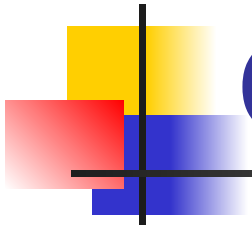
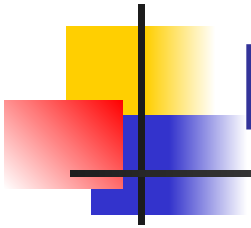
# HTML Documents and JavaScript

Tom Horton
Alfred C. Weaver
CS453 Electronic Commerce



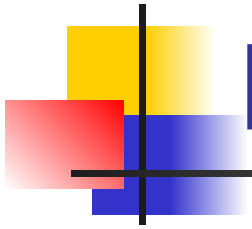
# Overview

- Some basic HTML
  - And principles and issues
- W3C Standards that are relevant
  - DOM, XML, XHTML, ECMAScript
- JavaScript introduction
- Your tasks:
  - HTML, JavaScript exercises in VirtualLabs
  - Homework 2 on JavaScript



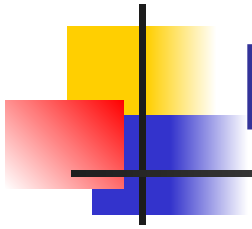
# Readings

- Many on-line tutorials
  - www.w3schools.com/Xhtml
  - Other on-line references (report!)
- ~~Our textbook~~
  - ~~Chap. 12 on HTML~~
- Virtual Lab exercises
  - On HTML, JavaScript



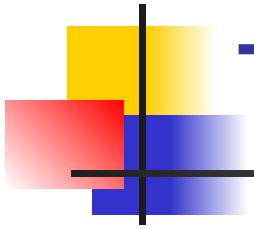
# HTML Background

- Many “markup” languages in the past
- SGML: Standard Generalized Markup Language
  - HTML (Hypertext Markup Language) based on SGML
- XML (eXtensible Markup Language) “replaces” SGML
  - XHTML is replacing HTML



# Principles

- Distinguish structure from presentation
  - Presentation based on structure
  - Presentation may vary, perhaps based on display characteristics, user-preference, etc.
- People like to ignore this idea
  - E.g. use <B> vs. <EM>
  - <font> tag?
- XML and CSS or XSL



# Tags and Elements

- Example of an element:
  <name attr1="attrval">content</name>
- Begin and end tags set off a section of a document
  - Has a semantic property by tag-name
  - Modified by attributes
- "content" can contain other elements
  - Elements nest, don't "overlap"
- Empty-elements: no end tag
  - <br /> <img … />
  - Note space before />

# Basic HTML Structure

- Comments:
  <!-- … -->
- Example:

```
<html>
  <head>
    …
  </head>
  <body>
    ….
  </body>
</html>
```

<--- title, meta-tags, etc. (not displayed)

<--- main content (displayed)

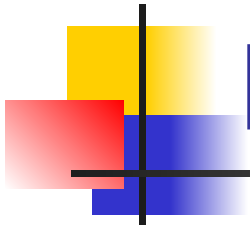
# Larger Example

```
<html>
<head>
<title>An Example</title>
</head>
<body>
<h3><hr>An Example</h3>
<p align="left">
  <font face="Comic Sans MS"
     size="4"><b>
  Hello World!</b></font>
</p>
<p align="right">
<font size="5"><u>I am
     21.</u></font>
</p>
<!-- see next column -->
```

```
<p>
  <ol type="I" start=7>
    <li><font
     color=#00FF00>Green</font><
     /li>
    <li>Yellow</li>
    <ul type=square>
      <li>John</li>
      <li>Mike</li>
    </ul>
  </ol>
</p>
</body>
</html>
```

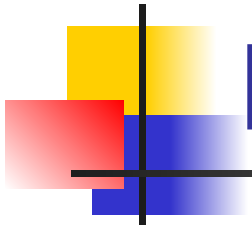
# Displays As...


An Example
file:///L
Google
Getting Started
Latest Headlines
Apple
Amazon
eBay
An Example
Hello World!
I am 21.
VII. Green
VIII. Yellow
John
Mike
Done



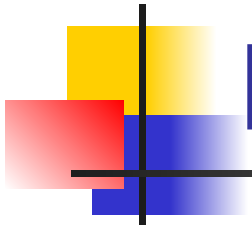
# Basic Tags

- Text display:
  - , , 
- Structure:
  - <h1>, <h2>, <h3>
  - <p>
  - <ul>, <ol>, <blockquote>
- Attributes:
  - Align, text, bgcolor, etc.



