CIS 4004: Web Based Information Technology Summer 2014

Introduction To JavaScript – Part 1 – Basic JavaScript

Instructor :   Dr. Mark Llewellyn
                   markl@cs.ucf.edu
                   HEC 236, 407-823-2790
          http://www.cs.ucf.edu/courses/cis4004/sum2014

Department of Electrical Engineering and Computer Science
University of Central Florida

JavaScript - Variables

- The values a program stores in computer memory are called variables. Technically speaking, a variable is actually a specific address in the computer memory. The data stored in a variable often changes.

  - Think of a variable like a book bag or back pack. You can put any book you want in the bag and retrieve it later for use. The books in your bag this semester will probably not be the same ones in your bag next semester.

- Many programming languages, such as Java and C++ have a very large set of rules that apply to variables. JavaScript is very loose in how variables can be used.

Naming Variables

- The name you assign to a variable is called an identifier. Although technically different, you can use the terms variable and identifier interchangeably.

- JavaScript defines the following rules for naming a variable:

  – Identifiers must begin with an uppercase or lowercase ASCII letter, dollar sign ($) or underscore(_). (Older browsers will not accept $.)

  – Numbers can appear in the identifier, but not as the first character.

  – No spaces are allowed in the identifier.

  – You cannot use any reserved word as an identifier (see page 5.)

Naming Variables

- Some examples:

  Valid identifiers: `Angela, num1, _newt, $amount, debi`

  Invalid identifiers: `Didi Thurau, 16_Nov, *69`

- Variable names should be descriptive not cryptic. Convention dictates that variable names begin with a lowercase letter and each additional word in the identifier begins with an uppercase letter. Some examples of conventional variable names are: `productDate, myLastName, birthDate,` and `myLastLapTime`.

Reserved Words In JavaScript

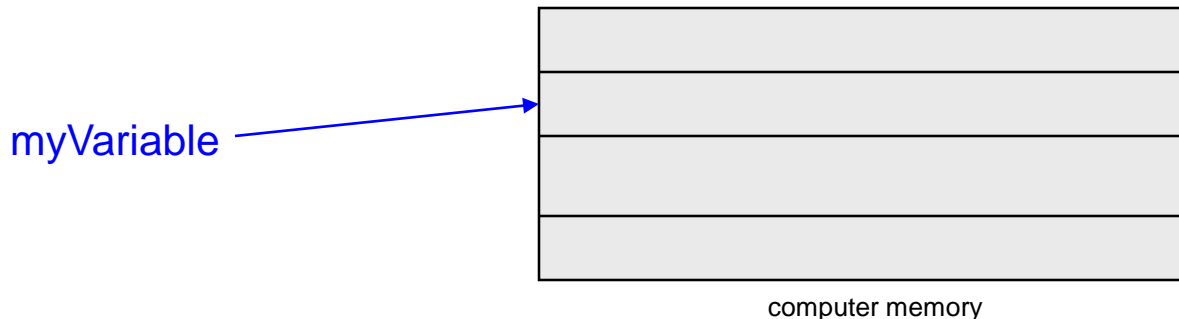|			
abstract	else	instanceof	switch
boolean	enum	int	synchronized
break	export	interface	this
byte	extends	long	throw
case	false	native	throws
catch	final	new	transient
char	finally	null	true
class	float	package	try
const	for	private	typeof
continue	function	protected	var
debugger	goto	public	void
default	if	return	volatile
delete	implements	short	while
do	import	static	with
double	in	super	

Using Variables

- Before you can use a variable, you need to declare it (basically that means create it). While there are different techniques to create variables, we'll stick with the most common and simplest form which uses the reserved word `var`.

- For example, to create a variable named `myVariable`, you need to write this statement:

$$\texttt{var myVariable;}$$

- All this statement does is make some memory location be accessible to your code whenever you refer to it by this name.

myVariable

computer memory

Using Variables

- Declaring a variable just sets aside memory for it, it does not assign any value to the memory.

- Often you want to give the memory location, hence the variable, some initial value. The shorthand notation for this occurs at the same time as the declaration as follows:

$$\texttt{var myVariable = value;}$$

- Examples: `var myName = "Mark";  //literal string`

  `var roomNumber = 104; //a number`

  `var myNum = "69";  //literal string`

Using Variables

- JavaScript is a dynamically typed language. This means that the type assigned to a variable is determined when the variable is used.

- For example, you could do the following in JavaScript:

```
var myVariable;

myVariable = 4;   //type is number

myVariable = "Mark";   //type is a string
```

- You should use caution however to ensure that operations on variables are compatible. See next example.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?

exampleXMLxhr.html   simpleXMLxhr.js   prog1.java   javascript dynamic typing.html

```html
 1  <!DOCTYPE html>
 2  <html lang="en">
 3  <head>
 4      <meta charset="utf-8">
 5      <title> Dynamic Typing In JavaScript </title>
 6      <style type="text/css">
 7          <!--   body {background-color: #2AE; }
 8                 h2 { text-decoration: underline; }
 9          -->
10      </style>
11  </head>
12  <body>
13      <h2> Dynamic Typing In JavaScript </h2>
14      <script type="text/javascript">
15          var myNum1 = 4;
16          var myNum2 = 20;
17          var total = myNum1 + myNum2;
18          document.write("<h3><br /> myNum1 + myNum2 = " + total);
19          document.write("<br />");
20          myNum1 = "Mark";
21          myNum2 = " Llewellyn";
22          total = myNum1 + myNum2;
23          document.write("<h3><br /> myNum1 + myNum2 = " + total);
24          document.write("<br /></h3>");
25      </script>
26  </body>
27  </html>
28
```

Hyper Text Ma   length : 689   lines : 28   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

