Fast Track Juniors: Assignments

Mr. Zach Littrell

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School Info (5 points). Due January 23rd

Sign and return the Student Handbook Sign-Off Sheet, Emergency Cards,the Certificate of Achievement Stuff, and my BYOD device policy.

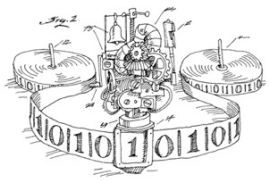
Computer Definitions (10 Points). Due January 21st

Answer the following questions. You may use any resource you want, but you must list the resources you use. Answer these in words you would use – I highly doubt you use phrases like 'syntactically distinguishable' in every day talk.

- What is a Computer? How many computers (you can be exact or ballpark it) are there in the Computer Science Room?
- What is a Computer Program?
- What is a Computer Programming Language? Name some examples.
- What is a Mark-up language? Name an example.
- Why are Programming Languages and Mark-up Languages different?
- What is the Turing Test?
- Go to http://nlp-addiction.com/eliza/. Would Eliza pass the Turing test? Why or why not?
- Describe a situation where using a test like the Turing Test to determine if you are dealing with a computer or a person would be useful? (If you're having difficulty thinking of one, here's a possible situation: Captchas)

Fun fact:

Alan Turing devised a theoretical machine, now called the Turing Machine.



It reads and writes symbol on an infinitely long tape, and keeps track of what its current state is. It sounds simple, but it forms the backbone of modern day computers. (Almost) every single program you write in this classroom can be replicated, in some form, on this theoretical machine.

Introductory Logic. (10 points) Due January 22nd

Basis of all logic in Computer Science is built on Boolean Logic.

We say a statement can either be true or false (we call that a boolean statement). Here's an example of a true statement:

1 is greater than 0.

Here is a statement which is false.

Red is the same color as blue.

The following operators are your friend.

- Or ($\vee$ or ||) - Given two booleans, A and B, we say A Or B is true if either A or B is true. If there are both false, it is false.
- And ($\wedge$ or &&) - Given two booleans, A and B, we say A And B is true if both A and B are true. If either are false, they are both false.
- Not ($\neg$ or !) - Given a boolean A, we say Not B is true if B is false. If B is true, then it is false.
- Implication/Implies ($\rightarrow$) - Given booleans A and B, we say A implies B if when A is true, B is true. If A is false, the statement remains true. If A is true and B is false, then the statement is false.
- Biconditional/If and only if/Iff ($\leftrightarrow$) - Given booleans A and B, we say A is true if and only if B is true. In other words, the statement is true if A and B are true and false at the same time.

Here are some definitions:

- Tautology - A statement that is always true.
- Contradiction - A statement that is simultaneously true and false (that is to say, nonsense).

The following is a truth table. You list the possible combinations of A and B, and then express the value of the other columns given A and B. Like this for example:

A	B	$A\&\&B$
T	T	T
T	F	F
F	T	F
F	F	F

Complete the following tasks:

- Using boolean operators above (like & and !), give an example of a tautology using just one boolean variable A.
- Write truth tables to show that $!(A\&B)$ is the same thing as $!A||!B$. (This is called De Morgan's Law).

- Consider the following sentence:

  This sentence is false.

  Is this a proper boolean statement? In other words, can you say it is true or false without leading to a contradiction.

- You are going to do a disproof by counterexample. The point is to show that a statement is false by coming up with an example that shows the statement cannot be always true.

  Disprove the following statement: "All men are named Mr. Littrell."

  (Hint: in logic, the opposite of 'all' or 'every' is 'some', by which we mean one or more, and the opposite of 'some' is 'all').

- Now a proof by contradiction! A proof by contradiction is a little more powerful than a counterexample. We show a statement is true by showing that its negation is false.

  Prove the following statement: "There is no largest integer."

  Which means disproving the following statement: "There is a largest integer."

  What happens if there is some integer, call it Z, that is bigger than any other integer? What happens if you add 1 to Z?

- Imagine this: there is an island where everyone either always tells the truth, or always tells a lie. You approach two roads guarded by two guards and they explain the rules: one is a truthteller, one is a liar. The truthteller guards the good road, and the liar guards the bad road. You may ask only one question to each of them. It must be the same question. Which of the following questions would allow you to figure out which guard is which?

  - Are you a liar?
  - Is the other guard a liar?
  - Would the other guard say you are a liar or a truthteller?

Fun fact:

English sentences in general don't really obey strict boolean logic, as our language is a tad on the ambiguous side. For example, here's an old corny joke.

Given the choice between a half-eaten egg sandwich, and eternal bliss, which would a mathematician choose?

The answer: a half-eaten egg sandwich.

Statement 1: Nothing is better than eternal bliss.

Statement 2: A half-eaten egg sandwich is better than nothing.

Therefore, a half-eaten egg sandwich is better than eternal bliss.

HTML Introduction: Setting up your computer (10 points)

Install Notepad++ on your computer from http://notepad-plus-plus.org/.

In your student drive is a file called MorningSongExcerpt.html. Open it in Notepad++.

