

WEB

## Scripting the Web

Javascript

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# Client Side ECMAScript & Document Object Model

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## JavaScript History

Javascript

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- Java was born as “**LiveScript**” at the beginning of the 94’s.
- Name changed into JavaScript (name owned by Netscape)
- Microsoft responds with Vbscript
- Microsoft introduces JScript (dialect of Javascript)
- A standard is defined: ECMAScript (ECMA-262, ISO-16262)

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## JavaScript Myths

Javascript

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JavaScript is NOT simple  
**Simple tasks are indeed simple**  
JavaScript is NOT Java

|                 | Java | JavaScript |
|-----------------|------|------------|
| Browser Control | NO   | YES        |
| Networking      | YES  | NO         |
| Graphics        | YES  | Partial    |

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## JavaScript is...

Javascript

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Scripted (not compiled)  
Powerful  
Object-based  
Cross-Platform  
Client and Server

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## JavaScript allows...

JavaScript

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Dynamic Web Sites  
Dynamic HTML (DHTML)  
Interactive Pages/Forms  
Server-Side CGI Functionality  
Application Development

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## JavaScript can...

JavaScript

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Build Objects  
Use Events  
Enforce Security  
Embed or Componentize

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Core

## JavaScript and HTML

JavaScript

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Between <SCRIPT> and </SCRIPT> tags  
Between <SERVER> and </SERVER> tags  
In a <SCRIPT SRC="url"></SCRIPT> tag

In an event handler:

```
<INPUT TYPE="button" VALUE="Ok"
      onClick="js code">
<B onMouseOver="Jscore">hello<B>
```

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## Strings

JavaScript

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a="foo"; b='tball'

Useful methods:

a+b => football

a<b => true

a.charAt(0) => f

indexOf(substring), lastIndexOf(substring)

charCodeAt(n),fromCharCode(value,...)

concat(value,...),slice(start,end)

toLowerCase(), toUpperCase()

replace(regex,string), search(regex)

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Strings

Javascript

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```
a="foo";
```

TAG-related methods:

```
a.bold() => <B>foo</B>
```

```
big(), blink(), fontcolor(), fontsize(), small(),  
strike(), sup()
```

```
anchor(), link()
```



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Functions

Javascript

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```
function f(x) {return x*x}
```

---

```
function add(x,y) {return x+y};
```

```
function multiply(x,y) {return x*y};
```

```
function operate(op,x,y) {return op(x,y)};
```

```
operate(add,3,2); => 5
```

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Example

Javascript

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```
<HTML>
<HEAD>
<SCRIPT>
function fact(n) {
    if (n==1) return n;
    return n*fact(n-1);
}
</SCRIPT>
</HEAD>
...
```

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Example

Javascript

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```
<BODY>
<H2>Table of Factorial Numbers </H2>
<SCRIPT>
for (i=1; i<10; i++) {
    document.write(i+"!="+fact(i));
    document.write("<BR>");
}
</SCRIPT>
</BODY>
</HTML>
```

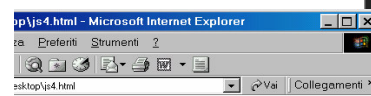


Table of Factorial Numbers

1!=1  
2!=2  
3!=6  
4!=24  
5!=120  
6!=720  
7!=5040  
8!=40320  
9!=362880

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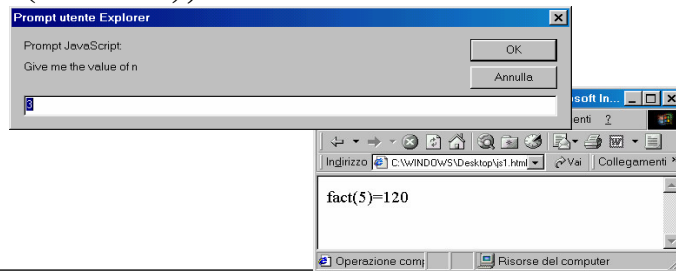
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## Example

Javascript

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```
<BODY>
<SCRIPT>
n=window.prompt("Give me the value of n",3)
document.write("fact("+n+")="+fact(n));
document.write("<BR>");
</SCRIPT>
</BODY>
</HTML>
```



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## Objects

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**Object:** A data structure with methods;  
a special method is the "constructor".

