Intro to Programming

Getting into the MindSet

What is Programming?

- The act of writing lists of instructions
- Telling a computer what to do step-by-step
- Understanding the how of breaking complex tasks into these instructions

What is Program?

A list of simple instructions

- Step A
- Step B
- Step C

What kind of Instructions?

- Storing data
- Retrieving data
- Showing data
- Checking if something is true/false
- When to start and when to finish

Programming Languages

Programming Languages are our ways of writing these instructions so that our computers understand tasks at hand. The instructions have a different form/syntax for each language. There are many languages: C, C++, Java, Python, Ruby, and of course JavaScript.

You’re already comfortable using Markup Languages (HTML and CSS) so now we can expand on our horizons into the land of JavaScript...but first

Computers VS Humans Problem Solving

HOW DO COMPUTERS THINK?

- Painfully simple sequential, instructions
- step 1, step 2, step 3, …
- They do simple things fast, and complex things slowly
- Much different from human thinking
- We do complex things fast, and simple things slowly
- Programming is so simple it seems complicated

**Nothing is random in a computer. Just a pattern that we don’t know yet.

Computers VS Humans Problem Solving

What is this?

Computers VS Humans Problem Solving

Computer ~ seconds

- Does it have fur? Y
- Are its ears pointy? Y
- Does it have whiskers? Y
- How big is it? Access Denied
- Does it meow? Y
- Does it have teeth? Y

Ok, it's a cat Human ~ milliseconds. It looks like a cat. Human for the win!

Computers VS Humans Problem Solving

What is 1,023,456 divided by 42?

Computer ~ nanoseconds

- Run long-division algorithm until remainder, is zero or repeats.

Human ~ minutes

- Get out piece of paper
- Get pencil
- Store results from long division algorithm on paper
- Run long-division algorithm until remainder is zero or repeats

The Key to Programming

Break down a complex problem into simple steps.

Learn to think like a computer, in the smallest steps possible.

Let’s use a password reset as example - whiteboard time!:

- Prompt user for password
- Store name in variable P
- Check password length
- If the name stored in P is less than 8 characters, prompt them again
- If the name stored in P is greater than or equal to 8 characters, print "you have successfully changed your password"

Pseudo-Code

Pseudo-coding can be a helpful way for you to think through the logic of your programs before you start writing your code. It will give you direction, and help you break large tasks into smaller ones. Using very simple English instructions to mimic a programming language it can make your workflow more organized and less daunting!

All developers from beginners to advanced use it since its programming language independent. You've already seen it in the password-reset example is an example of pseudo-code. We're going to do a couple of pseudo-code labs but first...

Basic Programming Terms

Term	Definition
Variables	A space in computer memory that holds a value. It can be a number, a letter, a name, etc.
Functions	A bit of code that defines a set of tasks. Once a function has been defined, it can be used throughout your code to execute the task.
If/else statements	A section of code that will execute only if certain conditions are met.
Loops	Code that happens over and over again until a condition is met.

Pseudo-Code Labs

Create Thermostat Pseudo-Code!

Instructions for our ThermoStat

1. Store the target temperature in X
2. Set X equal to 72
3. Get the temperature.
4. Store the temperature in a variable T
5. If the value of T is less than X, turn on the heater.
6. If the value of T is greater than or equal to X, turn off the heater.
7. Repeat steps 3 through 6 indefinitely.

Pseudo-Code Labs

Write pseudo-code to figure out who the winner is in a game of Rock-Paper-Scissors.

Using the ideas from out Thermostat code along create a rock paper scissors program.

ROCK PAPER SCISSORS:

1. Take in one of three choices from two players
2. Know which is value (r,p, or s) are greater than the other
3. Check the values given by the players
4. See if they one is greater or they match
5. Either tell which player one or if they match and should play again

JavaScript Basics

Adding interaction and power to you sites

What is JavaScript

JavaScript adds behavior to your web page -- The electricity, gas, plumbing of your house. It's a programming language not a markup language like HTML and CSS.

It gives a web page dynamic behavior such as:

- Keyboard/mouse interaction (click events, hover events, keydown, keyup)
- Create or rearrange elements in your HTML
- Get Data from a server

What can you do with it?
Create Apps, make games, complex animations, and of course create dynamic/interactive websites

Using JavaScript

*JavaScript files should be included after the last </element> and before the closing body tag of your HTML. This ensures that the page will be fully loaded before any JavaScript interactions occur.

We load the JS at the bottom because you want your content to load first; the interactivity can load after your content has finished.