Dynamic Typing In JavaScript

myNum1 + myNum2 = 24

myNum1 + myNum2 = Mark Llewellyn

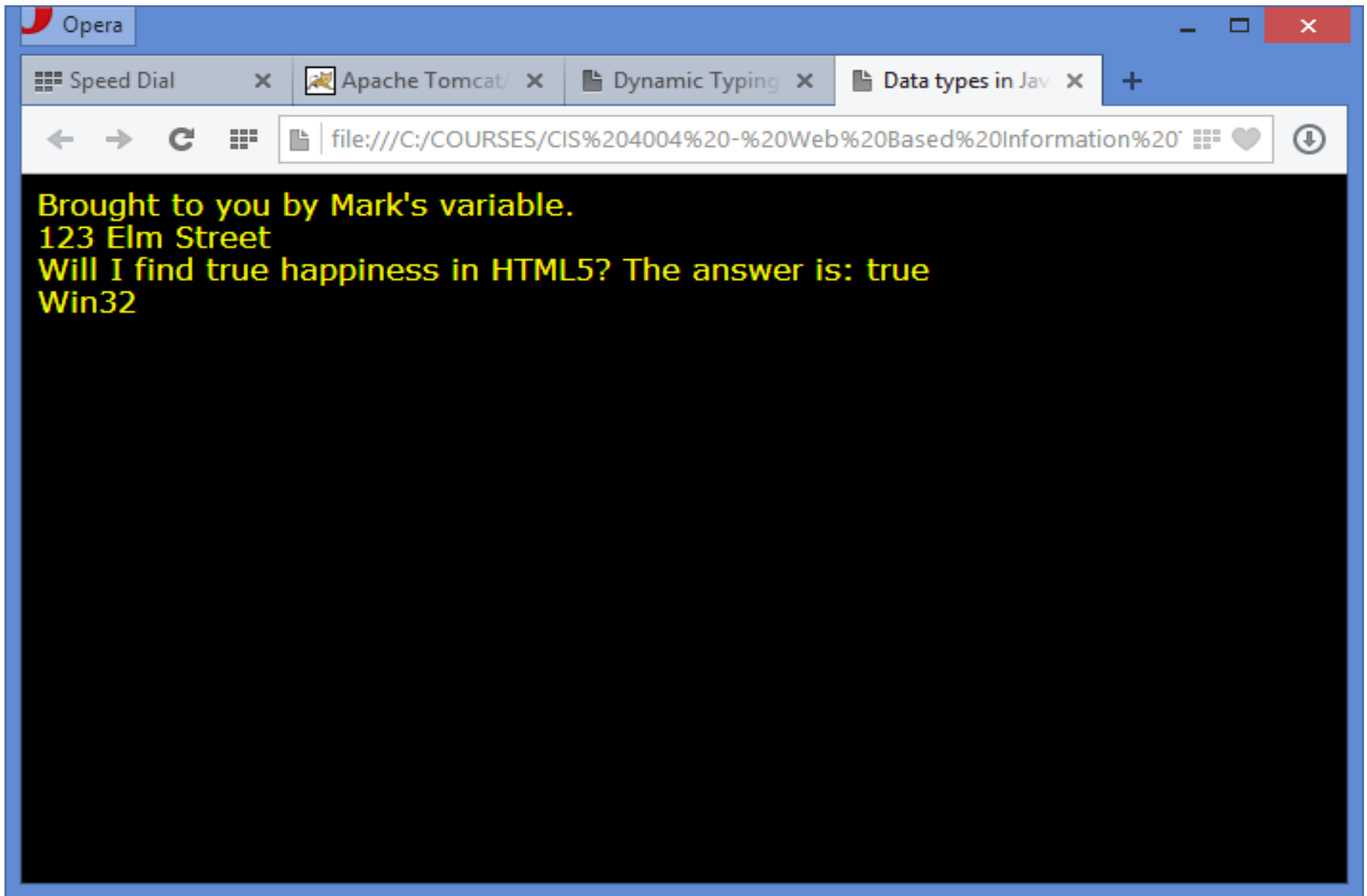# Using Variables

- JavaScript supports the following data types:

  - String: treated as text, typically in quotation marks.

  - Number: An actual number (integer or real) that responds to mathematical operations.

  - Boolean: A two state (true or false, 0 or 1) data type.

  - Function: a set of JavaScript operations contained in a module.

  - Object: An encapsulated collection of properties (variables/arrays) and methods (functions).

- The following example illustrates each of the JavaScript data types.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

exampleXMLxhr.html ☒ | simpleXMLxhr.js ☒ | prog1.java ☒ | javascript dynamic typing.html ☒ | SimpleVariable.html ☒

```html
13    <body>
14        <script type="text/javascript">
15        function advertisement() {
16            markVar="Brought to you by Mark's variable.";
17            return markVar;
18        }
19        //Variable with function
20        popUpAd=advertisement();
21        document.write(popUpAd);
22        //Variable with HTML5 code
23        cr="<br>";
24        document.write(cr);
25        // Variable with string
26        funHouse=" Elm Street";
27        // Boolean variable
28        var fate=true;
29        // Variable with string
30        query="Will I find true happiness in HTML5? The answer is: ";
31        // Variables with numbers
32        fun=100;
33        house=23;
34        // Math with variables
35        funPlusHouse=fun + house;
36        // Adding numeric and string variable (concatenation)
37        showAddress=funPlusHouse + funHouse;
38
39        browser=navigator.platform;
40        document.write(showAddress);
41        document.write(cr);
42        document.write(query);
43        document.write(fate);
```

Hyper Text Ma | length : 1141   lines : 49   Ln : 1   Col : 1   Sel : 0 | 0   UNIX   ANSI as UTF-8   INS

Brought to you by Mark's variable.
123 Elm Street
Will I find true happiness in HTML5? The answer is: true
Win32

Using Variables

- JavaScript supports arrays, which like normal variables are dynamically typed. Arrays are also dynamically sized in JavaScript.

- Unlike a normal variable which can hold one value at a time an array can hold many different values at the same time.

- Each element of an array can hold data of any data type. There is no requirement that each cell of an array contain the same type of data.

- To declare an array variable do the following:

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

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?

X

simpleXMLxhr.js   prog1.java   javascript dynamic typing.html   SimpleVariable.html   javascript arrays.html

```html
 5        <title> Arrays In JavaScript </title>
 6        <style type="text/css">
 7            <!--   body {background-color: #2AE; }
 8                   h2 { text-decoration: underline; }
 9            -->
10        </style>
11    </head>
12    <body>
13        <h2> Arrays In JavaScript </h2>
14        <script type="text/javascript">
15            var fruit = new Array();
16            fruit[0] = "Apples";
17            fruit[1] = "Oranges";
18            fruit[2] = "Grapes";
19                    fruit[3] = "Pears";
20            document.write("<h3><br /> fruit[0] = " + fruit[0]);
21            document.write("<br />");
22            var myFavoriteFruit=fruit.pop();   //pop() returns the last element in an array
23            document.write("<br /> My Favorite Fruit Is: " + myFavoriteFruit);
24            document.write("<br />");
25            document.write("<br /> There are currently " + fruit.length + " elements in fruit");
26            fruit[3] = 23;
27            fruit[4] = 50;
28            var total = fruit[3] + fruit[4];
29            document.write("<br />");
30            document.write("<br /> The sum of fruit[3] and [4] is = " + total);
31            document.write("<br /></h3>");
32        </script>
33    </body>
34 </html>
35
```

Hyper Text Markup Language file   length : 1035   lines : 35   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

Arrays In JavaScript

fruit[0] = Apples

My Favorite Fruit Is: Pears

There are currently 3 elements in fruit

The sum of fruit[3] and [4] is = 73

Using Variables

- If you create your own objects, you can get an idea of how objects work in the DOM.

- An object encapsulates both its properties and methods (functions).

- Creating an object is similar to creating a variable and assigning it a value.

- An object is sort of like a base of operations for doing a lot of different things and having different characteristics.

