JavaScript 1.8.5

By Vijay Shivakumar

Before We Begin

Before We Begin

- What we should have
  - An IDE
  - AptanaStudio / WebStorm (recommended)
- What you should know
  - Basics of HTML, CSS, XML, DOM etc…

What we will learn

- JavaScript Premier
- Objects in JavaScript
- Events
- Build Web (Browser) based programs
- Hands On Experience

About Me

Vijay Shivakumar

Designer | Developer | Trainer

Training on web and Adobe products from past 10+ years

About You ?

- **Developer**
- **Designer**
- **Architect**

History Of JavaScript

- Developed by Netscape
- Client side support for Sun's JAVA
- Concept to Creation in 10 days
- Shipped with Netscape ver. 2.0 (1995)
- Code Name *MOCHA* officially called *LIVESCRIPT*
- Renamed to JavaScript as Microsoft had the patent on the name live.

Brendan Eich

History Of JavaScript

- **Microsoft's implementation is called *JScript***
- **ECMA Script embraced JavaScript for standardization after 1996**
- **Officially called as *ECMA Script* but popularly known as *JavaScript***
- **Netscape was acquired by AOL in 1999**
- **AOL and Sun alliance for iPlanet after dissolution iPlanet and JavaScript is retained by Sun.**
- **Now Oracle owns the name JavaScript and Mozilla owns the source code**

Who reads your program ?

Browser's JavaScript engines

- V8 engine in Chrome
- Chakra in IE
- Monkey in Firefox
- SquirrelFish in Safari
- Futhark in Opera

They do

- memory management
- just in time compilation
  (in olden days browsers used to interpret your JavaScript)

What JavaScript is NOT …!

- **JAVASCRIPT is not JAVA**
- **Can’t create or edit files (cookies are an exception)**
- **Can’t be used to talk to databases**
- **Doesn't need to be compiled**
- **Can’t keep track of user’s interaction (stateless)**

NOTE : How ever there is a version of JavaScript derived from google’s V8 JavaScript engine called node.js and rhino.js from mozilla which can do all of the above…

What is JavaScript ?

- A programming tool for HTML designers / developers
- Read, Modify and Create HTML elements
- React to events like click, swipe, drag, tap etc..
- Validate data
- Detect visitor's browser
- Create and read cookies

Why JavaScript ?