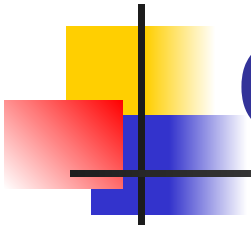
# Basic Tags (2)

- Links:
  <a href="…">…</a>
- Images:
  - <img src="…">  an empty tag
- Tables
  - Use an editor!
- Forms: later



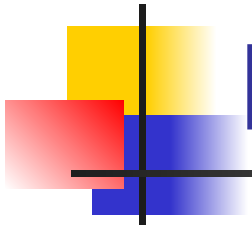
# More HTML

- Learn on your own
- You may never code in "raw" HTML
- You may need to tweak HTML files created by a tool
- You will need to understand HTML to code in JavaScript etc.
- You will need to understand HTML to know limitations on how docs on the web can be structured



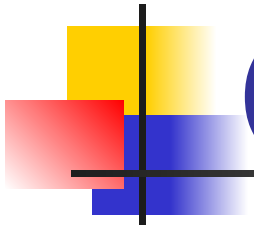
# Question:

- You're writing software to process an HTML page
  - A web-browser engine, for example
- What data structure would best represent an HTML document?
  - Why?



# Discuss and give me details

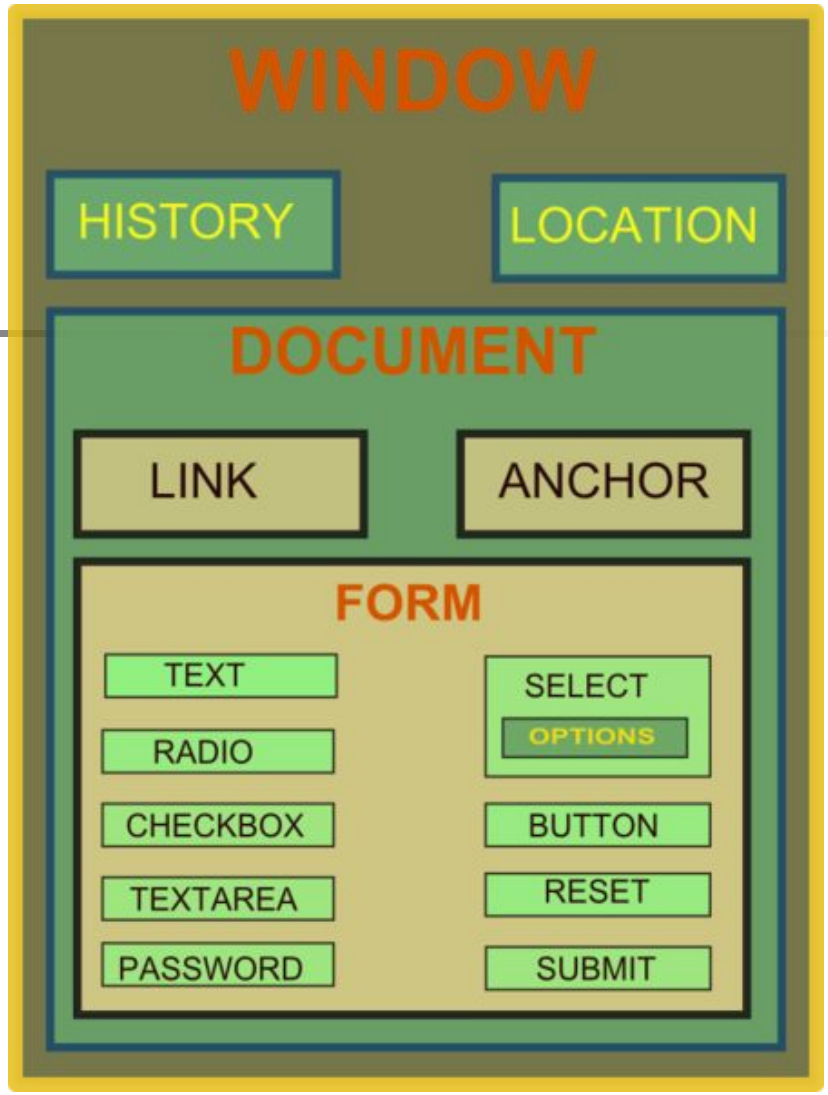
# Document Object Model (DOM)



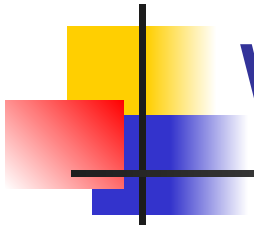
- An model for describing HTML documents (and XML documents)
  - A standard (ok, standards)
  - Independent of browser, language
    - (ok, mostly)
  - A common set of properties/methods to access everything in a web document
- APIs in JavaScript, for Java, etc.

