Document Object Model

What is DOM

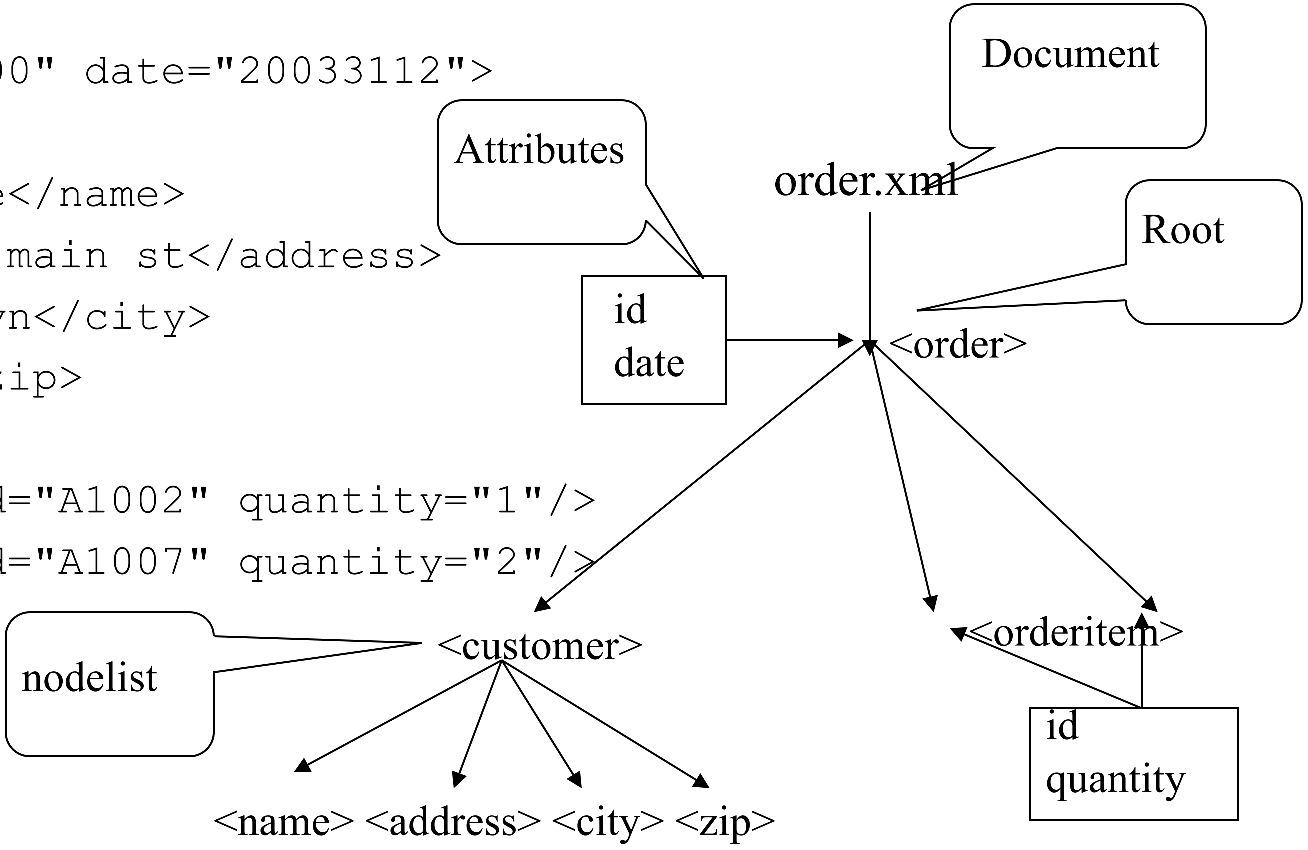
- The Document Object Model (DOM) is a programming interface for XML documents.
  - It defines the way an XML document can be accessed and manipulated
  - this includes HTML documents
- The XML DOM is designed to be used with **any programming language** and any operating system.
- The DOM represents an XML file as a tree
  - The documentElement is the top-level of the tree. This element has one or many childNodes that represent the branches of the tree.

Version History

- **DOM Level 1** concentrates on HTML and XML document models. It contains functionality for document navigation and manipulation. See:
  - http://www.w3.org/DOM/
- **DOM Level 2** adds a stylesheet object model to DOM Level 1, defines functionality for manipulating the style information attached to a document, and defines an event model and provides support for XML namespaces. The DOM Level 2 specification is a set of 6 released W3C Recommendations, see:
  - https://www.w3.org/DOM/DOMTR#dom2
- **DOM Level 3** consists of 3 different specifications (Recommendations)
  - DOM Level 3 Core, Load and Save, Validation, http://www.w3.org/TR/DOM-Level-3/
- **DOM Level 4 (aka DOM4)** consists of 1 specification (Recommendation)
  - W3C DOM4, http://www.w3.org/TR/domcore/
    - Consolidates previous specifications, and moves some to HTML5
- See All **DOM Technical Reports** at:
  - https://www.w3.org/DOM/DOMTR
- Now DOM specification is **DOM Living Standard (WHATWG)**, see:
  - https://dom.spec.whatwg.org

HTML or XML files viewed as a tree - order.xml

```
<order id="100" date="20033112">
<customer>
<name>S Spade</name>
<address>123 main st</address>
<city>Brooklyn</city>
<zip>10012</zip>
</customer>
<orderitem id="A1002" quantity="1"/>
<orderitem id="A1007" quantity="2"/>
</order>
```



DOM represents documents as a hierarchy of node objects
Some types of nodes have children

Some Useful DOM Functions

- **document is the root element**
- **document.getElementById("sample")**
  - Returns the one location defined by id=sample, e.g.

```
document.getElementById("sample").style.color="rgb(“FF",“00",“00");
```

assigns color red to the text

- **document.getElementsByTagName("font")**
  - returns ALL font elements, e.g.

```
arrayOfDocFonts = document.getElementsByTagName("font");
```

- **innerHTML**
  - assigns a new value to text defined by id=counter2

```
document.getElementById("counter2").innerHTML = "Number of clicks = 1";
```

- **style.left, style.color properties**
  - one can also assign values to CSS properties, e.g.

```
document.getElementById('counter1').style.left = '500px';
```

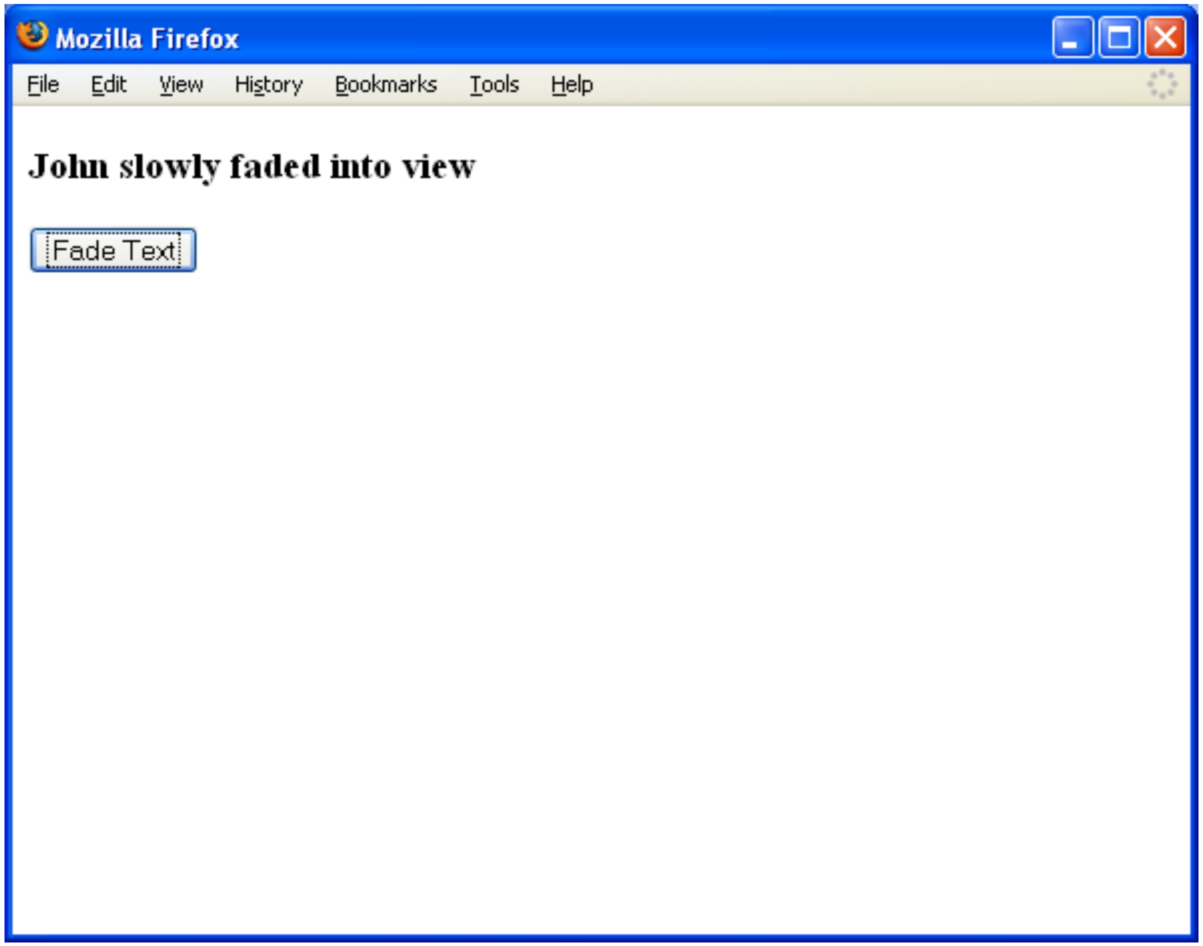
- the following slides have more examples

Example 1: Using DOM Functions to Alter a Page - Fading Text

```
<html><head>
<script language="JavaScript1.2">
hex=255 // Initial color value.
function fadetext(){
if(hex>0) { //If color is not black yet
hex-=11; // increase color darkness
document.getElementById("sample").style.color="rgb("+hex+","
   +hex+","+hex+")";
setTimeout("fadetext()",20);   }
else   hex=255 //reset hex value   }
</script></head><body>
<div id="sample" style="width:100%">
<h3>John slowly faded into view</h3></div>
<button onClick="fadetext()">Fade Text</button>
</body></html>
```

Go to: http://csci571.com/examples.html#dom

Browser Output



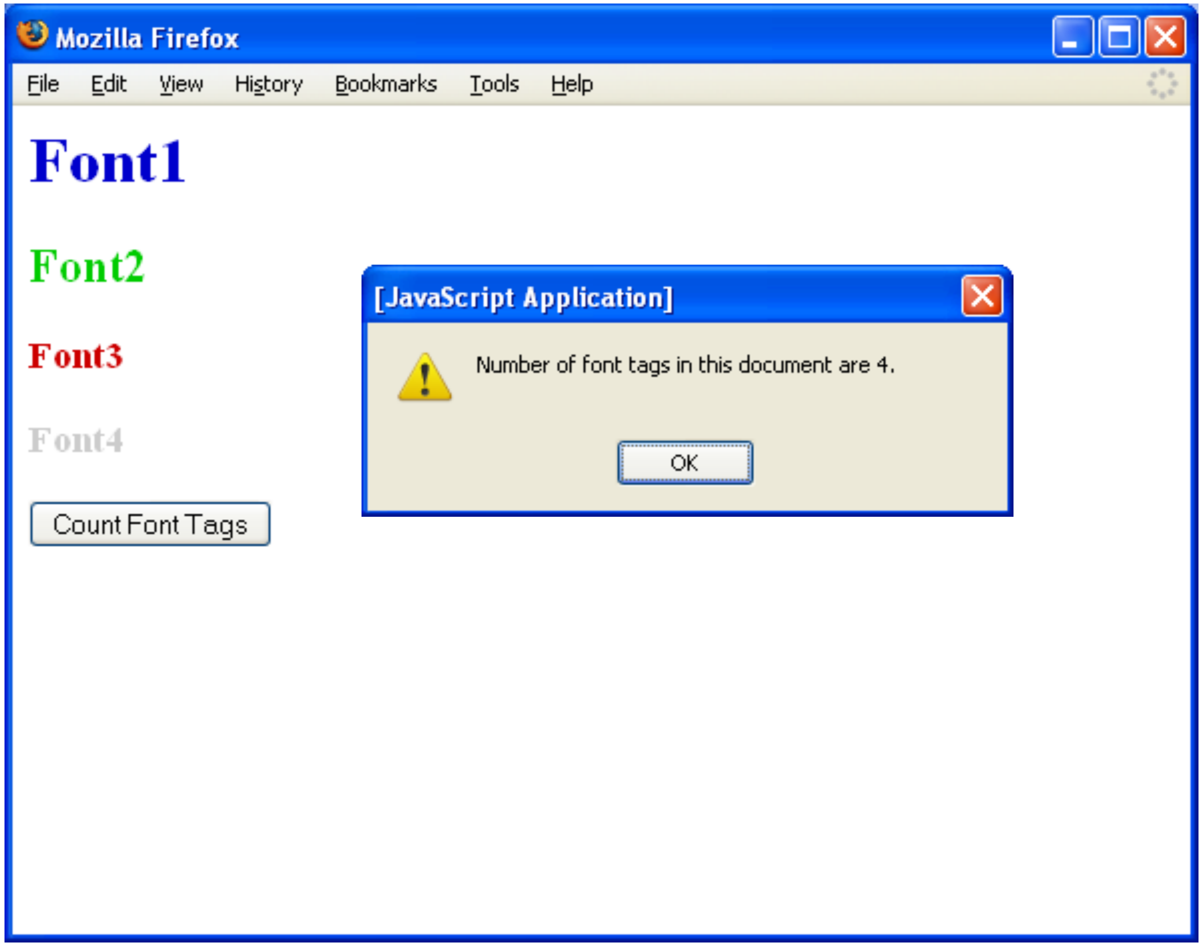
John slowly faded into view

See http://csci571.com/examples/dom/ex1.html

Example 2: Extracting Elements by Tag Name

```
<html><head>
<SCRIPT LANGUAGE="JavaScript">
function handleAllTags()
  { var arrayOfDocFonts;
    if (document.all || document.getElementById)
     { arrayOfDocFonts = document.getElementsByTagName("font"); }
    else { document.write("Unrecognized Browser Detected"); }
   alert("Number of font tags in this document are " +
   arrayOfDocFonts.length + ".");
  }
</SCRIPT> </head><body>
<h1><font COLOR="#0000cc">Font1</font></h1>
<h2><font COLOR="#00cc00">Font2</font></h2>
<h3><font COLOR="#cc0000">Font3</font></h3>
<h3><font COLOR="#cccccc">Font4</font></h4>
<input type=button onclick="handleAllTags()"
  value="Count Font Tags">
</body></html>
```

