CSE 135

Client-Side Programming

JavaScript & Ajax

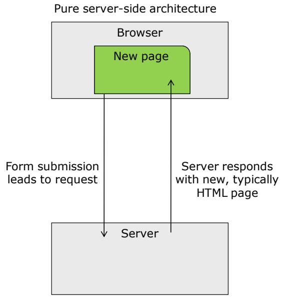
From pure server to client/server computation

- So far we have seen pure server-side programming

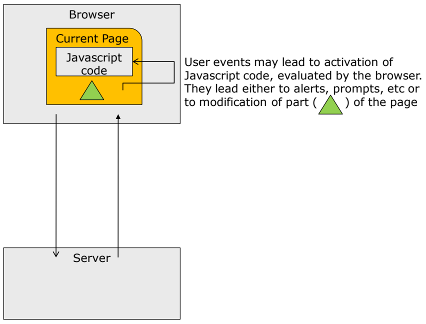
Next

- Enrich user experience, interactivity with client-side computations (JavaScript)
  - For example, validate that the user typed a number in a textbox
- Combine the best of both worlds with Ajax technologies
  - **Assignment focus: live views**

Architecturally speaking: Pure server-side programming

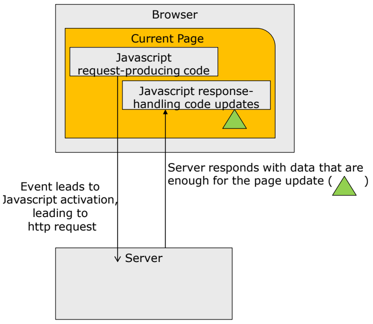

Pure server-side architecture
Browser
New page
Form submission leads to request
Server responds with new, typically HTML page
Server

Architecturally speaking: Client-side programming w Javascript



User events may lead to activation of Javascript code, evaluated by the browser. They lead either to alerts, prompts, etc or to modification of part (▲) of the page

Architecturally speaking: Ajax programming (@10 miles high)

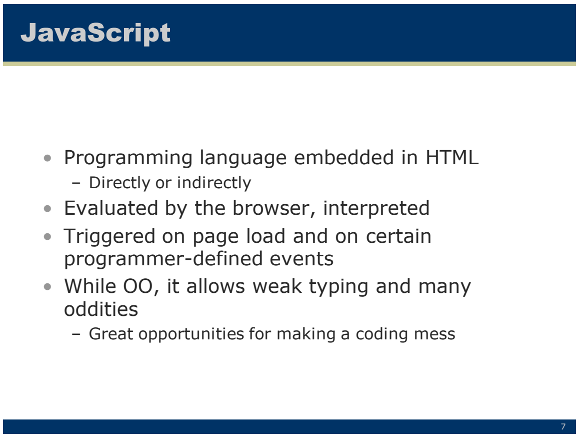

Browser
Current Page
Javascript request-producing code
Javascript response-handling code updates
Server

Event leads to Javascript activation, leading to http request

Server responds with data that are enough for the page update (▲)

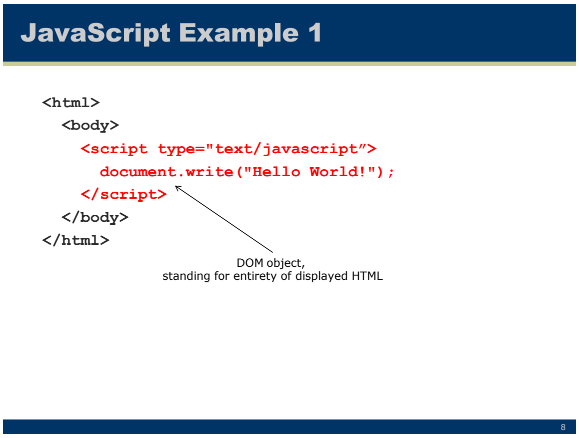
Preview: From basics to higher-level programming

1. First examples will demonstrate the essentials:
   - Directly accessing and manipulating the DOM object representation of the data shown on the browser
   - Packing & unpacking response data via XML
     - Not part of assignment – just broad knowledge
2. Making Javascript/DOM programming easier with utilities
   - Transferring data via JSON
   - Jquery
3. (much later) High level frameworks where you can altogether avoid Javascript
   - FORWARD
   - Ruby-on-Rails partials
   - GWT