# DOM

- You get anything you want from…

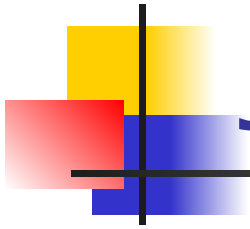



- More info: http://en.wikipedia.org/wiki/Document_Object_Model



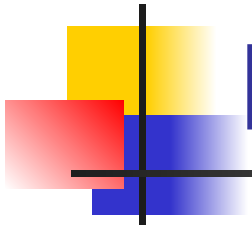
# W3C Standards

- XML, XHTML
- CSS, XSL
- XSLT
- DOM
- ECMAScript
- etc



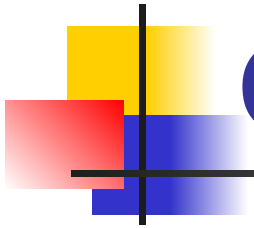
# JavaScript

- An example of a “scripting” langauge that is embedded in HTML documents
  - The browser’s display engine must distinguish from HTML and Script statements
- Others like this:
  - PHP (later in the course)



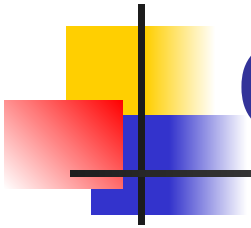
# History

- JavaScript created by Netscape
- JScript created by Microsoft
- IE and Netscape renderings are slightly different
- Standardized by European Computer Manufacturers Association (ECMA)
- http://www.ecma-international.org/publications /standards/Ecma-262.htm



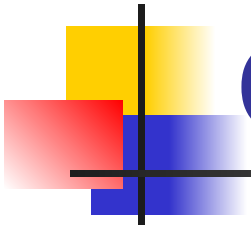
# General Format

- <!doctype ...>
- <html>
- <Head>
- <Title> Name of web page </title>
- <script type="text/javascript">
- ...script goes here
- </script>
- </head
- <body>
- ...page body here: text, forms, tables
- ...more JavaScript if needed
- ...onload, onclick, etc. commands here
- </body>
- </html>



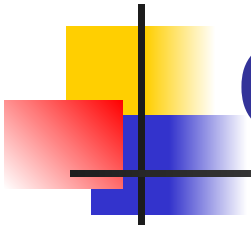
# Characteristics

- Case sensitive
- Object oriented
- Produces an HTML document
- Dynamically typed
- Standard operator precedence
- Overloaded operators
- Reserved words



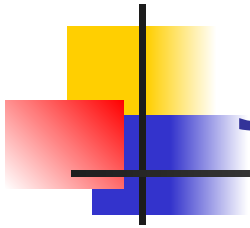
# Characteristics

- Division with / is not integer division
- Modulus (%) is not an integer operator
- 5 / 2 yields 2.5
- 5.1 / 2.1 yields 2.4285714285714284
- 5 % 2 yields 1
- 5.1 % 2.1 yields 0.8999999999999995



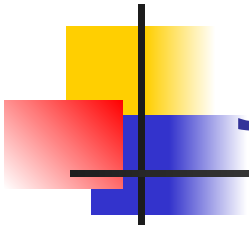
# Characteristics

- " and ' can be used in pairs
- Scope rules for variables
- Strings are very common data types
- Rich set of methods available
- Arrays have dynamic length
- Array elements have dynamic type
- Arrays are passed by reference
- Array elements are passed by value



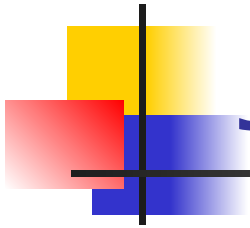
# JavaScript Topics

- code placement
- document.writeln
- document tags
- window.alert
- user input/output
- parseInt and parseFloat
- arithmetic
- arithmetic comparisons
- for loops
- while loops
- do-while loops
- if-else
- variable values in tags
- math library
- switch
- break
- labeled break
- continue
- Booleans