Browser Output



Number of font tags in this document are 4.

innerHTML Property

- The **innerHTML** property of an element was first introduced as non-standard extension by **Microsoft** in Internet Explorer
- Mozilla- and Gecko-based browsers (Firefox), WebKit as well as IE decided to support it, even though it was not part of the standard
- **innerHTML** is widely used in Ajax-based sites (*see later in the course*)
- Elements that do not have both an opening and closing tag cannot have an **innerHTML** property.
- The **innerHTML** property takes a string that specifies a valid combination of text and elements.
- When the **innerHTML** property is set, the given string completely replaces the existing content of the object. If the string contains HTML tags, the string is parsed and formatted as it is placed into the document
- Example 1: changes the color of the counter:

```
<DIV ID="counter2"><FONT COLOR="red">Number of clicks = 0</FONT></DIV>
```

- This line sets the innerHTML by replacing the entire text as follows:

```
document.getElementById("counter2").innerHTML = "<FONT COLOR='purple'>
   Number of clicks = " + hits2 + "</FONT>";
```

- **innerHTML has been added to the HTML5 specification**, DOM Parsing and Serialization specification **(sec.7.1, Attributes)**:

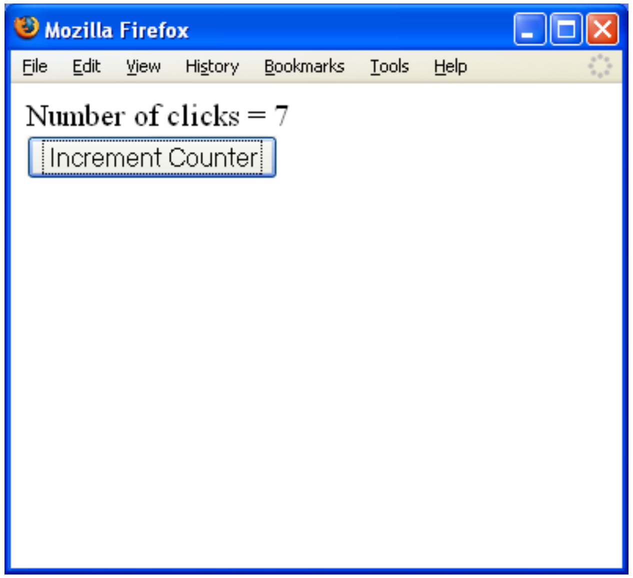
  https://www.w3.org/TR/DOM-Parsing/#widl-Element-innerHTML

  https://developer.mozilla.org/en-US/docs/Web/API/Element/innerHTML

Example 3: Setting innerHTML

- Example: update a counter by clicking a button

```
<DIV ID="counter">Number of clicks = 0</DIV>
       <INPUT TYPE="button"
        VALUE="Increment Counter"
        onclick="updateMessage()">
<SCRIPT LANGUAGE="JavaScript">
 var hits = 0;
 function updateMessage() {
    hits += 1;
    document.getElementById("counter").innerHTML =
       "Number of clicks = " + hits; }
 </SCRIPT>
```



Number of clicks = 7

Final Note on innerHTML

- **Suggested Rule:** If you use innerHTML, don't use the += operator with innerHTML for the following reason:
  - Every time innerHTML is set, the HTML must be parsed, a DOM constructed, and inserted into the document. This takes time.
  - For example, if elm.innerHTML has thousands of divs, tables, lists, images, etc, then calling .innerHTML += ... is going to cause the parser to re-parse *all that stuff* over again. This could also break references to already constructed DOM elements and cause other chaos. In reality, all you want to do is append a single new element to the end.
- E.g., it is better to just call **appendChild**:

```
var newElement = document.createElement('div');
newElement.innerHTML = '<p>Hello World!</p>';
elm.appendChild(newElement);
```

  This way, the existing contents of elm are not parsed again.
- See:
  https://developer.mozilla.org/en-US/docs/Web/API/Element.innerHTML
- <script> elements inserted using innerHTML do not execute (HTML5):
  http://www.w3.org/TR/2008/WD-html5-20080610/dom.html#innerhtml0

Example 4: Moving Objects Horizontally

- The browser-independent W3C Standard way to set and get an element's position is via the STYLE object's left and top properties
- the W3C DOM Standard defines a **"left"**, **"right"**, **"top"**, **"bottom"** properties of the style object
- **E.g., Moving Objects Horizontally**

```
<INPUT ID="counter1" STYLE="position:relative; left:0px"
  TYPE="button" VALUE="Move Button"
  onclick="document.getElementById('counter1').style.left
  = '500px';">
```

- **E.g., Moving Objects Vertically**

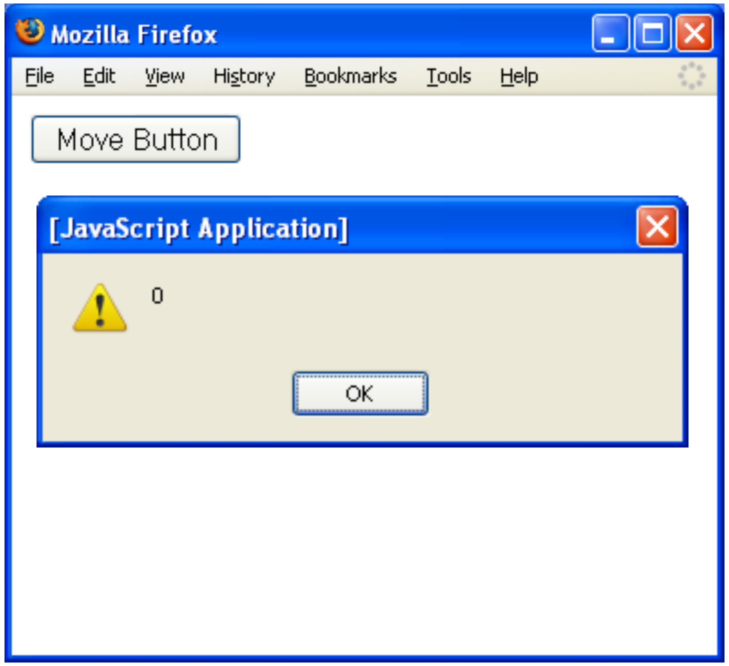
```
 <INPUT ID="counter1" STYLE="position:relative; top:0px"
  TYPE="button" VALUE="Move Button"
  onclick="document.getElementById('counter1').style.top =
  '15px';">
```

Another Example of Moving Objects on a Web Page

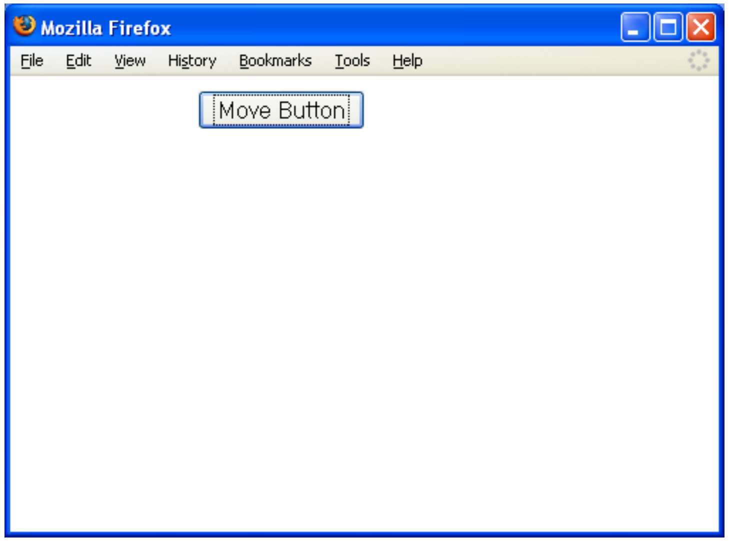
- The following code segment adds 50 pixels to the button's left property, every time the user clicks the button:

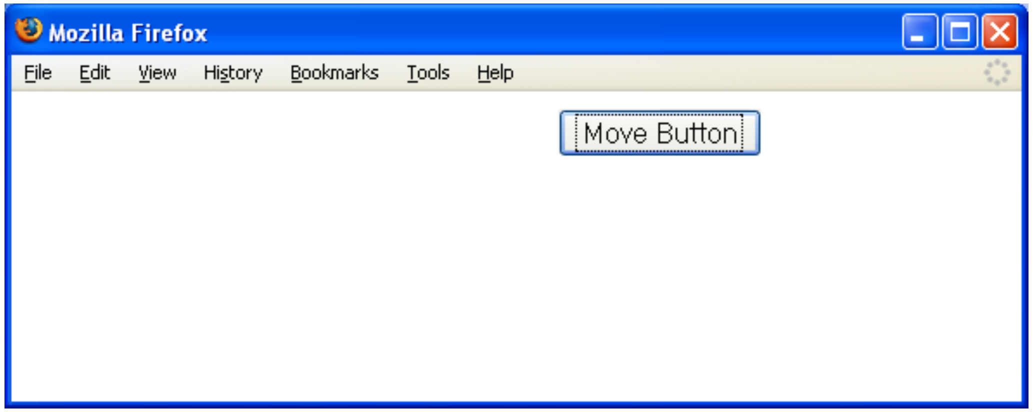
```
<INPUT ID="counter1" STYLE="position:relative; left:0px"
  TYPE="button" VALUE="Move Button"
  onclick="handleClick()">
 <SCRIPT LANGUAGE="JavaScript">
var obj = document.getElementById('counter1');
var xlocation = parseInt(obj.style.left);
  alert(xlocation);
function handleClick() { xlocation += 50;
  document.getElementById('counter1').style.left =
  xlocation + "px"; } </SCRIPT>
```