JavaScript

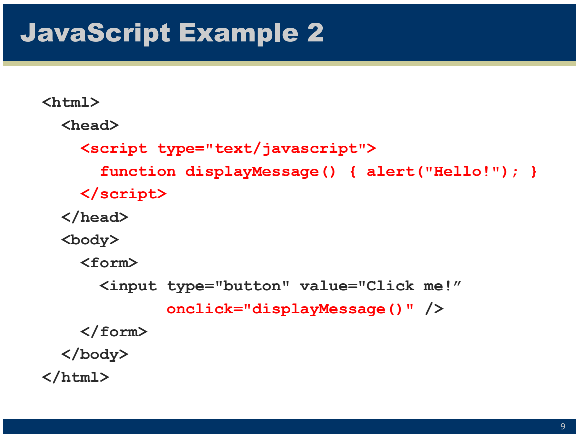
- Programming language embedded in HTML
  - Directly or indirectly
- Evaluated by the browser, interpreted
- Triggered on page load and on certain programmer-defined events
- While OO, it allows weak typing and many oddities
  - Great opportunities for making a coding mess



JavaScript Example 1

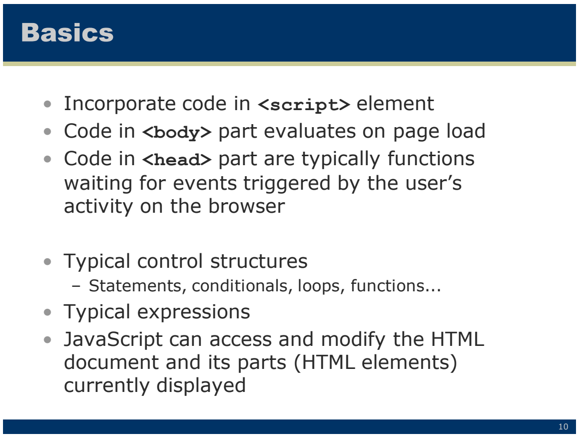
```
<html>
  <body>
    <script type="text/javascript”>
      document.write("Hello World!");
    </script>
  </body>
</html>
```

DOM object,
standing for entirety of displayed HTML



JavaScript Example 2

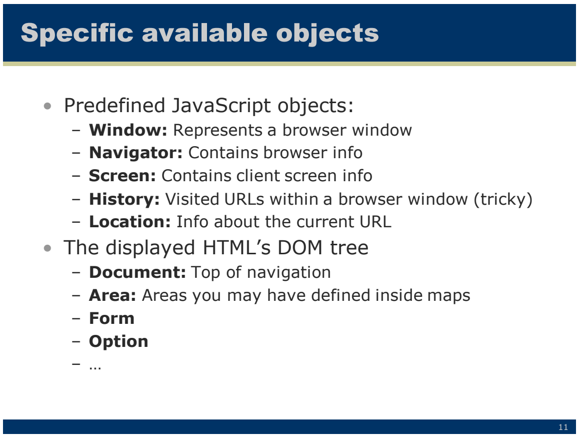
```
<html>
  <head>
    <script type="text/javascript">
      function displayMessage() { alert("Hello!"); }
    </script>
  </head>
  <body>
    <form>
      <input type="button" value="Click me!”
             onclick="displayMessage()" />
    </form>
  </body>
</html>
```



Basics

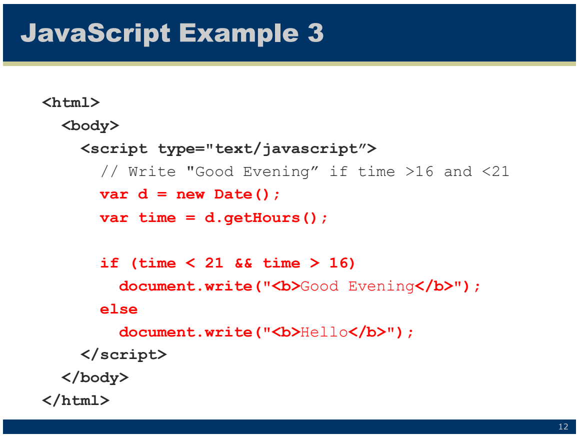
- Incorporate code in **<script>** element
- Code in **<body>** part evaluates on page load
- Code in **<head>** part are typically functions waiting for events triggered by the user’s activity on the browser

- Typical control structures
  - Statements, conditionals, loops, functions...
- Typical expressions
- JavaScript can access and modify the HTML document and its parts (HTML elements) currently displayed