Your JS will be loaded in externally like your CSS files:
<script type=”text/javascript” src=”js/project.js></script>

You may also have internal scripts (bad in general):
<script type=”text/javascript”> Your script here </script>

Using JavaScript Best Practices

To check to see if your script is working, you can include an alert or a console.log message:

- alert("This will make a popup box.”);
- console.log("This will print a message in your console."); → console.log()

Comments in JS:
// this is a single line comment
/*this is a
multiline
comment */

Statements in JavaScript: A statement is a complete instruction. It is terminated by a semi-colon -- usually occupies its own line. A program is essentially a list of statements that are executed sequentially.

Using JavaScript
Good to Know

jQuery is a JavaScript framework. This is just a bunch of functions that other people wrote, that you can use to save time and get things done faster. It's also reliable because it has been refined through years of use across the internet.

CDN means Content Delivery Network. Lots of frameworks are available via a CDN, which will serve the files quickly. You can embed jQuery in your pages using a CDN. Make sure to add the http: to the src attribute. https://developers.google.com/speed/libraries/

Development Sandboxes:
http://repl.it/languages/JavaScript
http://codepen.io/ - we know this one. :)
http://jsfiddle.net/
http://jsbin.com

JavaScript - Variables

What are Variables?

- One of the basic building blocks of a program and your programs will consist of many variables.
- Their values can be changed at any time while the program is running.
- They can contain different types of data: numbers, strings, objects, booleans, and arrays.

Declaring - The act of creating a variable is called declaration.

- var mySweetVar;

Assigning - The act of giving a variable a value is called assignment or defining.

- mySweetVar = "Sugar";

All together now

- var mySweetVar = “Sugar";

*Now, mySweetVar is the same as "Sugar", so I can use mySweetVar in place of “Sugar”….EXAMPLE TIME!

JavaScript - Best Practice Variables

NAMING VARIABLES:

- Don't use uppercase for variables to start you variables.
- Don't use dashes, symbols, or start your variables with numbers.
- Can’t be a keyword (reserved word), like var (look up reserved JavaScript words)
- Can take any sequence of characters A-Z, a-z, 0-9, $, and _ but it’s best to either use CamelCase or Underscore naming.

thisIsCamelCase and this_is_snake_case, both are good options for descriptive variable names.

JavaScript - Data Types

Data Type	Value
Number	1.345, 2, -6 (In JS there is no difference between an integer, a float, etc.)
Strings	”Arthur", 'Hello', '1.678' (Strings are in quotes, single or double quotes it doesn’t matter.)
Boolean	True or False
Arrays	A list of variables (in a sense) that are usually the same data type. (Just an Intro)
Object	A group of variables that vary in data types and can also include functions. (Coming up in a future Class)

JavaScript - Data Type Review & Labs

Numbers
var num1 = 5;
var num2 = 10.5;
num3 = num2; // num3 is now 10.5

Number operations:
multiplication * division / addition + subtraction - * and / take precedence over +

You can use parentheses to change order of operations.
var x = 2; var y = 20; var z = 3 + y / x; // equals 13, not 11.5

var w = (3 + y) / x; // equals 11.5, not 13

JavaScript - Data Type Review & Labs

Strings
var str1 = “Arthur”;

Concatenating Strings:
You can append one string to another, this is called concatenation. We are going to use the + "operator" between strings to connect our stings.
var string1 = "I am”; var space = " “; var string2 = "a coder”; var period = ".";
var concatenated = string1 + space + string2 + period;
console.log(concatenated); // prints: I am a coder.

Adding strings to numbers:
var string = "I am "; var age = 25;
var sentence = string + age + " years old forever";
console.log(sentence); // prints: I am 25 years old forever

JavaScript - Data Type Review & Labs

What if you wanted to put a quotation mark " in a string?

Escaping Strings:
You use the escape character \ var string = "He said, \"Hello!\""; // prints: He said, "Hello!"
Without the escape \, it's an error: var string2 = "He said, "Hello!"";

String Length:
How would you find the length of the string?
Using the .length property to get number of characters in string string.length
var s = "hello"; var length1 = s.length; // 5 var length2 = "abc".length; // 3
What else can strings do you ask? http://www.w3schools.com/jsref/jsref_obj_string.asp

Variables and Strings - Lab
http://codepen.io/Adamor/pen/NPggXy ~ 15 min

JavaScript - Data Type Review & Labs

Booleans:
Booleans become very important when you are making comparisons and using logic (if-statements and loops).

```
var bool1 = true;
var bool2 = false;
var truth = !bool1; // ! is not; truth is false (can't compute!!!! BOOM!)
```

Arrays:
An array is a data type that can hold a list of values. Arrays are good for things like grocery lists, the states, and any other list. You may have an array of any variable type (strings, numbers, booleans, objects, arrays).