Browser Output



0



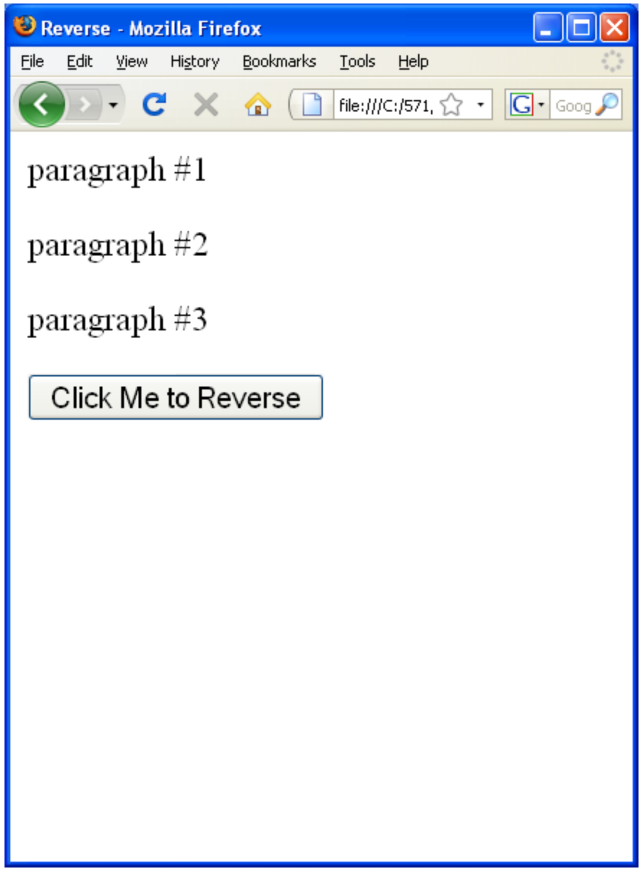


As the button is clicked it moves to the right

Example 5:Reversing the Nodes of a Document

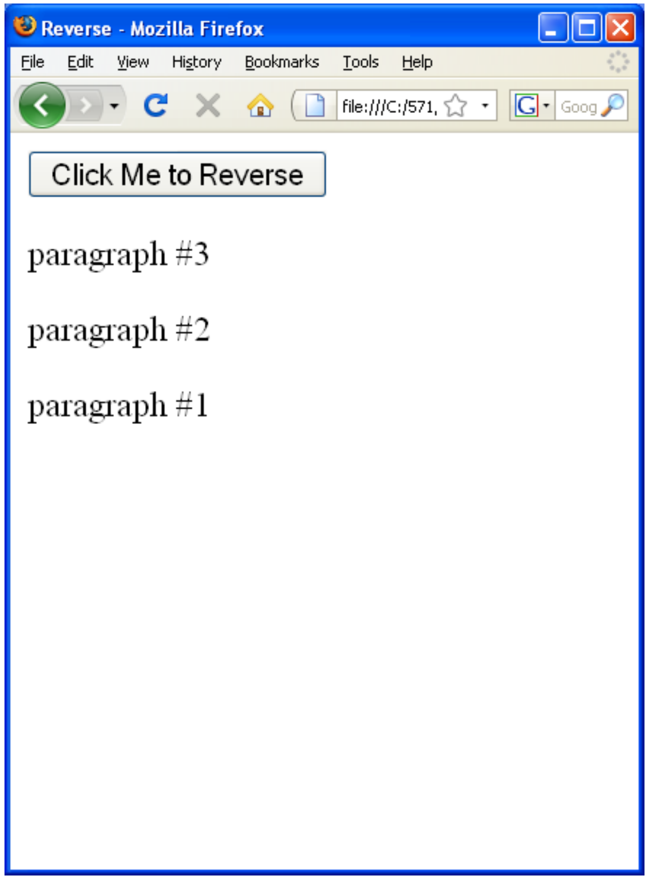
```
<head><title>Reverse</title> <script>
function reverse(n)
 { // Reverse the order of the children of Node n
   var kids = n.childNodes; // Get the list of children
   var numkids = kids.length; // Figure out how many
                                  children there are
   for(var i = numkids-1; i >= 0; i--) { // Loop backward
                                  through the children
      var c = n.removeChild(kids[i]); // Remove a child
      n.appendChild(c); // Put it back at its new position
  } }
</script> </head> <body> <p>paragraph #1<p>paragraph
  #2<p>paragraph #3 <p>
<button onclick="reverse(document.body);" >Click Me to
  Reverse</button> </body>
```

Browser Output


Reverse - Mozilla Firefox
File Edit View History Bookmarks Tools Help
file:///C:/571,
Goog
paragraph #1

paragraph #2

paragraph #3


Reverse - Mozilla Firefox
File Edit View History Bookmarks Tools Help
file:///C:/571,
Goog
Click Me to Reverse
paragraph #3

paragraph #2

paragraph #1

XMLHTTPRequest Object

- The XMLHttpRequest object is used to exchange data with a server
- With an XMLHttpRequest object you can:
  - Update a web page without reloading the page
  - Request data from a server after page has loaded
  - Receive data from a server after page has loaded
  - Send data to a server in the background
- All modern browsers (IE7+, Edge, Firefox, Chrome, Safari, etc.) have a built-in XMLHttpRequest object.
- **"Synchronous" XMLHttpRequest is "deprecated: being removed** from web platform (will take many years). Developer Tools will provide warning or error.
- See the open() method at:

https://xhr.spec.whatwg.org/#the-open()-method

- See **XMLHttpRequest Living Standard:**

https://xhr.spec.whatwg.org

Loading XML file into the Parser (1)

```
<script type="text/javascript">
var xmlDoc;
function loadXML(url) {
      if (window.XMLHttpRequest)
  {// code for IE7+, Firefox, Chrome, Opera, Safari
       xmlhttp=new XMLHttpRequest();
   }
 else
  {// code for IE6, IE5 [Obsolete]
    xmlhttp=new ActiveXObject("Microsoft.XMLHTTP");
  }
  xmlhttp.open("GET",url,false); // 'false' = synchronous request
  xmlhttp.send();                // DEPRECATED
  xmlDoc=xmlhttp.responseXML;    // properties of XMLHttpRequest
  return xmlDoc;                 // (file returned in responseXML
 }                               // or responseText for JSON)
// ....... processing the document goes here
</script>
```

Loading XML file into the Parser

```
<bookstore>
   <book category="cooking">
       <title lang="en">Everyday Italian</title>
       <author>Giada De Laurentiis</author>
       <year>2005</year>
       <price>30.00</price> </book>
   <book category="children">
       <title lang="en">Harry Potter</title>
       <author>J K. Rowling</author>
       <year>2005</year>
       <price>29.99</price> </book>
   <book category="web">
       <title lang="en">XQuery Kick Start</title>
       <author>James McGovern</author>
       <author>Per Bothner</author>
       <author>Kurt Cagle</author>
       <author>James Linn</author>
       <author>Vaidyanathan Nagarajan</author>
       <year>2003</year>
       <price>49.99</price> </book>
   <book category="web" cover="paperback">
       <title lang="en">Learning XML</title>
       <author>Erik T. Ray</author>
       <year>2003</year>
       <price>39.95</price> </book>
</bookstore>
```

books.xml

Loading XML file into the Parser (2)

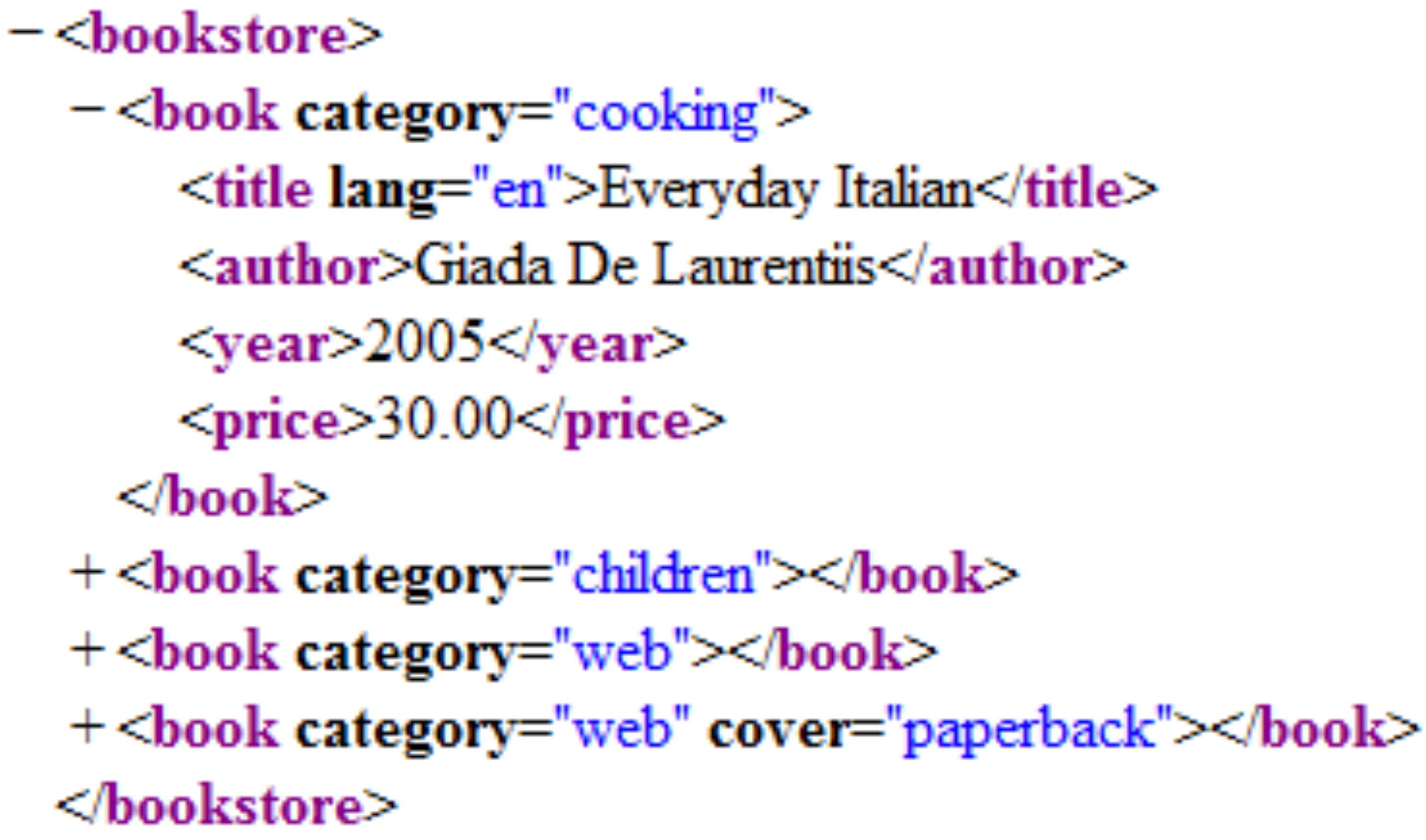
```
<!DOCTYPE html>
   <html>
   <body>
   <p id="demo"></p>

   <script>
   var xhttp = new XMLHttpRequest();
   xhttp.onreadystatechange = function() {
       if (this.readyState == 4 && this.status == 200) {
       myFunction(this);
       }
   };
   xhttp.open("GET", "books.xml", true); // asynchronous request
   xhttp.send();

   function myFunction(xml) {
       var xmlDoc = xml.responseXML;
       document.getElementById("demo").innerHTML =
       xmlDoc.getElementsByTagName("title")[0].childNodes[0].nodeValue;
   }
   </script>
   </body>
   </html>
```

This example reads "books.xml" into xmlDoc and retrieves the text value of the first <title> element in books.xml.

Node Types

Node Type	Named Constant
1	ELEMENT_NODE
2	ATTRIBUTE_NODE
3	TEXT_NODE
4	CDATA_SECTION_NODE
5	ENTITY_REFERENCE_NODE
6	ENTITY_NODE
7	PROCESSING_INSTRUCTION_NODE
8	COMMENT_NODE
9	DOCUMENT_NODE
10	DOCUMENT_TYPE_NODE
11	DOCUMENT_FRAGMENT_NODE

Another DOM Example
A simple XML file for a bookstore



```
- <bookstore>
  - <book category="cooking">
      <title lang="en">Everyday Italian</title>
      <author>Giada De Laurentiis</author>
      <year>2005</year>
      <price>30.00</price>
    </book>
  + <book category="children"></book>
  + <book category="web"></book>
  + <book category="web" cover="paperback"></book>
  </bookstore>
```

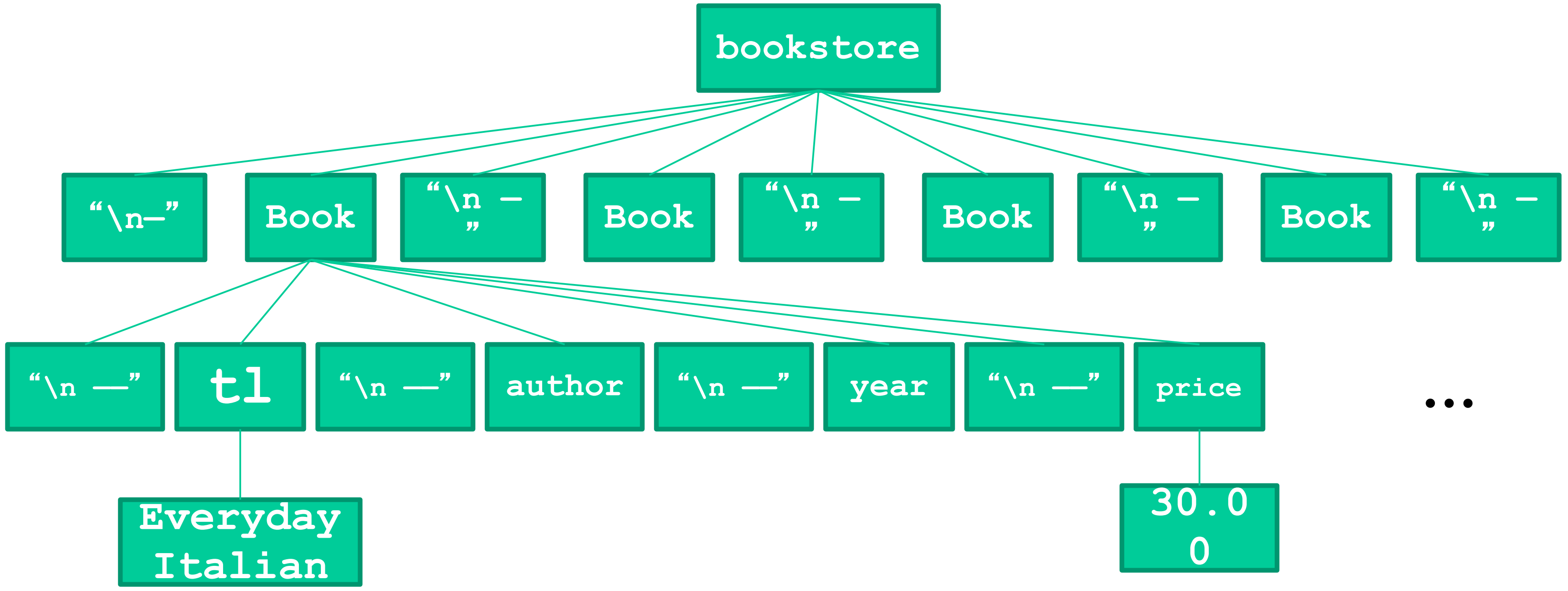
Some Node Types in an XML File

A Sample XML File

```
- <bookstore>
   <book category=“cooking”>
     <title lang=“en”>Everyday Italian</title>
     <author>Giada De Laurentiis</author>
     <year>2005</year>
     <price>30.00</price>
   </book>
 + <book>
 + <book>
</bookstore>
```

