Browser Object Model
&
Document Object Model

Browser Object Model (BOM)

Global Object

- In truth, there is no such thing as a global variables or global functions. All of them are defined as properties of the Global object.
- Global object is a virtual built-in object. It actually doesn't exist.

Global Object Property

- undefined, NaN, Infinity
- Object
- Array
- Function
- Boolean
- String
- Number
- Date
- RegExp
- Error
- EvalError
- RangeError
- ReferenceError
- SyntaxError
- TypeError
- URIError

Global Object v.s Window Object

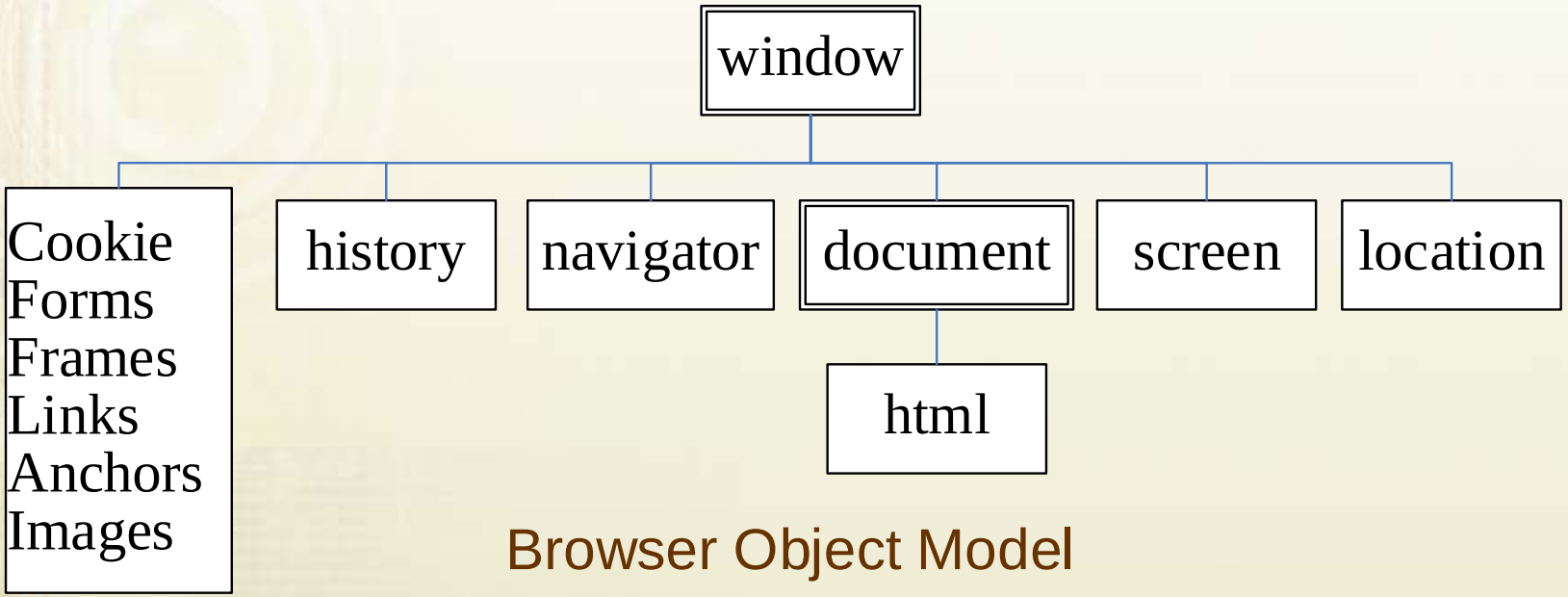
- The EMCA-Script doesn't indicate a way to access the Global object directly.
- Browsers implement it as part of the window object.
  - e.g.

```
var color = "red";  // declare a variable
// declare a function
function sayColor() { alert(window.color); }

window.sayColor();  // "red"
```

  - ps: can not "*delete window.color;*"

Browser Object Model



Browser Object Model

window Object

List window's Property

- e.g. BOM/windowProperty.html

```
for (var i in window)
        document.writeln("window."+i+"="+window[i]+"<br>
");
```