Most used scripting language

Great for UI-coding

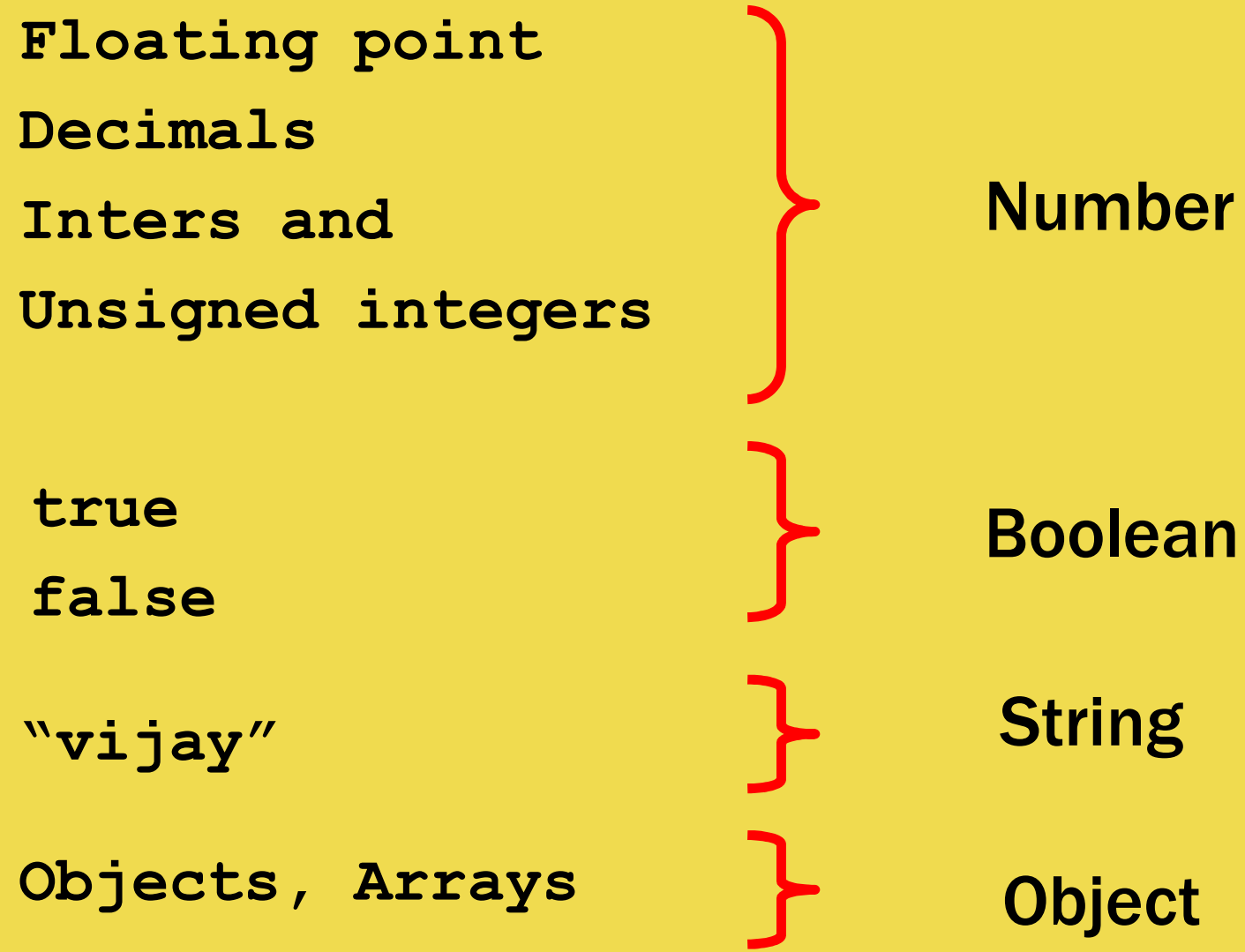
Flexible and powerful

Everything is an object (including functions)

AJAX makes it a must-know

JavaScript Fundamentals

Types in JavaScript



stores any data type above or arrays & objects

Data Types in JavaScript

Number | 4.5 Any number not inside quote marks

Boolean | true or false A logical operator

String | "Vijay" A series of characters inside quote marks

Object | A virtual thing defined by its properties and methods (in javascript most of them are objects)

Undefined | Returns when a non existent value is called.

undefined when you have not assigned any thing yet

Null | Usually assigned by developers when we initialize a variable but don't want to assign anything yet.

null is assigned by developers as place holders

Where to write JavaScript

Inline JavaScript

```
<a href="javascript:callfun()">click me</a>
<a onclick="callfun()" href="#">click me</a>
```

Infile (Embedded) JavaScript

```
<script type="text/javascript">
   callfun()
</script>
```

External JavaScript (best recommended)

```
yourscript.js
```

(do not use spaces for file names)

Programming in JavaScript

variables

operators

strings

arrays

functions

conditions

loops

Variables

- **A variable is a "container name" for information you want to store.**
- **A variable's value can change during the script.**
- **You can refer to a variable by name to access or to change its value.**
- **Rules for variable names:**

  Variable names are case sensitive

  They must begin with a letter or the underscore character

IMPORTANT! **JavaScript is case-sensitive! A variable named uName is not the same as a variable named uname**

Variables

- **A variable when declared will have a value of undefined.**
- **Variable can take any data-type in JavaScript and even be changed later**
- **Variables must be declared and assigned in the beginning else they get hoisted to the top as undefined**