Specific available objects

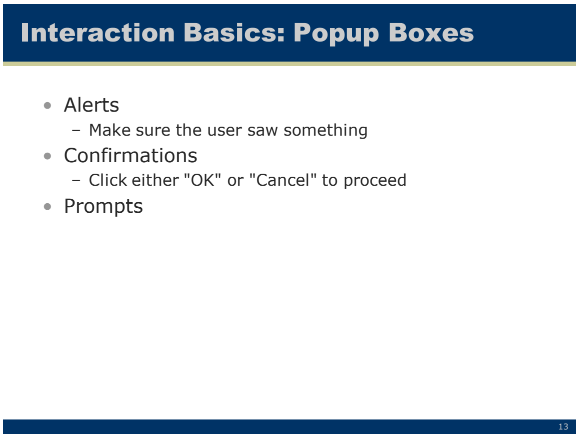
- Predefined JavaScript objects:
  - **Window:** Represents a browser window
  - **Navigator:** Contains browser info
  - **Screen:** Contains client screen info
  - **History:** Visited URLs within a browser window (tricky)
  - **Location:** Info about the current URL
- The displayed HTML’s DOM tree
  - **Document:** Top of navigation
  - **Area:** Areas you may have defined inside maps
  - **Form**
  - **Option**
  - …



JavaScript Example 3

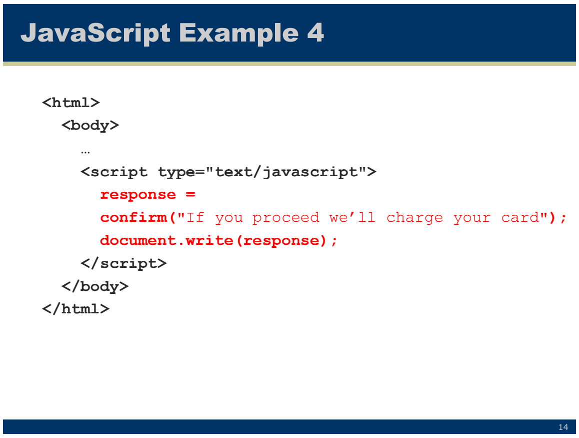
```
<html>
  <body>
    <script type="text/javascript”>
      // Write "Good Evening” if time >16 and <21
      var d = new Date();
      var time = d.getHours();

      if (time < 21 && time > 16)
        document.write("<b>Good Evening</b>");
      else
        document.write("<b>Hello</b>");
    </script>
  </body>
</html>
```



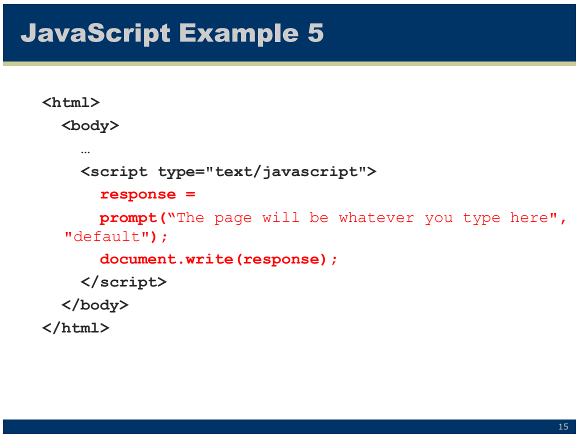
Interaction Basics: Popup Boxes

- Alerts
  - Make sure the user saw something
- Confirmations
  - Click either "OK" or "Cancel" to proceed
- Prompts



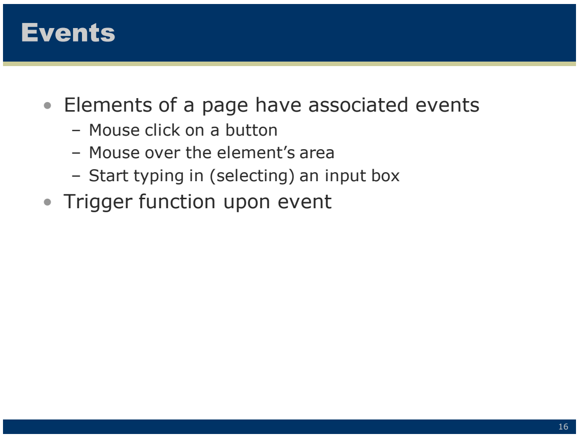
JavaScript Example 4

```
<html>
  <body>
    …
    <script type="text/javascript">
      response =
      confirm("If you proceed we’ll charge your card");
      document.write(response);
    </script>
  </body>
</html>
```