Complete the following:

- On Notepad++'s site, it describes the product as being "free as in free speech and free beer." What does it mean for a piece of software to be "free as in free speech" and what does it mean for it to be "free as in free beer"? What are the benefits of being free in either sense?
- Modify MorningSongExcerpt.html and record what happens:
  - Change the text inside of <title></title> to be your name.
  - Change h1 to h2.
  - Add
 after the following words: watch, cry.
  - Change ul to ol
  - Change title="..." to title="Hi!" (you may need to hover over the image to see the effects.
  - enclose "This page was written by Zach Littrell" in <!– and –>
- Find examples of the following in your document (you may use your book or internet resources to identify what these are):
  - An HTML tag
  - An HTML attribute
  - A closing tag/end tag.
  - A header.
  - A paragraph.
  - An empty tag.
  - An image tag.
  - An ordered list.
  - A comment tag. (Question, why might comments be useful?)

To test your html, save the file and choose Run and open in Firefox, IE, or Chrome. (Your computers may only have Firefox and IE).

Check in with me at this point, then you may proceed.

Now, create a new HTML file using Notepad++. Call it MyRecipeFor<Food>.html, where <Food> is the name of the recipe you are going to describe. It can be any recipe (you can make one up, even). You must have the following:

- A list for the ingredients you will use. (Is it better here to use an unordered list or ordered list?)
- A list for the steps of how to make it. (Is it better here to use an unordered list or ordered list?)

- At least two headers.
- An image.
- A paragraph somewhere describing what this is a recipe for.

Also, go to `http://validator.w3.org/#validate_by_input` and copy your HTML code in there and press validate. It will tell you if there are errors, like missing attributes (images need an alt attribute in the event the image doesn't display) or missing end tags, or incorrectly nested tags.

An invalid HTML file may still display correctly in some web browsers (looking at you, Internet Explorer), but we want to strive for valid HTML, as that means its not only likely to work consistently across all browsers, but for disabled people, who use a web reader, they are less likely to have issues understanding your web page.

Fun fact:

Back in the conception of HTML, invalid html was allowed by browsers because the designers didn't want a single mistake to render an entire webpage unreadable.

HTML Miscellanea

First, finish your work on MyRecipe.

Now, define/answer the following questions:

- What is a pre tag?
- What is the DOCTYPE tag for?
- What is the difference between XML, XHTML, and HTML?
- What is the difference between HTML Strict and HTML Transitional?
- Why bother with writing valid HTML if browsers will read invalid HTML to the best of their ability anyway?
- Name five (modern) web browsers.
- What is the W3C and what do they do?
- What is HTML5?

Images

Define answer the following questions:

- What is a pixel?
- What does RGB mean in the context of images?
- What does CMYK mean in the context of printing images? Why is it used specifically for printing?

- What is the difference between lossless images and lossy images?
- What sort of images is JPEG good for?
- What is smaller in size, a PNG file or a BMP file?

Now some questions about the img tag:

- What is the purpose of the alt attribute in an img tag?
- What unit of measurement does the width and height attribute of an image use?

Now, complete the following project:
Appreciation Page
Pick one of the following things:L

- Your favorite athlete/sports team
- Your favorite tv series/movie
- Your favorite animal

Make an HTML page that include the following:

- At least five images
- Each image must be 100 pixels in width and 100 pixels in height.
- Text accompanying each pictures
- Include appropriate alt text for each image.
- At least one image's src must be from an outside link (aka stored on the internet)
- At least one image's src must be from an image you have saved on your computer.

If you finish early, attempt to do an HTML image map.

Space Jam and General Miscellanea

(This activity will be done as a class)

In 1996, the biggest name in sports ever, Michael 'Air' Jordan, and the biggest name in cartoons, the Looney Tunes, combined forces to make the greatest movie ever made, Space Jam. To accompany this great movie, a website was made, which has thankfully survived to this day.

`http://www2.warnerbros.com/spacejam/movie/jam.htm`

Together, we're going to go over all the ways this is a poorly designed website and what mistakes it made.

Reverse Engineering/Source Code Viewing Open up Chrome, Firefox, or Internet Explorer and open a website. Right click and choose View Source. Also try selecting "Inspect Element." What does inspect element do?

Answer the following questions

- What are some ramifications of being able to look at a website's source code?
- What could a website do to prevent competitors from stealing their work, given that the HTML is visible?
- Define what Front-end development is. What is an example of a Front-end programming language/markup language?
- Define what Back-end development is. What is an example of a Back-end programming language/markup?
- What is UX design?

Popcorn Maker

Design a video using popcorn maker. It must contain 3 images, and involve a quote, song lyric, haiku, or motto. Embed this in an html page.

Typing, Characters, and Bits

Typing

(This was going to be an activity to do on Friday)

Go to `http://www.typingtest.com` and do the test for Aesop's Fables. (Mr. Littrell will do it as well. If you can beat his time...good for you? You get bragging rights. That's the greatest gift I can give you).

What is the formula they use to calculate words per minute. Is this test accurate/fair? We will discuss as a class.

Now for fun, we are going to do a typing test using Dvorak keyboards. Go to `http://learn.dvorak.nl/`, make sure that "Map QWERTY TO DVORAK" . How does your speed compare. Is this an accurate test?