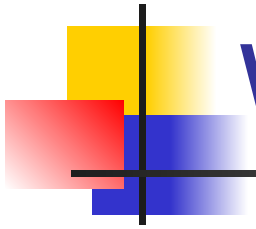
# JavaScript Topics

- functions
- random numbers
- rolling dice
- form input
- form output
- submit buttons
- games
- arrays
- searching
- strings
- substrings
- string conversions
- markup methods



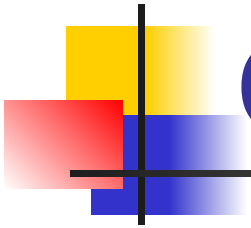
# JavaScript's Uses Include:

- "Dynamic" web-pages
  - What's DHTML? (in a second)
- Image manipulation
  - Swapping, rollovers, slide shows, etc.
- Date, time stuff (e.g. clocks, calendars)
- HTML forms processing
  - Verifying input; writing output to fields
- Cookies



# What's DHTML?

- Purpose: make dynamic / interactive web-pages on the client side
- Use of a collection of technologies together to do this, including
  - Markup language (HTML, XML, etc.)
  - Scripting language (JavaScript, etc.)
  - Presentation language (CSS etc.)



# Other References

- CS453 Virtual Lab exercises
- *The Web Wizard's Guide To JavaScript*, Steven Estrella, Addison-Wesley
- *JavaScript for the World Wide Web*, Gesing and Schneider, Peachpit Press
- http://www.w3schools.com/js/
- *www.javascript.com*
- E-books in UVa's Safari On-line Books: http://proquest.safaribooksonline.com/search

# Browser Compatability

- Use of:

```
<script type=”text/javascript"
language=”javascript" >
<!--

// ends script hiding -->
</script>
```

- “language=“ for pre IE5 and NS6
- Comment for very old browsers (e.g. IE2)
  - BTW, comments in HTML vs. in JavaScript

# Organization of JavaScript

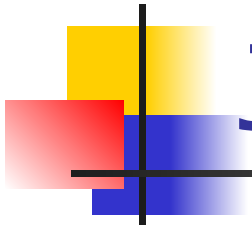
- Create functions (non-OO style)
  - Define in header
  - Or load a .js file in header:

```
<script type="text/javascript"
language="javascript" src="mylib.js">
```

- Functions called in <BODY>
  - Often in response to events, e.g.

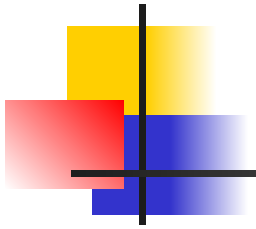
```
<input type="button"… onclick="myFunc(…);">
```

- Global variables



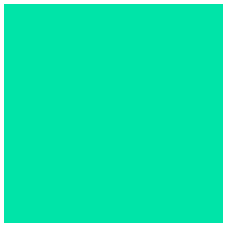
# JavaScript

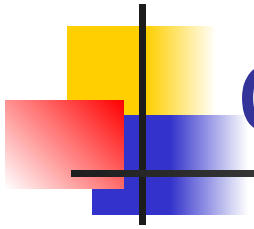
- Programming by example



# document.writeln

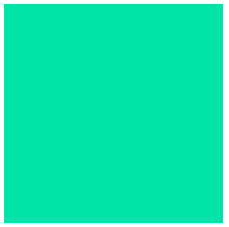
```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<!– Welcome to JavaScript -->
<HEAD>
<TITLE> Welcome to JavaScript </TITLE>
<SCRIPT TYPE="text/javascript">
     document.writeln( "<FONT COLOR='magenta'><H1>Welcome to ",
      "JavaScript Programming!</H1></FONT>" );
</SCRIPT>
</HEAD>
<BODY>
</BODY>
</HTML>
```





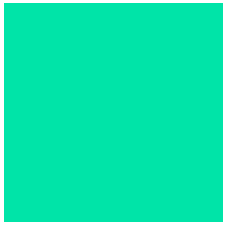
# document.write

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
<TITLE> Using document.write </TITLE>
<SCRIPT TYPE="text/javascript">
     document.write (    "<H1>Welcome to ");
     document.writeln(    "JavaScript Programming!</H1>" );
</SCRIPT>
</HEAD>
<BODY>
</BODY>
</HTML>
```



# window.alert

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
<TITLE> Using window.alert </TITLE>
<SCRIPT TYPE="text/javascript">
     window.alert( "Welcome to\nJavaScript\nProgramming!" );
</SCRIPT>
</HEAD>
<BODY>
<P>Click Refresh (or Reload) to run this script again.</P>
</BODY>
</HTML>
```



