), underscore(_), or dollar($) sign.
2. After first letter we can use digits (0 to 9), for example value1.
3. JavaScript variables are case sensitive, for example x and X are different variables.

Correct JavaScript variables

```
var x = 10;
var _value="sonoo";
```

JavaScript local variable

A JavaScript local variable is declared inside block or function. It is accessible within the function or block only. For example:

```
<script>
function abc(){
var x=10;//local variable
}
```

</script>

Or,

<script>
If(10**<13**){
var y=20;//JavaScript local variable
}
</script>

JavaScript global variable

A **JavaScript global variable** is accessible from any function. A variable i.e. declared outside the function or declared with window object is known as global variable. For example:

<script>
var data=200;//gloabal variable
function a(){
document.writeln(data);
}
function b(){
document.writeln(data);
}
a();//calling JavaScript function
b();
</script>

JavaScript Global Variable

A **JavaScript global variable** is declared outside the function or declared with window object. It can be accessed from any function.

<script>
var value=50;//global variable
function a(){
alert(value);
}
function b(){
alert(value);
}
</script>

Declaring JavaScript global variable within function

To declare JavaScript global variables inside function, you need to use **window object**. For example:

window.value=90;

Now it can be declared inside any function and can be accessed from any function. For example:

```
function m(){
window.value=100;//declaring global variable by window object
}
function n(){
alert(window.value);//accessing global variable from other function
}
```

Internals of global variable in JavaScript

When you declare a variable outside the function, it is added in the window object internally. You can access it through window object also. For example:

```
var value=50;
function a(){
alert(window.value);//accessing global variable
}
```

Javascript Data Types

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

1. Primitive data type
2. Non-primitive (reference) data type

JavaScript is a **dynamic type language**, means you don't need to specify type of the variable because it is dynamically used by JavaScript engine. You need to use **var** here to specify the data type. It can hold any type of values such as numbers, strings etc. For example:

```
1.  var a=40;//holding number
2.  var b="Rahul";//holding string
```

JavaScript primitive data types

There are five types of primitive data types in JavaScript. They are as follows:

Data Type	Description
String	represents sequence of characters e.g. "hello"
Number	represents numeric values e.g. 100
Boolean	represents boolean value either false or true

Undefined	represents undefined value
Null	represents null i.e. no value at all

JavaScript non-primitive data types

The non-primitive data types are as follows:

Data Type	Description
Object	represents instance through which we can access members
Array	represents group of similar values
RegExp	represents regular expression

JavaScript Operators

JavaScript operators are symbols that are used to perform operations on operands. For example:

```
var sum=10+20;
```

Here, + is the arithmetic operator and = is the assignment operator.

There are following types of operators in JavaScript.

1. Arithmetic Operators
2. Comparison (Relational) Operators
3. Bitwise Operators
4. Logical Operators
5. Assignment Operators
6. Special Operators

JavaScript Arithmetic Operators

Arithmetic operators are used to perform arithmetic operations on the operands. The following operators are known as JavaScript arithmetic operators.

Operator	Description	Example
+	Addition	10+20 = 30
-	Subtraction	20-10 = 10

*	Multiplication	10*20 = 200
/	Division	20/10 = 2
%	Modulus (Remainder)	20%10 = 0
++	Increment	var a=10; a++; Now a = 11
--	Decrement	var a=10; a--; Now a = 9

JavaScript Comparison Operators

The JavaScript comparison operator compares the two operands. The comparison operators are as follows:

Operator	Description	Example
==	Is equal to	10==20 = false
===	Identical (equal and of same type)	10==20 = false
!=	Not equal to	10!=20 = true
!==	Not Identical	20!==20 = false
>	Greater than	20>10 = true
>=	Greater than or equal to	20>=10 = true
<	Less than	20<10 = false
<=	Less than or equal to	20<=10 = false

JavaScript Bitwise Operators

The bitwise operators perform bitwise operations on operands. The bitwise operators are as follows:

Operator	Description	Example
&	Bitwise AND	(10==20 & 20==33) = false
|	Bitwise OR	(10==20 | 20==33) = false
^	Bitwise XOR	(10==20 ^ 20==33) = false
~	Bitwise NOT	(~10) = -10

<<	Bitwise Left Shift	(10<<2) = 40
>>	Bitwise Right Shift	(10>>2) = 2
>>>	Bitwise Right Shift with Zero	(10>>>2) = 2

JavaScript Logical Operators

The following operators are known as JavaScript logical operators.

Operator	Description	Example
&&	Logical AND	(10==20 && 20==33) = false
||	Logical OR	(10==20 || 20==33) = false
!	Logical Not	!(10==20) = true

JavaScript Assignment Operators

The following operators are known as JavaScript assignment operators.

Operator	Description	Example
=	Assign	10+10 = 20
+=	Add and assign	var a=10; a+=20; Now a = 30
-=	Subtract and assign	var a=20; a-=10; Now a = 10
*=	Multiply and assign	var a=10; a*=20; Now a = 200
/=	Divide and assign	var a=10; a/=2; Now a = 5
%=	Modulus and assign	var a=10; a%=2; Now a = 0

JavaScript Special Operators

The following operators are known as JavaScript special operators.

Operator	Description
(?:)	Conditional Operator returns value based on the condition. It is like if-else.
,	Comma Operator allows multiple expressions to be evaluated as

	single statement.
delete	Delete Operator deletes a property from the object.
in	In Operator checks if object has the given property
instanceof	checks if the object is an instance of given type
new	creates an instance (object)
typeof	checks the type of object.
void	it discards the expression's return value.
yield	checks what is returned in a generator by the generator's iterator.

JavaScript If-else

The **JavaScript if-else statement** is used to execute the code whether condition is true or false. There are three forms of if statement in JavaScript.