- dependent on browser!!

window.open() / close()

- winId = window.open(url, winName, optionsString, overwriteHistory);
  - url：the URL of the page
  - winName： the name of the window, or target attribute (_self, _blank, _parent, _top)
  - optionsString: e.g. width,height of window, whether or not to display scroll bar, status bar …etc.
  - overwriteHistory: Specifies whether the URL creates a new entry or replaces the current entry in the history list.
- close windows: winId.close()

window.open() - Exmaple

- e.g. BOM/windowOpen.html

  window.open("http://www.google.com/", "myWin", "width=800,height=600", false);
- note
  - Opera open windows in a new tab instead a new window

window open() Options

height=pixels	The height of the window. Min. value is 100
width=pixels	The width of the window. Min. value is 100
top=pixels	The top position of the window. Negative values not allowed
left=pixels	The left position of the window. Negative values not allowed
menubar=yes|no|1|0	Whether or not to display the menu bar
scrollbars=yes|no|1|0	Whether or not to display scroll bars. IE, Firefox & Opera only
status=yes|no|1|0	Whether or not to add a status bar
titlebar=yes|no|1|0	Whether or not to display the title bar. Ignored unless the calling application is an HTML Application or a trusted dialog box
toolbar=yes|no|1|0	Whether or not to display the browser toolbar. IE and Firefox only
location=yes|no|1|0	Whether or not to display the address field. Opera only
channelmode=yes|no|1|0	Whether or not to display the window in theater mode. Default is no. IE only
directories=yes|no|1|0	Obsolete. Whether or not to add directory buttons. Default is yes. IE only
fullscreen=yes|no|1|0	Whether or not to display the browser in full-screen mode. Default is no. A window in full-screen mode must also be in theater mode. IE only
resizable=yes|no|1|0	Whether or not the window is resizable. IE only

window print()

- 主題：利用 window.print() 列印網頁
  - 檔名： BOM/windowPrint.html
  - 程式碼重點

    列印此網頁
- 說明
  - windows.print() 會呼叫瀏覽器提供的列印程式，將這個網頁列印下來。

history Object

- no standard that applies to the history object, but all major browsers support it.

History Object Properties	
Property	Description
length	Returns the number of URLs in the history list
History Object Methods	
Method	Description
back()	Loads the previous URL in the history list
forward()	Loads the next URL in the history list
go(num)	Loads a specific URL from the history list

history - Example

- 主題：展示 history 的方法
- e.g. BOM/historyGo01.html

```
document.writeln(history.length)
<a href="javascript:history.go(-1)">回前一頁</a>
<a href="javascript:history.go(0)">重新整理</a>
<a href="javascript:history.go(+1)">跳下一頁</a>
```

- 說明
  - history.length 記錄了以前瀏覽網頁的頁數。
  - history.go(n) 可以跳到之前瀏覽過的網頁。
  - n<0 表示往前，n>0 表示往後，n=0 表示目前網頁

location Object

- **location** provides information about current document.
- **location** is a property of both **window** and **document** object. It means window.location and document.location refer to the same object.

location 屬性與方法

Location Object Properties	
hash	Returns the anchor portion of a URL
host	Returns the hostname and port of a URL
hostname	Returns the hostname of a URL
href	Returns the entire URL
pathname	Returns the path name of a URL
port	Returns the port number the server uses for a URL
protocol	Returns the protocol of a URL
search	query portion of URL, after and including the question mark.
Location Object Methods	
assign()	Loads a new document
reload()	Reloads the current document
replace()	Replaces the current document with a new one

- [URL format] protocol://hostname[:port]/[path][?search][#hash]

location Assignment

- 使用 assign(), replace() 指定新網址
- e.g. BOM/locationAssign.html
  location.assign("http://www.google.com/");
  location.replace("http://www.google.com/");
- assign() 會在 history 記錄新網址，replace() 則不會
- 也可以直接修改 location 的任一屬性值(除了hash)，就會重新讀取新網頁