# User input/output

```
<SCRIPT TYPE="text/javascript">
    var firstNumber,   // first string entered by user
    secondNumber,   // second string entered by user
    number1,          // first number to add
    number2,          // second number to add
    sum;              // sum of number1 and number2
    // read in first number from user as a string
    firstNumber = window.prompt("Enter first integer", "0" );
    // read in second number from user as a string
    secondNumber = window.prompt( "Enter second integer", "0" );
    // convert numbers from strings to integers
    firstNumber = parseInt(firstNumber);
    number2 = parseInt( secondNumber );
    // add the numbers
    sum = firstNumber + number2;
    // display the results
    document.writeln( "<H1>The sum is " + sum + "</H1>" );
</SCRIPT>
```

# Functions

```
<SCRIPT TYPE = "text/javascript">
      var input1 = window.prompt( "Enter first number", "0" );
      var input2 = window.prompt( "Enter second number", "0" );
      var input3 = window.prompt( "Enter third number", "0" );
      var value1 = parseFloat( input1 );
      var value2 = parseFloat( input2 );
      var value3 = parseFloat( input3 );
      var maxValue = maximum( value1, value2, value3 );
      document.writeln( "First number: " + value1 +
          "<BR>Second number: " + value2 +
        "<BR>Third number: " + value3 +
          "<BR>Maximum is: " + maxValue );
      // maximum method definition (called from above)
      function maximum( x, y, z ) {
            return Math.max( x, Math.max( y, z ) );
       }
</SCRIPT>
```

# Random Numbers

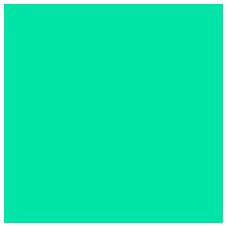
```
<SCRIPT TYPE="text/javascript">
    var value;
    document.writeln( "<H1>Random Numbers</H1>" +
       "<TABLE BORDER = '1' WIDTH = '50%'><TR>" );
    for ( var i = 1; i <= 20; i++ ) {
       value = Math.floor( 1 + Math.random() * 6 );
       document.writeln( "<TD>" + value + "</TD>" );
       if ( i % 5 == 0 && i != 20 )
          document.writeln( "</TR><TR>" );
    }
    document.writeln( "</TR></TABLE>" );
</SCRIPT>
```

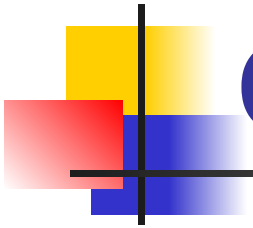
# Roll the Die

```
<SCRIPT TYPE="text/javascript">
    var frequency1 = 0, frequency2 = 0,
    frequency3 = 0, frequency4 = 0,
    frequency5 = 0, frequency6 = 0, face;
    // summarize results
    for ( var roll = 1; roll <= 6000; ++roll ) {
       face = Math.floor( 1 + Math.random() * 6 );
       switch ( face ) {
       case 1: ++frequency1; break;
       case 2: ++frequency2; break;
       case 3: ++frequency3; break;
       case 4: ++frequency4; break;
       case 5: ++frequency5; break;
       case 6: ++frequency6; break;
       }
    }
    document.writeln( "<TABLE BORDER = '1' WIDTH = '50%'>" ); .....
```

# Rules of Craps

- First roll:
  - 7 or 11 is a win
  - 2, 3, or 12 is a lose
  - otherwise, roll becomes your point
- Subsequent rolls:
  - rolling your point is a win
  - 7 or 11 is a lose
  - otherwise continue to roll



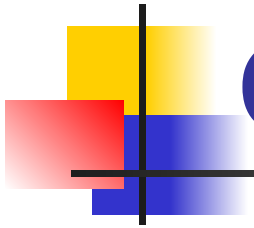


# Craps

```
<SCRIPT TYPE="text/javascript">
// variables used to test the state of the game
var WON = 0, LOST = 1, CONTINUE_ROLLING = 2;
// other variables used in program
var firstRoll = true,     // true if first roll
sumOfDice = 0,            // sum of the dice
myPoint = 0,              // point if no win/loss on first roll
gameStatus = CONTINUE_ROLLING;  // game not over yet
```