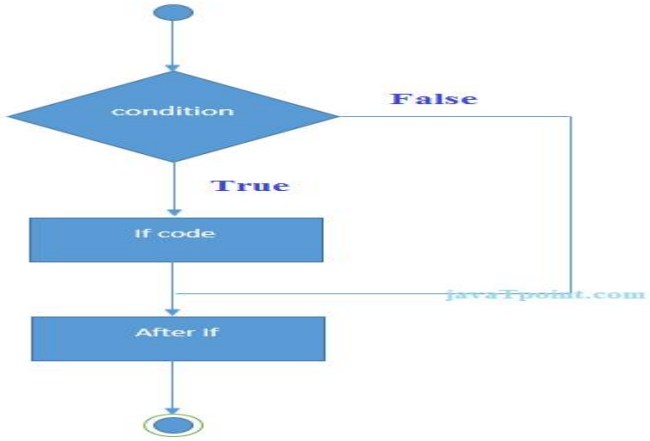
1. If Statement
2. If else statement
3. if else if statement

JavaScript If statement

It evaluates the content only if expression is true. The signature of JavaScript if statement is given below.

```
if(expression){
//content to be evaluated
}
```

Flowchart of JavaScript If statement



Let's see the simple example of if statement in javascript.

```
<script>
var a=20;
if(a>10){
document.write("value of a is greater than 10");
}
</script>
```

Output:

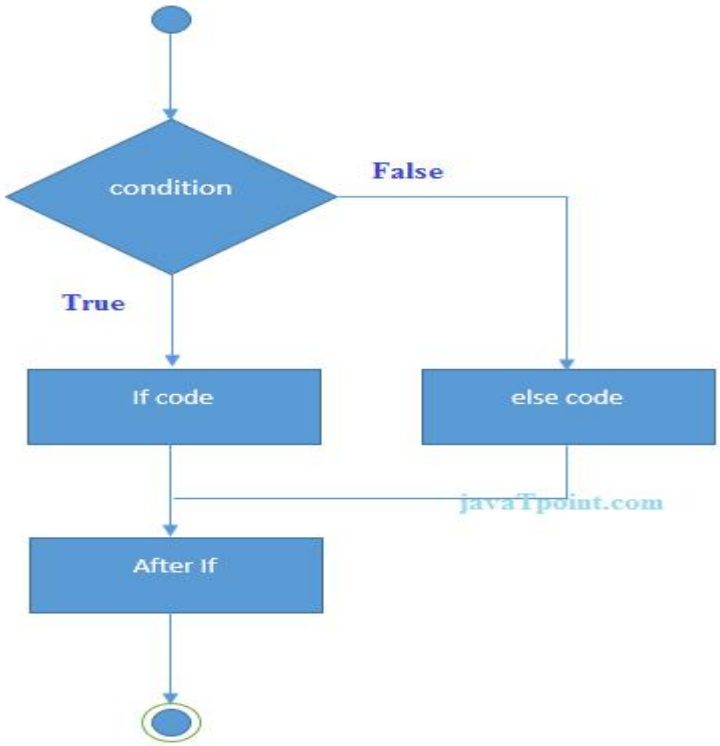
value of a is greater than 10

JavaScript If...else Statement

It evaluates the content whether condition is true of false. The syntax of JavaScript if-else statement is given below.

```
if(expression){
//content to be evaluated if condition is true
}
else{
//content to be evaluated if condition is false
}
```

Flowchart of JavaScript If...else statement



Let's see the example of if-else statement in JavaScript to find out the even or odd number.

```
<script>
var a=20;
if(a%2==0){
document.write("a is even number");
}
else{
document.write("a is odd number");
}
</script>
```

Output of the above example

```
a is even number
```

JavaScript If...else if statement

It evaluates the content only if expression is true from several expressions. The signature of JavaScript if else if statement is given below.

```
if(expression1){
```

```
//content to be evaluated if expression1 is true
}
else if(expression2){
//content to be evaluated if expression2 is true
}
else if(expression3){
//content to be evaluated if expression3 is true
}
else{
//content to be evaluated if no expression is true
}
```

Let's see the simple example of if else if statement in javascript.

```
<script>
var a=20;
if(a==10){
document.write("a is equal to 10");
}
else if(a==15){
document.write("a is equal to 15");
}
else if(a==20){
document.write("a is equal to 20");
}
else{
document.write("a is not equal to 10, 15 or 20");
}
</script>
```

Output of the above example

```
a is equal to 20
```

JavaScript Switch

The **JavaScript switch statement** is used to execute one code from multiple expressions. It is just like else if statement that we have learned in previous page. But it is convenient than if..else..if because it can be used with numbers, characters etc.

The signature of JavaScript switch statement is given below.

```
switch(expression){
case value1:
 code to be executed;
```

```
 break;
case value2:
 code to be executed;
 break;
.....

default:
 code to be executed if above values are not matched;
}
```

JavaScript Loops

The **JavaScript loops** are used to iterate the piece of code using for, while, do while or for-in loops. It makes the code compact. It is mostly used in array.

There are four types of loops in JavaScript.

1. for loop
2. while loop
3. do-while loop
4. for-in loop

1) JavaScript For loop

The **JavaScript for loop** iterates the elements for the fixed number of times. It should be used if number of iteration is known. The syntax of for loop is given below.

```
for (initialization; condition; increment)
{
   code to be executed
}
```

Let's see the simple example of for loop in javascript.

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

Output:

```
1
2
3
```

```
4
5
```

2) JavaScript while loop

The **JavaScript while loop** iterates the elements for the infinite number of times. It should be used if number of iteration is not known. The syntax of while loop is given below.

```
while (condition)
{
   code to be executed
}
```

Let's see the simple example of while loop in javascript.

```
<script>
var i=11;
while (i<=15)
{
document.write(i + "<br/>");
i++;
}
</script>
```

Output:

```
11
12
13
14
15
```

3) JavaScript do while loop

The **JavaScript do while loop** iterates the elements for the infinite number of times like while loop. But, code is executed at least once whether condition is true or false. The syntax of do while loop is given below.

```
do{
   code to be executed
}while (condition);
```

Let's see the simple example of do while loop in javascript.

```
<script>
var i=21;
do{
```

```
document.write(i + "<br/>");
i++;
}while (i<=25);
</script>
```

Output:

```
21
22
23
24
25
```

4) JavaScript for in loop

The **JavaScript for in loop** is used to iterate the properties of an object.

Syntax

The syntax of 'for..in' loop is −

```
for (variablename in object) {
    statement or block to execute
}
```

In each iteration, one property from **object** is assigned to **variablename** and this loop continues till all the properties of the object are exhausted.