Position or Index in array start at 0.
This means that the first element in an array is at position 0, the second is at position 1, etc.

JavaScript - Data Type Review & Labs

Declaring an array:
var myArr = []; // newer way using literal notation

Adding content to your arrays:
myArr = ["Hello", "there", "this", "is", "an", "array"];
myArr = [65, “hello”, , true];
// blank spaces make space in the array but have no information

Accessing information in your arrays:
myArr = [65, “hello”, , true];
console.log(myArr[0]); // prints 65
console.log(myArr[1]); // prints hello
console.log(myArr[2]); // prints undefined

Updating array values:
myArr = [65, “hello”, , true];
myArr[1] = “goodbye”; // myArr[1] now holds goodbye instead of hello

JavaScript - Data Type Review & Labs

Array Methods	Value
Length	Gets the full Length of an Array
Push	Add on to the end of the array
Unshift	Add on to the beginning of the array
Pop	Take something off the end of the array
Shift	Take something off the beginning of the array
Splice	Adding or removing something from an array at a specific position

JavaScript - Conditionals

To start talking Conditionals, we need to go into if-else statements.

An if-else statement is a statement that allows you to execute different statements depending on whether something is true or false.

```
var a = 2;

if (a > 2)
{ console.log("A is greater than 2"); } else
{ console.log("A is not greater than 2"); }
```

If else statements allow your program to make decisions. — Whiteboard time!

JavaScript - Conditionals

Syntax Check:
if (condition) { /* do stuff here */ } else
{ /* if the condition is false, do other stuff */ }

The else is optional. You can create an if-statement without including the else section.

In the previous example, our condition was (a > 2) but we can do more!

You can string conditions together, too, using else-if:
if (condition) { // do this }
else if (condition) { // do this stuff }
else if (condition) { // do this stuff }
else { // do this }

When conditions are related to each other, it's a nice idea to use if-else chains, as above, to indicate they are related. It would also work, though, to use individual if-statements. Make sure to open and close the curly brackets!

JavaScript - Conditionals

What is a condition?

A condition is a true or false value.
A simple condition checks if something is: Greater than, less than, equal to, or not equal to something else examples: a > 2 b == 3 c >= 5 today != "Monday"

Let’s talk the comparison operators which compare two values and logical operator which introduces logic between two conditions.

JavaScript - Conditional Operators

Operator	Description
>	Greater than
<	Less than
==	Equal to
===	Strict equal too
!=	Not equal
<=	Less than or equal to

JavaScript - Logical Operators

Operator	Description
&&	checks if both conditions are true
||	checks if at least one condition is true

```
var today = "Friday"; var day = 13;

if (today == "Friday" && day == 13)
  {console.log("Today is Friday the 13th"); } else
  { console.log("Today is just a normal day");
}
```

JavaScript - Complex Conditions

You can have many condition statements that are linked by && and ||.

```
var today = "Saturday"; var isHoliday = false;
if ((today == "Saturday" || today == "Sunday") && isHoliday != true) {
  console.log("Then you should probably go to class"); }
  else { console.log("Don't go to class");
}
```

Nesting Conditions - To make sure you have all you options covered.

```
if (today == “Saturday" || today == "Sunday") {
  goToClass();
  if( month == "June") {
    grabCoat();
   }
}
```

JavaScript - Final Lab

OPEN WEB - LAB:
Change the background color of a web page depending on temperature. Starter code available at this codepen http://codepen.io/Adamor/pen/jqvwQP

- Set the temperature to a celsius value
- Convert that temperature to Fahrenheit using the math operations
- Set a threshold temperature in Fahrenheit
- If the F temperature is below the threshold, set the background color to gray for the body
- Otherwise, set the background color to yellow
- Write the temperature to the page using either. document.write or set the innerHTML of a tag on the HTML page.
- Use this code to change background color: document.body.setAttribute("style", "background-color: red;");
- How else can you change the body color using setAttribute and CSS?

JavaScript - Optional Homework

Rock Paper Scissors:
Convert the pseudo-code you wrote earlier into a JavaScript.

- Take a option from a human player
- Have a computer player that choose one of the three options in an array randomly
- Validate inputs of both players
- Create if-else statements to find out which of two players wins
- Print on with innerHTML the result and congratulations message
- Change the selections of each player to confirm that your program is working

Use the previous examples given and resources to figure this out.