# 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

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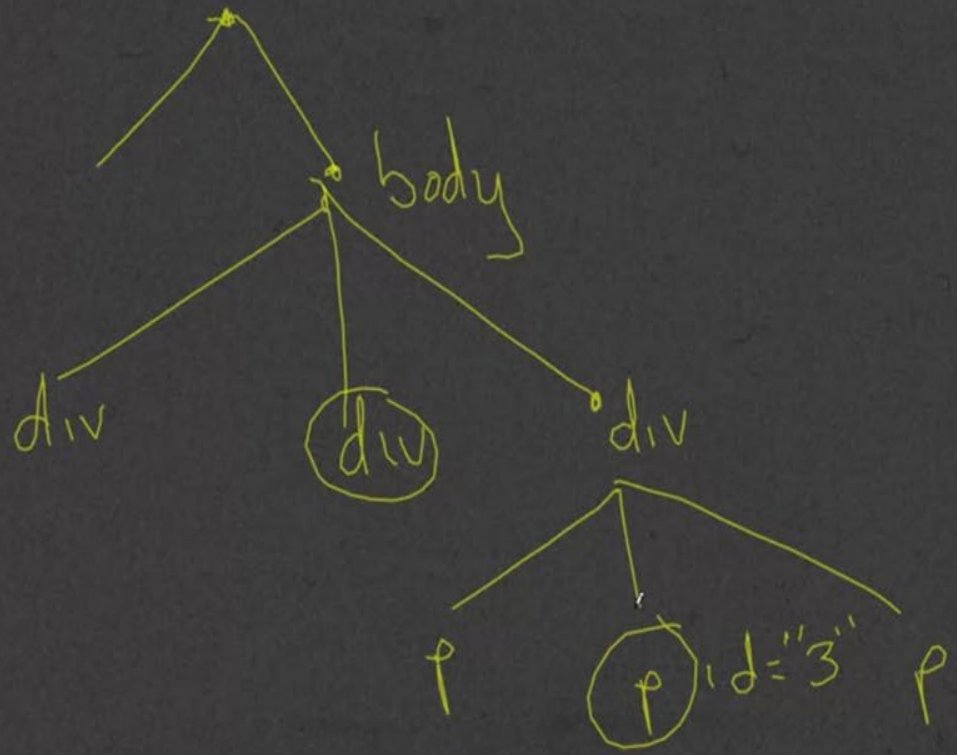
# DOM Review with Object Oriented Programming

# 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



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# 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

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# 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

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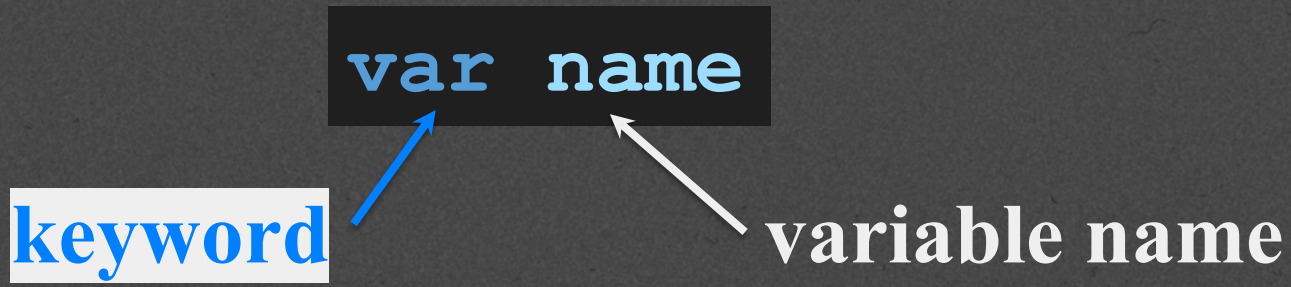
# Variables

# 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



# Storing Data

| Variable Name | Memory Location | Value “stored” in computer |
|---|---|---|
| name | 110011000011101 | “Christopher” |
| age | 110011000011110 | |
| … | 110011000011111 | |
| … | 110011000100000 | |
| … | 110011000100001 | |
| … | 110011000100010 | |
| … | 110011000100011 | |

# 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"
```

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

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# 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

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# 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<br>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;<br>x++; | 6 |
| -- | x = 12;<br>x-- | 11 |
| += | x = 2;<br>x+=5 | 7 |

# String Operators

| Operator | Example | Value stored in x |
|---|---|---|
| + | x = "Hi" + "There" | "HiThere" |
| + | x = "Hi" + 5 | "Hi5" |
| += | x = "Hi"<br>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)<br>both sides must be true | true |
| \|\| | (15 > x) \|\| (x > 5)<br>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

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