List of reserved words

break	delete	function	return
typeof	case	do	if
switch	var	catch	else
in	this	void	continue
false	throw	while	instanceof
debugger	finally	new	true
with	default	for	null
try	class	const	enum
export	extends	import	super

* Reserved in ECMA 5

List of reserved words

```
implements
let
private
public
yield
interface
package
protected
Static
arguments
eval
```

Operators | Basics

```
x + y (Numeric) Adds x and y together
x + y (String)    Concatenates x and y together
x - y             Subtracts y from x
x * y             Multiplies x and y together
x / y             Divides x by y
x % y             Modulus
x++, ++x          Adds 1
x--, --x          Subtracts 1
```

Operators | Assignment

`x = y`	`Sets x to the value of y`
`x += y`	`Same as x = x + y`
`x -= y`	`Same as x = x - y`
`x *= y`	`Same as x = x * y`
`x /= y`	`Same as x = x / y`
`x %= y`	`Same as x = x % y`

Operators | Comparison

```
==     Equals
!=     Does not equal
===    Strictly equals
!==    Strictly does not equal
>      Is greater than
>=     Is greater than or equal to
<      Is less than
<=     Is less than
```

Array

Array

- `var arr = new Array(5);`
- `var arr = [];`
- `var arr = [“one”,2,true,[],{}];`

Array Properties

```
length
constructor
prototype
```

Array Methods

`arr.concat(arr2)`	merge 2 arrays to create the 3rd
`arr.join()`	convert array to string join("|")
`arr.pop();`	removes the last value;
`arr.push(value);`	adds the value at the last;
`arr.unshift(value);`	adds the value in the first;
`arr.shift()`	removes the value in the first;

Array Methods

```
arr.slice(startIndex [endIndex]);
    will remove (return) from the start index to
    end index and create another array.
    Will not modify the existing array
```

```
arr.splice(startIndex,deleteCount,"new val");
    will remove from the start index to count
    and inserts the value in between.
    Will modify the existing array
```

```
arr.reverse() will reverse the existing order
```

```
arr.sort() takes a function to custom sorting
```

```
arr.toString() inherited method from object
```

```
arr.toLocaleString() same as above
```

Array Methods (in ES 5)

```
forEach()
map()
filter()
every()
some()
reduce()
reduceRight()
indexOf()
lastIndexOf()
```

Conditions

if . . . else conditions

```
if (condition) {
statement[s] if true
}
==================================
if (condition) {
statement[s] if true
} else {
statement[s] if false
}
==================================
while(condition){
   // statement to execute
}
```

Loops

loops

```
for ([initial expression]; [condition]; [update
   expression]) {
statement[s] inside loop
}
==================================
for(item in items){
   // loop for every item in items
}
```

Math

Few math methods

`Math.abs(val)`	Absolute value of val
`Math.round(val)`	N+1 when val >= n.5; otherwise N
`Math.ceil(val)`	Next integer greater than or equal to val
`Math.floor(val)`	Next integer less than or equal to val
`Math.sqrt(val)`	Square root of val
`Math.max(val1, val2)`	The greater of val1 or val2
`Math.min(val1, val2)`	The lesser of val1 or val2
`Math.random()`	Random number between 0 and 1

Number

Number methods

When Number is not a number

isNaN

==========

Converting to Number

Number()

parseInt()

parseFloat()

String

String Methods

```
var s = "hello world" // Start with some text.
s.charAt(0) // "h": the first character.
s.charAt(s.length-1) // "d": the last character.
s.substring(1,4) // "ell": start with and until.
s.slice(1,4) // "ell": same thing
s.slice(-3) // "rld": last 3 characters
s.indexOf("l") // 2: position of first letter l.
s.lastIndexOf("l") // 10: position of last letter l.
s.indexOf("l", 3) // 3: position of first "l" at or
  after 3
```

String Methods

```
s.split(", ") // ["hello", "world"] convert to array
s.replace("h", "H") // "Hello, world": replaces all
  instances
s.toUpperCase() // “HELLO, WORLD”
s.toLowerCase() // “hello, world”
```

