Programming Basics

INFO/CSE 100, Spring 2006
Fluency in Information Technology

http://www.cs.washington.edu/100
Readings and References

• Reading
  » Fluency with Information Technology
    • Chapter 18, Fundamental Concepts Expressed in JavaScript
    • Appendix B, Javascript Rules

• Other References
  » WebDeveloper.com
    • http://www.webdeveloper.com/forum/index.php
  » Thomas Jefferson National Accelerator Facility, Office of Science Education
    • http://education.jlab.org/indexpages/elementgames.html
  » W3Schools Javascript Home
    • http://www.w3schools.com/js/default.asp
An algorithm to alphabetize CDs

define variable named *Artist*

use *Artist* to refer to the name of the group that made a CD

for all slots in the rack starting at one end

call the current slot *alpha*

for all the remaining slots in the rack

call the next slot *beta*

Exchange?

If *Artist* of the CD in the *beta* slot is earlier in the alphabet than the *Artist* of the CD in the *alpha* slot, interchange the CDs

next *beta*

next *alpha*

done
The Plan

- We will learn JavaScript over the next few lectures
  - JavaScript is used with HTML in Web pages
  - JavaScript is a contemporary programming language -- we will learn only its basics
  - You will program in a text editor and run your program with your browser

JavaScript is a way to make HTML "dynamic"
Begin with HTML

Basic HTML is static
the contents of the file are displayed as given

```html
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
    "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<title>Simple A</title>
</head>
<body>
What is 2.0 + 2.0?
</body>
</html>
```
Browser interprets your page

- You are telling the browser what to do
  - using HTML for the static parts of the page

*This page is written in the HTML language.*

Here is some *header information* about the page.

Here is the *main body* of the page.
Add some “dynamic” content

Scripting languages let us create active pages
  » implement actions to be taken at run-time when the page is loaded or in response to user event

```html
<head>
<title>Simple B</title>
<script type="text/javascript">
var greeting = "Hello World!";
</script>
</head>

<body>
<script type="text/javascript">
document.write(greeting);
</script>
What is 2.0 + 2.0?
</body>
```
JavaScript in an HTML page

```html
<head>
<title>Simple B</title>
<script type="text/javascript">
var greeting = "Hello World!";
</script>
</head>

<body>
<script type="text/javascript">
document.write(greeting);
</script>
What is 2.0 + 2.0?
</body>
```

Language we are using is javascript

Generate HTML “on the fly” with document.write(...)
Browser interprets your page

- You are telling the browser what to do
  » using HTML for the static parts of the page
  » using JavaScript for the more dynamic parts

Here is some script initialization information.

```html
<head>
<title>Simple B</title>
<script type="text/javascript">
var greeting = "Hello World!";
</script>
</head>

Here is some script for the body of the page.