```
function Rectangle(w, h) {
  this.width=w;
  this.height=h;
  this.area=function(){return this.w*this.h}
}
```

Annotations in the code:

- A red arrow points from the text "A data structure with methods;" to the function definition.
- A red arrow points from the text "a special method is the 'constructor'." to the function name "Rectangle".
- Two red arrows point from the text "Instance variables" to "this.width=w;" and "this.height=h;".
- A red arrow points from the text "method" to "this.area=function(){return this.w\*this.h}".

a=new Rectangle(3,4);    a.area() => 12    a.width => 3

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## Objects

Javascript

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Actually, JavaScript does NOT have classes and inheritance.

Moreover, the approach we have shown is not the most efficient in terms of memory allocation.

It would be better to use the "prototype" feature, which can be considered a STATIC object

```
Rectangle.prototype.area=function(){return this.w*this.h}
```

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## Arrays

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```
a = new Array()  
a[0]=3; a[1]="hello"; a[10]=new Rectangle(2,2);  
a.length() => 11
```

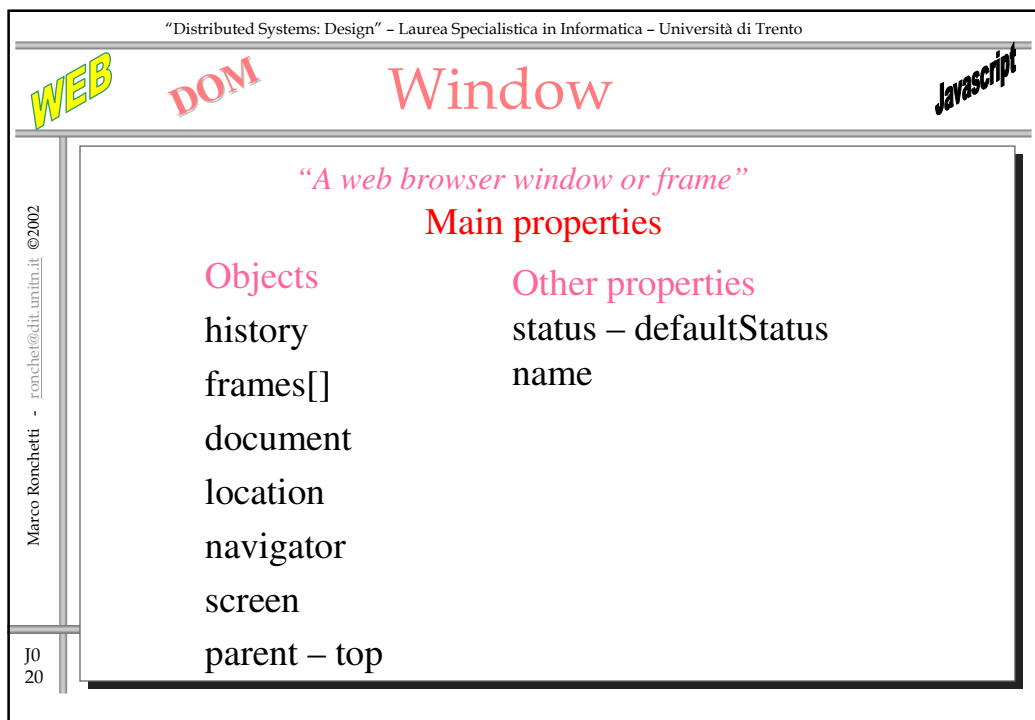
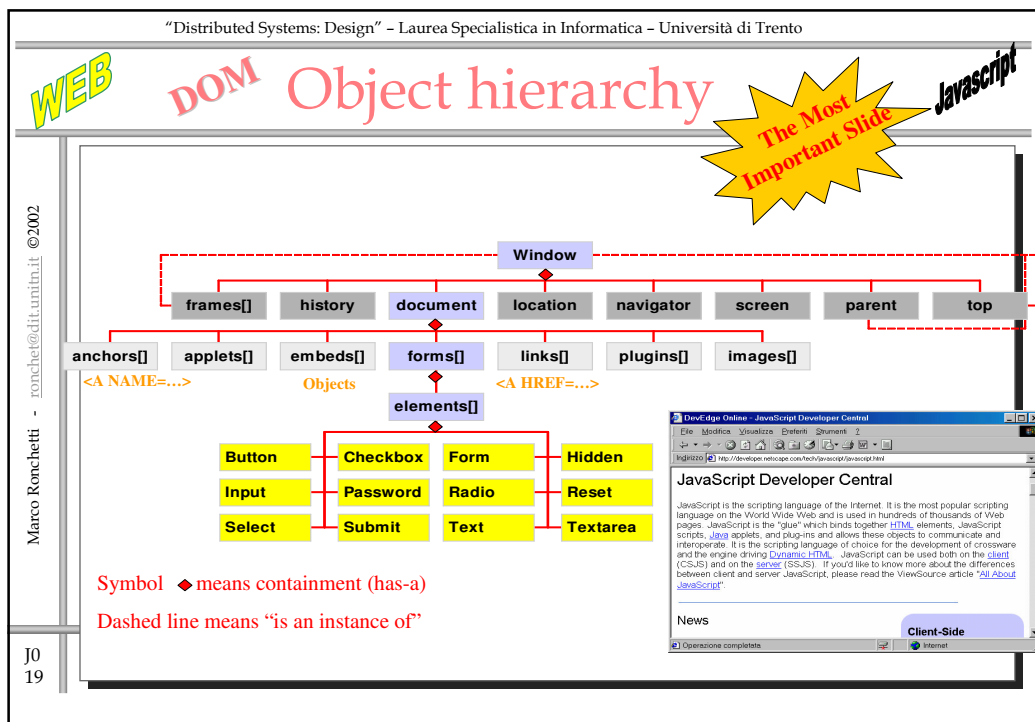
Arrays can be