- Consider the following example that creates a JavaScript object named AddingMachine.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

simpleXMLxhr.js | prog1.java | javascript dynamic typing.html | SimpleVariable.html | javascript arrays.html | UserObject.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Way Simple Adding Machine - Using A Simple Object</title>
    <style type="text/css">
    <!--
        body { background-color: blue; color:white; fon          :bold;}
    -->
    </style>
    <script type="text/javascript">
        var AddingMachine=new Object();
            //Object properties
            AddingMachine.firstNumber=25;
            AddingMachine.secondNumber=72;
            //Object method
            AddingMachine.total=function()
        {
            document.write(this.firstNumber + this.secondNumber);
        }
        //Fire the method!
        AddingMachine.total();
    </script>
</head>
</html>
```
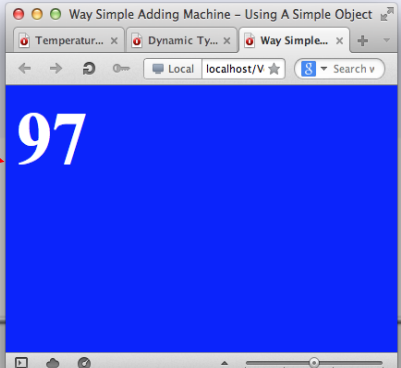
Create the object

Object properties

Object function (method)

Result

Invoke the method

97

Hyper Text Markup Language file   length : 605   lines : 26   Ln : 1   Col : 1   Sel : 0 | 0   UNIX

Writing A Variable's Value To A Web Page

- While some variables will be used only internally to JavaScript, others will need to be sent to the Web page for display.

- This is quite simple in JavaScript and is basically no different than what we have already been doing with our simple scripts that have been printing text (strings) to the Web page.

- The next page illustrates a simple HTML5 document with an embedded JavaScript that uses a variable which is sent to the Web page for rendering by the browser.

Writing A Variable's Value To A Web Page - Example

```
C:\Courses\CIS 4004 - Web Based Information Technology\code\JavaScript\JavaScript - Part 1\writing a javascript variable ...
```

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?

javascript dynamic typing.html | SimpleVariable.html | javascript arrays.html | UserObject.html | writing a javascript variable to a web page.html

```html
1   <!DOCTYPE html>
2   <html lang="en">
3   <head>
4       <meta charset="utf-8">
5       <title> Writing a JavaScript variable to a Web page  </title>
6       <style type="text/css">
7       <!--
8           body {background-color: #34CDEF; }
9       -->
10      </style>
11  </head>
12  <body>
13      <h1> Thanks for using JavaScript <img src="smiley1.jpg" alt="a smiley face" /> </h1>
14      <script type="text/javascript">
15          var userName = "Tiffany";
16          document.write("<h2><br /> Welcome ");
17          document.write(userName);
18          document.write(" !!<br /></h2>");
19      </script>
20  </body>
21  </html>
22
```

Hyper Text Markup Language file | length : 528 lines : 22 | Ln : 1 Col : 1 Sel : 0 | 0 | Dos\Windows | ANSI as UTF-8 | INS

Writing A Variable's Value To A Web Page - Example

This works great if all of the visitors to your site are named Tiffany, otherwise it won't be too useful!

Assigning Variable Values Using A Prompt

- To make your Web page more interactive, you obviously need some way to receive values from the visitor (we've already done this to some extent using only HTML5 with forms).

- In the previous example, things worked well if all the visitors to our Web page were named Tiffany. If your name happens to be Debi, the page doesn't really seem too personal!

- What we need to do is prompt the visitor to tell us their name, then we can assign that to a variable and use the value whenever it seems appropriate.

- The `prompt()` method is a method of the window object (just like the `alert()` method that we've already used in the intrinsic event examples to display the date and time). Normally the `prompt()` method is used in conjunction with a variable, so that the incoming data is stored in the variable.

