Programming Basics

INFO/CSE 100, Spring 2005
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
  - Games and Puzzles
    - Thomas Jefferson National Accelerator Facility, Office of Science Education
    - http://education.jlab.org/indexpages/elementgames.html
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>
```
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

This page is written in the **HTML language**.

Here is some **header information** about the page.

Here is the **main body** of the page.
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 solve each crossword puzzle!

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!

http://education.jlab.org/indexpages/elementgames.html
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 Name</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
  - 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>dayOfWeek</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
  
greeting *gets the value* “Hello World!”
  
balance *gets the value* 52

Each language expresses “gets” in a particular way

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

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

<script type="text/javascript">

var eyeColor;  // undefined!

var eyeColor = "green";  // initialized

var eyeColor = "";  // initialized, empty

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

hairColor = "carmel";

</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!\"";
<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("<p>"+greeting+"</p>" );
document.writeln("<p>My current Husky Card balance is $"+balance+".</p>" );
document.writeln("<p>The next transaction will be for $"+transaction+".</p>" );
document.writeln("<p>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

```plaintext
balance = balance - transaction;
seconds = 60*minutes;
message = "Status code is " + codeValue;
```
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 current 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

4/22/05  fit100-11-programming  20
http://www.w3schools.com/js/js_examples.asp

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

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