Introduction to JavaScript

Welcome

- JavaScript has many uses, but we will focus on Web Design, specifically how to add interactivity
- In this class there is an assumption that you are new to programming, but you know HTML and CSS

What you can do with It

- JavaScript is a “real” programming language
    - Store variables
    - Set decision points
    - Loop
    - Reuse code with functions
- In addition
    - Get data from the browser
    - Manipulate the DOM that browsers use to create web pages

Variables

- Store data and refer back to it later

Decision Points

- Use control statements to decide which code to run under different circumstances

Looping

- Avoid writing the same (or similar) code over and over again
- Determine at runtime how many times you want to run some code

Functions

- Reuse code multiple times, but only write it once
- Use code from others

Manipulating the DOM

- JavaScript can find, add, and delete elements from the DOM
- Can also react to mouse clicks, page reloads, and other actions

Review

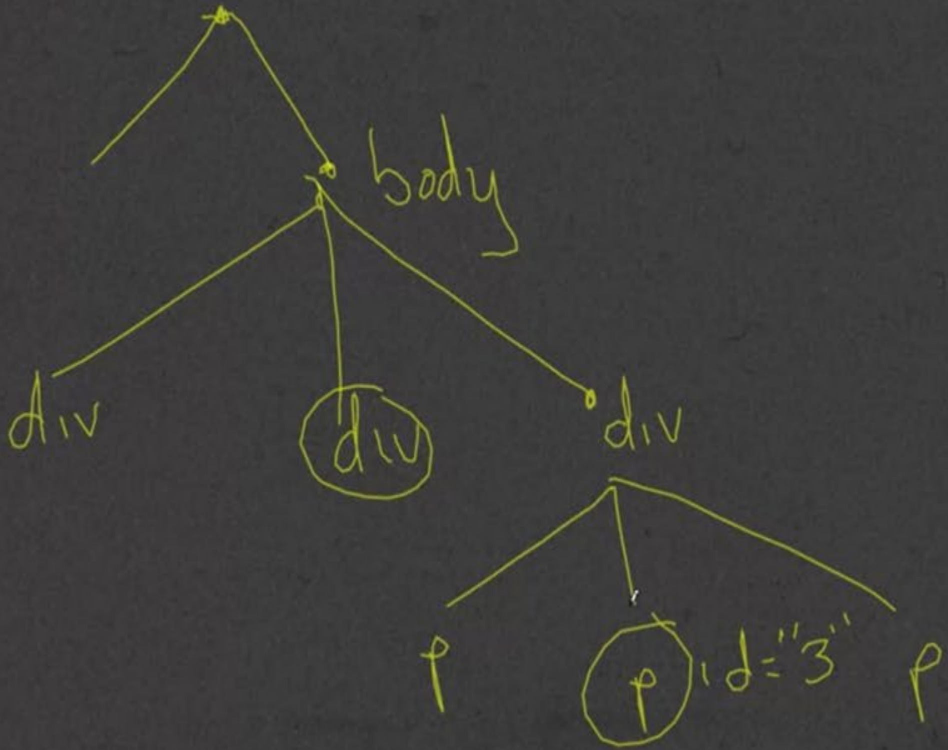
- A major component of learning any programming language is practice and repetition
- Expect to make mistakes
    - if you aren’t you aren’t learning

DOM Review with Object Oriented Programming

Web Pages are built upon the DOM

- Document Object Model
- Structures documents like a tree
- Every node has one parent, and possibly many children
- Nodes have properties, methods, and events

Sample Document



The DOM and JavaScript

- Page content is represented by the DOM
- Scripting languages (JavaScript) use the DOM to interact with the document

How Does It Work?