Refresh 頁面

- reload():
  - reload(): reload from browser cache if it hasn't change
  - reload(true): reload from server
- location.reload() 與 history.go(0) 都可以用來重整頁面
- e.g. BOM/locationRefresh.html
  - 程式重點

    function softRefresh() { history.go(0); }

    function hardRefresh(){ location.reload(true); }
  - (IE) go(0) 會保留已進行的輸入

navigator Object

- navigator object 內存有與瀏覽器相關的資訊
  - 包括瀏覽器類別、版本、CPU 類別、平台、是否支援 cookie 之類的資訊。
  - e.g. BOM/navigatorProperty.html
- 為了撰寫跨各家瀏覽器平台的 JavaScript 程式碼，我們可以利用 navigator 資訊來偵測使用者所用的瀏覽器種類，以決定選用何種 JavaScript 程式。
  - e.g. BOM/navigatorInformation.html
- 我們只要使用 navigator 物件的各種屬性，就可以知道使用者的 navigator 物件的重要屬性

navigator 常見方法和屬性

Property	Description
appCodeName	Returns the code name of the browser
appName	Returns the name of the browser
appVersion	Returns the version information of the browser
cookieEnabled	Determines whether cookies are enabled in the browser
geolocation	Returns a Geolocation object that can be used to locate the user's position
language	Returns the language of the browser
onLine	Determines whether the browser is online
platform	Returns for which platform the browser is compiled
product	Returns the engine name of the browser
userAgent	Returns the user-agent header sent by the browser to the server
Method	**Description**
javaEnabled()	Specifies whether or not the browser has Java enabled

screen Object

Property	Description
availHeight	Returns the height of the screen (excluding the Windows Taskbar)
availWidth	Returns the width of the screen (excluding the Windows Taskbar)
colorDepth	Returns the bit depth of the color palette for displaying images
height	Returns the total height of the screen
pixelDepth	Returns the color resolution (in bits per pixel) of the screen
width	Returns the total width of the screen

- e.g. BOM/screenProperty.html, BOM/screenInformation.html

Document Object Model (DOM)

Document Object Model DOM

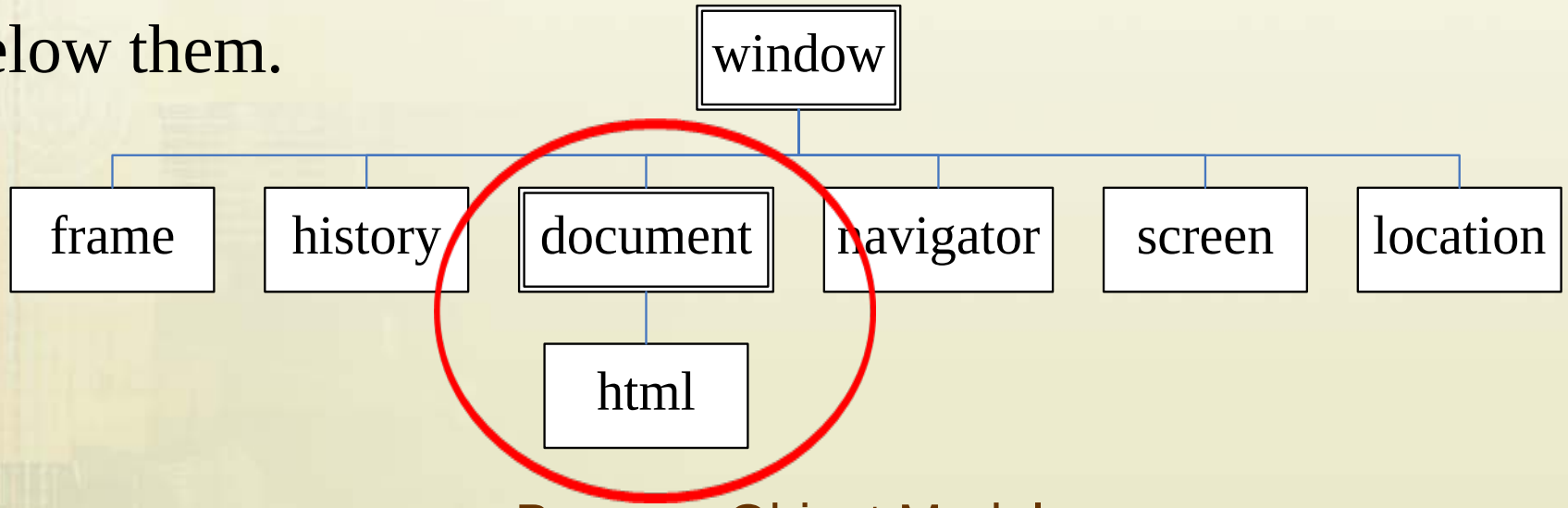
- The DOM is a W3C (World Wide Web Consortium) standard for accessing documents like HTML and XML.