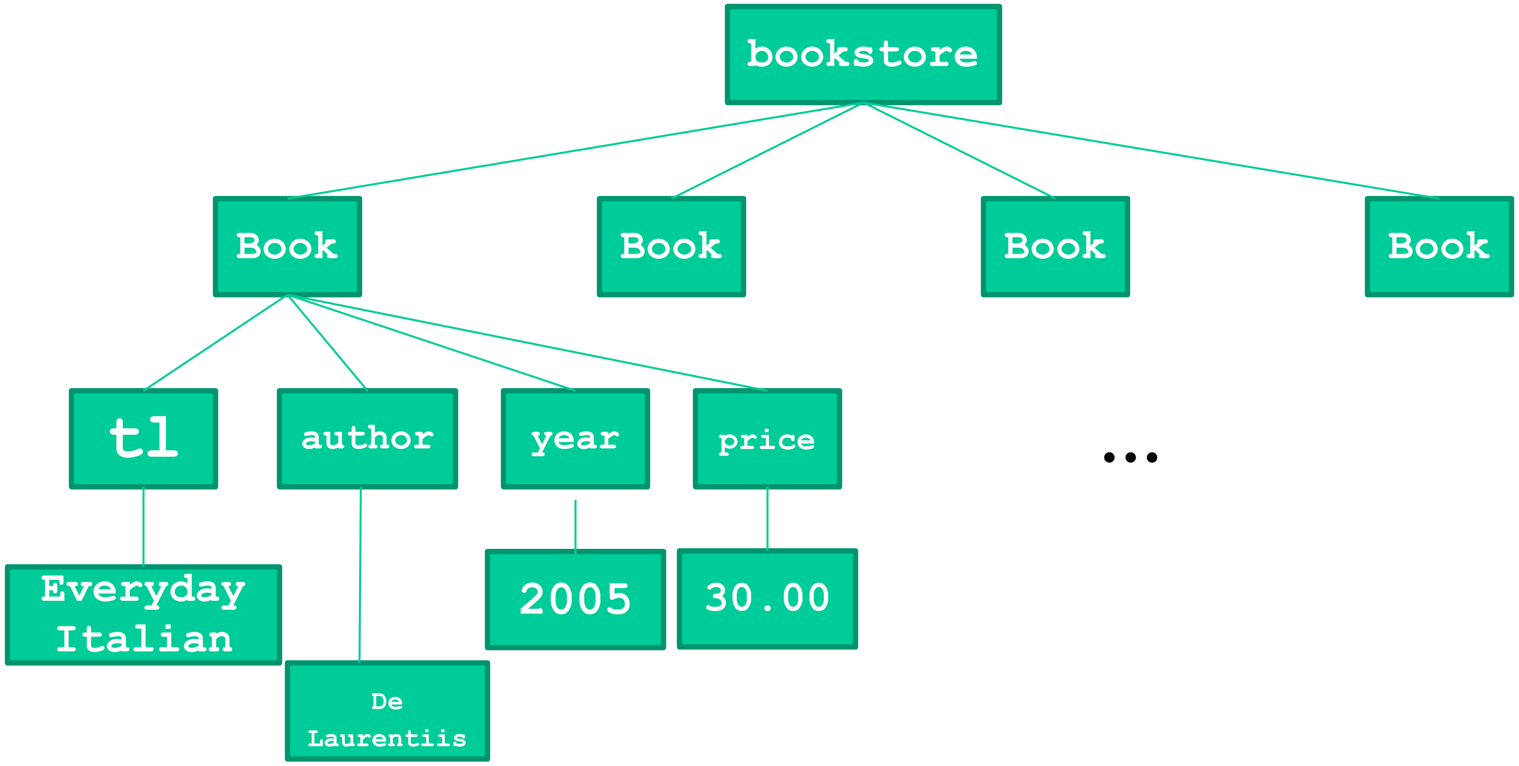
- Some possible node types
- ELEMENT_NODE (type 1)
  - bookstore, book, title, author, year, price
- TEXT_NODE (type 3)
  - “/n” nodes
  - “Everyday Italian”, “30.00”, …
- Hint:
  - element nodes have children
  - text nodes are leaves
- x[i].nodeType == 1
  - tests for element nodes.
  - text nodes (like “\n”) are ignored

The Same XML tree in FireFox



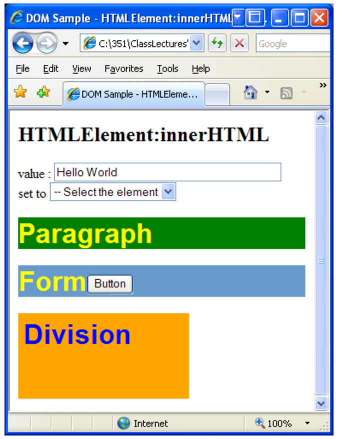
Where – represents one space character

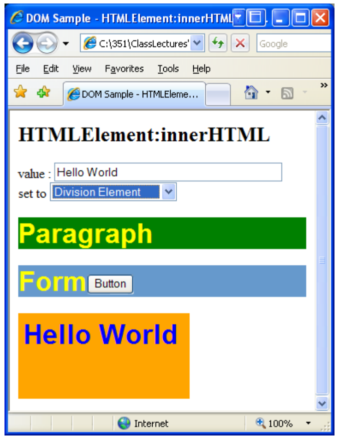
An XML Tree in other Browsers

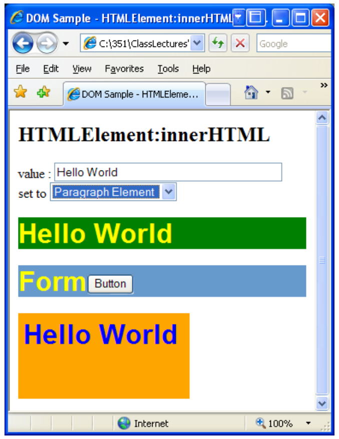


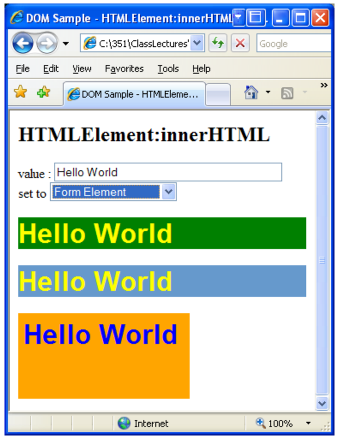
http://csci571.com/examples/dom/domtest.html

Example 6: DOM and Three InnerHTML Examples

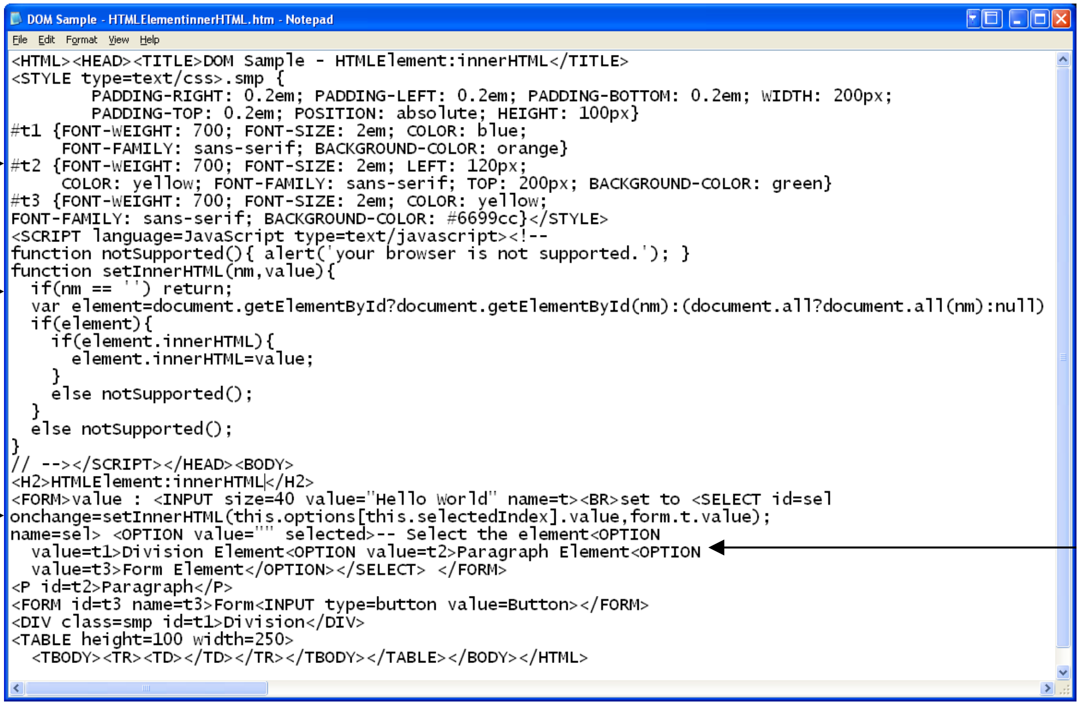








Initial page **Select division** **Select paragraph** **Select form**


DOM Sample - HTMLElementinnerHTML.htm - Notepad

```
<HTML><HEAD><TITLE>DOM Sample - HTMLElement:innerHTML</TITLE>
<STYLE type=text/css>.smp {
        PADDING-RIGHT: 0.2em; PADDING-LEFT: 0.2em; PADDING-BOTTOM: 0.2em; WIDTH: 200px;
        PADDING-TOP: 0.2em; POSITION: absolute; HEIGHT: 100px}
#t1 {FONT-WEIGHT: 700; FONT-SIZE: 2em; COLOR: blue;
     FONT-FAMILY: sans-serif; BACKGROUND-COLOR: orange}
#t2 {FONT-WEIGHT: 700; FONT-SIZE: 2em; LEFT: 120px;
     COLOR: yellow; FONT-FAMILY: sans-serif; TOP: 200px; BACKGROUND-COLOR: green}
#t3 {FONT-WEIGHT: 700; FONT-SIZE: 2em; COLOR: yellow;
FONT-FAMILY: sans-serif; BACKGROUND-COLOR: #6699cc}</STYLE>
<SCRIPT language=JavaScript type=text/javascript><!--
function notSupported(){ alert('your browser is not supported.'); }
function setInnerHTML(nm,value){
  if(nm == '') return;
  var element=document.getElementById?document.getElementById(nm):(document.all?document.all(nm):null)
  if(element){
    if(element.innerHTML){
      element.innerHTML=value;
    }
    else notSupported();
  }
  else notSupported();
}
// --></SCRIPT></HEAD><BODY>
<H2>HTMLElement:innerHTML</H2>
<FORM>value : <INPUT size=40 value="Hello World" name=t><BR>set to <SELECT id=sel
onchange=setInnerHTML(this.options[this.selectedIndex].value,form.t.value);
name=sel> <OPTION value="" selected>-- Select the element<OPTION
  value=t1>Division Element<OPTION value=t2>Paragraph Element<OPTION
  value=t3>Form Element</OPTION></SELECT> </FORM>
<P id=t2>Paragraph</P>
<FORM id=t3 name=t3>Form<INPUT type=button value=Button></FORM>
<DIV class=smp id=t1>Division</DIV>
<TABLE height=100 width=250>
  <TBODY><TR><TD></TD></TR></TBODY></TABLE></BODY></HTML>
```

id definitions
t1 (orange)
t2 (green)
t3 (yellow)