Bits

Answer the following questions:

- What are the possible values of a bit?
- How many bits are in a byte?
- How many bits and bytes are in a kilobyte
- How many bits, bytes, and kilobytes are in a megabyte
- How many bits, bytes, kilobytes, and megabytes are in a gigabyte?
- What is a qubit?
- What is ASCII?
- Why is there something called "Bell" in ASCII?
- What is Unicode?

Question: Do you think the following problem can be solved by a computer: A program that detects if another program will freeze or not.

Ethics/Responsible Usage

- What is a copyleft license?
- What things can be copyrighted? Can colors, algorithms, sounds, or words be copyrighted? If so, give examples?

Answer the following questions: are they ethical or a good idea?

- Complain about your work on Twitter, before or after you leave the job.
- Post a picture on Facebook of you drinking. Regret it. Delete it.
- Google someone to figure out all of their information.

Go to the Wayback machine (Google wayback machine or internet archive).

- What does the Wayback machine do?
- How far back does the Wayback machine go?
- How could it be useful?
- How could it be hurtful?
- Are there ways to tell the Wayback machine to not store your website?

Number Bases

Important Note!

We are computer scientists, so we always count starting from 0!

Our typical numbering is in the decimal numbers – each digit goes from 0-9 (thus why it is called decimal, because there are 10 possible values that go in a digit). It is also called Base 10.

The most popular non-decimal numbering is Binary, or Base 2. Each digit is either 0 or 1.

A common base to use is Base 16, or Hexadecimal. Once you reach 9, you switch to alphabetical characters (A for 10, B for 11, C for 12, D for 13, E for 14, F for 15).

To convert from Base n to Base 10 First, multiply the digit in the ith place by n^i. Then add the results together.

For instance, given 1001_2, it is in base 10: $1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 8 + 1 = 9$.

To convert from Base 10 to Base n

Long divide the given number by n, which mean keep track of the quotient (how much goes in evenly) and the remainder.

Then repeat, dividing the quotient by n as well.

Keep doing this until the remainder is 0. Take all the remainders you got from each step, and arrange them in reverse order from how you got them. This is your final number.

For example, given 127, when divided by 16, gives you a quotient of 7 and a remainder of 15 (or F).

7 divided by 16 gives a quotient of 0 and a remainder of 7.

0 divided by 16 gives a quotient of 0 and a remainder of 0.

Therefore, $127_{10} = 7F_{16}$ (this is sometimes referred to as $0 \times 7F$.

Nice thing about binary to hexadecimal

If you have a binary number, divide its digits into groups of four.

So 10101001_2 turns into 1010_2 and 1001_2. Convert the groups individually into hexadecimal. So $1010_2 = 10_{10} = A_{16}$, and $1001_2 = 9_{10} = 9_{16}$. Then put the groups back together and they form the correct hexadecimal number.

$10101001_2 = A9_{16}$.

If we have time this quarter, we will discuss negative binary numbers and how to perform arithmetic with them

0.1 You are a computer! Exercise

You are going to simulate a very small computer.

On a scratch piece of paper, keep track of 16 address of memory (little slots/boxes where you can store a number), numbered 0-15. We may not use all of them, though, so only draw ones once you need them.

Also keep track of a box on your paper called AC, or Accumulator Register. This is where data you are working with is stored. Also have a box called PC, or Program Counter. This keeps track of which line you are on.

Every instruction is an 8 bit number. The first 4 bits say what instruction it is, and the last 4 bits say what data to use (call this the Argument).

Here are the instructions (this is called an Instruction Set) you little computers will do (the instructions here are numbers in decimal notation):

0. Load: Load the data from the memory at Argument into AC
1. Store: Store the value in AC into the data
2. Add: Add whatever in the memory at Argument to AC.
3. Jump: Change PC (aka, go to a different code line) to Argument.
4. SkipEql: Skip if AC is equal to the data from the memory at Argument.
5. Halt: Stop the program.

Now, compute the following programs(Note, the AC and PC both start at 0).

Message Place the number 0 in Address 0, 3 in address 1, 10 in address 2, 8 in address 3, 14 in address 4, 1 in address 5.

0. 00000101
1. 00100010
2. 00010010
3. 00000000
4. 00100101

5. 00010000
6. 01000001
7. 00110000
8. 01010000

Convert Address 2, 3, and 4 into Hexadecimal. What do they spell?

Interesting Program Place the number 3 in Address 0, 3 in Address 1, 1 in Address 2.

1. 00000000
2. 00100010
3. 01000001
4. 00110000
5. 01010000

What does this program do?

Hexadecimal Colors/Intro to CSS

Recall that all colors, w.r.t. computers, are a combination of Red, Green, and Blue. We say a color's red value is a number between 0-255 (aka 2^0-$(2^8 - 1)$), and likewise for green and blue. So it only takes 8 bits to represent a color.

We'd prefer to deal with one number rather than 3 numbers, so we can use hexadecimal to do that. It takes 8 bits to represent R, or G, or B. So the first 8 bits of a hexadecimal number are the red, the second 8 bits are green, and the last 8 bits are blue.