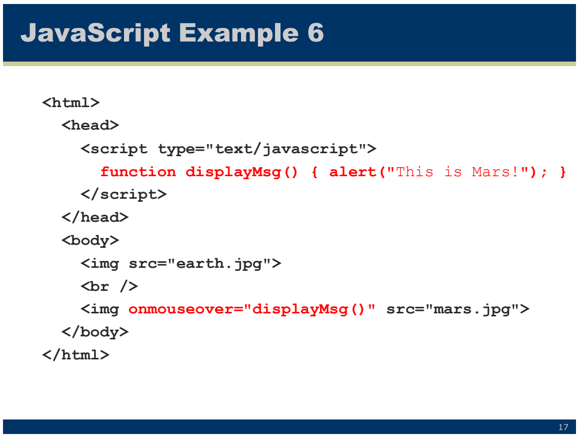
JavaScript Example 5

```
<html>
  <body>
    …
    <script type="text/javascript">
      response =
      prompt(“The page will be whatever you type here",
  "default");
      document.write(response);
    </script>
  </body>
</html>
```



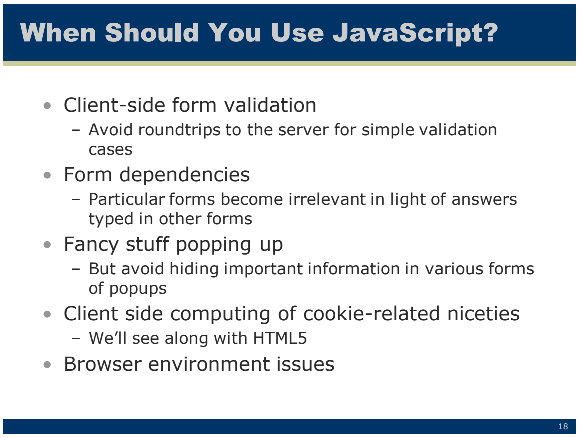
Events

- Elements of a page have associated events
  - Mouse click on a button
  - Mouse over the element’s area
  - Start typing in (selecting) an input box
- Trigger function upon event



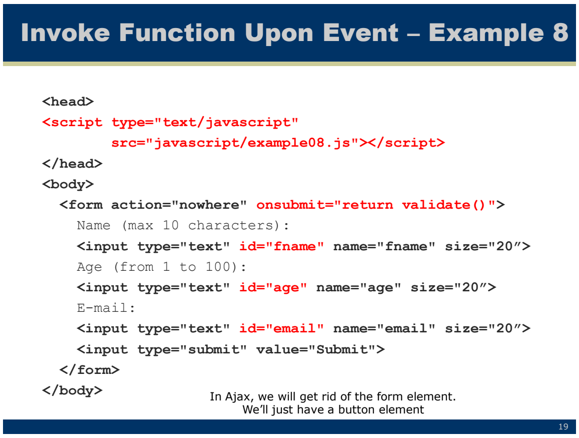
JavaScript Example 6

```
<html>
  <head>
    <script type="text/javascript">
      function displayMsg() { alert("This is Mars!"); }
    </script>
  </head>
  <body>
    <img src="earth.jpg">
    <br />
    <img onmouseover="displayMsg()" src="mars.jpg">
  </body>
</html>
```



When Should You Use JavaScript?

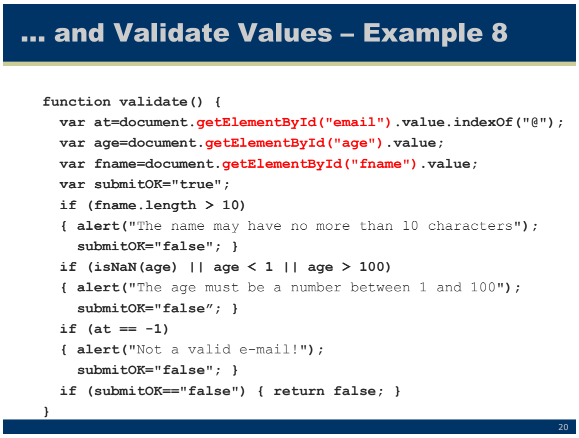
- Client-side form validation
  - Avoid roundtrips to the server for simple validation cases
- Form dependencies
  - Particular forms become irrelevant in light of answers typed in other forms
- Fancy stuff popping up
  - But avoid hiding important information in various forms of popups
- Client side computing of cookie-related niceties
  - We’ll see along with HTML5
- Browser environment issues