**SPARSE, INHOMOGENEOUS, ASSOCIATIVE**

```
a["name"]="Jaric"
```

```
z=new Rectangle(3,4);  z["width"] ⇔ z.width
```

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## Window

Javascript

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### Main methods

alert(), prompt(), confirm()  
focus(), blur()  
moveBy(), moveTo()  
resizeBy(), resizeTo()  
scroll(), scrollBy(), scrollTo()  
setInterval(), clearInterval()  
setTimeout(), clearTimeout()

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## Screen

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*"Information about the display"*

### Main properties

availHeight, availWidth  
height, width  
colorDepth, pixelDepth  
hash

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## Navigator

Javascript

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*"Information about the browser in use"*

### Main properties

appName

appVersion

Platform

### Main methods

javaEnabled()

### Other properties

Info on available plugins, but only in Netscape Navigator!

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## History

Javascript

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*"The URL history of the browser"*

### Main properties

length

### Main methods

back()

forward()

go(+/-n)

go(target\_substring)

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## Location

Javascript

*"The specification of the current URL"*

### Main properties

href  
protocol, hostname, port  
search  
hash

### Main methods

reload()  
replace()

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## Document

Javascript

*"An HTML document"*

### Main properties

#### Arrays of Component Objects

anchors[]  
applets[]  
embeds[]  
forms[]  
links[]  
plugins[]

### Main methods

open()  
close()  
clear()  
write()

### Other properties

bgColor, fgColor, linkColor, vlinkColor  
lastModified  
title, URL, referrer, cookie

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## Image

Javascript

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*"An image embedded in an HTML document"*

### Main properties

border *[width in pixels]*

height

width

src *[URL of the image to be displayed]*

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## Events

Javascript

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|             |                                |                                      |
|-------------|--------------------------------|--------------------------------------|
| onClick     | User clicks once. (*)          | Link, button                         |
| onDbClick   | User clicks twice              | Document, Image, Link, button        |
| onMouseDown | User presses mouse button (*)  | Document, Image, Link, button        |
| onMouseUp   | User releases mouse button (*) | Document, Image, Link, button        |
| onMouseOver | Mouse moves over element       | Link, Image, Layer                   |
| onMouseOut  | Mouse moves off element        | Link, Image, Layer                   |
| onKeyDown   | User presses key (*)           | Document, Image, Link, Text elements |
| onKeyUp     | User releases key              | Document, Image, Link, Text elements |
| onKeyPress  | KeyDown+KeyUp (*)              | Document, Image, Link, Text elements |

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(\*) Return false to cancel default action

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# Events

Javascript

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|          |                                                    |                                        |
|----------|----------------------------------------------------|----------------------------------------|
| onFocus  | Element gains focus                                | TextElement, Window, all form elements |
| onBlur   | Element loses focus                                | TextElement, Window, all form elements |
| onChange | User selects/deselects a text and moves focus away | Select, text input elements            |
| onError  | Error while loading image                          | Image                                  |
| onAbort  | Loading interrupted                                | Image                                  |
| onLoad   | Document or image finishes loading                 | Window, Image                          |
| onUnload | Document is unloaded                               | Window                                 |
| onResize | Window is resized                                  | Window                                 |
| onReset  | Form reset requested (*)                           | Form                                   |
| onSubmit | Form submission requested(*)                       | Form                                   |