Convert the following colors to hexadecimal (in HTML, we mark hexadecimal numbers by putting a # at the beginning of the number)

- Red
- Green
- Blue
- Black (that's where red is 0, green is 0, and blue is 0)
- White (that's where red, green, and blue are at maximum)
- Violet (red at maximum, blue at maximum, green at 0)

To test this, create an HTML file with a p tag like the following

```
<p style="color:...;">I'm beautiful.</p>
```

Replace ... with one of the colors above.
Define/answer the following questions:

- What does CSS stand for and what does it do?

- How do div and span tags differ? What are they used for?
- What are gradients in CSS?
- What is inheritance in CSS?
- What is the difference between embedded styles, inline styles, and external styles?
- How are ids used in CSS?
- What are CSS classes?
- When do you use margins or padding?
- What is a monospaced font?

The following css styles are ideal to look at, especially for the next assignment:

- align
- color
- border
- width
- height
- text-align
- margin (you can specify margin-left, margin-right, etc)
- padding (you can specify padding-left, padding-right, etc)
- background-color
- float

If you want to center align an image, you might want to use the following css class:

```
.centeredimage {
  display: block;
  margin-left: auto;
  margin-right: auto;
}
```

CSS Assignment: Pascal's Triangle

Pascal's Triangle is a famous mathematical object. The first row (aka the 0th row) is just the number 1. Each row after that begins and ends with 1. You then take the sum of each adjacent pair in the previous row and add it between the 1s on the current row.

For example, the first four rows:

1
1 1
1 2 1
1 3 3 1

Make an HTML page with the following requirements:

- You display the first six rows of Pascal's triangle.
- Use a monospaced font
- Have a border around each number.
- Numbers on evenly numbered rows (starting with 0) should have the same background color, while numbers on oddly numbered rows should share a background color which is different from the evenly numbered rows. (ex. evenly numbered rows could be colored cyan and oddly numbered rows could be colored red)
- Each row should be centered.
- Must include a header tag
- Must include a paragraph describing at least one application of Pascal's Triangle.
- Must include an external stylesheet, an embedded style, and an inline style.

Links and Paths

A Path, or URL, can either be absolute or relative.

An absolute path is the complete address or location of a file. For a local file, it'd look something like: C:\Users\MrLittrell\Documents\Poems\Strike.png.

A relative path is the address of a file RELATIVE to the CURRENT LOCATION.

So if I had a file called Foo.html in C:\Users\MrLittrell\Documents and I want to include the image Strike.png, I only need to specify the fact that its in the folder Poems.

```
<img alt="An image of a strike" src="Poems\Strike.png">
```

Now, if Strike.png was instead in the MrLittrell folder, which is back a folder, I use .. to specify "Go back a folder."

```
<img alt="An image of a strike" src="..\Strike.png">
```

Dictionary/Thesaurus (15 points)

Pick 8-12 words and make an HTML page for each of them. This project must satisfy the following requirements:

- Include a home page to navigate your mini-dictionary.
- Each word has its own page
- A word's page must include a picture somehow related, any of its definitions.
- Include at the bottom of the page where you found the definition and the picture.
- At least two of the words must be either synonyms or antonyms (I encourage to have more than 2). Include on such pages links to its synonyms or antonyms.
- There must be at least one example of a link to an external website, a link to one of your own local pages, and a link to another location on the same page.
- Use an external stylesheet so each page has a consistent style.

You may add any additional information to each page as you like. Do try to make the pages look appealing.

Tables

What do the following tags or attributes do?

- table
- tbody
- thead
- th
- tfooter
- td
- tr
- colspan

Prisoner's Dilemma Table

There is a branch of mathematics called "Game Theory," which is the study of making strategic decisions. Here's a classic game in Game Theory.

There are two prisoners/players. They committed a crime together and are caught. They are put in separate interrogation rooms. They have the option to either remain **quiet** or **rat** out their partner.

- If you are quiet, and your partner is quiet, you get 1 year in prison.
- If you are quiet, and your partner rats, you get 3 years.
- If you rat, and your partner is quiet, you get 0 years in prison.
- If you rat, and your partner rats, you get 2 years in prison.

We will play out a few rounds to see who can get away with smallest number of years in prison.

Then, make an HTML page with the following requirements:

- Have one "Payoff" table. A table that explains how many years you get based what you do and your partner does.
- Have a table for the game we play as a class. Include each of your classmates in a column, how many years they got each round, and their total number of years. Highlight the rows of those with the least number of years in one color total, and those with the most in another color.
- Make sure to include table headers.

If absent/not present

If you are absent this day, do this alternative exercise:

Construct a table for the original 13 colonies of the United States. Include in this table information on:

- Date of establishment
- Languages Spoken
- Currencies Used
- A picture of the modern day state's flag.

Make sure to include table headers, and color them differently from the rest of the cells.

Forms/Data/Miscellanea

For this section, the following form elements/html tags would be useful

- form
- submit
- option

- input (number, range, email, checkbox, radio, password, date, etc.)
- textarea
- fieldset
- legend
- select

Pretend we are making a website where we will allow users to make a new account at Mr. Littrell's Film Fan Club.

You are responsible to make the New Account page for Mr. Littrell's Film Fan Club.