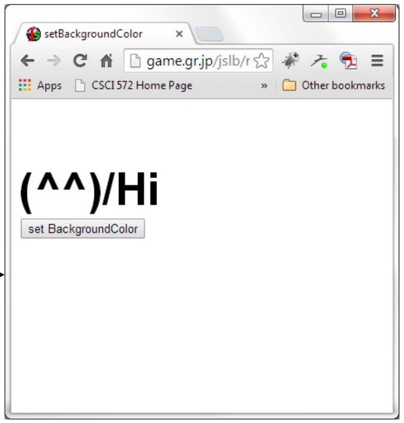
setInnerHTML function defined here

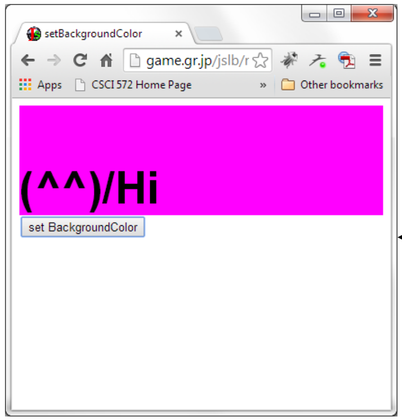
Handle selection

3 select options: division, paragraph form

Example 7: DOM and CSS Properties – Changing Background color

before



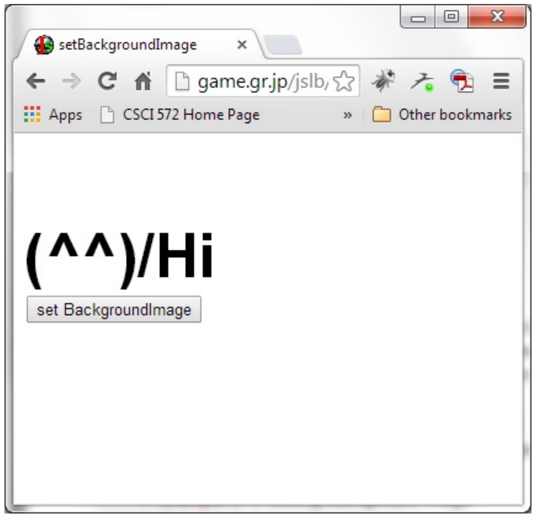


After clicking

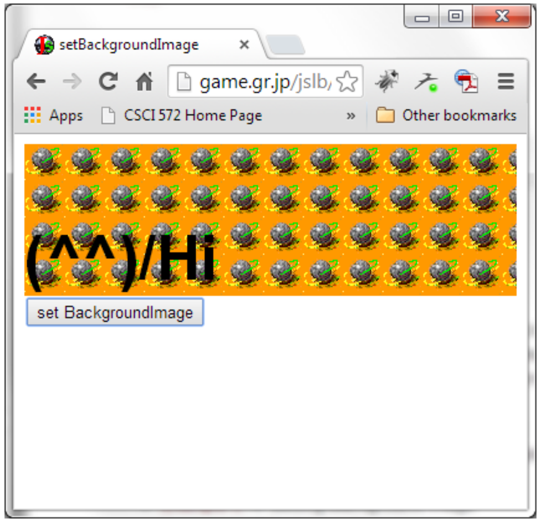
```
<HTML><HEAD><TITLE>setBackgroundColor</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function setBackgroundColor(id,bgcolor){
    document.getElementById(id).style.backgroundColor =  bgcolor  ;
}
//-->
</SCRIPT></HEAD><BODY>
<DIV ID="test" STYLE="font:900 50px Arial"><BR>(^^)/Hi</DIV>
<FORM>
<INPUT TYPE="button"
       VALUE="set BackgroundColor"
onClick="if(document.getElementById)setBackgroundColor('test','magenta')">
</FORM>
</BODY></HTML>
```

See all examples at: http://csci571.com/examples.html#dom

Example 8: DOM and CSS Properties – Changing Background Image



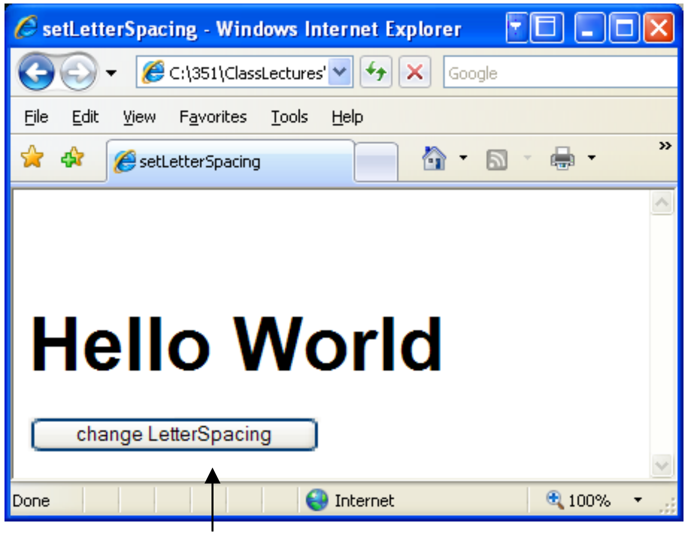
before



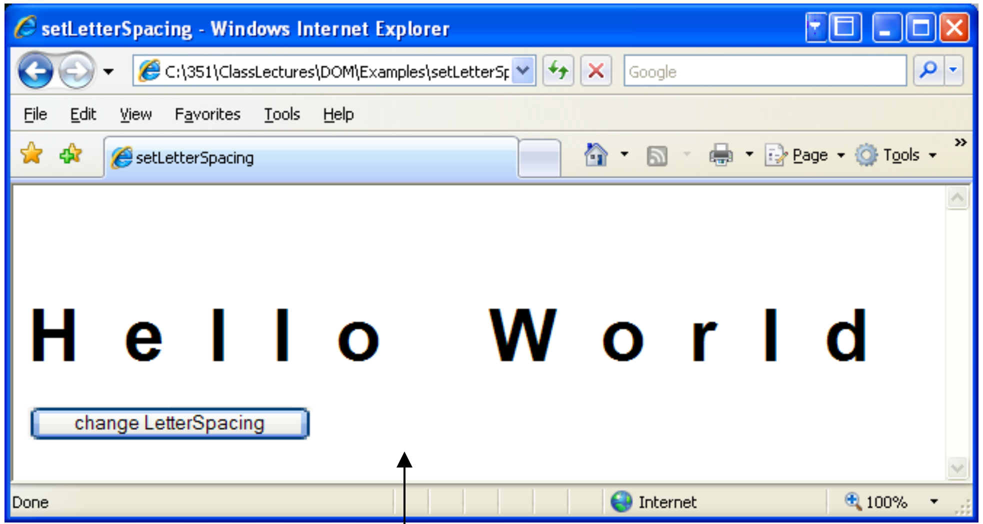
After clicking

```
<HTML><HEAD><TITLE>setBackgroundImage</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function setBackgroundImage(id,image){
    document.getElementById(id).style.backgroundImage = 'url('+image+')'  ;
}
//-->
</SCRIPT>
</HEAD>
<BODY><DIV ID="test" STYLE="font:900 50px Arial"><BR>(^^)/Hi</DIV>
<FORM>
<INPUT TYPE="button"
   VALUE="set BackgroundImage"
   onClick="if(document.getElementById)setBackgroundImage('test','tamas.gif')">
</FORM></BODY></HTML>
```

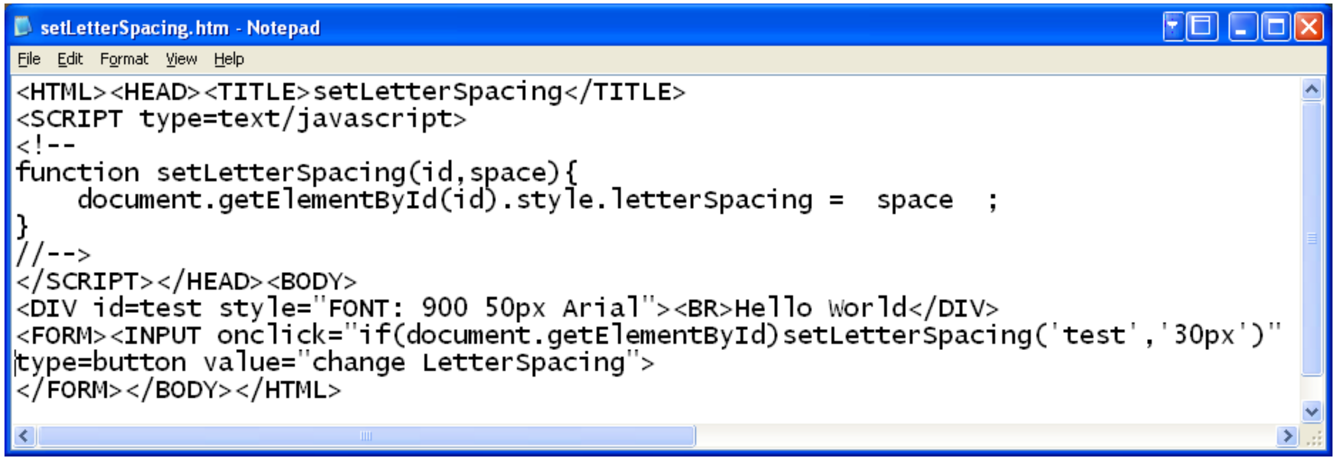
Example 10: DOM and CSS Properties – Changing Letter Spacing



before



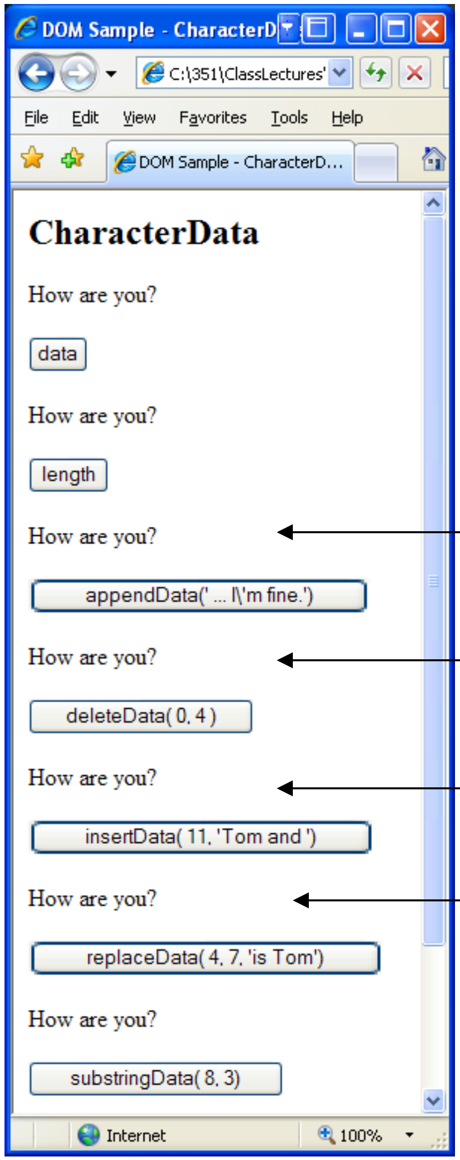
After clicking



```
<HTML><HEAD><TITLE>setLetterSpacing</TITLE>
<SCRIPT type=text/javascript>
<!--
function setLetterSpacing(id,space){
    document.getElementById(id).style.letterSpacing =  space  ;
}
//-->
</SCRIPT></HEAD><BODY>
<DIV id=test style="FONT: 900 50px Arial"><BR>Hello World</DIV>
<FORM><INPUT onclick="if(document.getElementById)setLetterSpacing('test','30px')"
type=button value="change LetterSpacing">
</FORM></BODY></HTML>
```

http://csci571.com/examples/dom/setLetterSpacing.htm

Example 11: DOM and Manipulating Character Data


DOM Sample - CharacterD
C:\351\ClassLectures
File Edit View Favorites Tools Help
DOM Sample - CharacterD...
Internet
100%

CharacterData

How are you?

data

How are you?

length

How are you?

appendData(' ... I\'m fine.')

How are you?

deleteData(0, 4)

How are you?