Example

```
<html>
    <body>
        <script type = "text/javascript">
            <!--
                var aProperty;
                document.write("Navigator Object Properties<br /> ");
                for (aProperty in navigator) {
                    document.write(aProperty);
                    document.write("<br />");
                }
                document.write ("Exiting from the loop!");
            //-->
        </script>
        <p>Set the variable to different object and then try...</p>
    </body>
</html>
```

Output

Navigator Object Properties
serviceWorker
webkitPersistentStorage
webkitTemporaryStorage
geolocation
doNotTrack
onLine
languages
language
userAgent
product
platform
appVersion
appName
appCodeName
hardwareConcurrency
maxTouchPoints
vendorSub
vendor
productSub
cookieEnabled
mimeTypes
plugins
Set the variable to different object and then try..

JavaScript Functions

JavaScript functions are used to perform operations. We can call JavaScript function many times to reuse the code.

Advantage of JavaScript function

There are mainly two advantages of JavaScript functions.

1. **Code reusability**: We can call a function several times so it save coding.
2. **Less coding**: It makes our program compact. We don't need to write many lines of code each time to perform a common task.

JavaScript Function Syntax

The syntax of declaring function is given below.

```
function functionName([arg1, arg2, ...argN]){
 //code to be executed
}
```

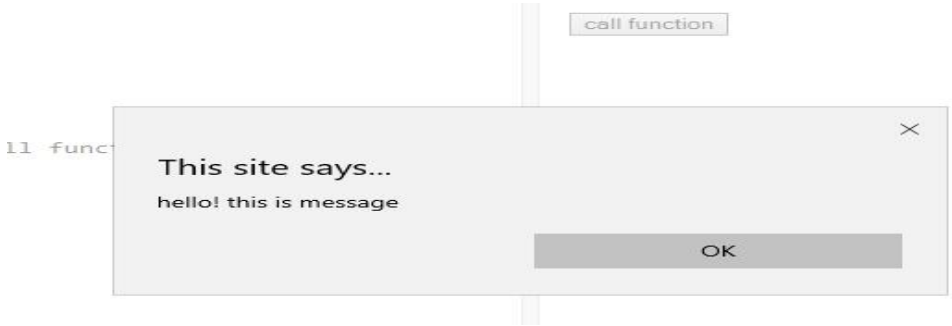
JavaScript Functions can have 0 or more arguments.

JavaScript Function Example

Let's see the simple example of function in JavaScript that does not has arguments.

<script>

```
function msg(){
alert("hello! this is message");
}
</script>
<input type="button" onclick="msg()" value="call function"/>
```



JavaScript Function Arguments

We can call function by passing arguments.

```
<script>
function getcube(number){
alert(number*number*number);
}
</script>
<form>
<input type="button" value="click" onclick="getcube(4)"/>
</form>
```

Output:

Function with Return Value

We can call function that returns a value and use it in our program. Let's see the example of function that returns value.

```
<script>
function getInfo(){
return "hello javatpoint! How r u?";
}
```

```
</script>
<script>
document.write(getInfo());
</script>
```

Output of the above example

hello javatpoint! How r u?

JavaScript Function Object

In JavaScript, the purpose of **Function constructor** is to create a new Function object. It executes the code globally. However, if we call the constructor directly, a function is created dynamically but in an unsecured way.

Syntax

new Function ([arg1[, arg2[, ...argn]],] functionBody)

Parameter

arg1, arg2, ... , argn - It represents the argument used by function.

functionBody - It represents the function definition.

JavaScript Function Methods

Let's see function methods with description.

Method	Description
apply()	It is used to call a function contains this value and a single array of arguments.
bind()	It is used to create a new function.
call()	It is used to call a function contains this value and an argument list.
toString()	It returns the result in a form of a string.

JavaScript Function Object Examples

Example 1

Let's see an example to display the sum of given numbers.

```
<script>
var add=new Function("num1","num2","return num1+num2");
document.writeln(add(2,5));
</script>
```

Output:

7

JavaScript Objects

A JavaScript object is an entity having state and behavior (properties and method). For example: car, pen, bike, chair, glass, keyboard, monitor etc.

JavaScript is an object-based language. Everything is an object in JavaScript.

JavaScript is template based not class based. Here, we don't create class to get the object. But, we direct create objects.

Creating Objects in JavaScript

There are 3 ways to create objects.

1. By object literal
2. By creating instance of Object directly (using new keyword)
3. By using an object constructor (using new keyword)

1) JavaScript Object by object literal

The syntax of creating object using object literal is given below:

```
object={property1:value1,property2:value2.....propertyN:valueN}
```

As you can see, property and value is separated by : (colon).

Let's see the simple example of creating object in JavaScript.

```
<script>
emp={id:102,name:"Shyam Kumar",salary:40000}
document.write(emp.id+" "+emp.name+" "+emp.salary);
</script>
```

Output of the above example

```
102 Shyam Kumar 40000
```

2) By creating instance of Object

The syntax of creating object directly is given below:

```
var objectname=new Object();
```

Here, **new keyword** is used to create object.

Let's see the example of creating object directly.

```
<script>
var emp=new Object();
emp.id=101;
emp.name="Ravi Malik";
emp.salary=50000;
document.write(emp.id+" "+emp.name+" "+emp.salary);
</script>
```

Output of the above example

```
101 Ravi 50000
```

3) By using an Object constructor

Here, you need to create function with arguments. Each argument value can be assigned in the current object by using this keyword.

The **this keyword** refers to the current object.

The example of creating object by object constructor is given below.

```
<script>
function emp(id,name,salary){
this.id=id;
this.name=name;
this.salary=salary;
}
e=new emp(103,"Vimal Jaiswal",30000);
document.write(e.id+" "+e.name+" "+e.salary);
</script>
```

Output of the above example

```
103 Vimal Jaiswal 30000
```

Defining method in JavaScript Object

We can define method in JavaScript object. But before defining method, we need to add property in the function with same name as method.