First, list what sort of data would I want for someone joining a Film Fan Club. Think in terms of both their personal information as well as information related to being a member of a film fan club. (You definitely need name, email).

Make sure there is a submit button within your form.

For form, use the following tag:

```
<form action="MAILTO:someone@example.com" method="post" enctype="text/plain">
```

When you are done, be prepared to answer the following questions:

- Why did you use each form element for each particular piece of data?
- What happens when you submit the form?
- What are the possible downsides to submitting data in plain text?

Javascript Introduction

Answer the following questions:

- What is Javascript?
- What is ECMAScript?
- Is Java the same thing as Javascript?
- What is the script tag for? How do you define an embedded script versus an external script?
- How are Javascript and CSS different?
- What does var do in Javascript?
- What does alert do in Javascript?
- What does confirm do in Javascript?
- What is a Javascript function? How do you define one?
- What does the onclick even do?
- What does window.location do?

Quiz Project Write a series of HTML pages for a quiz (you determine the questions). It must have the following requirements:

- There must be a starting page and an ending page.
- There must be at least five questions, all with four answers. Each question must share a common theme.
- Use the button tag or divs with onclick events for the possible answers (why might using links be a bad idea for a quiz?)
- When clicking on the wrong answer, alert the user that they're wrong and take them back to the beginning of the quiz.
- When clicking on the right answer, alert the user that they're right and take them to the next question.

Call me at this point.
Calculator Project Answer the following:

- What is a DOMElement?
- What does document.getElementById do?
- What does innerHTML change?
- What is variable scope?
- How does If-Else-Else If work in Javascript?
- What is a String variable, a Number variable, and a Boolean variable in Javascript?
- What does the Number function do?
- What is NaN, Infinity, and -Infinity in Javascript?
- How do you get the text from a textbox in Javascript?

Write an HTML calculator with the following requirements:

- You must include two textboxes for the two operands (there may be form elements that are better for selecting numbers. Use them if you want)
- You must include some way to display the total.
- You must include buttons/divs for +,-,*,/. When you press one of these operands, it puts the result of the operation in the total display.
- If the user attempts to divide by 0, stop them and alert them to their mistake!
- Include a clear button. This sets the two textboxes for the operands and the total to 0.

Slideshow Project Answer the following:

- What is an Array in Javascript?

- How do you get an element or length from an Array in Javascript?
- What do the setTimeout and setInterval functions do? How are they different?
- What does clearInterval do?

Write an HTML slideshow with the following requirements:

- Find at least three images, either online or on your computer. Make an array in Javascript of each of these urls/addresses as Strings (for example, var imageSources = [”coolimage1.png”,”coolimage2.png”,...])
- There must be an img, with a set width and height. Ideally make this img centered. Set the src to the first image in your array from the previous step.
- There must be a ”Forward” button and ”Backwards” button.
- When you click forward, change the src of the img tag to the next image. If you are at the last image, loop to the beginning. Likewise, when you click Backwards, change the src of the img tag to the previous image. If you are at the first image, loop to the end.

As a hint, I suggest you keep a variable called ”position” that tracks which image you are on, starting with 0. To change an image's source, you just have to get the DOMElement for the img tag and changes its .src attribute.

Slideshow Redux: Stop Motion

Write an HTML slideshow stop motion video with the following requirements:

- Find a gif image and split it into several small images. Use `http://ezgif.com/split` (if this is for some reason blocked, Mr. Littrell will find a different way). Store these in a folder called Images.
- There must be an img, with a set width and height. Ideally make this img centered. Set the src to the first image from the previous step (the beginning of the gif)
- There must be a Play and Stop button.
- When you click Play, it goes through the images from the gif one by one in order (make sure it runs fast enough to make the playing semi-seamless). If it reaches the end, it loops to the beginning. When you click Stop, it stops the video from playing.
- Feel free to add a ”Play in reverse” button.

Like before, you probably want to keep a variable called position. Instead of keeping an array of all the different images, I recommend using the fact that the images share a common name (like foo1.jpg, foo2.jpg, etc). You can add Strings and numbers together like, if x = 3, ”foo” + x = ”foo3”.

Pig Latin Translator Answer the following questions

- What does substring do in Javascript?

- What is a For Loop in Javascript? What is a While Loop in Javascript?
- How are tabs and new lines represented in Javascript strings?
- What is the difference between \n and \r\n when it comes to new lines?

Create an HTML page with the following requirements:

- There should be a textarea for users to put type input
- There should be a textarea for output.
- There should be text and a title explaining how the page works
- There should be a button to make the conversion from English to Pig Latin.
- The rules for English to Pig Latin are as follows: if a word begins with a consonant (we consider y for this a consonant), move the consonant to the end of the word and add 'ay'. For example, Pig Latin becomes Igpay Atinlay. If the word begins with a vowel, simply add 'way' to the end of the word. So Egg becomes Eggway.

To accomplish the translation, I recommend using the following algorithm:

1. Loop through each letter in the text.
2. If it is a punctuation mark, space, new line, or tab, just add it to the output.
3. Once you hit a non-space, find where the word ends.
4. Pull the word out, convert it and translate it.
5. Add the converted word to the output.
6. Continue to the next letter after the word and repeat.