- Accessing the DOM is done with an API – Application Programming Interface
    - No matter which browser, no matter which scripting language, the API is the same

The DOM objects/elements

- document – the root of the page
  - document.URI, document.height, document.links, document.bgColor,….
- element – a node in the tree
  - Returned by a member of the API
- nodeList – an array (group) of elements
  - document.getElementsByTagName('p') would return a set of nodes
- attribute
  - A node in the DOM, though rarely used that way. Another way to manipulate/change the document

Specific APIs

- document.getElementById(id)
- document.getElementsByClassName(class)
- element.innerHTML
- element.style
- element.setAttribute(attribute, value)
- element.removeAttribute(attribute)

Review

- As you learn more JavaScript, you will be able to use the APIs
- We will start slow, but the important part is to eventually feel comfortable searching for these tools

Newer DOM methods

querySelector and querySelectorAll

Selecting the First Element

- getElementById() takes a single parameter and that parameter must be an id selector
- querySelector() Method
    - returns first result of the given selector which could be *anything* – except pseudo-elements
- Because the selector can be anything which is a valid CSS selector you must include the #, ., etc.

Selecting Multiple Elements

- The querySelectorAll() method is identical to the querySelector() but returns all the found values
- Again, while getElementsByClassName doesn't need the "." as part of the selector, querySelectorAll does

Deciding on a Method

- Speed won't be an issue for you
- querySelector allows you to use any css selector
- I am less prone to typos in the method name
- getElementById, getElementsByClassName, etc have more mnemonic names.
- I am less prone to typos in the css selector

Output

Interactivity

- HTML5 and CSS3 are not really interactive
- New elements and pseudo-classes can only go so far

What Can JavaScript do?

- Read and write HTML elements
- Reacts to events (mouse events, keyboard events, etc.)
- Validate data
- Detect the visitor's browser
- Create cookies

JavaScript Output

- JavaScript doesn't have a built-in
  print function
- Data is displayed via
  - an alert box using *window.alert()*
  - *a prompt using window.prompt()*
  - HTML output using *document.write()*
  - HTML element using *innerHTML()*
  - the browser console using *console.log()*

alert()

- In JS, an alert is a pop-up window that displays information
- The parentheses mean that this is a function

```
alert("My Message Here")
```

prompt()

- Very similar to alert, but wants input.

```
prompt("Enter your name: ")
```

document.write()

- What if we want something permanent?
- document.write() writes directly to the page
- Here we have combined a function with an object that will add to page

```
document.write("Time to learn JavaScript")
```

document.write()

- Not usually recommended since it can easily be misused

innerHTML

- To change the contents of the DOM, use innerHTML combined with the element you want to change

no parentheses!!

```
element.innerHTML = "Time to learn JavaScript"
```

console.log()

- This option write the data to the browser console
- The console is a place to see what is going on during the execution of your program

```
console.log("Leave a secret message")
```

The console

- You should be utilizing the console by now
- Does more than take "print" statements, also provides debugging information for JavaScript, HTML and CSS

Debugging

- Safari: Preferences → Advanced Check the Show development menu in menu box”
- Google Chrome: Developer → JavaScript Console
- Firefox: Tools→ Console
- Edge: F12

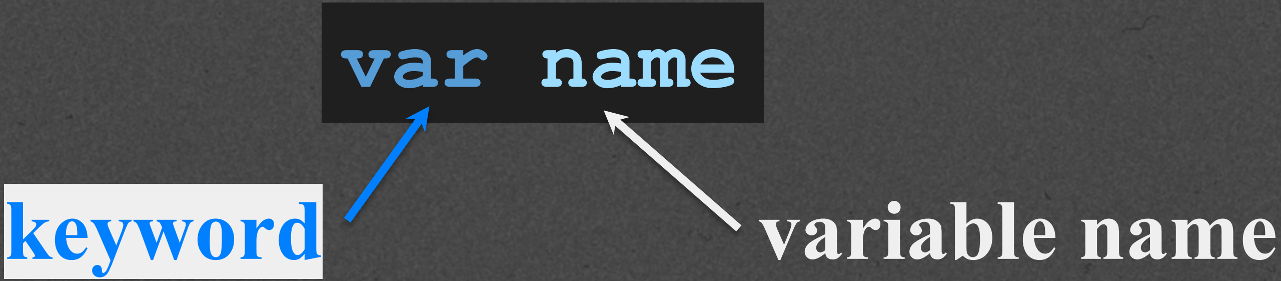
Review

- Right now, we are doing simple things with output
- As you learn more, the power grows

Variables

Storing Data

- Part of learning to program is learning to store data
- In JavaScript, data is stored in variables
- To use a variable, you have to declare it



```
var name
```