(\*) Return false to cancel default action

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# Input

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## Objects

|            | defaultValue | form | length | blur() | click() | focus() | select() |   |   |   |   |   |   |   |   |   |   |   |   |
|------------|--------------|------|--------|--------|---------|---------|----------|---|---|---|---|---|---|---|---|---|---|---|---|
| Button     |              |      | X      |        | X       |         |          | X | X | X | X | X |   | X |   | X | X | X |   |
| Checkbox   | X            | X    | X      |        | X       |         |          | X | X | X | X | X |   | X |   | X | X | X |   |
| Radio      | X            | X    | X      |        | X       |         |          | X | X | X | X | X |   | X |   | X | X | X |   |
| Reset      |              |      | X      |        | X       |         |          | X | X | X | X | X |   | X |   | X | X | X |   |
| Submit     |              |      | X      |        | X       |         |          | X | X | X | X | X |   | X |   | X | X | X |   |
| Text       |              |      | X      | X      | X       |         |          | X | X | X |   | X | X | X | X |   | X |   | X |
| Textarea   |              |      | X      | X      | X       |         |          | X | X | X |   | X | X | X | X |   | X |   | X |
| Password   |              |      | X      | X      | X       |         |          | X | X | X |   | X | X | X | X |   | X |   | X |
| FileUpload |              |      | X      | X      | X       |         |          | X | X | X |   | X | X | X | X |   | X |   | X |
| Select     |              |      | X      | X      | X       | X       | X        | X |   | X | X | X |   | X | X |   | X |   | X |
| Hidden     |              |      | X      |        | X       |         |          | X | X |   |   |   |   |   |   |   |   |   |   |

## Properties

checked defaultChecked name options[] selectedIndex type value onblur onchange onclick onfocus

## Event Handlers

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DOM

## Form

Javascript

*"An HTML input form"*

### Main properties

action [*destination URL*]

method [*get/post*]

name [*name of Form*]

name [*destination Window*]

Elements[] [*list ;of contained elements*]

### Main methods

reset()

submit()

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## Events

```
<HTML>
<HEAD>
<TITLE>Form Example</TITLE>
<SCRIPT LANGUAGE="JavaScript1.2">
function setColor() {
    var choice;

    choice = document.colorForm.color.selectedIndex;

    switch(choice) {
        case 0: document.bgColor = "FF0000"; break;
        case 1: document.bgColor = "00FF00"; break;
        case 2: document.bgColor = "0000FF"; break;
        case 3: document.bgColor = "FFFFFF"; break;
        case 4: document.bgColor = "FFFF00"; break;
        case 5: document.bgColor = "FF00FF"; break;
    }
}
</SCRIPT>
```



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# Events

Javascript

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```
<BODY>
<CENTER><H1>Color Changer</H1></CENTER>
<BR><BR>
Select Your Favorite Background Color:
<FORM NAME="colorForm">
<SELECT NAME="color" onChange=setColor() >
  <OPTION VALUE="red">Red          <OPTION VALUE="green">Green
  <OPTION VALUE="blue">Blue        <OPTION VALUE="white">White
  <OPTION VALUE="yellow">Yellow    <OPTION
    VALUE="purple">Purple
</SELECT>
</FORM>

</BODY>
</HTML>
```

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# A more complex example -1

Javascript

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**Data Form Validation Example - Microsoft Internet Explorer**

File Modifica Visualizza Preferiti Strumenti 2

Indirizzo C:\WINNT\Profiles\Administrator\Desktop\prova.html Vai Links >>

**PERSONAL INFORMATION**

*Fields marked with an asterisk (\*) must be entered.*

\* Family Name:

Company Name:

NOTE: We replace the usual Submit button with a "Display" that acts locally, by calling some code to display what was typed in.

Please enter a Company Name Risorse del computer

A simple data entry  
validation page

**Results - Microsoft Internet Explorer**

File Modifica Visualizza Preferiti Strumenti >>

Indirizzo C:\WINNT\Profiles\Adminis... Vai Links >>

**Data Entered:**

Last Name

Company Name

Operazione con Risorse del computer

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## A more complex example -2

Javascript

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Start of file "FormValidation.html"

```
<HTML>
<HEAD>
<TITLE>Data Form Validation Example</TITLE>

<SCRIPT LANGUAGE="JavaScript1.1" SRC="FormCheck.js"></SCRIPT>
```

Load file "FormCheck.js",  
which contains several JavaScript functions

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## A more complex example -3

Javascript

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```
function isEmpty(s)
{ return ((s == null) || (s.length == 0))
}
```

Check that the string  
"s" is not empty

```
function warnEmpty (theField, s)
{
  var mPrefix = "You did not enter a value into the ";
  var mSuffix = " field. This is a required field. Please enter it now.";
  theField.focus();
  alert(mPrefix + s + mSuffix);
  return false;
}
```