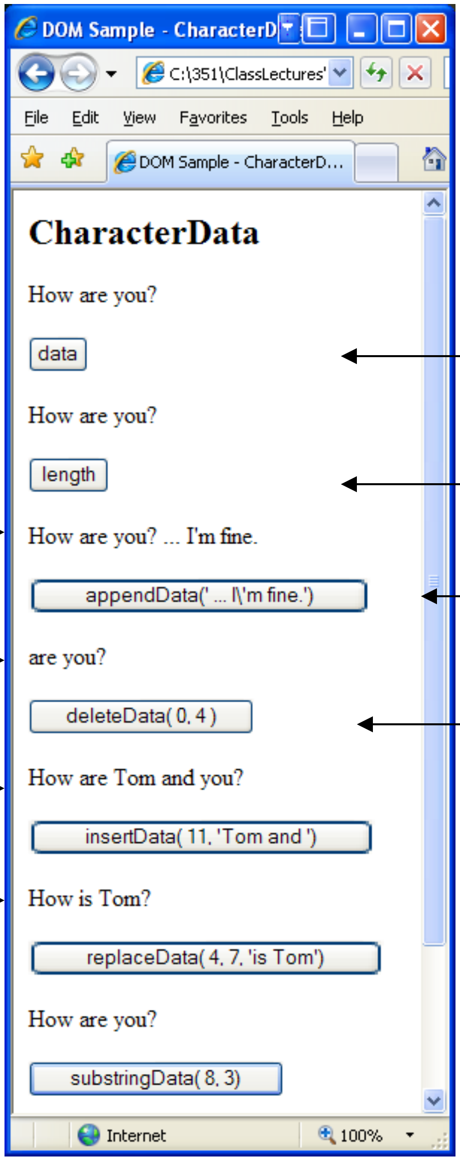
insertData(11, 'Tom and ')

How are you?

replaceData(4, 7, 'is Tom')

How are you?

substringData(8, 3)


DOM Sample - CharacterD
C:\351\ClassLectures
File Edit View Favorites Tools Help
DOM Sample - CharacterD...
Internet
100%

CharacterData

How are you?

data

How are you?

length

How are you? ... I'm fine.

appendData(' ... I\'m fine.')

are you?

deleteData(0, 4)

How are Tom and you?

insertData(11, 'Tom and ')

How is Tom?

replaceData(4, 7, 'is Tom')

How are you?

substringData(8, 3)

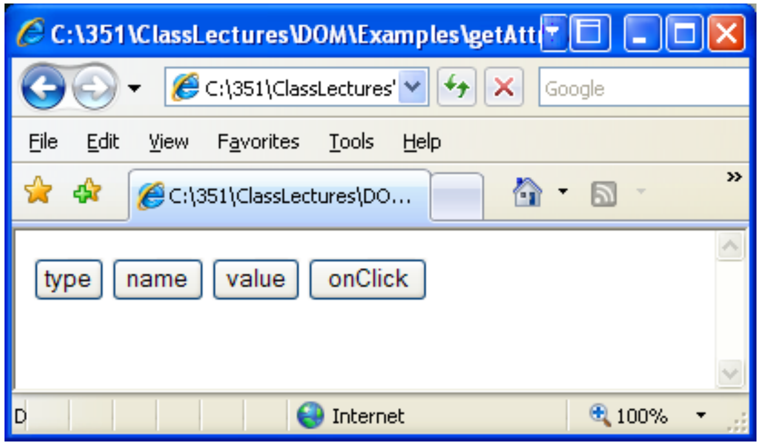
Capture data in an alert box

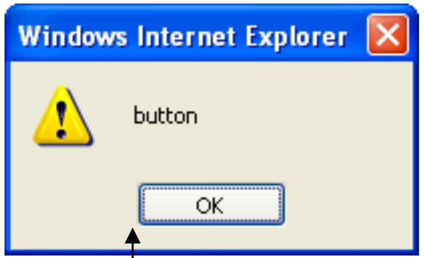
Capture length of string in an alert box

Add text string "…I' m fine" at end of a string

Delete the first 4 characters from a string

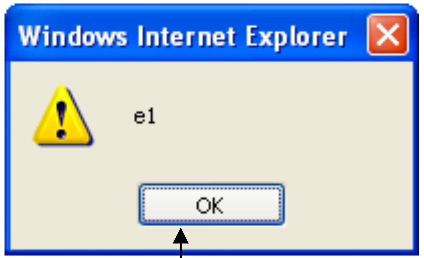
Example 12: DOM and Retrieving Attributes


C:\351\ClassLectures\DOM\Examples\getAtt
File Edit View Favorites Tools Help
type
name
value
onClick
Internet
100%



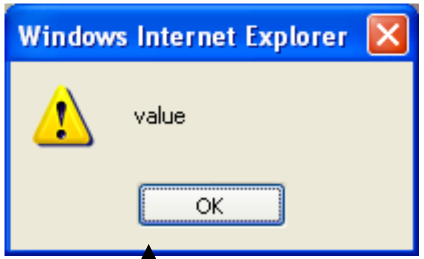
button

type



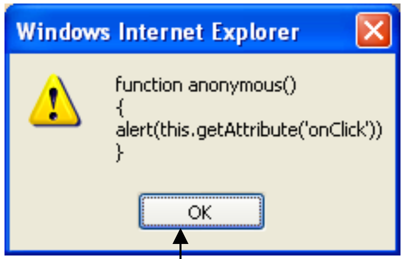
e1

name



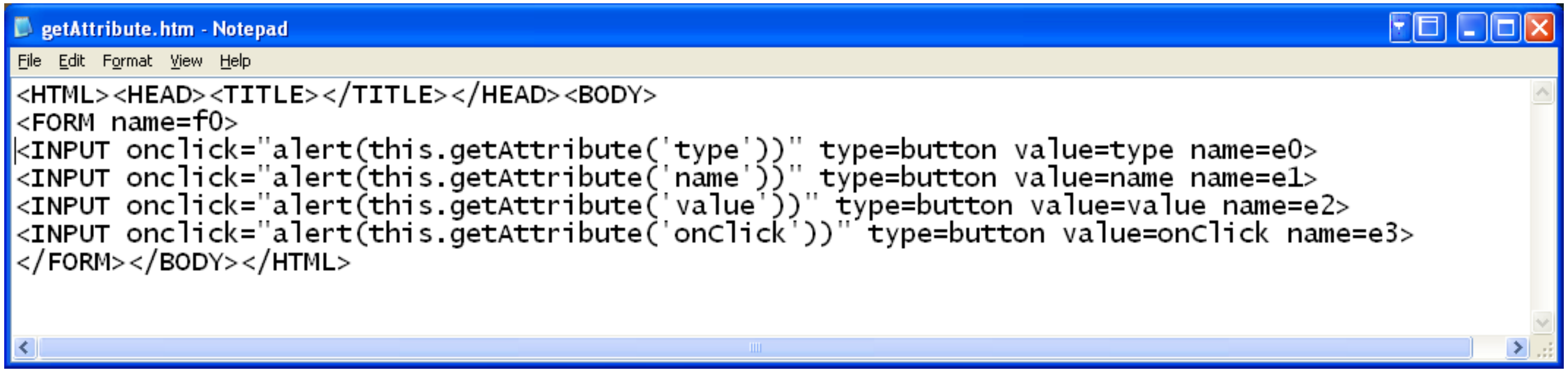
value

value



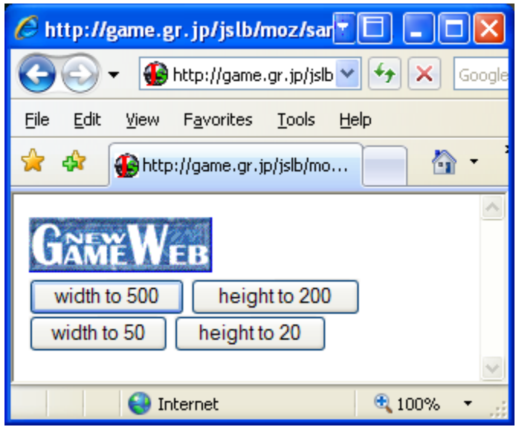
```
function anonymous()
{
alert(this.getAttribute('onClick'))
}
```

onClick

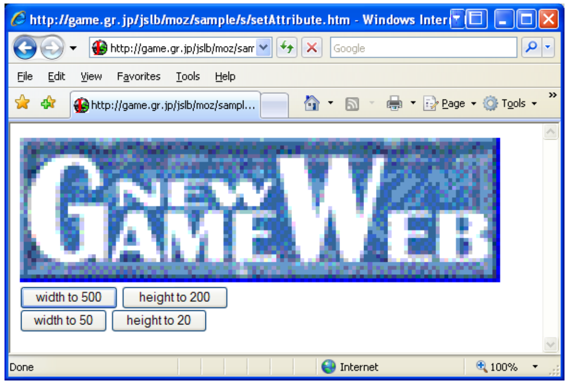


```
<HTML><HEAD><TITLE></TITLE></HEAD><BODY>
<FORM name=f0>
<INPUT onclick="alert(this.getAttribute('type'))" type=button value=type name=e0>
<INPUT onclick="alert(this.getAttribute('name'))" type=button value=name name=e1>
<INPUT onclick="alert(this.getAttribute('value'))" type=button value=value name=e2>
<INPUT onclick="alert(this.getAttribute('onClick'))" type=button value=onClick name=e3>
</FORM></BODY></HTML>
```

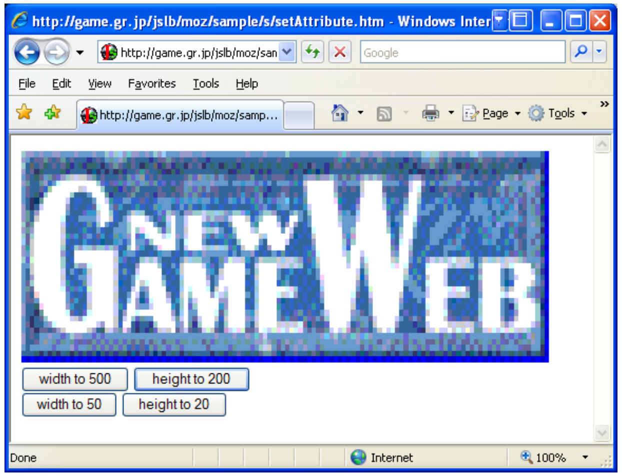
Example 13: DOM and Setting Attributes



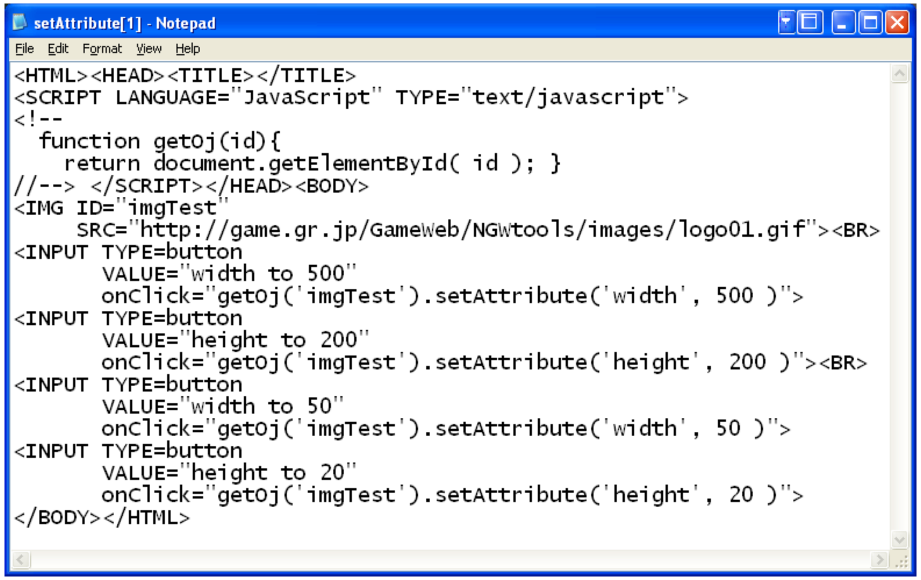
initial


http://game.gr.jp/jslb/moz/sample/s/setAttribute.htm - Windows Inter
width to 500
height to 200
width to 50
height to 20
Done
Internet
100%

Change Width to 500


http://game.gr.jp/jslb/moz/sample/s/setAttribute.htm - Windows Inter
width to 500
height to 200
width to 50
height to 20
Done
Internet
100%

Change Height to 200



```
<HTML><HEAD><TITLE></TITLE>
<SCRIPT LANGUAGE="JavaScript" TYPE="text/javascript">
<!--
  function getOj(id){
    return document.getElementById( id ); }
//--> </SCRIPT></HEAD><BODY>
<IMG ID="imgTest"
     SRC="http://game.gr.jp/GameWeb/NGWtools/images/logo01.gif"><BR>
<INPUT TYPE=button
       VALUE="width to 500"
       onClick="getOj('imgTest').setAttribute('width', 500 )">
<INPUT TYPE=button
       VALUE="height to 200"
       onClick="getOj('imgTest').setAttribute('height', 200 )"><BR>
<INPUT TYPE=button
       VALUE="width to 50"
       onClick="getOj('imgTest').setAttribute('width', 50 )">
<INPUT TYPE=button
       VALUE="height to 20"
       onClick="getOj('imgTest').setAttribute('height', 20 )">
</BODY></HTML>
```

Nodes a DOM Can Contain

- An Example

```
<sentence>   The &projectName; <![CDATA[<i>project</i>]]>
   is   <?editor: red><bold>important</bold><?editor: normal>.
   </sentence>
```