```
someVariable = prompt("prompt message");
```
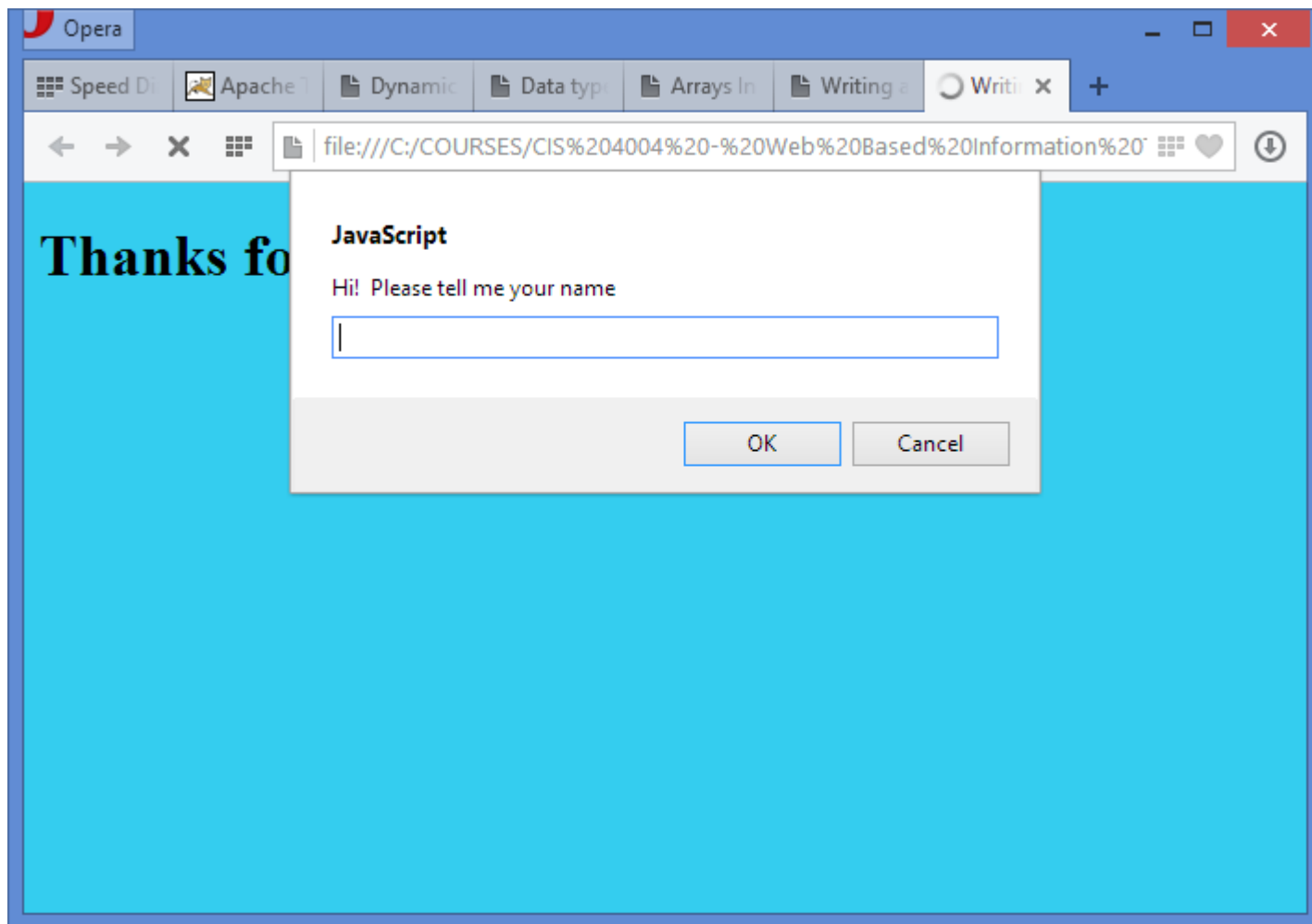
- The following example develops a modified version of the previous example using a prompt.

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?   X

SimpleVariable.html   javascript arrays.html   UserObject.html   writing a javascript variable to a web page.html   using a prompt with a variable.html
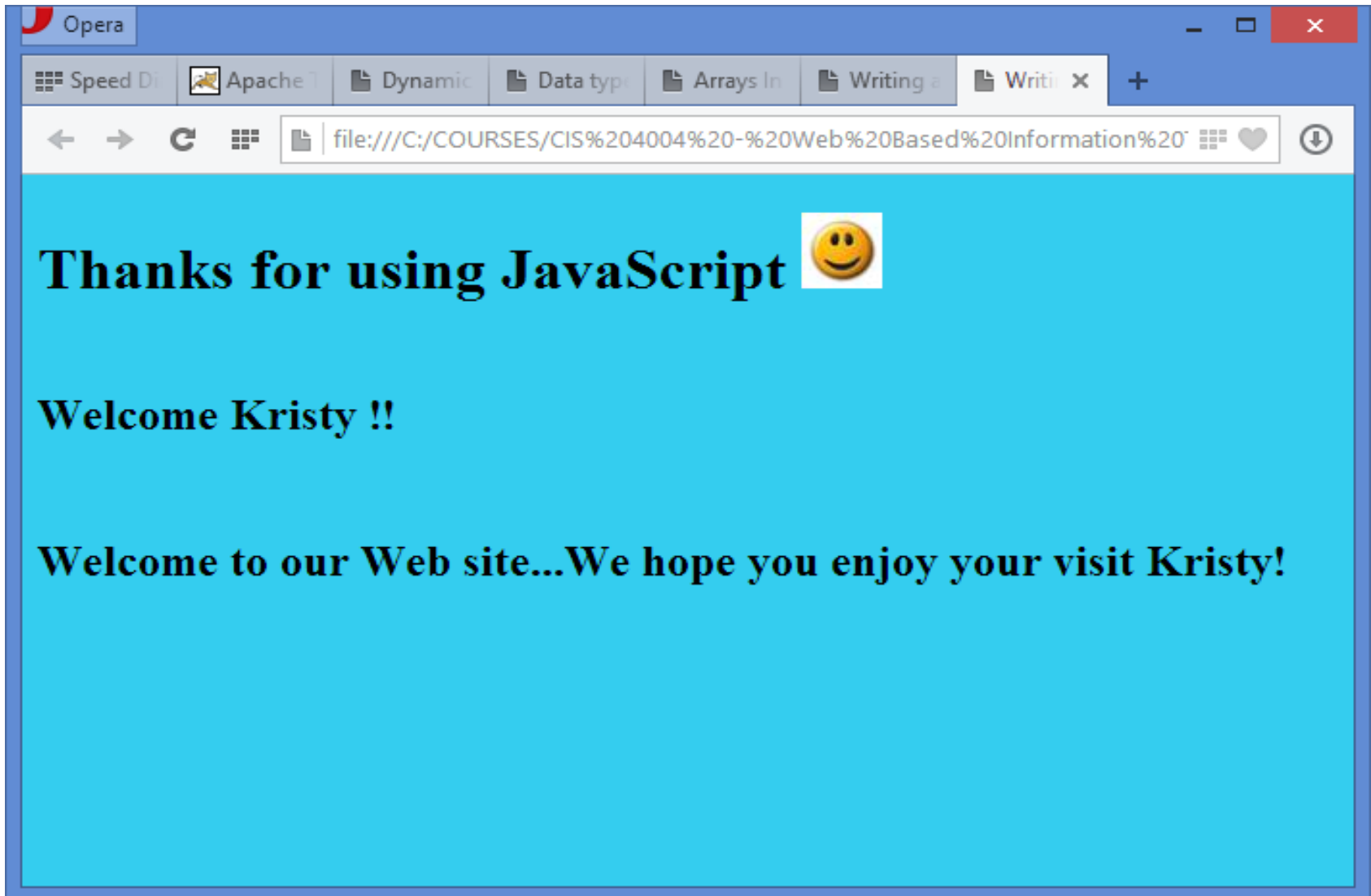
```
 1  <!DOCTYPE html>
 2  <html lang="en">
 3  <head>
 4      <meta charset="utf-8">
 5      <title> Writing a JavaScript variable to a Web page using a prompt  </title>
 6      <style type="text/css">
 7      <!--
 8          body {background-color: #34CDEF; }
 9      -->
10      </style>
11  </head>
12  <body>
13      <h1> Thanks for using JavaScript <img src="smiley1.jpg" alt="a smiley face" /> </h1>
14      <script type="text/javascript">
15          var userName;
16          userName = prompt("Hi!  Please tell me your name");
17          document.write("<h2><br /> Welcome ");
18          document.write(userName);
19          document.write(" !!<br /><br /> <br />");