  "The Document Object Model is a platform- and language-neutral interface that will allow programs and scripts to dynamically access and update the content, structure and style of documents." --- http://www.w3.org/DOM/

- DOM是一個階層式的物件模型，包含了網頁的各種物件，經由調整這些物件的性質和方法，才能產生動態的網頁
- 當瀏覽器讀入一頁網頁時，就會根據此網頁的內容來建立相關的 Document Object

Document Tree

- The DOM presents documents as a hierarchy of Node (tree or forest).
- ***document*** object is the root of document tree
- Node represents a single object in the document tree.
- Some types of nodes may have child nodes of various types, and others are leaf nodes that cannot have anything below them.

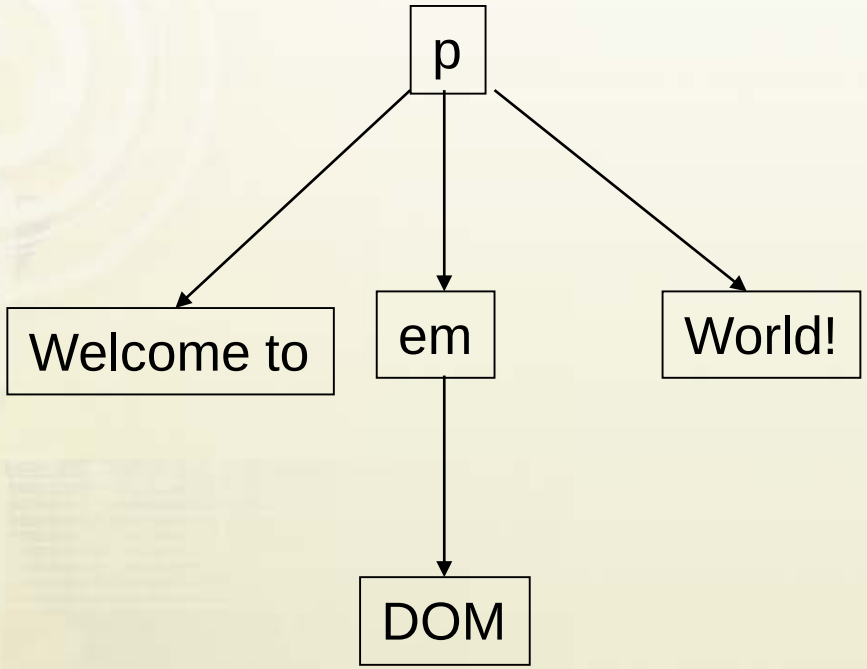


Browser Object Model

Document Tree - Example

- e.g.

Welcome to DOM World!



DOM Node 1/3

- Everything in an HTML document is a node.
- DOM 主要的 6 種節點類型如下：

nodeType	Type Name	說明	nodeName	nodeValue
1	Element	tag name, e.g. body		null
2	Attr	搭配 Tag的屬性節點	e.g. href	e.g. "url"
3	Text	內容文字	#text	e.g. "Hello, World!"
8	Comment	註解節點	#comment	content of the comment
9	Document	#document	#document	null
10	DocumentType	document type name		e.g. <!doctype...>

- The entire document is a document node
- Every HTML element is an element node
- The text in the HTML elements are text nodes
- Every HTML attribute is an attribute node