Storing Data

Variable Name	Memory Location	Value "stored" in computer
name	11001100001101	"Christopher"
age	11001100001110	
…	11001100001111	
…	11001100010000	
…	11001100010001	
…	11001100010010	
…	11001100010011	

Variable Names

- Consists of letters, digits, underscores, and dollar sign($)
- Can not start with a digit
- Are case-sensitive…
    - name Name, naMe, NAME are all different variables
- Should be mnemonic (meaningful)

Variable assignments

- It is silly to have a variable if you are never going to use it
- You can assign values using the = operator

```
var name ="Colleen"
```

$\uparrow$

assignment operator

Assignment statements

- I like to refer to the LHS and RHS of statements
- LHS – the variable being updated
- RHS – the new value that will be stored in the variable

```
var name

name ="Colleen"
```

LHS RHS

Using a Variable

```
var name = prompt("What is your name?")

document.write(name)

var date= Date()

document.write(date)

var location= window.location

document.write(location)
```

Review

- Variables are a key component of creating interactive programs
- We will be using them in the remaining lectures so practice them and feel comfortable

Data Types

Assignments

```
var name = prompt("What is your name?”)

var name = Date()

var name = window.location
```

Types

- In many programming languages, variables need to have a single type
- In JavaScript, a variable can take on many different types
- What are these types?

Number

- Numerical values
  - with or without decimals

```
var width = window.innerWidth

var pi = 3.14
```

String

- A String is a collection of characters (letters, numbers, punctuation, ….)
- To create a string you put the value in quotes "…"

```
var location = window.location
var name = "Colleen"
```

Boolean

- In programming, a boolean value is one that is either true or false

```
var status=false

var windowStatus=window.closed
```

- Later, we will learn how to write our own boolean expressions to check if things are true or false

Object

- Sometimes the variables are more complex
    - A node in the DOM a good example

```
var topic= document.getElementById("myID")
```

- Nodes are more than a single value, they have attributes

Array

- How can a function return more than one value?

```
var links= document.getElementsByTagName('a')
```

Accessing Array Elements

- Arrays store multiple value using a variable name, and an index for each element in the array

```
var links= document.getElementsByTagName('a')
document.write(links[0])
```

- We will cover arrays in depth later in the course

Review

- Luckily in JavaScript you have a lot of flexibility with the types of data
- For now, focus on learning the types of data returned by the most common APIs

Operators and Expressions

Statements

- We have been using statements to execute our JavaScript code
- Statements often have *expressions*
- Expressions produce values

Expression

- So if you think back to LHS = RHS, the LHS is a variable and the RHS is what generates the value
- What are our tools for generating values on the RHS?

Assignment Operators

Operator	Example	Value stored in x
=	x = 5	5

=	y = 12
	x = y
		12

Arithmetic Operators

Operator	Example	Value stored in x
+	x = 2 + 5	7
-	x = 5 - 2	3
*	x = 2 * 5	10
/	x = 5/2	2.5
%	x = 5%2	1

More Operators

Operator	Example	Value stored in x

++	x = 5;
	x++;
		6

--	x = 12; x--	11

+=	x = 2;
	x+=5
		7

String Operators

Operator	Example	Value stored in x
+	x = "Hi" + "There"	"HiThere"
+	x = "Hi" + 5	"Hi5"

+=	x = "Hi"
	x +="There"
		"HiThere"

Boolean Operators

- We can also use operators to compare values
- Assume x = 12;

Operator	Example	Returns
==	x ==5	false
==	x ==12	true
!=	x !=5	true

Boolean Operators

- Assume x = 12;

Operator	Example	Returns
>	x >12	false
>=	x >=12	true
<	x <12	false
<=	x <=12	true

Boolean Operators

- Assume x = 12;

Operator	Example	Returns…
==	x == "12"	true
===	x === "12"	false
!===	x !== 12	false

- You need to really stop and think about these operators…

Logical Operators

- Assume x = 12;

Operator	Example	Returns…
&&	(15 > x) && (x > 5) both sides must be true	true
||	(15 > x) || (x > 5) at least one side must be true	true
!	!(x == 12)	false

Review

- Programming is not just about knowing the syntax of a language
- You need to think about the logic behind what you want to do, before you start to code