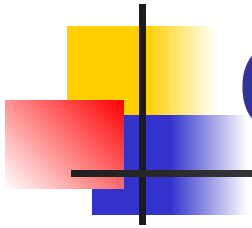
# Craps

```
// process one roll of the dice
function play() {
   if ( firstRoll ) {
      // first roll of the dice
      sumOfDice = rollDice();
      switch ( sumOfDice ) {
         case 7: case 11:
            // win on first roll
            gameStatus = WON;
            document.craps.point.value = ""; // clear point field
            break;
         case 2: case 3: case 12:
            // lose on first roll
            gameStatus = LOST;
            document.craps.point.value = ""; // clear point field
            break;
```



# Craps

```
default:
            // remember point
            gameStatus = CONTINUE_ROLLING;
            myPoint = sumOfDice;
            document.craps.point.value = myPoint;
            firstRoll = false;
         }
   }
   else {
      sumOfDice = rollDice();
      if ( sumOfDice == myPoint ) gameStatus = WON;
      else if ( sumOfDice == 7 )  gameStatus = LOST;
   }
```

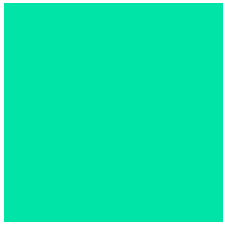


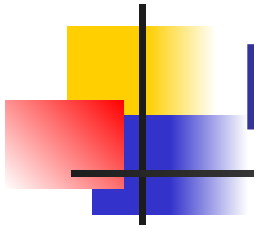
# Craps

```
if ( gameStatus == CONTINUE_ROLLING ) window.alert ("Roll again");
   else {
      if ( gameStatus == WON ) {
         window.alert ("Player wins. " + "Click Roll Dice to play again.");
         document.craps.point.value = " ";
      }
      else {
         window.alert ("Player loses. " + "Click Roll Dice to play again.");
         document.craps.point.value = " ";
      }
  firstRoll = true;
  }
}
```

# Craps

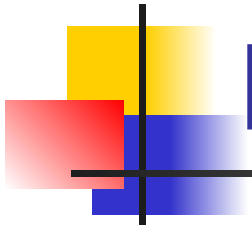
```
// roll the dice
function rollDice() {
   var die1, die2, workSum;
   die1 = Math.floor( 1 + Math.random() * 6 );
   die2 = Math.floor( 1 + Math.random() * 6 );
   workSum = die1 + die2;
   document.craps.firstDie.value = die1;
   document.craps.secondDie.value = die2;
   document.craps.sum.value = workSum;
   return workSum;
}
</SCRIPT>
```





# Poker Hand

```
<SCRIPT TYPE="text/javascript">
function rand1toN(N) {
   return Math.floor( 1+Math.random()*N );
   }
function dealcard(card) {
   var rank = new Array(0,"A","2","3","4","5","6","7",
        "8","9","T","J","Q","K");
   var suit = new Array(0, "Spades", "Hearts", "Diamonds", "Clubs");
   card[0] = rank[rand1toN(13)];
   card[1] = suit[rand1toN(4)];
}
```



# Poker Hand

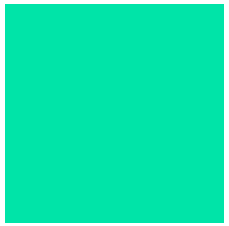
```
var card = new Array(2);
var player = new Array(10);
var dealer = new Array(10);
for (var i=0; i<=4; i++) {
   dealcard(card);
   player[i*2] = card[0];
   player[i*2+1] = card[1];
   dealcard(card);
   dealer[i*2] = card[0];
   dealer[i*2+1] = card[1];
}
```

# Poker Hand

```
document.writeln("<H1> PLAYER </H1>");
document.writeln("<TABLE BORDER='1' >");
for (var i=0; i<=4; i++) {
   document.writeln("<TR><TD><P>" + player[i*2] + "</TD>"
     + "<TD><P>" + player[i*2+1] + "</TD></TR>");
}
document.writeln("</TABLE> </HTML>");
</SCRIPT>
```