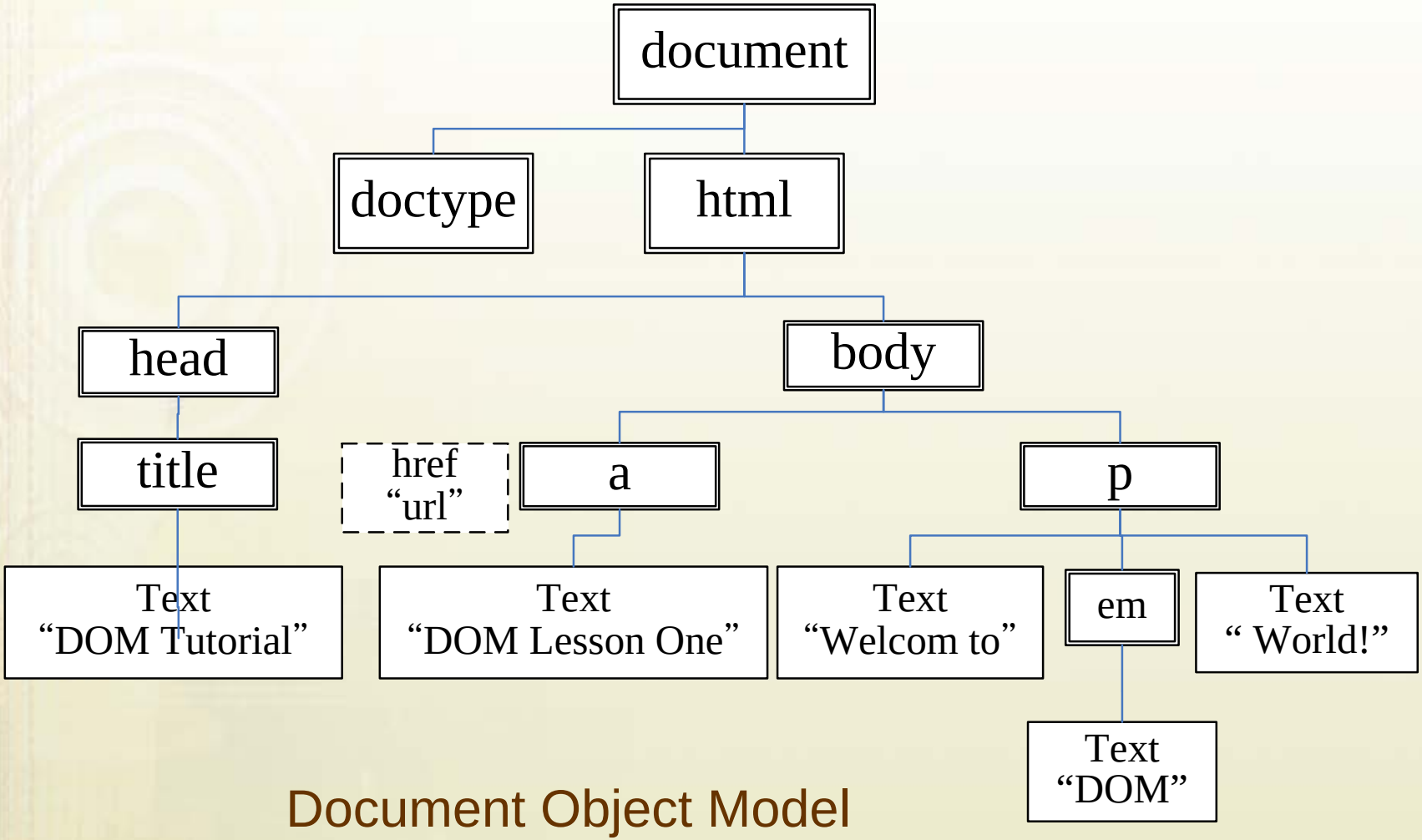
DOM Node 2/3

- e.g. domFirst.html

```
<html>  <head>  <title>DOM Tutorial</title>  </head>
<body>
<a href="url">DOM Lesson one</a>
<p>Welcome to <em>DOM</em> world!</p>
</body>
</html>
```

- The root node in this HTML is <html>. All other nodes in the document are contained within <html>.
- The <html> node has two child nodes; <head> and <body>.
- The <head> node holds a <title> node. The <body> node holds a <a> and <p> node.