  - contains an entity ref., CDATA section, processing instructions (<?...?>

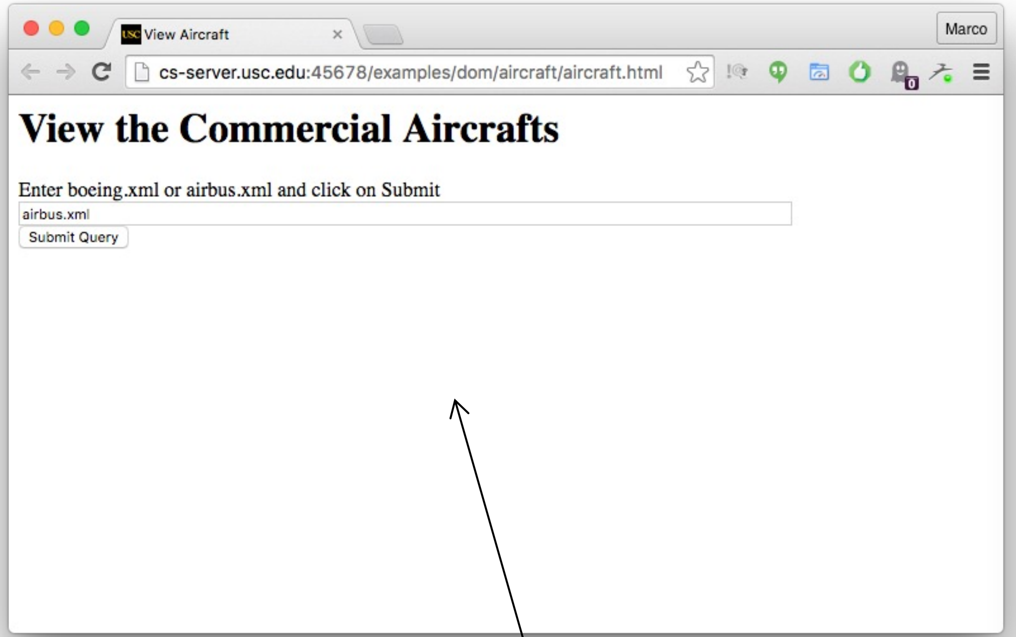
- Its DOM structure looks like this:

```
+ ELEMENT: sentence
   + TEXT: The
   + ENTITY REF: projectName
     + COMMENT: The latest name we're using
     + TEXT: Eagle
   + CDATA: <i>project</i>
   + TEXT: is
   + PI: editor: red
   + ELEMENT: bold
     + TEXT: important
   + PI: editor: normal
```

Summary of XML/HTML node types and children

- *Document* -- Element(maximum of one), ProcessingInstruction, Comment, DocumentType (maximum of one)
- *DocumentFragment* -- Element, ProcessingInstruction, Comment, Text, CDATASection, EntityReference
- *DocumentType* -- no children
- *EntityReference* -- Element, ProcessingInstruction, Comment, Text, CDATASection, EntityReference
- *Element* -- Element, Text, Comment, ProcessingInstruction, CDATASection, EntityReference
- *Attr* -- Text, EntityReference
- *ProcessingInstruction* -- no children
- *Comment* -- no children
- *Text* -- no children
- *CDATASection* -- no children
- *Entity* -- Element, ProcessingInstruction, Comment, Text, CDATASection, EntityReference
- *Notation* -- no children

Example 14: A Longer DOM Example

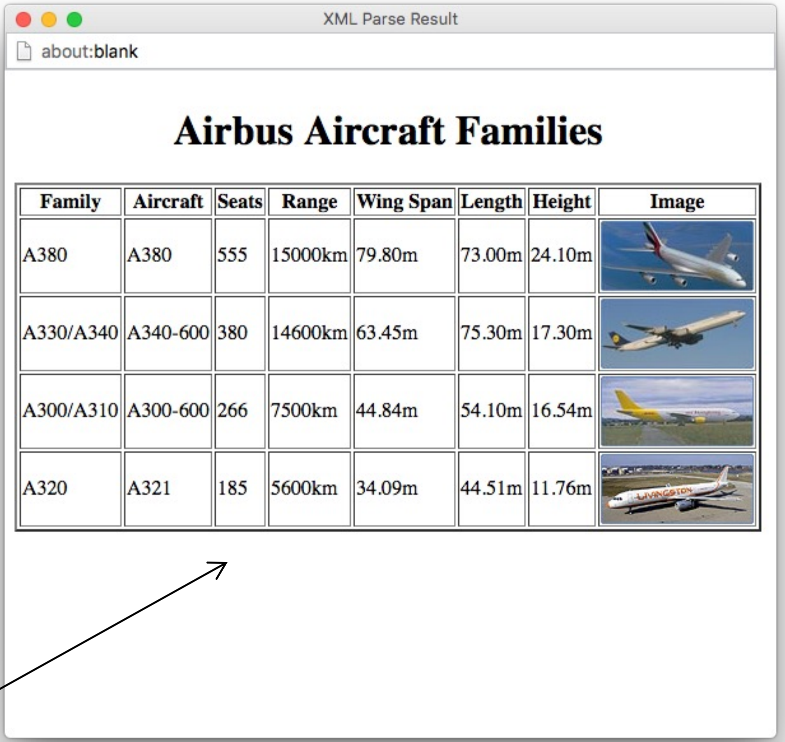


View the Commercial Aircrafts

Enter boeing.xml or airbus.xml and click on Submit

airbus.xml

Submit Query

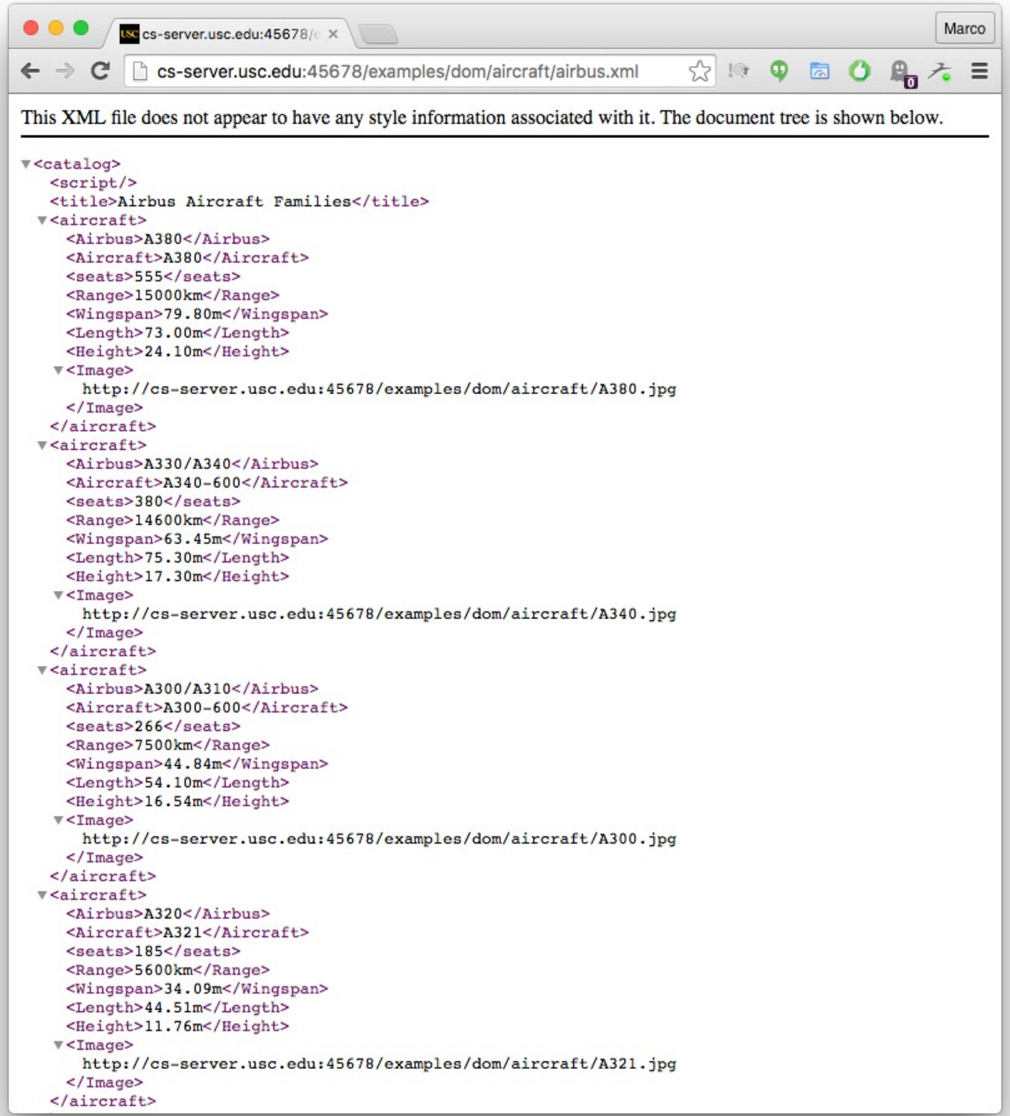


Airbus Aircraft Families

Family	Aircraft	Seats	Range	Wing Span	Length	Height	Image
A380	A380	555	15000km	79.80m	73.00m	24.10m	
A330/A340	A340-600	380	14600km	63.45m	75.30m	17.30m	
A300/A310	A300-600	266	7500km	44.84m	54.10m	16.54m	
A320	A321	185	5600km	34.09m	44.51m	11.76m	

Given a URL of an XML file that describes a set of aircraft, re-format the data into an HTML page

airbus.xml



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
▼<catalog>
   <script/>
   <title>Airbus Aircraft Families</title>
 ▼<aircraft>
     <Airbus>A380</Airbus>
     <Aircraft>A380</Aircraft>
     <seats>555</seats>
     <Range>15000km</Range>
     <Wingspan>79.80m</Wingspan>
     <Length>73.00m</Length>
     <Height>24.10m</Height>
   ▼<Image>
       http://cs-server.usc.edu:45678/examples/dom/aircraft/A380.jpg
     </Image>
   </aircraft>
 ▼<aircraft>
     <Airbus>A330/A340</Airbus>
     <Aircraft>A340-600</Aircraft>
     <seats>380</seats>
     <Range>14600km</Range>
     <Wingspan>63.45m</Wingspan>
     <Length>75.30m</Length>
     <Height>17.30m</Height>
   ▼<Image>
       http://cs-server.usc.edu:45678/examples/dom/aircraft/A340.jpg
     </Image>
   </aircraft>
 ▼<aircraft>
     <Airbus>A300/A310</Airbus>
     <Aircraft>A300-600</Aircraft>
     <seats>266</seats>
     <Range>7500km</Range>
     <Wingspan>44.84m</Wingspan>
     <Length>54.10m</Length>
     <Height>16.54m</Height>
   ▼<Image>
       http://cs-server.usc.edu:45678/examples/dom/aircraft/A300.jpg
     </Image>
   </aircraft>
 ▼<aircraft>
     <Airbus>A320</Airbus>
     <Aircraft>A321</Aircraft>
     <seats>185</seats>
     <Range>5600km</Range>
     <Wingspan>34.09m</Wingspan>
     <Length>44.51m</Length>
     <Height>11.76m</Height>
   ▼<Image>
       http://cs-server.usc.edu:45678/examples/dom/aircraft/A321.jpg
     </Image>
   </aircraft>
```

HTML Code for the Initial Input

```
<h1>View the Commercial Aircrafts </h1>
Enter XML file
<form name="myform" method="POST" id="location">
<input type="text" name="URL" maxlength="255"
  size="100" value="airbus.xml" />
<br />
<input type="button" name="submit" value="Submit
  Query" onClick="viewXML(this.form)" />
</form>
```

viewXML Routine