# Character Processing

```
<SCRIPT TYPE="text/javascript">
var s = "ZEBRA";
var s2 = "AbCdEfG";
document.writeln( "<P> Character at index 0 in '"+
   s + "' is " + s.charAt( 0 ) );
document.writeln( "<BR>Character code at index 0 in '" +
   s + "' is " + s.charCodeAt( 0 ) + "</P>" );
document.writeln( "<P>'" + String.fromCharCode( 87, 79, 82, 68 ) +
   "' contains character codes 87, 79, 82 and 68</P>" );
document.writeln( "<P>'" + s2 + "' in lowercase is '" +
   s2.toLowerCase() + "'" );
document.writeln( "<BR>'" + s2 + "' in uppercase is '" +
   s2.toUpperCase() + "'</P>" );
</SCRIPT>
```

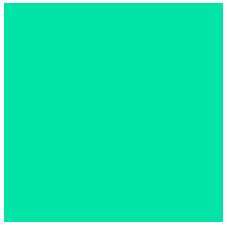


# Dates and Times

```
<SCRIPT LANGUAGE = "JavaScript">
var current = new Date();
document.writeln(current);
document.writeln( "<H1>String representations and valueOf</H1>" );
document.writeln( "toString: " + current.toString() +
    "<BR>toLocaleString: " + current.toLocaleString() +
    "<BR>toUTCString: " + current.toUTCString() +
    "<BR>valueOf: " + current.valueOf() );
document.writeln( "<H1>Get methods for local time zone</H1>" );
document.writeln( "getDate: " + current.getDate() +
   "<BR>getDay: " + current.getDay() + "<BR>getMonth: " +
   current.getMonth() + "<BR>getFullYear: " + current.getFullYear() +
   "<BR>getTime: " + current.getTime() + "<BR>getHours: " +
   current.getHours() + "<BR>getMinutes: " + current.getMinutes() +
   "<BR>getSeconds: " + current.getSeconds() +  "<BR>getMilliseconds: " +
   current.getMilliseconds() + "<BR>getTimezoneOffset: " +
   current.getTimezoneOffset() );
```

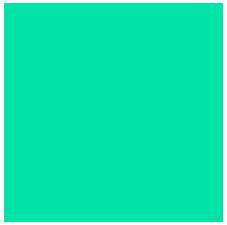
# Dates and Times

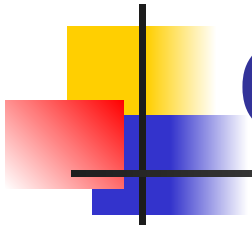
```
document.writeln( "<H1>Specifying arguments for a new Date</H1>" );
var anotherDate = new Date( 1999, 2, 18, 1, 5, 3, 9 );
document.writeln( "Date: " + anotherDate );
document.writeln( "<H1>Set methods for local time zone</H1>" );
anotherDate.setDate( 31 );
anotherDate.setMonth( 11 );
anotherDate.setFullYear( 1999 );
anotherDate.setHours( 23 );
anotherDate.setMinutes( 59 );
anotherDate.setSeconds( 59 );
document.writeln( "Modified date: " + anotherDate );
</SCRIPT>
```



# Radio buttons

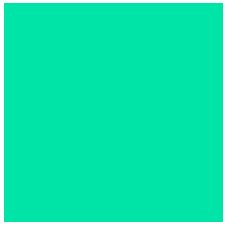
- Assure that at least one radio button is clicked before taking action

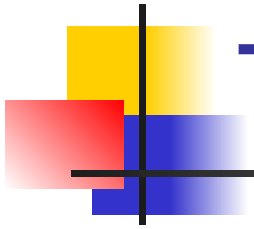




# Checkboxes

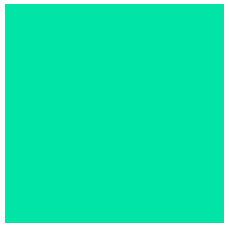
- Respond to selections made with checkboxes





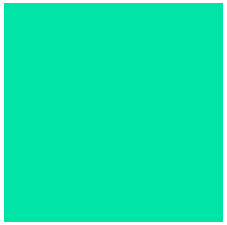
# Textboxes

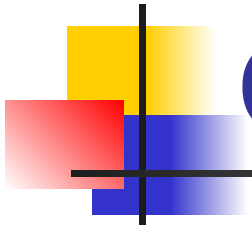
- Detecting an empty textbox



# Self-grading Tests

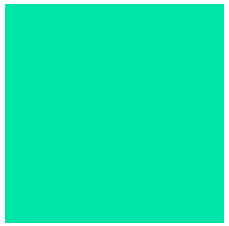
- Collecting and evaluating answers to questions