Escape Characters

```
\b Backspace (\u0008)
\t Horizontal tab (\u0009)
\n Newline (\u000A)
\v Vertical tab (\u000B)
\r Carriage return (\u000D)
\" Double quote (\u0022)
\' Apostrophe or single quote (\u0027)
```

Date

Date

```
var dt = new Date(); // Returns current date
var dt = new Date(yyyy,mm,dd); // set date
dt.getFullYear(); // returns current year
dt.getMonth(); // zero-based months
dt.getDate(); // one-based days
dt.getDay(); // 0 is Sunday.
dt.getHours(); // 24hrs time
dt.getUTCHours(); // hours in UTC time depends on timezone
dt.toString(); // converts date info to string
```

Date

```
dt.toLocaleDateString() //"01/01/2015"
dt.toLocaleTimeString() //"09:10:30 AM"
```

Functions

Functions in JavaScript

Functions : a code block with a name

Methods : when inside an object

Class : that contain private, public members

Constructor : used to create instances

Module : self containing code block

Function Anatomy

```
function myFun(arg1, arg2){
  alert(arg1 + arg2);
};
```

```
function : expression
myFun : name (optional)
arg1, arg2 : parameters
{} : body of the function
```

Functions are first class citizens

Can be passed as an argument to a function

Can be returned from a function

Can be assigned to a variable

Can be stored in an array

==========

Inherit from Function.prototype

Always have a return

If the function doesn't return anything it returns undefined

Function can be statement or an expression

Function statement:

```
function myFun(){
}
```

Function expression :

```
var myFun = function(){
}
```

Object

Top Level Objects

```
document
window
location
navigator
screen
history
```

window.methods

.open()

```
var win = window.open("url.html","winName", "status,height=200,width=300");
```

.close()

```
close(), window.close(), self.close(), windowName.close();
```

.alert()

.prompt()

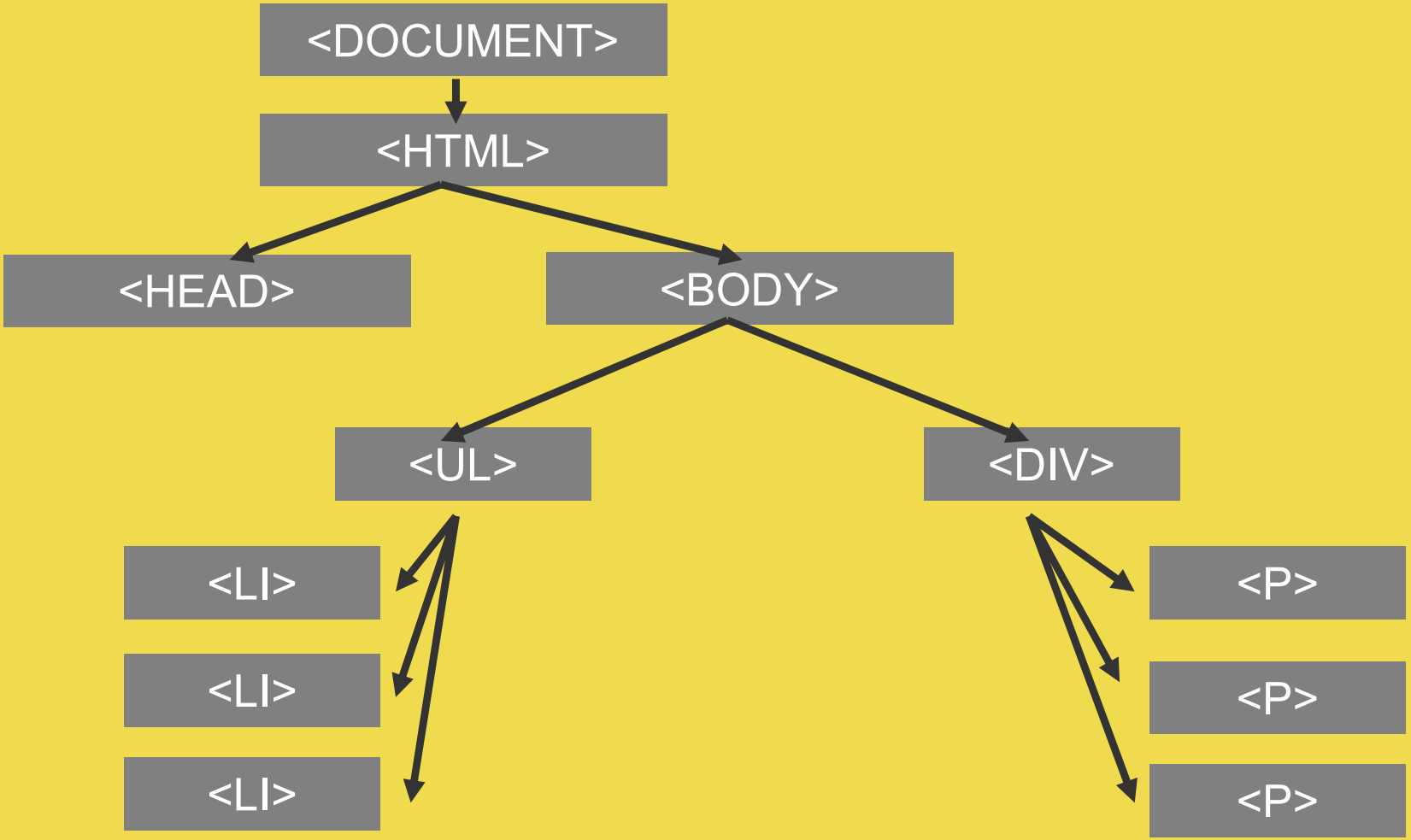
.confirm()