```
function viewXML(what)
{var URL = what.URL.value;
  function loadXML(url) {
      if (window.XMLHttpRequest)
  {// code for IE7+, Firefox, Chrome, Opera, Safari
       xmlhttp=new XMLHttpRequest();   }
 else {// code for IE6, IE5
    xmlhttp=new ActiveXObject("Microsoft.XMLHTTP");  }
  xmlhttp.open("GET",url,false);
  xmlhttp.send();
  xmlDoc=xmlhttp.responseXML;
  return xmlDoc;   }
  xmlDoc = loadXML(URL);
 if (window.ActiveXObject) //if IE, simply execute script (due to async prop).
 {  if (xmlDoc.parseError.errorCode != 0) {
    var myErr = xmlDoc.parseError;
    generateError(xmlDoc);
    hWin = window.open("", "Error", "height=300,width=340");
    hWin.document.write(html_text);
  } else {  generateHTML(xmlDoc);
            hWin = window.open("", "Assignment4", "height=800,width=600");
            hWin.document.write(html_text);   }
 } else //else if FF, execute script once XML object has loaded
 {  xmlDoc.onload=generateHTML(xmlDoc);
    hWin = window.open("", "Assignment4", "height=800,width=600");
    hWin.document.write(html_text);  }
 hWin.document.close();  }
```

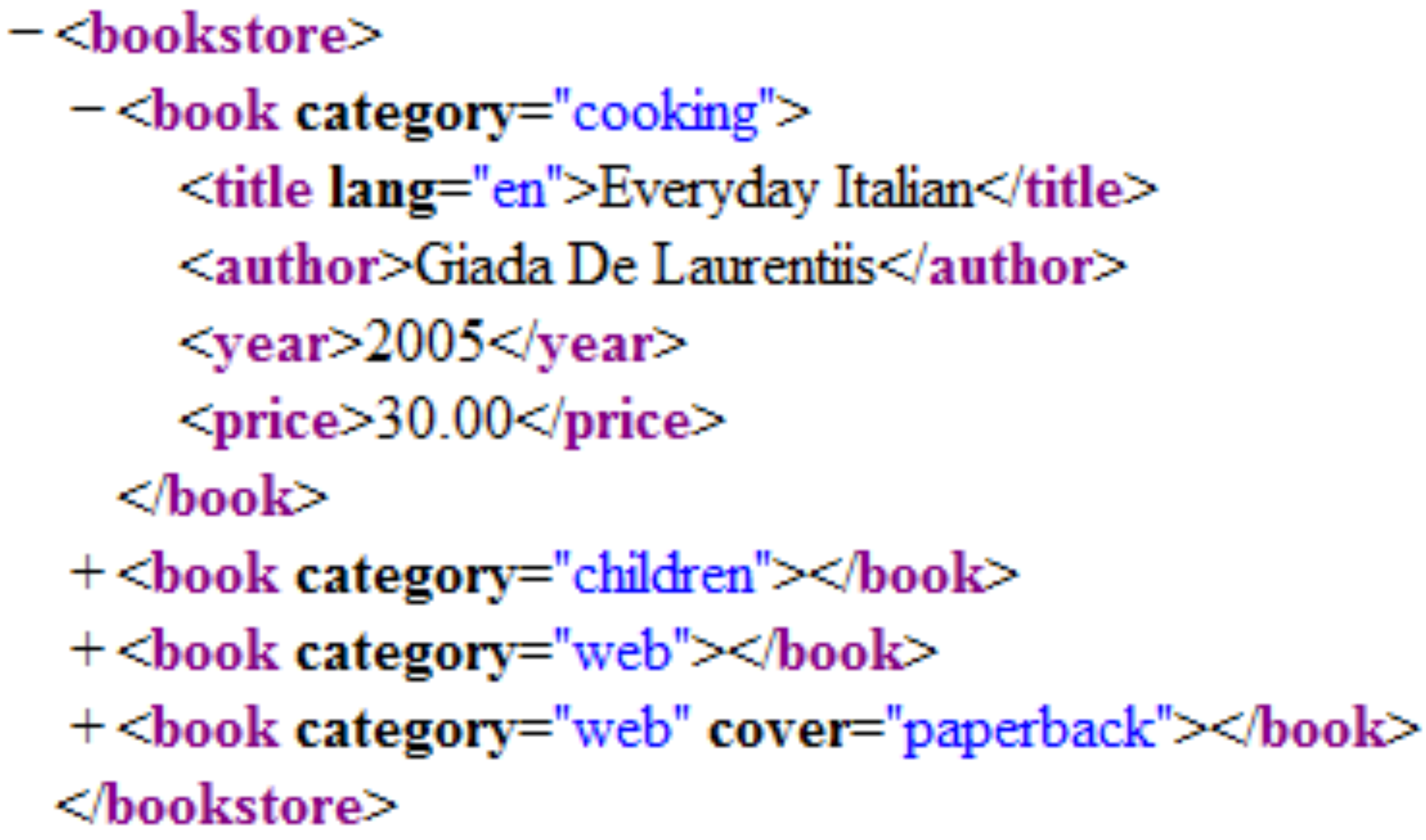
generateXML Routine

```
function generateHTML(xmlDoc)
   {  ELEMENT_NODE = 1;    // MS parser doesn't define Node.ELEMENT_NODE
          root=xmlDoc.DocumentElement;
          html_text="<html><head><title>XML Parse Result</title></head><body>";
          html_text+="<table border='2'>";
       caption=xmlDoc.getElementsByTagName("title").item(0).firstChild.nodeValue;
          html_text+="<caption align='left'><h1>"+caption+"</h1></caption>";
          planes=xmlDoc.getElementsByTagName("aircraft");
          planeNodeList=planes.item(0).childNodes;
          html_text+="<tbody>";
          html_text+="<tr>";
          x=0;  y=0;
      // output the headers
          for(i=0;i<planeNodeList.length;i++)
          {  if(planeNodeList.item(i).nodeType==ELEMENT_NODE)
                      {  header=planeNodeList.item(i).nodeName;
                               if(header=="Airbus")
                               {  header="Family";  x=120;  y=55;  }
                               if(header=="Boeing")
                               {  header="Family";  x=100;  y=67;  }
                               if(header=="seats")
                                   header="Seats";
```

generateXML Routine (cont'd)

```
 if(header=="Wingspan")  header="Wing Span";
 if(header=="height")    header="Height";
                  html_text+="<th>"+header+"</th>";  }   }
          html_text+="</tr>";
          // output out the values
          for(i=0;i<planes.length;i++) //do for all planes
          {  planeNodeList=planes.item(i).childNodes; //get properties of a plane
              html_text+="<tr>";      //start a new row of the output table
              for(j=0;j<planeNodeList.length;j++)
              {  if(planeNodeList.item(j).nodeType==ELEMENT_NODE)
                           {
                   if(planeNodeList.item(j).nodeName=="Image")
                             {//handle images separately
                   html_text+="<td><img
    src='"+planeNodeList.item(j).firstChild.nodeValue+"' width='"+x+"'
    height='"+y+"'></td>";  }
          else {
html_text+="<td>"+planeNodeList.item(j).firstChild.nodeValue+"</td>";
          }   }    }
              html_text+="</tr>";  }
          html_text+="</tbody>";  html_text+="</table>";
          html_text+="</body></html>";  }
```

Example 15: Another DOM Example
A simple XML file for a bookstore

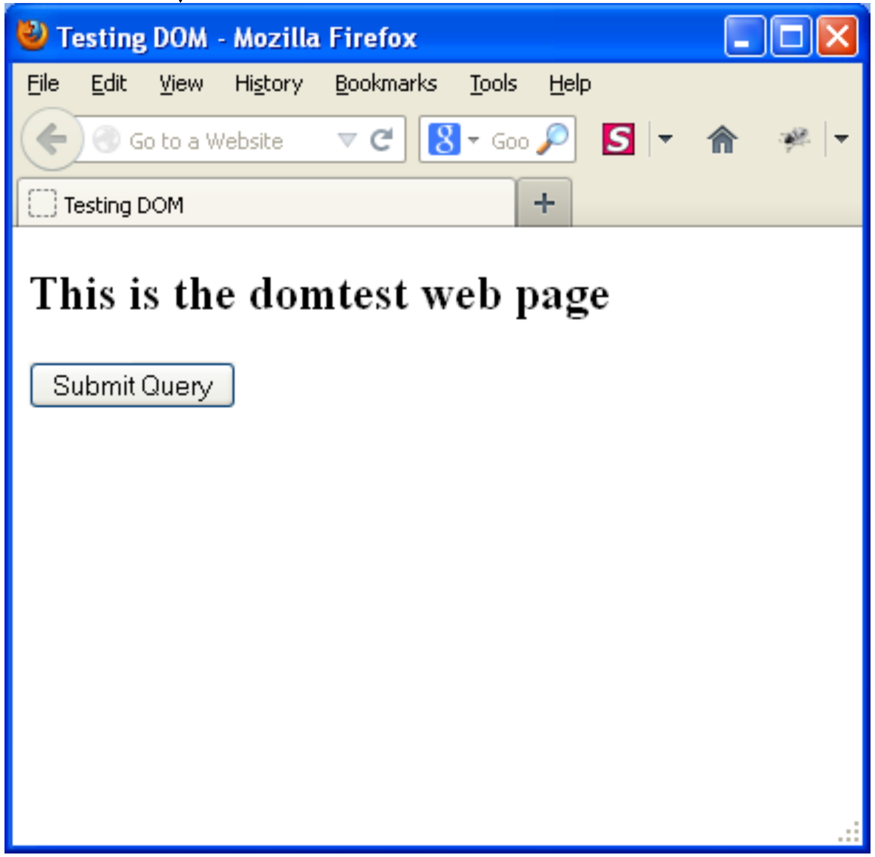


```
- <bookstore>
  - <book category="cooking">
      <title lang="en">Everyday Italian</title>
      <author>Giada De Laurentiis</author>
      <year>2005</year>
      <price>30.00</price>
    </book>
  + <book category="children"></book>
  + <book category="web"></book>
  + <book category="web" cover="paperback"></book>
  </bookstore>
```

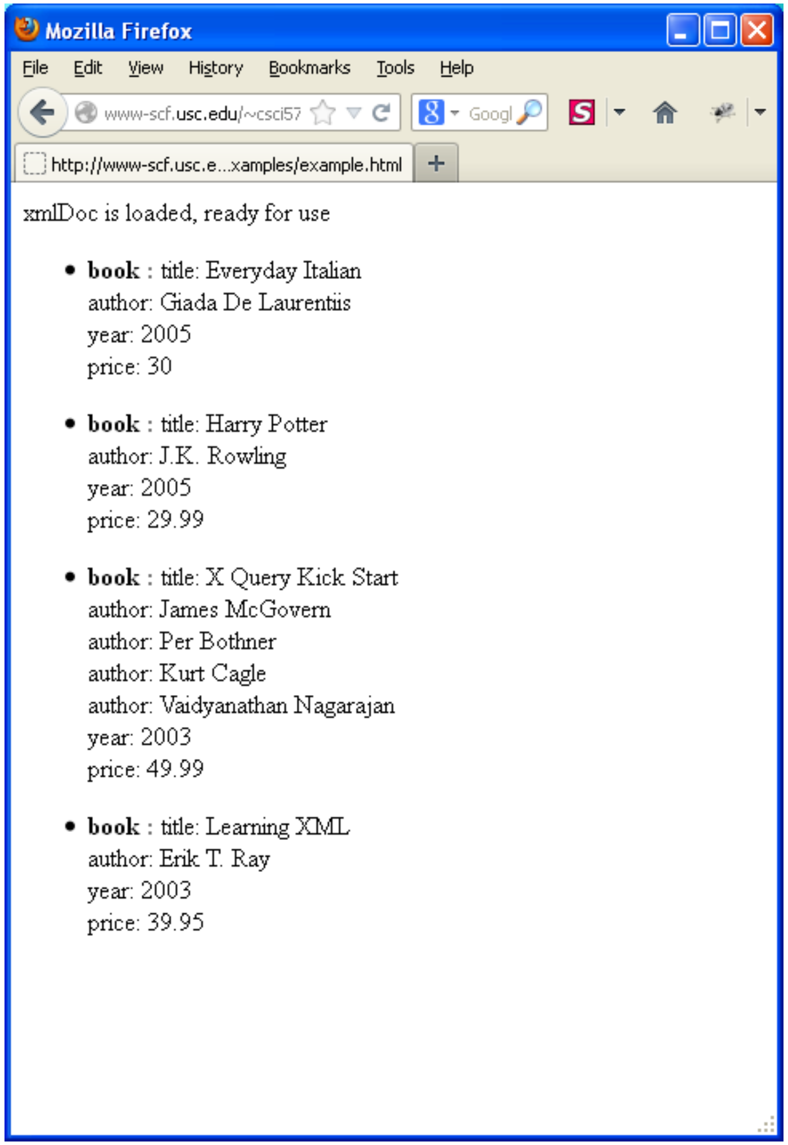
Example Cont'd – function xmlparse traverses and outputs the books

```
function displayString(out) {
        var output = document.getElementById("output");
        output.innerHTML = out;    }
function xmlparse() {
        var html = "";
        xmlDoc = loadXML("bookstore.xml");
        html += ("xmlDoc is loaded, ready for use<br />");
        var bookstore = xmlDoc.documentElement;
        for (i=0;i< bookstore.childNodes.length ;i++)
        {      var book = bookstore.childNodes[i];
                if (book.nodeType==1)
                {  html += ('<ul><li>');
                   html += ('<b>'+bookstore.childNodes[i].nodeName+' : </b>');
                   y = book.childNodes;
                        for (j=0;j<y.length;j++)
                        {   if (y[j].nodeType==1)
                                {  html += y[j].nodeName + ": "; //-> title, author etc
                                   html += y[j].childNodes[0].nodeValue; //-> text values
                                        html += ("<br />");    }     }
                html += ('</li></ul>');
                }    }
        displayString(html);   }
</script></head><body><h2>This is the domtest web page</h2>
<input type="button" name="submit" value="Submit Query"  onClick="xmlparse()" />
<noscript><div id="output"></div></body></html>
```

Before and After


Testing DOM - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Go to a Website
Testing DOM

This is the domtest web page


Mozilla Firefox
File Edit View History Bookmarks Tools Help
www-scf.usc.edu/~csci57
http://www-scf.usc.e...xamples/example.html

xmlDoc is loaded, ready for use

- **book** : title: Everyday Italian
  author: Giada De Laurentiis
  year: 2005
  price: 30
- **book** : title: Harry Potter
  author: J.K. Rowling
  year: 2005
  price: 29.99
- **book** : title: X Query Kick Start
  author: James McGovern
  author: Per Bothner
  author: Kurt Cagle
  author: Vaidyanathan Nagarajan
  year: 2003
  price: 49.99
- **book** : title: Learning XML
  author: Erik T. Ray
  year: 2003
  price: 39.95

An alternate solution that makes use of "bookstore.children" instead of Childnodes can be found at http://csci571.com/examples/dom/example2.html (Example 17)

Additional Reads

DOM Examples at w3schools.com:

https://www.w3schools.com/jsref/dom_obj_document.asp

See **Document Object Properties and Methods** section

(hint: try all examples])