20          document.write("Welcome to our Web site...We hope you enjoy your visit " + userName + "!<br /></h2>");
21      </script>
22  </body>
23  </html>
24
```
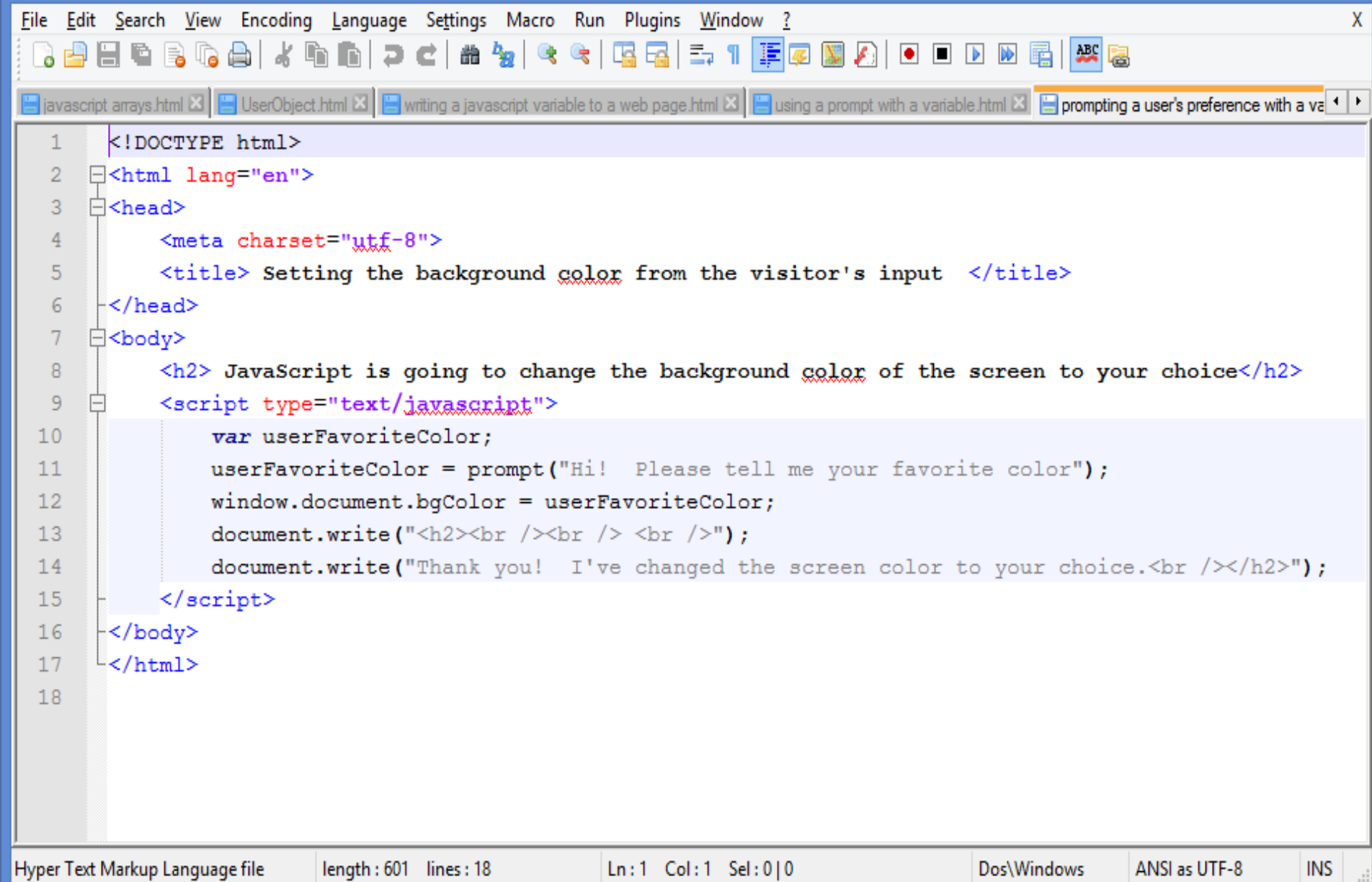
Hyper Text Markup Language file   length : 698   lines : 24   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

Initial page

After visitor enters their name and clicks "OK" in prompt window

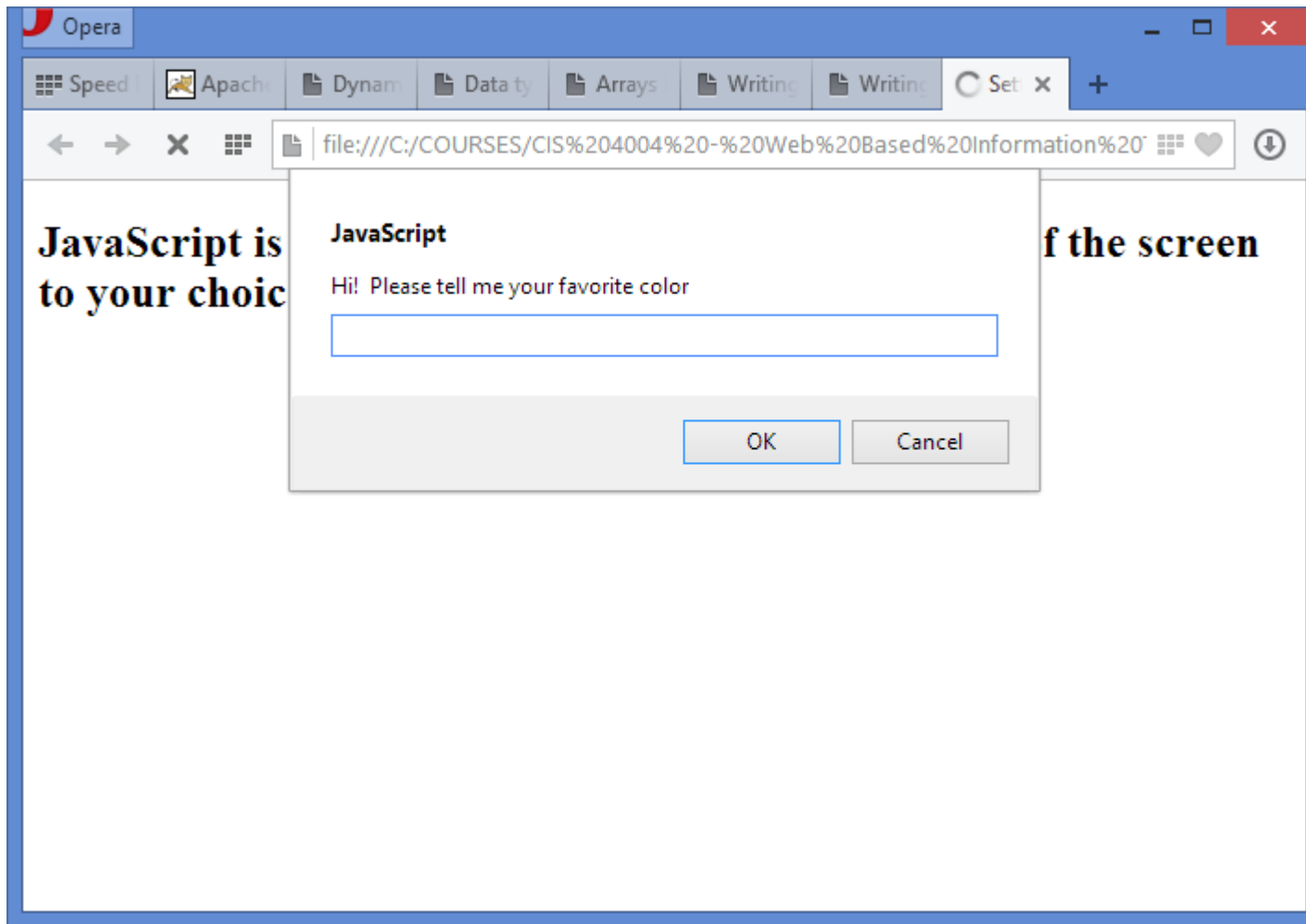# Assigning Variable Values Using A Prompt

- For a second example of using variables combined with user prompts, let's build a simple page that will ask the user to enter their favorite color and then reset the background color of the active window to their choice.

- In this case we'll be asking the user to enter a color and then use the value they enter as a parameter to a built-in JavaScript function that defines the background color of the active window.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

Tabs: javascript arrays.html | UserObject.html | writing a javascript variable to a web page.html | using a prompt with a variable.html | prompting a user's preference with a va