Invoke Function Upon Event – Example 8

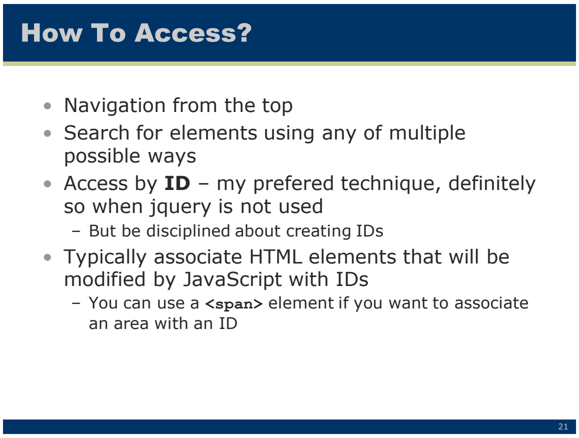
```
<head>
<script type="text/javascript"
        src="javascript/example08.js"></script>
</head>
<body>
  <form action="nowhere" onsubmit="return validate()">
    Name (max 10 characters):
    <input type="text" id="fname" name="fname" size="20”>
    Age (from 1 to 100):
    <input type="text" id="age" name="age" size="20”>
    E-mail:
    <input type="text" id="email" name="email" size="20”>
    <input type="submit" value="Submit">
  </form>
</body>
```

In Ajax, we will get rid of the form element.
We'll just have a button element



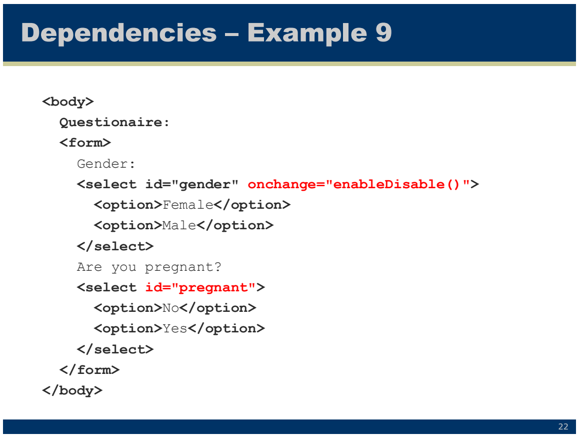
… and Validate Values – Example 8

```
function validate() {
  var at=document.getElementById("email").value.indexOf("@");
  var age=document.getElementById("age").value;
  var fname=document.getElementById("fname").value;
  var submitOK="true";
  if (fname.length > 10)
  { alert("The name may have no more than 10 characters");
    submitOK="false"; }
  if (isNaN(age) || age < 1 || age > 100)
  { alert("The age must be a number between 1 and 100");
    submitOK="false”; }
  if (at == -1)
  { alert("Not a valid e-mail!");
    submitOK="false"; }
  if (submitOK=="false") { return false; }
}
```



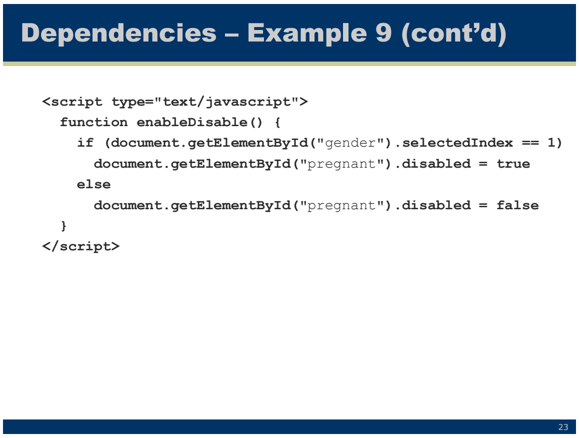
How To Access?