The example of defining method in object is given below.

```
<script>
function emp(id,name,salary){
this.id=id;
this.name=name;
this.salary=salary;
this.changeSalary=changeSalary;
function changeSalary(otherSalary){
this.salary=otherSalary;
}
}
e=new emp(103,"Sonoo Jaiswal",30000);
document.write(e.id+" "+e.name+" "+e.salary);
e.changeSalary(45000);
document.write("<br>"+e.id+" "+e.name+" "+e.salary);
</script>
```

Output of the above example

```
103 Sonoo Jaiswal 30000
103 Sonoo Jaiswal 45000
```

JavaScript Object Methods

The various methods of Object are as follows:

S.No	Methods	Description
1	Object.assign()	This method is used to copy enumerable and own properties from a source object to a target object
2	Object.create()	This method is used to create a new object with the specified prototype object and properties.
3	Object.defineProperty()	This method is used to describe some behavioral attributes of the property.
4	Object.defineProperties()	This method is used to create or configure multiple object properties.

5	Object.entries()	This method returns an array with arrays of the key, value pairs.
6	Object.freeze()	This method prevents existing properties from being removed.
7	Object.getOwnPropertyDescriptor()	This method returns a property descriptor for the specified property of the specified object.
8	Object.getOwnPropertyDescriptors()	This method returns all own property descriptors of a given object.
9	Object.getOwnPropertyNames()	This method returns an array of all properties (enumerable or not) found.
10	Object.getOwnPropertySymbols()	This method returns an array of all own symbol key properties.
11	Object.getPrototypeOf()	This method returns the prototype of the specified object.
12	Object.is()	This method determines whether two values are the same value.
13	Object.isExtensible()	This method determines if an object is extensible
14	Object.isFrozen()	This method determines if an object was frozen.
15	Object.isSealed()	This method determines if an object is sealed.
16	Object.keys()	This method returns an array of a given object's own property names.
17	Object.preventExtensions()	This method is used to prevent any extensions of an object.
18	Object.seal()	This method prevents new properties from being added and marks all existing properties as non-configurable.
19	Object.setPrototypeOf()	This method sets the prototype

		of a specified object to another object.
20	Object.values()	This method returns an array of values.

JavaScript Array

JavaScript array is an object that represents a collection of similar type of elements.

There are 3 ways to construct array in JavaScript

1. By array literal
2. By creating instance of Array directly (using new keyword)
3. By using an Array constructor (using new keyword)

1) JavaScript array literal

The syntax of creating array using array literal is given below:

var arrayname=[value1,value2.....valueN];

As you can see, values are contained inside [ ] and separated by , (comma).

```
<script>
var emp=["Sonoo","Vimal","Ratan"];
for (i=0;i<emp.length;i++){
document.write(emp[i] + "<br/>");
}
</script>
```

The .length property returns the length of an array.

Output of the above example

Sonoo
Vimal
Ratan

2) JavaScript Array directly (new keyword)

The syntax of creating array directly is given below:

```
var arrayname=new Array();
```

Here, **new keyword** is used to create instance of array.

```
<script>
```

```
var i;
var emp = new Array();
emp[0] = "Arun";
emp[1] = "Varun";
emp[2] = "John";
for (i=0;i<emp.length;i++){
document.write(emp[i] + "<br>");
}
</script>
```

Output of the above example

```
Arun
Varun
John
```

3) JavaScript array constructor (new keyword)

Here, you need to create instance of array by passing arguments in constructor so that we don't have to provide value explicitly.

```
<script>
var emp=new Array("Jai","Vijay","Smith");
for (i=0;i<emp.length;i++){
document.write(emp[i] + "<br>");
}
</script>
```

Output of the above example

```
Jai
Vijay
Smith
```

JavaScript Array Methods

Methods	Description
concat()	It returns a new array object that contains two or more merged arrays.
copywithin()	It copies the part of the given array with its own elements and returns the modified array.
entries()	It creates an iterator object and a loop that iterates over

	each key/value pair.
every()	It determines whether all the elements of an array are satisfying the provided function conditions.
flat()	It creates a new array carrying sub-array elements concatenated recursively till the specified depth.
flatMap()	It maps all array elements via mapping function, then flattens the result into a new array.
fill()	It fills elements into an array with static values.
from()	It creates a new array carrying the exact copy of another array element.
filter()	It returns the new array containing the elements that pass the provided function conditions.
find()	It returns the value of the first element in the given array that satisfies the specified condition.
findIndex()	It returns the index value of the first element in the given array that satisfies the specified condition.
forEach()	It invokes the provided function once for each element of an array.
includes()	It checks whether the given array contains the specified element.
indexOf()	It searches the specified element in the given array and returns the index of the first match.
isArray()	It tests if the passed value ia an array.
join()	It joins the elements of an array as a string.
keys()	It creates an iterator object that contains only the keys of the array, then loops through these keys.
lastIndexOf()	It searches the specified element in the given array and returns the index of the last match.
map()	It calls the specified function for every array element and returns the new array
of()	It creates a new array from a variable number of arguments, holding any type of argument.

pop()	It removes and returns the last element of an array.
push()	It adds one or more elements to the end of an array.
reverse()	It reverses the elements of given array.
reduce(function, initial)	It executes a provided function for each value from left to right and reduces the array to a single value.
reduceRight()	It executes a provided function for each value from right to left and reduces the array to a single value.
some()	It determines if any element of the array passes the test of the implemented function.
shift()	It removes and returns the first element of an array.
slice()	It returns a new array containing the copy of the part of the given array.
sort()	It returns the element of the given array in a sorted order.
splice()	It add/remove elements to/from the given array.
toLocaleString()	It returns a string containing all the elements of a specified array.
toString()	It converts the elements of a specified array into string form, without affecting the original array.
unshift()	It adds one or more elements in the beginning of the given array.
values()	It creates a new iterator object carrying values for each index in the array.

JavaScript String

The **JavaScript string** is an object that represents a sequence of characters.