DOM Node 3/3



Document Object Model

DOM Node Tree - Example

- e.g. DOM/nodeTree.html

DOM

Every document element are organized in a tree structure, called the DOM tree.
node type in the tree:

- element node
- attribute node
- text node

```
HTML (Type: element)
    HEAD (Type: element)
        META (Type: element)
        TITLE (Type: element)
            #text (Type: text) (Value: Show Document Tree)
        LINK (Type: element)
        SCRIPT (Type: element)
    BODY (Type: element)
        DIV (Type: element)
            H2 (Type: element)
                #text (Type: text) (Value: DOM)
            P (Type: element)
                #text (Type: text) (Value: Every document element
                structure, called the DOM tree.)
            #text (Type: text) (Value: node type in the tree: )
            UL (Type: element)
                LI (Type: element)
                    #text (Type: text) (Value: element node)
                LI (Type: element)
                    #text (Type: text) (Value: attribute node)
                LI (Type: element)
                    #text (Type: text) (Value: text node)
```

Document Creation

- 我們可以利用 node creation 從無到有，建立一個完整的網頁
  - e.g. DOM/nodeBorn.html
- 只是這樣太麻煩了，所以可行的作法是先以建立一靜態網頁，再隨需求操作 document node，動態改變網頁的內容。

Find Elements in the DOM Tree

- If you want to manipulate elements, you have to find the elements first. The ways to find elements in the DOM tree:
  - by tag name: getElementsByTagName()
  - by id attribute: getElementById()
  - by name attribute: getElementsByName()
  - (HTML5)by class attribute: getElementsByClassName()
  - by CSS selector: QuerySelector()
  - 使用內建的 document 屬性來存取物件節點

Find Elements by Tag Name

- 每一個 HTML 的標籤在 Document Tree 下就是一個節點，可利用標籤名稱來存取這個節點
- e.g. DOM/domAccess.html

```
var pList=document.getElementsByTagName("li");
for ( i=0; i<pList.length; i++) {
      msg += pList[i]. childNodes[0].nodeValue;
}
```

  - 取得網頁所有 <li> 標籤的節點
  - 回傳值 pList 為陣列
  - childNodes[] 為 <li> 的子節點
  - nodeValue 為節點值

Find Elements by id

- 每一個 HTML 的標籤可設定其 id 屬性 (id="idValue")，可利用此一 id 屬性值來存取此節點
- idValue 值在同一文件中應唯一，只要 idValue 在整個網頁是唯一的，可以使用兩種方法來取得此物件
  - document.getElementById(idValue)：標準作法，符合 W3C 的標準。
  - document.all(idValue)：這是 IE4 自創的規格，目前並未被 W3C 的標準 DOM 所採納

Find Elements by name

- 對於每一個標籤，我們可以使用 name 屬性來存取節點，但 name 不唯一，不同標籤可以使用相同的 name
- document.getElementsByName(nameValue)
- 回傳值是一個陣列
- e.g.

```
var x=document.getElementsByName("x");
x[2].value = parseInt(x[0].value) + parseInt(x[1].value);
```

Find Elements by CSS selector

- The querySelector() method returns the first descendant element that matches a specified *CSS selector(s)*
- e.g. document.querySelector(“#content")
- e.g. var baseElement = document.querySelector("p");
  document.getElementById("output").innerHTML =
  baseElement.querySelector("div span").innerHTML

- **Note:** The querySelector() method only returns the first element that matches the specified selectors. To return all the matches, use the querySelectorAll() method instead.