.setInterval() , .clearInterval()

.setTimeout(), .clearTimeout()

DOM with JavaScript

What is DOM ?



DOM Manipulation

- DOM selection
- DOM creation
- DOM attributes
- DOM removing

Properties Of DOM

```
document.body
document.title
document.forms[0]
document.forms["formName"]
document.formName
document.images[]
document.scripts
document.links
document.cookie
document.domain
```

Methods Of DOM

```
document.write() // open write layout stream
document.close() // close layout stream
document.createElement()
document.createTextNode()
document.getElementById()
document.getElementsByTagName()
document.getElementsByName()
document.renameNode(selectnode,namespace,targetnode)
```

More properties, methods & events of DOM

cookie	onkeydown	focus()
height	onkeypress	detachEvent()
width	onkeyup	write()
lastChild	onmouseover	writeln()
firstChild	onmousedown	hasFocus()
location	onmousemove	open()
nextSibling	onmouseup	getElementById()
nodeName	onmouseout	getElementsByName()
nodeType	onpropertychange	getElementsByTagName()
parentNode	onreadyStatechange	
parentWindow	forms[]	
previousSibling	frames[]	
readyState	images[]	
title	links[]	
	scripts[]	
	styleSheets[]	

Events of DOM

onblur	When the element loses focus
onchange	When the element changes
onclick	When an object is clicked
ondblclick	When an object is double-clicked
onfocus	When the element gets focus
onkeydown	When key is pressed
onkeypress	When key is pressed and released
onkeyup	When key is released
onmousedown	When mouse button is pressed
onmousemove	When mouse pointer moves
onmouseout	When mouse pointer moves out of an element
onmouseover	when mouse pointer moves over an element
onmouseup	when mouse button is released
onreset	when the form is reset
onselect	when the element is selected
Onsubmit	when the form is submitted

OOP in JavaScript

What is Object Oriented Programming ?

A paradigm that uses objects to create your program.

Any thing that is usually self contained and re-usable…

An object has the resources to work on its own to achieve the objective or can inherit properties and methods from other objects.