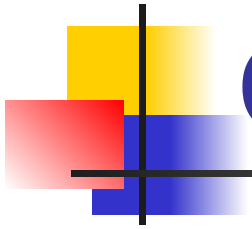




# Character String Processing

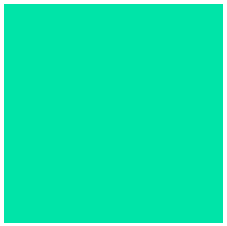
- Validate an email address

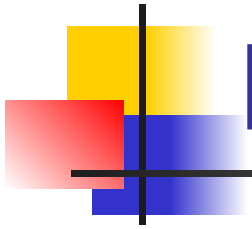




# Cookies

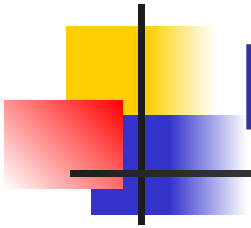
- Write a cookie on the client's device





# Events

- JavaScript can execute a statement (typically, call a function) when an event occurs
- <… *oneventname*="javascript stmt;">
- <BODY … ONLOAD="func();">
- <INPUT TYPE="submit" … ONSUBMIT="f();">

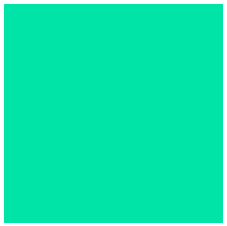


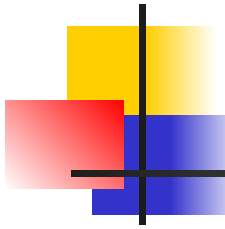
# Events

- *onsubmit* - call when submit button is clicked
- *onclick* - call when this button is clicked
- *onreset* - call when the reset button is clicked
- *onload* - call after page loads
- *onmouseover* - call when mouse pointer enters image area
- *onmouseout* - call when mouse pointer leaves image area
- *onfocus* - call when control receives focus
- *onblur* - call when a control loses focus
- *onchange* - call when a control loses focus and the value of its contents has changed
- many more

# Mouse Events

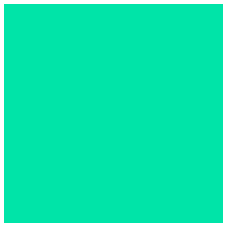
- Illustrate *onmouseover* and *onmouseout*

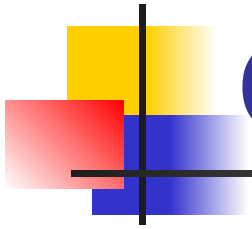




# Handling Time

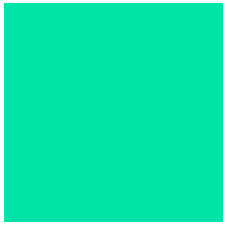
- Create a simple JavaScript clock





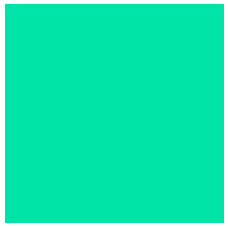
# Controlling Time

- Turn a clock on and off and format the time string



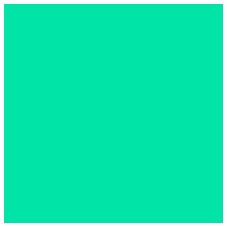
# Handling Images

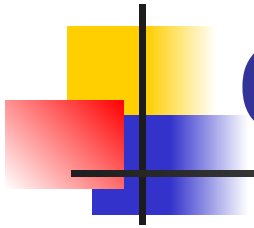
- Create a slide show



# Generate Real-Time Data

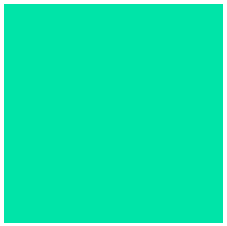
- Simulate monitoring real-time information from a device

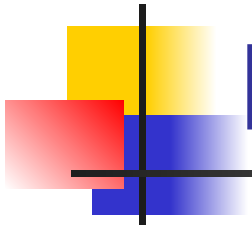




# Continuous Update

- Gather data synchronously using the clock as the event generator





# End of Examples