There are 2 ways to create string in JavaScript

1. By string literal
2. By string object (using new keyword)

1) By string literal

The string literal is created using double quotes. The syntax of creating string using string literal is given below:

```
var stringname="string value";
```

```
<script>
var str="This is string literal";
document.write(str);
</script>
```

Output:

This is string literal

2) By string object (using new keyword)

The syntax of creating string object using new keyword is given below:

```
var stringname=new String("string literal");
```

Here, **new keyword** is used to create instance of string.

```
<script>
var stringname=new String("hello javascript string");
document.write(stringname);
</script>
```

Output:

hello javascript string

JavaScript String Methods

Methods	Description
charAt()	It provides the char value present at the specified index.
charCodeAt()	It provides the Unicode value of a character present at the specified index.
concat()	It provides a combination of two or more strings.
indexOf()	It provides the position of a char value present in the given string.
lastIndexOf()	It provides the position of a char value present in the given string by searching a character from the last position.
search()	It searches a specified regular expression in a given string and returns its position if a match occurs.

match()	It searches a specified regular expression in a given string and returns that regular expression if a match occurs.
replace()	It replaces a given string with the specified replacement.
substr()	It is used to fetch the part of the given string on the basis of the specified starting position and length.
substring()	It is used to fetch the part of the given string on the basis of the specified index.
slice()	It is used to fetch the part of the given string. It allows us to assign positive as well negative index.
toLowerCase()	It converts the given string into lowercase letter.
toLocaleLowerCase()	It converts the given string into lowercase letter on the basis of host?s current locale.
toUpperCase()	It converts the given string into uppercase letter.
toLocaleUpperCase()	It converts the given string into uppercase letter on the basis of host?s current locale.
toString()	It provides a string representing the particular object.
valueOf()	It provides the primitive value of string object.
split()	It splits a string into substring array, then returns that newly created array.
trim()	It trims the white space from the left and right side of the string.

1) JavaScript String charAt(index) Method

The JavaScript String charAt() method returns the character at the given index.

```
<script>
var str="javascript";
document.write(str.charAt(2));
</script>
```

Output:

```
v
```

2) JavaScript String concat(str) Method

The JavaScript String concat(str) method concatenates or joins two strings.

```
<script>
var s1="javascript ";
var s2="concat example";
var s3=s1.concat(s2);
document.write(s3);
</script>
```

Output:

javascript concat example

3) JavaScript String indexOf(str) Method

The JavaScript String indexOf(str) method returns the index position of the given string.

```
<script>
var s1="javascript from javatpoint indexof";
var n=s1.indexOf("from");
document.write(n);
</script>
```

Output:

11

4) JavaScript String lastIndexOf(str) Method

The JavaScript String lastIndexOf(str) method returns the last index position of the given string.

```
<script>
var s1="javascript from javatpoint indexof";
var n=s1.lastIndexOf("java");
document.write(n);
</script>
```

Output:

16

5) JavaScript String toLowerCase() Method

The JavaScript String toLowerCase() method returns the given string in lowercase letters.

```
<script>
var s1="JavaScript toLowerCase Example";
var s2=s1.toLowerCase();
document.write(s2);
</script>
```

Output:

javascript tolowercase example

6) JavaScript String toUpperCase() Method

The JavaScript String toUpperCase() method returns the given string in uppercase letters.

```
<script>
var s1="JavaScript toUpperCase Example";
var s2=s1.toUpperCase();
document.write(s2);
</script>
```

Output:

JAVASCRIPT TOUPPERCASE EXAMPLE

7) JavaScript String slice(beginIndex, endIndex) Method

The JavaScript String slice(beginIndex, endIndex) method returns the parts of string from given beginIndex to endIndex. In slice() method, beginIndex is inclusive and endIndex is exclusive.

```
<script>
var s1="abcdefgh";
var s2=s1.slice(2,5);
document.write(s2);
</script>
```

Output:

cde

8) JavaScript String trim() Method

The JavaScript String trim() method removes leading and trailing whitespaces from the string.

```
<script>
```

```
var s1="     javascript trim    ";
var s2=s1.trim();
document.write(s2);
</script>
```

Output:

javascript trim

9) JavaScript String split() Method

```
<script>
var str="This is JavaTpoint website";
document.write(str.split(" ")); //splits the given string.
</script>
```

JavaScript Date Object

The **JavaScript date** object can be used to get year, month and day. You can display a timer on the webpage by the help of JavaScript date object.

You can use different Date constructors to create date object. It provides methods to get and set day, month, year, hour, minute and seconds.

Constructor

You can use 4 variant of Date constructor to create date object.

1. Date()
2. Date(milliseconds)
3. Date(dateString)
4. Date(year, month, day, hours, minutes, seconds, milliseconds)

JavaScript Date Methods

Methods	Description
getDate()	It returns the integer value between 1 and 31 that represents the day for the specified date on the basis of local time.
getDay()	It returns the integer value between 0 and 6 that represents the day of the week on the basis of local time.
getFullYears()	It returns the integer value that represents the year on the basis of local time.
getHours()	It returns the integer value between 0 and 23 that

	represents the hours on the basis of local time.
getMilliseconds()	It returns the integer value between 0 and 999 that represents the milliseconds on the basis of local time.
getMinutes()	It returns the integer value between 0 and 59 that represents the minutes on the basis of local time.
getMonth()	It returns the integer value between 0 and 11 that represents the month on the basis of local time.
getSeconds()	It returns the integer value between 0 and 60 that represents the seconds on the basis of local time.
getUTCDate()	It returns the integer value between 1 and 31 that represents the day for the specified date on the basis of universal time.
getUTCDay()	It returns the integer value between 0 and 6 that represents the day of the week on the basis of universal time.
getUTCFullYears()	It returns the integer value that represents the year on the basis of universal time.
getUTCHours()	It returns the integer value between 0 and 23 that represents the hours on the basis of universal time.
getUTCMinutes()	It returns the integer value between 0 and 59 that represents the minutes on the basis of universal time.
getUTCMonth()	It returns the integer value between 0 and 11 that represents the month on the basis of universal time.
getUTCSeconds()	It returns the integer value between 0 and 60 that represents the seconds on the basis of universal time.
setDate()	It sets the day value for the specified date on the basis of local time.
setDay()	It sets the particular day of the week on the basis of local time.
setFullYears()	It sets the year value for the specified date on the basis of local time.
setHours()	It sets the hour value for the specified date on the basis of local time.
setMilliseconds()	It sets the millisecond value for the specified date on the