Issue a warning  
message

All this is contained in the file "FormCheck.js"

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## A more complex example -4

Javascript

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```
function promptEntry (s)
{ window.status = "Please enter a " + s;
}

function validatePersonalInfo(form)
{ return (
    checkString(form.elements["LastName"],sLastName)
)
}

function checkString (theField, s)
{
    if (isEmpty(theField.value)) return warnEmpty (theField, s);
    else return true;
}
```

Type a message in the status bar

Validate the form

(should run over all fields  
And perform suitable checks)

Check that "theField"  
is not empty

All this is contained in the file "FormCheck.js"

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## A more complex example -5

Javascript

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```
<SCRIPT>
var sCompany="Company Name"; var sLastName="Last Name"; var
form="PersonalInfo";

function displayPersonalInfo(form)
{ var outputTable = "<HTML><HEAD><TITLE>Results</TITLE></HEAD>" +
  "<BODY><H1>Data Entered:</H1><TABLE BORDER=1>" +
  "<TR><TD>" + sLastName + "</TD><TD>" + form.elements["LastName"].value +
  "</TD></TR>" +
  "<TR><TD>" + sCompany + "</TD><TD>" + form.elements["Company"].value +
  "</TD></TR></TABLE><FORM>" +
  "<INPUT TYPE='BUTTON' NAME='Back' VALUE='Back'"
  onClick='history.back()'> </FORM></BODY></HTML>"
  document.writeln(outputTable)
  document.close()
  return true
} </SCRIPT>
```

Global variables

Value-printing  
function

Add a Button to go  
back in history

End of "HEAD" portion of "FormValidation.html"

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## A more complex example -6

Javascript

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```
<BODY BGCOLOR="#ffffff">
<CENTER><H2>PERSONAL INFORMATION </H2></CENTER>
<P><P><I>Fields marked with an asterisk (*) must be entered.</I>
<FORM NAME="PersonalInfo">
<TABLE>
<TR>
  <TD>* Family Name:</TD>
  <TD><INPUT TYPE="text" NAME="LastName"
    onFocus="promptEntry(sLastName)"
    onChange="checkString(this,sLastName)" ></TD>
</TR>
<TR>
  <TD>Company Name:</TD>
  <TD><INPUT TYPE="text" NAME="Company"
    onFocus="promptEntry(sCompany)"></TD>
</TR>
```

First Field

Second Field

Start of "BODY" portion of "FormValidation.html"

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## A more complex example -7

Javascript

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```
<TR>
  <TD>
    <INPUT TYPE="BUTTON" NAME="fakeSubmit" VALUE="Display"
      onClick="if (validatePersonalInfo(this.form)) displayPersonalInfo(this.form); ">
    </TD>
    <TD><INPUT TYPE = "reset" VALUE = "Reset">
    </TD>
</TR>
</TABLE>
<P> NOTE: We replace the usual Submit button with a "Display" that acts locally,
<BR>by calling some code to display what was typed in.
</FORM>
</BODY>
</HTML>
```

First Button

Second Button

End of file "FormValidation.html"

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DOM

## Applet

Javascript

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*"An applet embedded in a Web page"*

### Properties

Same as the public fields  
of the Java applet

### Methods

Same as the public methods  
of the Java applet

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## LiveConnect

Javascript

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A two-faced, (**Netscape-only**) technology to let JavaScript  
interact with Java, so that:

- A JavaScript script can control and coordinate Java applets, and let Java applets interact with plugins.
- A Java Applet can execute JavaScript code.

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## Server-Side JavaScript

Javascript

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### Not discussed here!

A substitute for CGI.

*Server-dependent* technology to process the Web page *before* passing it to the client.

(The Netscape SSJS object model is different from the Microsoft ASP object model, although JavaScript can be used as SSLanguage for ASP)

See

[http://developer.netscape.com/viewsource/husted\\_js/husted\\_js.html](http://developer.netscape.com/viewsource/husted_js/husted_js.html)

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## References

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### Standard ECMA-262 ECMAScript Language Specification:

<http://www.ecma.ch/ecma1/STAND/ECMA-262.HTM> ()

### Tutorials and references:

- <http://developer.netscape.com/tech/javascript/javascript.html>
- <http://www.sauronsoftware.it/jsreference>

### Books:

- D.Flanagan "Javascript. The definitive guide" O'Reilly.
- D.Goodman "Dynamic HTML. The definitive reference" O'Reilly

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