```html
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4      <meta charset="utf-8">
5      <title> Setting the background color from the visitor's input  </title>
6  </head>
7  <body>
8      <h2> JavaScript is going to change the background color of the screen to your choice</h2>
9      <script type="text/javascript">
10         var userFavoriteColor;
11         userFavoriteColor = prompt("Hi!  Please tell me your favorite color");
12         window.document.bgColor = userFavoriteColor;
13         document.write("<h2><br /><br /> <br />");
14         document.write("Thank you!  I've changed the screen color to your choice.<br /></h2>");
15     </script>
16  </body>
17  </html>
18
```
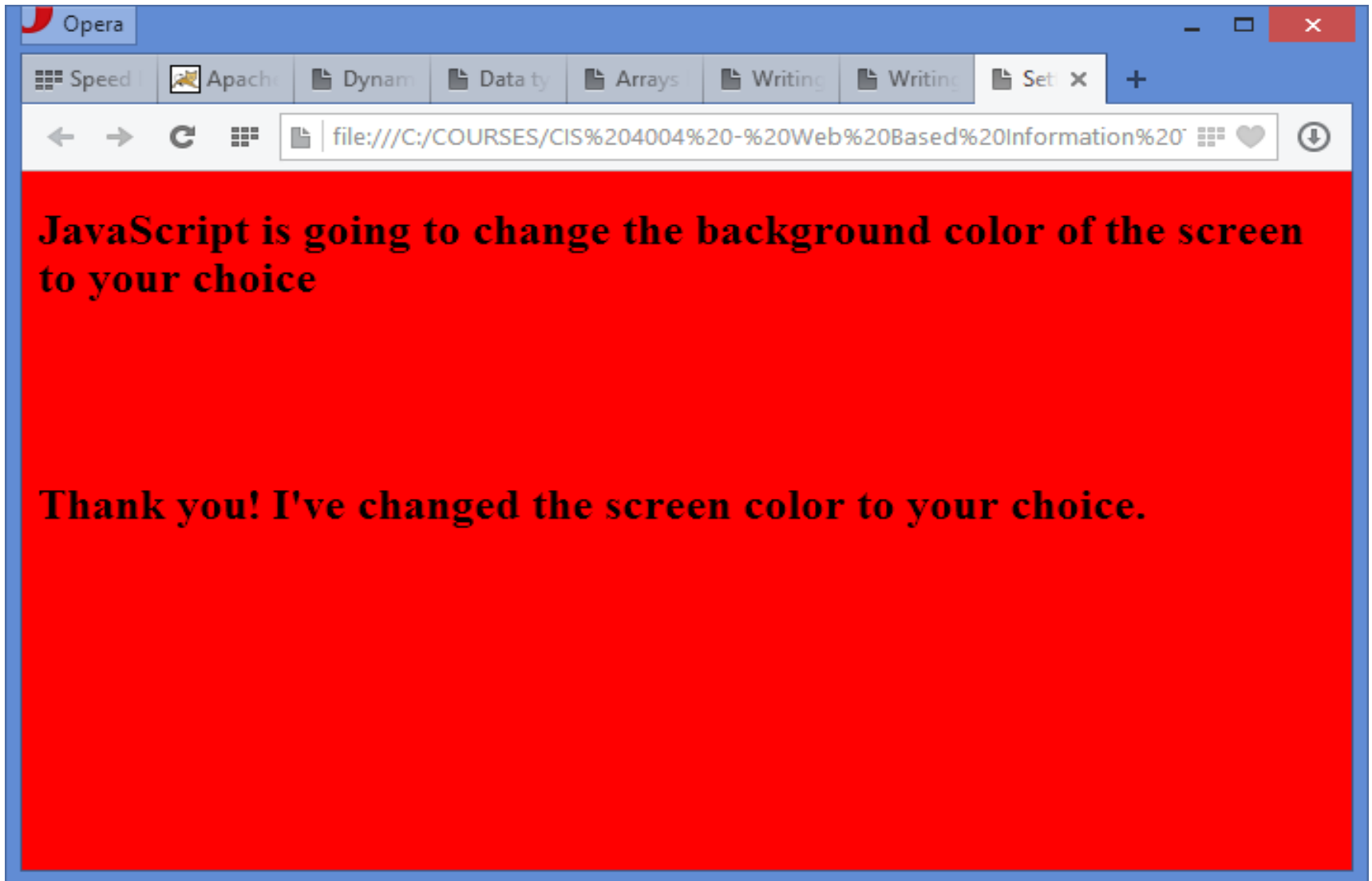
Hyper Text Markup Language file   length : 601   lines : 18   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

Initial page

After visitor enters their favorite color and clicks "OK" in prompt window

Functions In JavaScript
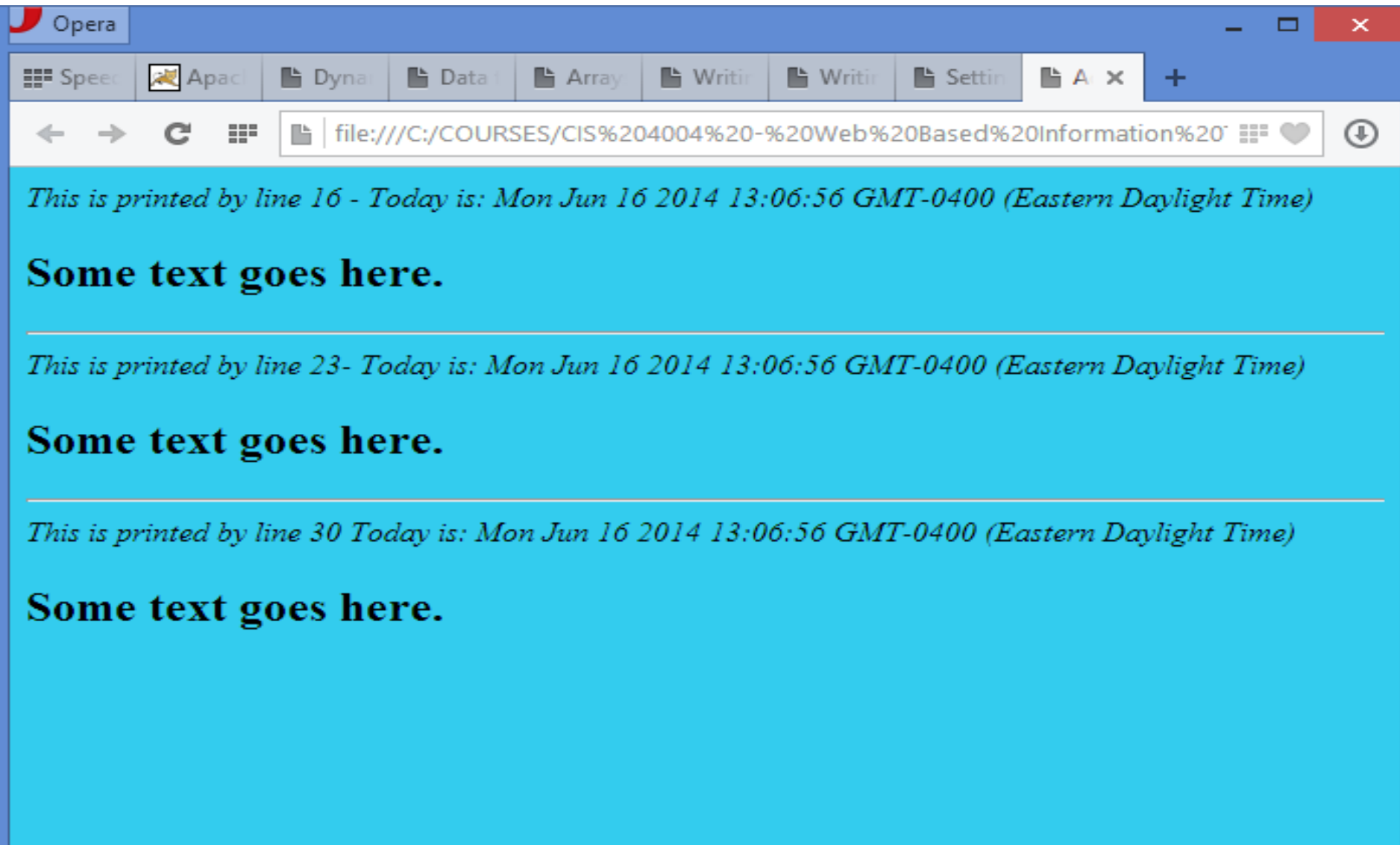
- A function is a set of JavaScript statements that perform some task.

- Every function must have a name and is invoked (or called) by other parts of a script. A function can be called as many times as needed during the running of a script (just like you can use the value of a variable as many times as you need).

- Look at the rendering of the HTML5 document shown on the next page. Notice that the date and time appear three times. The HTML5 document that produced this is shown on the subsequent page. Notice that the script to produce the date and time, appears three times.

- This markup does not use a function, it simply repeats the script code every place we want the date/time to appear in the rendering, in this case in three places.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

using a prompt with a variable.html   prompting a user's preference with a variable.html   date and time without functions.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Adding the date and time to a page via JavaScript without a function </title>
    <style type="text/css">
    <!--
        body {background-color: #33CCEE; }
    -->
    </style>
</head>
<body>
    <div>
        <i> <script type="text/javascript">
            document.write("This is printed by line 16 - Today is: " + Date()); </script> </i>
        <br />
        <h2> Some text goes here. </h2>
    </div>
    <hr />
    <div>
        <i> <script type="text/javascript">
            document.write("This is printed by line 23- Today is: " + Date()); </script> </i>
        <br />
        <h2> Some text goes here.</h2>
    </div>
    <hr />
    <div>
        <i> <script type="text/javascript">
            document.write("This is printed by line 30 Today is: " + Date()); </script> </i>
        <br />
        <h2> Some text goes here.</h2>
    </div>
</body>
```