Question: Given the rules for Pig Latin, if one reverses the algorithm to translate from Pig Latin back to English, is it necessarily umambiguous? In other words, are there any words that when translated from English to Pig Latin, they end up becoming the same Pig Latin word, so it's unclear how to translate them back to English? (The fancy math word for this is asking if the function from English to Pig Latin is one-to-one, or injective. This is equivalent in asking if the function from Pig Latin to English is well-defined).

Extra Project: For if you complete projects ahead of time If you finish ahead of time, I challenge thee to do one of the following extra projects:

- *Quiz Redux* Make another quiz project (either the same as before, a new quiz, or a 'personality' quiz [like, Which Type Of Dog Are You?], place each question all in one page. Use radio buttons for the answers to each question. And at the end, the user clicks a button and they are told what the final results are.
- *Fancy Haiku Reading* Write an HTML page that displays a Haiku of your creation, one letter at a time (you might want to use some of the code from the Slideshow to make this happen)

Objects in Javascript (and also, books. Cool, amiright?)

Answer the following questions:

- How do you make an Object in Javascript?
- What is an Object property in Javascript? How do you define it and access it?
- What is object-oriented programming?
- Why might one use an Object in lieu of an array?
- What is the onload event for?
- What does \n do in a String in a Javascript?
- How do you add a new child element to an existing DOMelement in Javascript?
- What does document.createElement do in Javascript?
- What is public domain?
- What is Project Gutenberg?
- What is Google Books?

My Library Project

Create an HTML page where you will showcase your favorite freely available books. It must have the following requirements:

- You must have at least four books/stories selected from Project Gutenberg (if you are looking for ideas, it has Frankenstein, Beowulf, books by Shakespeare, Charles Dickens, Jane Austen, Lewis Carroll – the guy who wrote *Alice in Wonderland*, Agatha Christie, Charles Darwin, and more. You may want to look at this link for ideas `http://www.gutenberg.org/browse/scores/top`).
- The page should have a link or button for each book. When clicked, the page displays the following information about the selected book:
  - its title
  - a brief description of it
  - a personal rating (either thumbs up, thumbs down, or some star system. Your call)
  - a link to the text on Project Gutenberg, preferably the "Read online in HTML" url.
  - Optional: Include a picture.
- Only one book's info should be displayed at a time.
- This must be all on one page.

- You may NOT explicitly write out the links/buttons. They must be generated by Javascript code. Look below for a suggestion ow to accomplish this.

Suggested method of attack:

1. Have two divs, one with the id "menubar" and one with the id "bookinfo"
2. In the bookinfo div, have a header with the id "title", a span with with the id "rating", a p tag with the id "description", and an a tag with id "read". All of these should have no text between their opening and closing tags.
3. Give the body tag the attribute "onload" equal to "generateBookInfoLinks()"
4. In a script tag in the head, make two functions, one called generateBookInfoLinks() and one called showBookInfo(bookInfo).
5. Also include in the script tag as a global variable an array of Objects called booksInfo. Each object in booksInfo should have the following properties: title, rating,description, url.
6. In showBookInfo, set all the elements inside bookinfo to display info matching bookInfo (you will have to access the properties from bookInfo, and modify either the innerHTML or href property of the elements in the div)
7. In generateBookInfoLinks(), loop over each element in bookInfo. You can use a more typical for loop or while loop

   ```
   var i;
   for (i=0; i < booksInfo.length; i++){
     var bookInfo = booksInfo[i];
   }
   ```

   In the loop, create a new button element. set its innerHTML to the title of the bookInfo, and set its onclick to a function that calls showBookInfo on bookInfo. So it'd look like this:

   ```
   newButton.onclick = clicker(bookInfo);
   ```

   Create a helper function called clicker that looks like this

   ```
   function clicker(bookInfo){
     return function(){showBookInfo(bookInfo)};
   }
   ```

Manually creating and archiving files

Create a folder on your desktop and name it Foo. Create inside of it a folder named Bar. Create inside of Bar a folder named Baz. From google, download three images and place one in Foo, one in Bar, and one in Baz.

Right-click the folder on your desktop and choose Send to > Compressed (zipped) folder. This should create a zip file. Compare the sizes of the original folder Foo and the zip file by right clicking and choosing properties.

To decompress the file, right click the zip file and choose extract all.

Zip files, very roughly, work by figuring out which letters appear the most. Letters that appear the most (for example, a space) should be encoded as small as possible, like as a single 1. Letters that appear rarely (like) should have longer codes, like 10101010. That way, if your file has many letters, and some letters appear way more frequently than others, Zip can squeeze the frequent letters into smaller representation.

Answer the following questions:

- What is a directory or subdirectory?
- Zip file format is a lossless compression algorithm. What does lossless mean? Why is it important that Zip be lossless?
- What situations would a zip file NOT be useful for decompression?
- Would zipping a zip file really help? (Try zipping a zip file, and then zipping that zip file, and see what happens)
- Huffman Coding is the basis of the encoding Zip uses. Describe basically how Huffman Coding/a Huffman Tree works/looks like (including something about prefixes is nice).