Why OOP ?

Makes code easy to re-use | **No Re- write**

Makes code easy to update | **Less Bugs**

Code easily accessible through APIs | **Minimize Mistakes**

(Hides what is not required by other objects, Provides access to only what is required)

Objects

Objects contain properties and methods

Objects are made up of key value pairs

Key : value

If more than one property they are separated by comma " , "

Keys can not be reserved key words

eg do, while, class, for etc

If so you can use quotes to overcome them eg., "class"

Values can be of any data type.

If values are functions we call them methods.

Objects Creation

Objects can be created using

```
var obj = new Object();
var obj = {};
var obj = Object.create(null);
```

OOP Concepts

Creation

- creating Instances a piece of code via classes, functions or duplication

Inheritance

- Extending the behavior of other classes

Encapsulation

- Protect the internal functionalities from being accessed or modified

Polymorphism

- Modify properties and methods of the parent class to achieve a customized performance

Scope in JavaScript

Scope... what is it ?

scope refers to

the current context of your code

(it simply is: “where to look for”)

Scopes can be

***globally* or *locally* defined**

Scope also depends on

who is looking for what and where

Closure in JavaScript

Closure in javascript

```
var user = function(){
  var data = “Hello World”;
   return function(){
         console.log(data);
         }
}
```

Creating Objects

Object.defineProperty

```
Object.defineProperty(obj, prop, descriptor)
obj   : The object on which to define the
        property.
prop  : The name of the property to be
        defined or modified.
descriptor : The descriptor for the property
        being defined or modified.
```

Descriptor Object

configurable: true if the descriptor itself can be changed, defaults to false.

enumerable: true if this property shows up only while enumeration defaults to false.

value : The value for the property.

writable : true if the value can be changed. default is false

get : A function which serves as a getter for the property defaults to undefined.

set : A function which serves as a setter for the property, defaults to undefined.

Design Pattern

JavaScript Design Patterns

- Constructor Pattern
- Module Pattern (protection of private members via closure, expose only what you need to via an object)
- Revealing Module Pattern (the name of prop or method reveal if it will be private or public)
- Singleton Pattern (only a single instance is made available)
- Observer Pattern
- Mediator Pattern
- Prototype Pattern
- Command Pattern
- Facade Pattern
- Factory Pattern
- Mixin Pattern
- Decorator Pattern
- Flyweight Pattern

JavaScript MV* Patterns

- MVC Pattern
- MVP Pattern
- MVVM Pattern

Modern Modular JavaScript Design Patterns

- AMD
- CommonJS
- ES Harmony

Prototype Pattern

Prototype Pattern Behaviour

Use the keyword new to convert functions to constructors.

Supports inheritance by creating instance of another function.

Some what unfriendly in the current ECMA script version.

Module / Modular Pattern

Module Pattern Behaviour

Single Usage / One time usage and no instance

Protection of private members via closures

- variables (properties) and functions (methods)

No Inheritance

- Not allowed to create a sub class

Constructed using a SIAF / IIFE and should return usually an object

Exception Handling

Exception Handling

What are Exceptions ?

A way to deal with errors that interupt your program from working normally.

When do they happen?

On the runtime when an error has occurred which will cause the browser to create an exception

Or when programmatically you create an error with the throw method.

How can they be handled ?

You can use try catch and finally statements.

Try | Catch | Finally

```
try{
   This is the section of code that is expected to execute
   normally. But if any error occurs then its passed to the
   nearest catch block.
}
catch(err){
   This is the section deals with the error that's thrown
   by try block.
}
finally{
   The default section that executes in either case (if
   error or if no error)
}
```

Throw Exception | Catch Error

```
throw “can throw a string error”;
throw 123456;
throw new Error(“this is my error message”);

catch (error)
The error properties vary from IE and W3C
  browsers
But the name and the message is the same
name : will be the type of error usually
  Error
message : will be the message thrown
```

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