使用內建的 document 屬性來存取

- 瀏覽器可能會自動建立一些屬性，方便直接存取網頁上的物件：
- e.g. 經由設定 document.title 來改變網頁的標題 (document.title = "Access element by document property ")
- e.g. 特殊陣列物件，如 links, images, forms 儲存網頁中所有 link, image, form
- e.g. DOM/accessByProperty.html
  - 列出文件中的 links, images, forms 物件
- 有些則使用標籤 name 屬性值做為 document 屬性值
  e.g. 上例中，當 <img name="image1" …>，存取第一張圖片檔名，可以用 document.image1.src
  - 此法 dependent on 瀏覽器，不建議使用

Change Element Node

- 改變物件(element node)的屬性值，就能動態改變網頁內容
- 存取物件的屬性值，有三種方法：
  - 用標籤的屬性名稱來存取物件的屬性(這是最常用到的方法)
    語法：object.propertyName
  - 以屬性名稱做為索引字串來存取物件的屬性值
    (此種方法好處是：可將屬性名稱以變數儲存)
    語法：object["propertyName"]
  - 用數字索引來存取物件的屬性值(比較少用)
    語法：object[index]

Example: List Document Property

- 列出網頁文件中的物件所具有的性質
- e.g. DOM/documentProperty.html
  - 程式碼

```
for (var prop in document)
  document.writeln('document.'+prop+'='+document[prop]+'<br>');
```

- 說明
  - 區域變數 prop 則會依次等於物件的每一個屬性名稱，document[prop] 則是對應屬性的值。

改變大量節點值的快速方法

- 不論是經由設定節點 nodeValue 來改變節點值，或透過物件的內建屬性來改變節點值，在設定大量節點皆不方便，所以各家 browser (特別是 IE) 除了規格書上定義的方法與屬性外，新增一些功能較強的屬性來設定節點值
- e.g. IE 4 首先在 Element Node 加上下列屬性
  - innerText, innerHTML, outerText, outerHTML
    - (Supported by IE, Safari, Opera, Chrome, FireFox)
- DOM Level 3 定義了 textContent，相當於 innerText

innerText & innerHTML

- innerText
  - 傳回其下所有Text Node的值 (in Depth-First Order)
- innerHTML
  - 傳回其下所有節點的值，包括Element Node, Text Node, Comment Node
- consider following example
  - some.innerText = "Hello, \"World\"!";
  - some.innerHTML = "Hello, \"World\"!";
- e.g. DOM/innerHTMLGet.html, DOM/innerHTMLSet.html, DOM/innerText.html

outerText & outerHTML

- outerText
  - like innerText, except it includes the node itself
- outerHTML
  - like innerHTML, except it includes the node itself
- e.g. DOM/outerHTMLGet.html,
  DOM/outerHTMLSet.html,
  DOM/outerText.html

- ps: 這四個屬性很耗資源，應該盡量避免放在迴圈內使用

Access CSS Style

by DOM Operation

First Example - 隱藏圖片

- e.g. DOM/cssFirst.html

```
// 取得圖片
var my_imgs =
document.getElementsByTagName("img");
var my_img = my_imgs[0];
.....
 // 隱藏圖片
my_img.style.visibility = "hidden";
// or
my_img.style.display = "none";
```

JavaScript 中的 CSS 屬性名稱

- CSS 的屬性名稱常會包含有連字號 -
- e.g. font-family：

  <h1 id="header" style="font-family: sans-serif;">這是標題文字</h1>
- 連字號 - 在 JavaScript 並非合法變數用字，會解讀成減號，因此在 CSS2Properties 物件中將連字號移除，然後將連字號後面的第1個字母改成大寫。
- e.g. font-family 變成 fontFamily：

  var h1 = document.getElementById('header');

  h1.style.fontFamily = "serif";

讀取數值

- 讀取元素中設定的 CSS 樣式值
- e.g.

   這是段落文字

  相對的style屬性

  ```
  var myP = document.getElementById('para');
  myP.style.paddingLeft;
  myP.style.paddingRight;
  ```

設定 CSS 屬性值

- 在使用 CSS2Properties 物件的屬性時，所有的屬性數值都必須寫成字串。
- e.g.

```
<p id="para">這是段落文字</p>
.....
var myP = document.getElementById('para');
myP.style.fontFamily = "sans-serif";
myP.style.fontWeight = "bold";
myP.style.color = "#FF0000";
myP.style.backgroundColor = "yellow";
```

設定 CSS 多個屬性值

- 有些 CSS 屬性可以一次設定許多個屬性值
- e.g.