	basis of local time.
setMinutes()	It sets the minute value for the specified date on the basis of local time.
setMonth()	It sets the month value for the specified date on the basis of local time.
setSeconds()	It sets the second value for the specified date on the basis of local time.
setUTCDate()	It sets the day value for the specified date on the basis of universal time.
setUTCDay()	It sets the particular day of the week on the basis of universal time.
setUTCFullYears()	It sets the year value for the specified date on the basis of universal time.
setUTCHours()	It sets the hour value for the specified date on the basis of universal time.
setUTCMilliseconds()	It sets the millisecond value for the specified date on the basis of universal time.
setUTCMinutes()	It sets the minute value for the specified date on the basis of universal time.
setUTCMonth()	It sets the month value for the specified date on the basis of universal time.
setUTCSeconds()	It sets the second value for the specified date on the basis of universal time.
toDateString()	It returns the date portion of a Date object.
toISOString()	It returns the date in the form ISO format string.
toJSON()	It returns a string representing the Date object. It also serializes the Date object during JSON serialization.
toString()	It returns the date in the form of string.
toTimeString()	It returns the time portion of a Date object.
toUTCString()	It converts the specified date in the form of string using UTC time zone.
valueOf()	It returns the primitive value of a Date object.

JavaScript Date Example

Let's see the simple example to print date object. It prints date and time both.

```
Current Date and Time: <span id="txt"></span>
<script>
var today=new Date();
document.getElementById('txt').innerHTML=today;
</script>
```

Output:

Current Date and Time: Mon May 04 2020 11:14:15 GMT+0530 (India Standard Time)

Let's see another code to print date/month/year.

```
<script>
var date=new Date();
var day=date.getDate();
var month=date.getMonth()+1;
var year=date.getFullYear();
document.write("<br>Date is: "+day+"/"+month+"/"+year);
</script>
```

Output:

Date is: 4/5/2020

JavaScript Current Time Example

Let's see the simple example to print current time of system.

```
Current Time: <span id="txt"></span>
<script>
var today=new Date();
var h=today.getHours();
var m=today.getMinutes();
var s=today.getSeconds();
document.getElementById('txt').innerHTML=h+":"+m+":"+s;
</script>
```

Output:

Current Time: 11:14:15

JavaScript Math

The **JavaScript math** object provides several constants and methods to perform mathematical operation. Unlike date object, it doesn't have constructors.

JavaScript Math Methods

Methods	Description
abs()	It returns the absolute value of the given number.
acos()	It returns the arccosine of the given number in radians.
asin()	It returns the arcsine of the given number in radians.
atan()	It returns the arc-tangent of the given number in radians.
cbrt()	It returns the cube root of the given number.
ceil()	It returns a smallest integer value, greater than or equal to the given number.
cos()	It returns the cosine of the given number.
cosh()	It returns the hyperbolic cosine of the given number.
exp()	It returns the exponential form of the given number.
floor()	It returns largest integer value, lower than or equal to the given number.
hypot()	It returns square root of sum of the squares of given numbers.
log()	It returns natural logarithm of a number.
max()	It returns maximum value of the given numbers.
min()	It returns minimum value of the given numbers.
pow()	It returns value of base to the power of exponent.
random()	It returns random number between 0 (inclusive) and 1 (exclusive).
round()	It returns closest integer value of the given number.
sign()	It returns the sign of the given number
sin()	It returns the sine of the given number.
sinh()	It returns the hyperbolic sine of the given number.
sqrt()	It returns the square root of the given number

tan()	It returns the tangent of the given number.
tanh()	It returns the hyperbolic tangent of the given number.
trunc()	It returns an integer part of the given number.

Math.sqrt(n)

The JavaScript math.sqrt(n) method returns the square root of the given number.

```
Square Root of 17 is: <span id="p1"></span>
<script>
document.getElementById('p1').innerHTML=Math.sqrt(17);
</script>
```

Output:

```
Square Root of 17 is: 4.123105625617661
```

Math.random()

The JavaScript math.random() method returns the random number between 0 to 1.

```
Random Number is: <span id="p2"></span>
<script>
document.getElementById('p2').innerHTML=Math.random();
</script>
```

Output:

```
Random Number is: 0.666264993380191
```

Math.pow(m,n)

The JavaScript math.pow(m,n) method returns the m to the power of n that is m^n.

```
3 to the power of 4 is: <span id="p3"></span>
<script>
document.getElementById('p3').innerHTML=Math.pow(3,4);
</script>
```

Output:

```
3 to the power of 4 is: 81
```

Math.floor(n)

The JavaScript math.floor(n) method returns the lowest integer for the given number. For example 3 for 3.7, 5 for 5.9 etc.

```
Floor of 4.6 is: <span id="p4"></span>
<script>
document.getElementById('p4').innerHTML=Math.floor(4.6);
</script>
```

Output:

```
Floor of 4.6 is: 4
```

Math.ceil(n)

The JavaScript math.ceil(n) method returns the largest integer for the given number. For example 4 for 3.7, 6 for 5.9 etc.

```
Ceil of 4.6 is: <span id="p5"></span>
<script>
document.getElementById('p5').innerHTML=Math.ceil(4.6);
</script>
```

Output:

```
Ceil of 4.6 is: 5
```

Math.abs(n)

The JavaScript math.abs(n) method returns the absolute value for the given number. For example 4 for -4, 6.6 for -6.6 etc.

```
Absolute value of -4 is: <span id="p8"></span>
<script>
document.getElementById('p8').innerHTML=Math.abs(-4);
</script>
```

Output:

```
Absolute value of -4 is: 4
```

JavaScript Number Object

The **JavaScript number** object enables you to represent a numeric value. It may be integer or floating-point. JavaScript number object follows IEEE standard to represent the floating-point numbers.

By the help of Number() constructor, you can create number object in JavaScript. For example:

```
var n=new Number(value);
```

If value can't be converted to number, it returns NaN(Not a Number) that can be checked by isNaN() method.