Navigating via cmd prompt

Open up the Foo folder with Windows Explorer (not Internet Explorer). In the location bar, type

cmd.exe

This will bring up the command prompt with its working/current directory in Foo. We will spend much time in here. When I say "working in command line" I mean here.

To go to a folder, type

cd FolderName

To go backwards, use

cd ..

cd is short for 'current directory'

We call a full path (like C:/Users/Foo/Foo.html an **absolute path**.

We call a partial path (like Foo/Foo.html or ../../ Foo.html) a **relative path**

What commands do you need to use to do the following:

- In a single line, cd from Foo to Baz
- In a single line, cd from Baz to Foo
- cd from Foo to your Documents folder. You may not use .. (hint: try typing the full location name for your Documents folder).

- This sort of url format can be used for hrefs and srcs in HTML for files that aren't located in the same folder. Make two (simple) html pages, one in Foo and one in Bar, that have links to each other. You must use relative paths.

What happens if you use the following commands while in the Foo folder: (I recommend doing these one at a time. You may need to use notepad to see what happens to txt files like welcome.txt)

- dir
- echo "Hi!"
- echo "Hi!" > welcome.txt
- dir *.txt
- echo "Bye" >> welcome.txt
- echo "Bye!" > welcome.txt
- type welcome.txt
- mkdir TextFiles
- move welcome.txt TextFiles
- erase TextFiles/welcome.txt

You can also let Command prompt help you out. **What happens** if you type the following
cd Text
and then hit tab?
Call me at this point.
Challenge: Now create a bunch of txt files in TextFiles. In one line, move all the files in TextFiles to Baz. Hint: wish upon a star.txt

Batch files

As we can't expect users to input lines one by one, we can combine many lines of command prompt code into a single batch file.

Madlib

In notepad or notepad++ write the following

```
@echo off
set /p myname= What is your name?
echo Hello %myname%
pause
```

Based off this, create a batch file that allows the user to make a simple madlib (no more than five options).

Note: To set a variable without asking for user input, you can do something along these lines:

set myvar= hello

If you want to set it specifically to a number, use

set /a myvar= 3

To add (say 1) to a variable, use

set /a myvar+= 1

Loops

Guess what? Batch has loops as well.

Numerical For Loop

FOR /L %%I IN (1,1,10) DO echo %%I

Question, what do the numbers represent in (,,)?

For each/List Loop

FOR %%M IN (January February March April May June July) DO echo %%M

For each/File Loop

FOR %%F IN (*) DO echo %%F

To make this recursively go down inside subdirectory, try:

FOR /R %%F IN (*) DO echo %%F

Some extra commands

If you need to pause, use timeout like

TIMEOUT 10

Will count down from 10 to 0. You can add the /nobreak argument to prevent users from exiting early.

TIMEOUT /nobreak 10

An alternative way to wait is to use ping. ping tries to talk to a server, but you can send it to ping yourself. There is a second delay between pings, so this can serve nicely.

PING -n 2 127.0.0.1 < nul

Question: Why do I specify 2, 127.0.0.1, and nul?

Multi Line For Loops

If you need to have multiple lines in a FOR loop, use parentheses to enclose the body of the loop.

```
FOR /L %%I IN (1,2,10) DO (
  echo %%I is the loneliest number
  echo it's the loneliest number since the number 1.
)
```

Command line arguments

Sometimes you want the ability to pass 'arguments' to your programs without having to ask the user for input. These are command line arguments.

Write the following batch script

```
@echo off
echo %1 is cool.
echo %2 is cooler.
pause
```

Then in command prompt, call the batchscript as follows:

```
CommandLineArgsTest.bat Zach Chess

CommandLineArgsTest.bat Zach

CommandLineArgsTest.bat Zach Chess Checkers
```

What is the result of each of these?

Define what is a command line argument and their purpose in BATCH.

What happens if you click on a file in Windows Explorer and drag it on top of the icon of your batch script?

Tasks

- Write a batch script that counts down from 10 to 1, one second in between, and then says "Lift off!"
- Write a batch script that counts the number of files with either the extension .txt or .png. Hint: Look back in the section where I show how to set variables. Adding numbers works exactly how you'd expect.
- (Here's something Mr. Littrell could really use) Write a batch script that takes a file somehow and copies it to all folders whose name start with CTC. The simpler the better!

Malware

You will be divided into one of six groups. Each group is responsible for tackling one of the following types of malware:

- Computer Worm
- Trojan Horse
- Botnet
- Spyware
- Rootkit
- Ransomware

As a group, you will make a presentation (ideally powerpoint) with the following topics addressed, if applicable:

- How does your piece of malware work?
- What is a notable example (if there are 4 people in your group, include 2 examples) of your malware? Include the following details if possible:

  - Who made it
  - What did/does it do
  - What were the repercussions of it/is it still active today?

- What are some ways to combat your type of malware?

Batch and command prompt continued (If statements)

Batch would be pretty useless without some form of If statement.

IF EXIST

You can ask if a file exists, as follows

```
IF EXIST foo.txt (
  echo Been there done that.
)
```

You can optionally put NOT in front of EXIST to instead ask if a file doesn't exist.

IF ==

You can ask if two strings are the same, as follows

```
IF "foo"=="%var%" (
  echo We are the same.
)
```

If you want to make it case insensitive, add /I after the IF
(We can make this much more advance in the next section)
Like before, use the NOT keyword to see if the strings are not the same.