   這是段落文字

  可寫成

  ```
  var myP = document.getElementById('para');
  myP.style.padding = "80px 60px 40px 50px";
  ```

長度單位

- 在使用 CSS2Properties 物件的位置屬性時，所有的屬性數值都必須有單位(在standard mode時)。
- e.g.

```
var para= document.getElementById('para');
para.style.position = "absolute";
para.style.left = "300px";
para.style.top = "250px";
```

Style Properties and Methods

- style.cssText
  - e.g. my.style.cssText="width: 25px; height: 100px;"
- style.setProperty(propertyName, value, priority)
  - priority can be "important" or null
- style.getPropertyValue(propertyName)
- style.removeProperty(propertyName)
- style.length
- style.item(index)
  - return the name of CSS property at the given position

- [note] style 物件的內容僅止於標籤的 style 屬性設定

Iterating the CSS Properties

- e.g. cssStyle.html

```
for (var i=0; i<obj.style.length; i++) {
        prop =obj.style.item(i);  // or obj.style[i]
        value = obj.style.getPropertyValue(prop);
        document.writeln(…);
}
```

存取 CSS Rules

- Document 物件的 styleSheets 屬性值是 CSSStyleSheet 物件的陣列
- CSSStyleSheet 物件的 cssRules 屬性值是樣式表中的所有規則的陣列
- e.g. // W3C DOM Level 2

  var firstRule = document.styleSheets[0].cssRules[0];

  // 第一個樣式表的第一條規則
- IE 不支援 cssRules 屬性，而是使用 rules 屬性

  var firstRule = document.styleSheets[0].rules[0];

存取 CSS Rules - Example

- e.g. cssRulesGet.html
  myStyleSheets[1].cssRules[0].selectorText // selector name
  myStyleSheets[1].cssRules[0].cssText // declaration

- [note]
  please display this example by FireFox.
  For Chrome, cssRules is null when stylesheets loaded from local disk, so do not open this sample by Chrome

讀取 Effective CSS 樣式

- 下列範例讀取 p 元素的 color 樣式值，不管 color 樣式的來源為何：
  - e.g.

    ```
    var p = document.getElementsByTagName("p")[0];
    var color = window.getComputedStyle(p, null).color;
    ```
  - 語法 : window.getComputedStyle(*element*[, *pseudoElt*]);
- Internet Explorer 不支援 Windows 物件的 getComputedStyle 方法，而是使用元素的 currentStyle 屬性來取得元素的所有來源的樣式：

```
var p = document.getElementsByTagName("p")[0];
var color = p.currentStyle.color;
```

- e.g. cssEffective.html

附錄：預約程式碼的執行

setTimeout(), setInterval()

setTimeout() 使用方式

- Syntax

  timer = setTimeout("JavaScript的命令列", 時間長度);

- 說明
  - 設定使某段程式碼在指定時間後開始執行。
  - 第一個參數是執行的程式碼，可以是一個函數；或者是一段 JavaScript 程式碼，以字串的形態傳入。
  - 第二個參數是幾毫秒後開始，單位是毫秒(ms)，所以要用秒來計算時記得 *1000。
  - 用 clearTimeout(timer) 取消預約執行。

setTimeout() - Example

- e.g. marquee.html
- 利用 setTimeout() 反覆執行某段程式碼

```
function messageRotate(){
    setTimeout(messageRotate, 400);
}
```

  - 當執行到 setTimeout(messageRotate, 400); 的時，會預約下一次的執行，即可定時重複執行這個函式
  - messageRotate() 每次執行會把 message 的第一個字移至字串最末端，藉以制造跑馬燈的錯覺

setInterval() 使用方法

- timer = setInterval("JavaScript的命令列", 時間長度)
  - 週期性執行某段程式碼
  - 也可以用 setTimeout() 達到此效果，但是 setInterval()更為精簡。
  - 用 clearInterval() 取消預約。
- e.g. clock.html 使用 setInterval() 顯示數位時鐘
- 說明
  - 每次執行 showTime() 就重新取得最新時間。