You can direct assign a number to a variable also. For example:

```
var x=102;//integer value
var y=102.7;//floating point value
var z=13e4;//exponent value, output: 130000
var n=new Number(16);//integer value by number object
```

Output:

```
102 102.7 130000 16
```

JavaScript Number Constants

Constant	Description
MIN_VALUE	returns the largest minimum value.
MAX_VALUE	returns the largest maximum value.
POSITIVE_INFINITY	returns positive infinity, overflow value.
NEGATIVE_INFINITY	returns negative infinity, overflow value.
NaN	represents "Not a Number" value.

JavaScript Number Methods

Methods	Description
isFinite()	It determines whether the given value is a finite number.
isInteger()	It determines whether the given value is an integer.
parseFloat()	It converts the given string into a floating point number.
parseInt()	It converts the given string into an integer number.
toExponential()	It returns the string that represents exponential notation of the given number.
toFixed()	It returns the string that represents a number with exact digits

	after a decimal point.
toPrecision()	It returns the string representing a number of specified precision.
toString()	It returns the given number in the form of string.

JavaScript Boolean

JavaScript Boolean is an object that represents value in two states: true or false. You can create the JavaScript Boolean object by Boolean() constructor as given below.

Boolean b=new Boolean(value);

The default value of JavaScript Boolean object is false.

JavaScript Boolean Example

```
<script>
document.write(10<20);//true
document.write(10<5);//false
</script>
```

JavaScript Boolean Properties

Property	Description
constructor	returns the reference of Boolean function that created Boolean object.
prototype	enables you to add properties and methods in Boolean prototype.

JavaScript Boolean Methods

Method	Description
toSource()	returns the source of Boolean object as a string.
toString()	converts Boolean into String.
valueOf()	converts other type into Boolean.

JavaScript Popup Boxes

JavaScript has three kind of popup boxes: ***Alert box, Confirm box, and Prompt box.***

Alert Box

An alert box is often used if you want to make sure information comes through to the user.

When an alert box pops up, the user will have to click "OK" to proceed.

Syntax

window.alert("sometext");

The window.alert() method can be written without the window prefix.

Example
alert("I am an alert box!");

Confirm Box

A confirm box is often used if you want the user to verify or accept something.

When a confirm box pops up, the user will have to click either "OK" or "Cancel" to proceed.

If the user clicks "OK", the box returns **true**. If the user clicks "Cancel", the box returns **false**.

Syntax

window.confirm("sometext");

The window.confirm() method can be written without the window prefix.

Example

```
if (confirm("Press a button!")) {
  txt = "You pressed OK!";
} else {
   txt = "You pressed Cancel!";
}
```

Prompt Box

A prompt box is often used if you want the user to input a value before entering a page.

When a prompt box pops up, the user will have to click either "OK" or "Cancel" to proceed after entering an input value.

If the user clicks "OK" the box returns the input value. If the user clicks "Cancel" the box returns null.

Syntax

window.prompt("sometext","defaultText");

The window.prompt() method can be written without the window prefix.

Example

```
var person = prompt("Please enter your name", "Harry Potter");
if (person == null || person == "") {
  txt = "User cancelled the prompt.";
} else {
  txt = "Hello " + person + "! How are you today?";
}
```

JavaScript Events

The change in the state of an object is known as an **Event**. In html, there are various events which represents that some activity is performed by the user or by the browser. When javascript code is included in HTML, js react over these events and allow the execution. This process of reacting over the events is called **Event Handling**. Thus, js handles the HTML events via **Event Handlers**.

For example, when a user clicks over the browser, add js code, which will execute the task to be performed on the event.

Some of the HTML events and their event handlers are:

Mouse events:

Event Performed	Event Handler	Description
click	onclick	When mouse click on an element
mouseover	onmouseover	When the cursor of the mouse comes over the element
mouseout	onmouseout	When the cursor of the mouse leaves an element
mousedown	onmousedown	When the mouse button is pressed over the element
mouseup	onmouseup	When the mouse button is released over the element
mousemove	onmousemove	When the mouse movement takes place.

Keyboard events:

Event Performed	Event Handler	Description
Keydown & Keyup	onkeydown & onkeyup	When the user press and then release the key

Form events:

Event Performed	Event Handler	Description
focus	onfocus	When the user focuses on an element
submit	onsubmit	When the user submits the form
blur	onblur	When the focus is away from a form element
change	onchange	When the user modifies or changes the value of a form element

Window/Document events

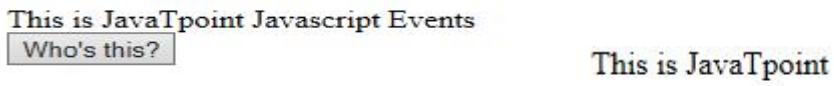
Event Performed	Event Handler	Description
load	onload	When the browser finishes the loading of the page
unload	onunload	When the visitor leaves the current webpage, the browser unloads it
resize	onresize	When the visitor resizes the window of the browser

Click Event

```
<html>
<head> Javascript Events </head>
<body>
<script language="Javascript" type="text/Javascript">
   <!--
   function clickevent()
   {
      document.write("This is JavaTpoint");
   }
```

```
    //-->
</script>
<form>
<input type="button" onclick="clickevent()" value="Who's this?"/>
</form>
</body>
</html>
```

Output:



Exception Handling in JavaScript

An exception signifies the presence of an abnormal condition which requires special operable techniques. In programming terms, an exception is the anomalous code that breaks the normal flow of the code. Such exceptions require specialized programming constructs for its execution.

What is Exception Handling

In programming, exception handling is a process or method used for handling the abnormal statements in the code and executing them. It also enables to handle the flow control of the code/program. For handling the code, various handlers are used that process the exception and execute the code. **For example**, the Division of a non-zero value with zero will result into infinity always, and it is an exception. Thus, with the help of exception handling, it can be executed and handled.

In exception handling:

A throw statement is used to raise an exception. It means when an abnormal condition occurs, an exception is thrown using throw.

The thrown exception is handled by wrapping the code into the try…catch block. If an error is present, the catch block will execute, else only the try block statements will get executed.

Types of Errors

While coding, there can be three types of errors in the code:

1. **Syntax Error:** When a user makes a mistake in the pre-defined syntax of a programming language, a syntax error may appear.
2. **Runtime Error:** When an error occurs during the execution of the program, such an error is known as Runtime error. The codes which create runtime

errors are known as Exceptions. Thus, exception handlers are used for handling runtime errors.