IF ERRORLEVEL

Every command or program on Windows has an "exit code" – a number it returns when it is finished. Traditionally, if the exit code is 0, everything went fine. If it is -1, something bad happened. Other codes mean other things, but if they aren't 0 then there is probably an issue.

Try this for size:

```
echo hi
IF %ErrorLevel% EQU 0 echo Saying hello works
```

Or this

```
copy foomanchu
IF %ErrorLevel% EQU 0 echo All is well.
IF %ErrorLevel% EQU 1 echo Poop!
```

Once again, use the NOT keyword if you want to see if the last exit code was not a given number (this is handy for checking if a command doesn't return 0).

you can also just use ERRORLEVEL ¡Number¿, but that returns true if the error level is equal to or greater than Number.

CHOICE

You can use the CHOICE function in conjunction with errorlevel to allow the user to easily select from a group of choices, then use ErrorLevel to figure out which one it was

```
echo Do you want:
echo (a) A puppy
echo (b) A kitten
echo (c) a lizard

CHOICE /C abc /M "Here is my message: Make a choice!"
IF %ErrorLevel% EQU 3 echo Godzilla is on blu-ray now I think
IF %ErrorLevel% EQU 2 echo Meow
If %ErrorLevel% EQU 1 echo Hide the chocolate.
```

If you omit the /C choices, the default choices are YN, for yes and no.

Practice

- Write a batch file that takes command line argument, and checks to see if the given file exists. If it does, it types out the file. If the file doesn't exist, ask the user to input a line of text and write that line of text to the file.

  Note for this, put at the top of your program:

  ```
  setlocal EnableDelayedExpansion
  ```

  And for the variables, instead of using % var%, use !var!.

  This is due to BATCH's weird handling of variables inside of fors or if.

- Write a batch file that takes user input. It then attempts to run the string given as a command (put the variable on its own line). If the command fails to work, let the user know that they're a dummy.

- Write a batch file where the user inputs a filename. Check to see if there is a file with the name in the current folder. The search should be case insensitive!

- Write a batch file that asks the user if they want to hear a song lyric, giving them three possible songs. When they press the button associated with a song, echo a line from that song. Use the CHOICE command.

Call me at this point.

Henceforth, I will not go over every single possible command in Batch. Here is a fairly complete list with possible commands (Be CAREFUL with these!

Some of these commands can mess up your computer. It's best just to use the commands I suggest unless you are certain).

`http://ss64.com/nt/`

Here's another good site with good references (I think some of the examples are incorrect, but it's still an excellent resourceS)

Streams and piping

Let's first develop your lingo so you can talk intelligently with IT people and me about Batch. Answer the following questions, and I suggest you type them or write them as I will ask you about them and they can appear on tests:

- In Batch, what does < do? (this is NOT to be confused with >)
- In Batch, what is Standard Output?
- In Batch, what is Standard Error?
- In Batch, what is Standard Input?
- How can you make echo send output to the Standard Error instead of Standard Output?
- What is the NUL device in Batch? Why use it?
- How can I silence both the Standard Output and Standard Error?
- What is the Console?
- What is piping?

Practice

- Use your madlib generator from the previous section and redirect input from a textfile, one that I will provide.
- Write the following batch file

  ```
  @echo off
  echo Standard Output is working!
  echo Standard Error is working! 1>&2
  ```

  Now, run it from command prompt in such a way that it produces no output or error (it should not make a new file either!)

- Accomplish the same task as the first bullet, but this time you may not use the standard input redirect trick. You must use piping.

String Manipulation

(Skipped in favor of time. May become homework)

Go to `http://www.dostips.com/DtTipsStringManipulation.php` and look through the different ways to manipulate Strings. I will not go over every function, but there are four I stress as useful.

Middle String This gets the characters from a string from a starting position and given length

```
set fooberry= fooberry
echo %fooberry:~2,5%
::This echoes oober
```

Left String

This gets the first n characters from a String (this is effectively just using the middle string slicing again)

```
set fooberry= fooberry
echo %fooberry:~0,3%
::This echoes foo
```

Right String

This gets the last n characters from a String

```
set fooberry= fooberry
echo %fooberry:~-4%
::This echoes erry
```

Replace

This replaces a given pattern with a given replacement string

```
set fooberry= fooberry
echo %fooberry:r=t%
::This echoes foobetty
```

Practice

- Write a batch file that takes a COMMAND LINE ARGUMENT and echoes what its file extension is (so if someone gives it the file foo.jpg, it echoes 'jpg'). Assume the extension is only 3 letters long.
- Write a batch file to see if any file located in the current directory starts with the letter B (lower or upper case)

  Tip! For this, first make sure delayed expansion is enabled. Then in the for loop, put the loop variable in another variable, like

  ```
  FOR %%F IN (*) DO (
    set filename=%%F
  ```

  Then do string manipulation on filename. Remember to use ! instead of %!
- Write a batch file called AcronymBopper that takes the three initials of someone, and replaces the middle initial with the legend.

  For example:

>AcronymBopper.bat ZAL
ZthelegendL