- Navigation from the top
- Search for elements using any of multiple possible ways
- Access by **ID** – my prefered technique, definitely so when jquery is not used
  - But be disciplined about creating IDs
- Typically associate HTML elements that will be modified by JavaScript with IDs
  - You can use a **`<span>`** element if you want to associate an area with an ID



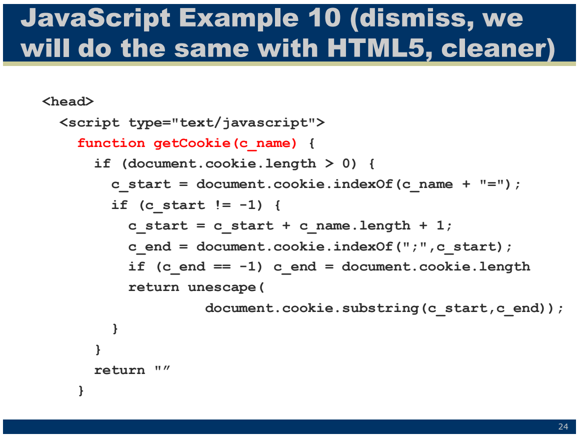
Dependencies – Example 9

```
<body>
  Questionaire:
  <form>
    Gender:
    <select id="gender" onchange="enableDisable()">
      <option>Female</option>
      <option>Male</option>
    </select>
    Are you pregnant?
    <select id="pregnant">
      <option>No</option>
      <option>Yes</option>
    </select>
  </form>
</body>
```



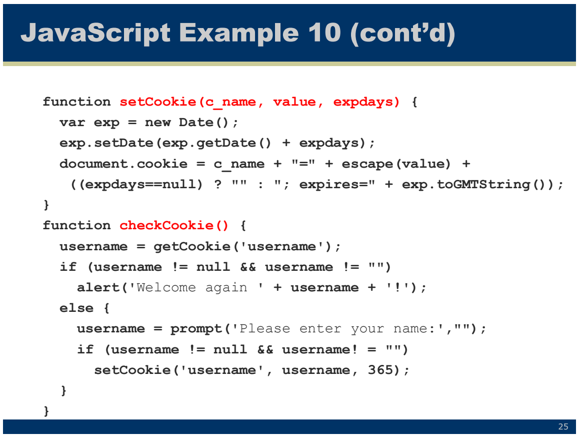
Dependencies – Example 9 (cont'd)

```
<script type="text/javascript">
  function enableDisable() {
    if (document.getElementById("gender").selectedIndex == 1)
      document.getElementById("pregnant").disabled = true
    else
      document.getElementById("pregnant").disabled = false
  }
</script>
```



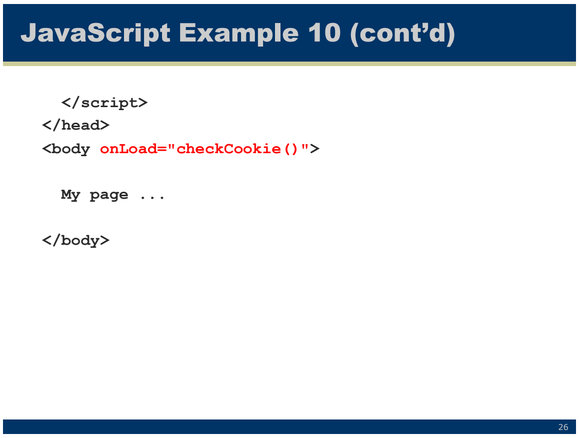
JavaScript Example 10 (dismiss, we will do the same with HTML5, cleaner)

```
<head>
  <script type="text/javascript">
    function getCookie(c_name) {
      if (document.cookie.length > 0) {
        c_start = document.cookie.indexOf(c_name + "=");
        if (c_start != -1) {
          c_start = c_start + c_name.length + 1;
          c_end = document.cookie.indexOf(";",c_start);
          if (c_end == -1) c_end = document.cookie.length
          return unescape(
                   document.cookie.substring(c_start,c_end));
        }
      }
      return "”
    }
```



JavaScript Example 10 (cont'd)

```
function setCookie(c_name, value, expdays) {
  var exp = new Date();
  exp.setDate(exp.getDate() + expdays);
  document.cookie = c_name + "=" + escape(value) +
   ((expdays==null) ? "" : "; expires=" + exp.toGMTString());
}
function checkCookie() {
  username = getCookie('username');
  if (username != null && username != "")
    alert('Welcome again ' + username + '!');
  else {
    username = prompt('Please enter your name:',"");
    if (username != null && username! = "")
      setCookie('username', username, 365);
  }
}
```



JavaScript Example 10 (cont'd)

```
  </script>
</head>
<body onLoad="checkCookie()">

  My page ...

</body>
```