3. **Logical Error:** An error which occurs when there is any logical mistake in the program that may not produce the desired output, and may terminate abnormally. Such an error is known as Logical error.

Error Object

When a runtime error occurs, it creates and throws an Error object. Such an object can be used as a base for the user-defined exceptions too. An error object has two properties:

1. name: This is an object property that sets or returns an error name.
2. **message:** This property returns an error message in the string form.

Although Error is a generic constructor, there are following standard built-in error types or error constructors beside it:

1. **EvalError:** It creates an instance for the error that occurred in the eval(), which is a global function used for evaluating the js string code.
2. **InternalError:** It creates an instance when the js engine throws an internal error.
3. **RangeError:** It creates an instance for the error that occurs when a numeric variable or parameter is out of its valid range.
4. **ReferenceError:** It creates an instance for the error that occurs when an invalid reference is de-referenced.
5. **SyntaxError:** An instance is created for the syntax error that may occur while parsing the eval().
6. **TypeError:** When a variable is not a valid type, an instance is created for such an error.
7. **URIError:** An instance is created for the error that occurs when invalid parameters are passed in **encodeURI()** or **decodeURI()**.

Exception Handling Statements

There are following statements that handle if any exception occurs:

- ***throw statements***
- ***try…catch statements***
- ***try…catch…finally statements.***

These exception handling statements are discussed in the next section.

JavaScript try…catch

A try…catch is a commonly used statement in various programming languages. Basically, it is used to handle the error-prone part of the code. It initially tests the code for all possible errors it may contain, then it implements actions to tackle those errors

(if occur). A good programming approach is to keep the complex code within the try…catch statements.

try{} statement: Here, the code which needs possible error testing is kept within the try block. In case any error occur, it passes to the catch{} block for taking suitable actions and handle the error. Otherwise, it executes the code written within.

catch{} statement: This block handles the error of the code by executing the set of statements written within the block. This block contains either the user-defined exception handler or the built-in handler. This block executes only when any error-prone code needs to be handled in the try block. Otherwise, the catch block is skipped.

Note: catch {} statement executes only after the execution of the try {} statement. Also, one try block can contain one or more catch blocks.

Syntax:

```
try{
expression; } //code to be written.
catch(error){
expression; } // code for handling the error.
```

try…catch example

```
<html>
<head> Exception Handling</br></head>
<body>
<script>
try{
var a= ["34","32","5","31","24","44","67"]; //a is an array
document.write(a);    // displays elements of a
document.write(b); //b is undefined but still trying to fetch its value. Thus catch block will
 be invoked
}catch(e){
alert("There is error which shows "+e.message); //Handling error
}
</script>
</body>
</html>
```

Throw Statement

Throw statements are used for throwing user-defined errors. User can define and throw their own custom errors. When throw statement is executed, the statements present after it will not execute. The control will directly pass to the catch block.

Syntax:

throw exception;

try…catch…throw syntax

```
try{
throw exception; // user can define their own exception
}
catch(error){
expression; }  // code for handling exception.
```

The exception can be a string, number, object, or boolean value.

throw example with try…catch

```
<html>
<head>Exception Handling</head>
<body>
<script>
try {
   throw new Error('This is the throw keyword'); //user-defined throw statement.
}
catch (e) {
  document.write(e.message); // This will generate an error message
}
</script>
</body>
</html>
```

With the help of throw statement, users can create their own errors.

try…catch…finally statements

Finally is an optional block of statements which is executed after the execution of try and catch statements. Finally block does not hold for the exception to be thrown. Any exception is thrown or not, finally block code, if present, will definitely execute. It does not care for the output too.

Syntax:

```
try{
```

```
expression;
}
catch(error){
expression;
}
finally{
expression; } //Executable code
```

JavaScript Form Validation

It is important to validate the form submitted by the user because it can have inappropriate values. So, validation is must to authenticate user.JavaScript provides facility to validate the form on the client-side so data processing will be faster than server-side validation. Most of the web developers prefer JavaScript form validation.Through JavaScript, we can validate name, password, email, date, mobile numbers and more fields.

JavaScript Form Validation Example

In this example, we are going to validate the name and password. The name can't be empty and password can't be less than 6 characters long.Here, we are validating the form on form submit. The user will not be forwarded to the next page until given values are correct.

```
<script>
function validateform(){
var name=document.myform.name.value;
var password=document.myform.password.value;
if (name==null || name==""){
  alert("Name can't be blank");
  return false;
}else if(password.length<6){
  alert("Password must be at least 6 characters long.");
  return false;
  }
}
</script>
<body>
<form name="myform" method="post" action="abc.jsp" onsubmit="return validateform()
" >
Name: <input type="text" name="name"><br/>
Password: <input type="password" name="password"><br/>
<input type="submit" value="register">
</form>
```

Output:

JavaScript Number Validation

Let's validate the textfield for numeric value only. Here, we are using isNaN() function.

```
<script>
function validate(){
var num=document.myform.num.value;
if (isNaN(num)){
  document.getElementById("numloc").innerHTML="Enter Numeric value only";
  return false;
}else{
  return true;
  }
}
</script>
<form name="myform" onsubmit="return validate()" >
Number: <input type="text" name="num"><span id="numloc"></span><br/>
<input type="submit" value="submit">
</form>
```

Output:

JavaScript email validation

We can validate the email by the help of JavaScript.There are many criteria that need to be follow to validate the email id such as:

- email id must contain the @ and . character
- There must be at least one character before and after the @.
- There must be at least two characters after . (dot).

```
<script>
function validateemail()
{
var x=document.myform.email.value;
var atposition=x.indexOf("@");
var dotposition=x.lastIndexOf(".");
if (atposition<1 || dotposition<atposition+2 || dotposition+2>=x.length){
  alert("Please enter a valid e-mail address \n atpostion:"+atposition+"\n dotposition:"+dot
position);
  return false;
  }
}
</script>
<body>
<form name="myform"  method="post" action="#" onsubmit="return validateemail();">
Email: <input type="text" name="email"><br/>
<input type="submit" value="register">
</form>
```