Hyper Text Markup Language file   length : 858   lines : 35   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

Functions In JavaScript

This is printed by line 16 - Today is: Mon Jun 16 2014 13:06:56 GMT-0400 (Eastern Daylight Time)

Some text goes here.

This is printed by line 23- Today is: Mon Jun 16 2014 13:06:56 GMT-0400 (Eastern Daylight Time)

Some text goes here.

This is printed by line 30 Today is: Mon Jun 16 2014 13:06:56 GMT-0400 (Eastern Daylight Time)

Some text goes here.

Functions In JavaScript

- What a function allows us to do is simplify our HTML5 document, by not requiring us to duplicate the script each time we would like to have its effect placed into the document.

- Look at the next page, which produces a virtually identical rendering in a browser (the line numbers are different due to the different amount of code in the document). Notice that the code contains only a single appearance of the script code, this time as a function.

  – In this example, since the script itself is small, there is not a lot of space saved using a function, but at least we only had to write the actual script once. We'll see more advantages with functions as we progress to larger examples.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

using a prompt with a variable.html | prompting a user's preference with a variable.html | date and time without functions.html | date and time with a function.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Adding the date and time to a page via JavaScript using a function  </title>
    <script type="text/javascript">
        function writeDateAndTime() {
            document.write("Today is: " + Date());
        }
    </script>
    <style type="text/css">
    <!--        body {background-color: #33CCEE; }        -->
    </style>
</head>
<body>
    <div>
        Calling the function - line 19:  
        <i><script type="text/javascript"> writeDateAndTime();  </script> </i> <br />
        <h2> Some text goes here. </h2>
    </div>
    <hr />
    <div>
        Calling the function - line 25:  
        <i><script type="text/javascript"> writeDateAndTime();  </script> </i> <br />
        <h2> Some text goes here.</h2>
    </div>
    <hr />
    <div>
        Calling the function - line 31:  
        <i> <script type="text/javascript"> writeDateAndTime(); </script> </i> <br />
        <h2> Some text goes here. </h2>
    </div>
</div>
</body>
```

Hyper Text Markup Language file   length : 951   lines : 35   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20

Calling the function - line 19:   *Today is: Mon Jun 16 2014 13:07:43 GMT-0400 (Eastern Daylight Time)*

Some text goes here.

Calling the function - line 25:   *Today is: Mon Jun 16 2014 13:07:43 GMT-0400 (Eastern Daylight Time)*

Some text goes here.

Calling the function - line 31:   *Today is: Mon Jun 16 2014 13:07:43 GMT-0400 (Eastern Daylight Time)*

Some text goes here.

Functions In JavaScript

- The next function example is similar to the first except that the function simply prints a person's name every time it is called. Note that it always prints the same name!

- This function does not invoke a built-in function (like `Date()` in the previous example), it simply prints a line of text (a name) every time it is invoked.

File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

prompting a user's preference with a variable.html ☒ │ date and time without functions.html ☒ │ date and time with a function.html ☒ │ simple function example.html ☒