```html
<body>
<script type="text/javascript">
document.write(greeting);
</script>
What is 2.0 + 2.0?
</body>
```
All of these internet based games require a JavaScript enabled browser.

**Science Games**

- **Who Wants to Win $1,000,000?** - Answer 15 science and math based questions correctly and become a (pretend!) millionaire!
- **Virginia State Standards of Learning Practice Tests** - Practice taking the SOL tests! Subjects currently include algebra, math, science and technology.
- **Science Vocabulary Hangman** - Use the clues to discover the computer's secret word!
- **Science Crossword Puzzles** - Use the clues provided to

**Element Games**

- **Element Flash Cards** - Learn the names and symbols of the elements!
- **Element Math Game** - Calculate the number of protons, neutrons or electrons in an atom based on information from the Periodic Table of Elements!
- **Element Hangman** - Discover which element the computer has picked by guessing the letters in its name!
- **Element Crossword Puzzles** - Use the clues provided to solve each crossword puzzle!
**Variables In Real Life**

- A variable is a "container" for information you want to store
  - The name of the variable stays the same, but the value associated with that name can change
    - That’s why it’s called a “variable”!

<table>
<thead>
<tr>
<th>Variable</th>
<th>Current Value</th>
<th>Previous Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Single</td>
<td>My Boo, Usher And Alicia Keys</td>
<td>Goodies, Ciara</td>
</tr>
<tr>
<td>AL Champion</td>
<td>Boston Red Sox</td>
<td>New York Yankees</td>
</tr>
<tr>
<td>#1 Box Office</td>
<td>Shark Tale</td>
<td>Shark Tale</td>
</tr>
<tr>
<td>Day Of The Week</td>
<td>Monday</td>
<td>Sunday</td>
</tr>
<tr>
<td>Husky Card Balance</td>
<td>$52</td>
<td>$60</td>
</tr>
</tbody>
</table>
Variables In Programming

- Program variables have names and values
  - Names (also called identifiers)
    - generally start with a letter and can contain letters, numbers, and underscore characters “_”
    - Names are case sensitive
    - No spaces!
  - Values
    - can be numbers, strings, boolean, etc
    - change as the program executes

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Current Value</th>
<th>Previous Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No_1_Single</td>
<td>My Boo, Usher And Alicia Keys</td>
<td>Goodies, Ciara</td>
</tr>
<tr>
<td>ALChampion</td>
<td>Boston Red Sox</td>
<td>New York Yankees</td>
</tr>
<tr>
<td>No_1_Box_Office</td>
<td>Shark Tale</td>
<td>Shark Tale</td>
</tr>
<tr>
<td>dayOfTheWeek</td>
<td>Monday</td>
<td>Sunday</td>
</tr>
<tr>
<td>huskyCardBalance</td>
<td>$52</td>
<td>$60</td>
</tr>
</tbody>
</table>
Assign a value to a variable

The universal form of the assignment statement

» variable gets value
  balance gets the value 52
  greeting gets the value “Hello World!”

Each language expresses “gets” in a particular way

» JavaScript uses the single equals sign =
  var balance = 52;
  var greeting = "Hello World!";

NOTE: The equals sign = is used differently in math and programming.
Variable Declarations

```javascript
var eyeColor;  {/* undefined!*/

var eyeColor = "green";  {/* initialized*/

var eyeColor = "";  {/* initialized, empty*/

var eyeColor = "green", hairColor="blonde";

hairColor = "carmel"; {/* variable assignment*/

</script>
```
Basic Data Types in Javascript

Numbers:
var gasPrice = 2.55;

Strings
var eyeColor = "hazel green";

Boolean
var isFriday = true;
var isWeekend = 0;
Special String Characters

- All English letters and numbers are valid.
- Most English punctuation is valid.
- There are some special string characters which we use with an escape sequence

\t tab
\n newline
" double quote
` single quote
\ \ backslash

var nikeQuote = "\"Just Do It!\"";
JavaScript Variables

```html
<html>
<head>
<title>Simple C</title>
<script type="text/javascript">
var greeting = "Hello World!";
var balance = 52;
var transaction = 12;
</script>
</head>

<body>
<script type="text/javascript">
document.writeln(""+greeting+"\</p>"");
document.writeln(""+balance+".\</p>"");
document.writeln(""+transaction+".\</p>"");
document.writeln("What will the new balance be?\</p>"");
</script>
</body>
```
Expressions

• The right-hand side of an assignment statement can be any valid *expression*

• Expressions are “formulas” saying how to manipulate existing values to compute new values

```java
balance = balance - transaction;
seconds = 60*minutes;
message = "Status code is " + codeValue;
isFreezing = (temp < 32);
```
Operators

Use operators to build expressions

» Numeric operators
  
  + - * / mean add, subtract, multiply, divide
  
  $3 + 3 = 6$

» String operator
  
  + means concatenate strings
  
  "3" + "3" = "33"

» Relational operators
  
  < <= == != >= > mean less than, less than or equal to, equal to, not equal to, greater than or equal to, greater than

» Boolean operators
  
  && || ! mean and, or, not
JavaScript Expressions

<html>
<head>
<title>Simple D</title>
<script type="text/javascript">
var balance = 52;
var transaction = 12;
</script>
</head>
<body>
<script type="text/javascript">
document.writeln("<p>My Husky Card balance is $"+balance+".</p>");
document.writeln("<p>The next transaction will be for $"+transaction+".</p>");
balance = balance - transaction;
document.writeln("<p>The new balance will be $"+balance+".</p>");
</script>
</body>
</html>
Practice, practice, practice

• Write a simple web page with a simple script like the ones here
• Save it to disk
• Open the web page with your browser
• Does it look like what you expected?
  » Edit, save, reload
  » Edit, save, reload
  » ...

The Information School of the University of Washington
http://www.w3schools.com/js/js_examples.asp