```html
 1  <!DOCTYPE html>
 2  <html lang="en">
 3  <head>
 4      <meta charset="utf-8">
 5      <title> Writing a JavaScript function  </title>
 6      <script type="text/javascript">
 7          function writeTiffany() {
 8              document.write("Tiffany");
 9          }
10      </script>
11      <style type="text/css">
12          <!--    body {background-color: #3CF; }   -->
13      </style>
14  </head>
15  <body>
16      <script type="text/javascript">
17              document.write("<h2><br /> Welcome ");
18              writeTiffany();
19              document.write(" !!<br />");
20              document.write("<br /> <br /> We hope you enjoy your visit ");
21              writeTiffany();
22              document.write(". <br />");
23              document.write("<br /> <br /> Have a nice day ");
24              writeTiffany();
25              document.write("!</h2>");
26      </script>
27      <img src="smiley1.jpg" alt="a smiley face" />
28  </body>
29  </html>
```

Hyper Text Markup Language file   length : 761   lines : 29   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

file:///C:/COURSES/CIS%204004%20-%20Web%20Based%20Information%20

Welcome Tiffany !!

We hope you enjoy your visit Tiffany.

Have a nice day Tiffany!

More On JavaScript Functions

- The functions we've seen so far have been functions which required no parameters. In other words, we did not need to send any information to the function in order for the function to accomplish its task. (Recall that when a function is invoked (called) it simply performs the task it was designed to accomplish.)

- In the previous example the function printed Tiffany's name. Suppose that we wanted the function to be able to print any visitor's name. To accomplish this, we would need to ask the user to enter their name and then send their name as a parameter to the function.

- Just like the variables we've already seen in JavaScript, a parameter is also a variable, but this variable belongs only to the function in which it is defined.

- Let's rewrite the previous example using a function with a parameter in which we will send the function the visitor's name.
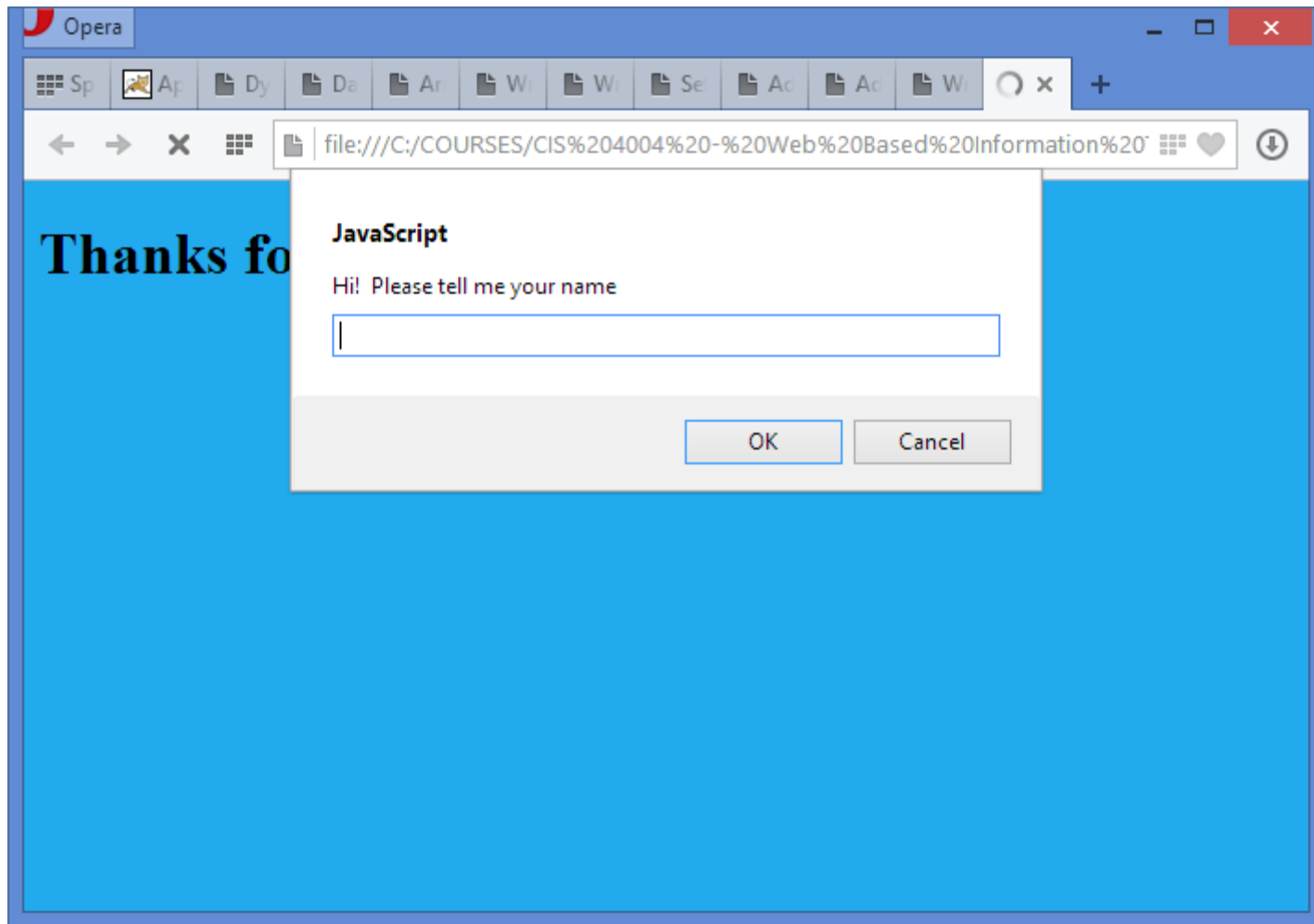
File   Edit   Search   View   Encoding   Language   Settings   Macro   Run   Plugins   Window   ?   X

date and time without functions.html   date and time with a function.html   simple function example.html   javascript function with parameters.html

```
 1   <!DOCTYPE html>
 2   <html lang="en">
 3   <head>
 4       <meta charset="utf-8">
 5       <title> JavaScript functions with parameters </title>
 6       <script type="text/javascript">
 7           function writeVisitorName(name) {
 8               document.write(" " + name + " ");
 9           }
10       </script>
11       <style type="text/css">
12           <!--  body {background-color: #2AE; }   -->
13       </style>
14   </head>
15   <body>
16       <h1> Thanks for using JavaScript <img src="smiley1.jpg" alt="a smiley face" /> </h1>
17       <script type="text/javascript">
18           var userName;
19           userName = prompt("Hi!  Please tell me your name");
20           document.write("<h2><br /> Welcome ");
21           writeVisitorName(userName);
22           document.write(" !!<br /><br /> <br />");
23           document.write("Welcome to our Web site...We hope you enjoy your visit ");
24           writeVisitorName(userName);
25           document.write("!<br /></h2>");
26       </script>
27   </body>
28   </html>
29
```

Hyper Text Markup Language file   length : 842   lines : 29   Ln : 1   Col : 1   Sel : 0 | 0   Dos\Windows   ANSI as UTF-8   INS

More On JavaScript Functions

More On JavaScript Functions