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| Title | Week | Track | Lab | Assignment | Extra Credit | Associated AP Unit | Research (Markdown) |
| Q1 Start |  |  |  |  |  |  |  |
| Module 1 | 1  Aug 12-16 | IO  Intro | Install software: JDK, Git, Atom.  Accounts on git.tiseagles.com, 4 projects for IO, Data, Physics tracks, and research tutorial.  UNIX CLI on-screen demo  Walk through online tutorial on Markdown in class: <https://learn.getgrav.org/16/content/markdown>  <https://docs.gitlab.com/ee/user/markdown.html>  Use command line to navigate to .java, compile using javac, and run using java. | Lab:  Create a simplistic .java program that prints something, and then record <1 min (narrated) screen video of navigating to the directory, compiling, and running the .java file.  Exercise:  Complete W3Scools Java HOME through Syntax (4 screens) <https://www.w3schools.com/java/default.asp> | Research using Nano, and use to write a Java program. Record a screen movie of writing/compiling/running a class using only command line. | 1: Primitive types | Read/summarize:  Chap 1 “The History and Philosophy of Java” – “Try This 1-1”  Code snippets and screenshot:  1-1 |
| Module 1 | 2  Aug 19-23 | Data  CPUs | Simplistic “compilation” for trivial processor: (1+2)\*(3+2), then loop to increment variable to a threshold.  Simplistic Processor PPT  ~~PPT for Boolean algebra, simplification, “bubble-pushing”~~  [DeMorgan’s Theorems](https://www.allaboutcircuits.com/textbook/digital/chpt-7/demorgans-theorems/)  PPT Computer Architecture overview  ~~Overview of a “Turing Machine”~~  Play game:   * Program table * ALU table * Memory table | Lab:  1. Write Simplistic Processor instructions to execute (2+2)/(1+1).  2. upload a text file SimplisticProcessor.md  Exercise:  1. Draw the logic gate circuit for a 4-bit full adder.  2. Highlight the wires that are “on” for the addition 7+9. Explaining why this operation “overflows” the adder.  3. upload photo or scan of your image  **Need:**  **Arrays practice** | - Write Simplistic Processor instructions to execute 10\*10.  - Two memory addresses will need to be used to hold the result.  - Describe a generic process to multiply any two 4-bit numbers. | 3: Booleans and if statements | Read/summarize:  Chap 1 “Two Control Statements” – “The Java Class Libraries”  Code snippets and screenshot:  1-2 |
| Module 1 | 3  Aug 26-30 | Sim  Ball  Traj | Calculate a ball trajectory distance: solve equations by hand, then write program using only variables. | Lab:  Calculate the height reached by the ball: **solve by hand**, then add height to program from lab.  **Need:**  **Loops practice**  Exercise:  Complete the W3Schools Java Comments through Break/Continue (13 screens) <https://www.w3schools.com/java/java_comments.asp> | height/distance for 4 independent balls | 1: Primitive types | Read/summarize:  Chap 2 “Why Data Types are Important” – “Try This 2-1”  Code snippets and screenshot:  2-1 |
| Module 2 | 4  Sep 2-6 | IO  CLI | Loop through the CLI arguments array and print each argument. Print a message if no arguments were passed on the command line.  Direct the output to a text file.  Teaching steps:  Have everyone build an example of these:  **Arrays** (initialize/populate)  Int[]  String[]  **Loops** (loop through contents of an array & populate using a loop)  **while**  **for** (convert while loops to for loops)  **CLI arguments**  Print list of CLI arg strings  **String methods**  Use .substring() and .length() to loop through “abcd” and print each char.  Take the first CLI arg and count the number of ‘A’s in the string.  **Methods**  Void method() to print  Int method() to print and return a value  Int method(String) to count number of ‘A’s in a string  String method(String) to return first char in a string  **binaryString Code**  Use .substring(), .length(), and .equals() to loop through “00101” and calculate binary value. | Lab:  Write a binaryValue() method to return an int value from a string containing binary 1s and 0s. Return 0 for a string containing any other characters. Attempt to convert each CLI argument into a binary number and print the decimal equivalent.  - Direct the output to a text file.  Exercise:  Complete the W3Schools Java Arrays through Methods (3 screens) <https://www.w3schools.com/java/java_arrays.asp> | Re-write the binaryValue() method to consider the first bit to be a sign bit, and use two’s compliment to convert the value to an int (including negative numbers). | 3: if statements  4: Iteration  6: Arrays | Read/summarize:  Chap 2 “Literals” – “Expressions”  Code snippets and screenshot:  2-2 |
| Secondary Fall Camps | Sep 9-13 |  |  |  |  |  |  |
| Module 2 | 5  Sep 16-20 | Data  FSMs | Create a Finite State Machine diagram for a crosswalk model and parsing a CSV file.  Implement the FSM, read a .CSV file directed to the stdin and redirect to an .HTML file from the stdout.  FSM PowerPoint | Add FSM state backslash escape character | Add FSM states toggle on/off delimiter checking based on quotation marks | 1: Primitive types  3: Booleans and if statements | Read/summarize:  Chap 3 “Input Characters from the Keyboard” – “Try This 3-2”  Code snippets and screenshot:  3-1  3-2 |
| Module 2 | 6  Sep 23-27 | Sim  Ball | write Physics.java with time(), distance(), and graph(), and test using TestPhysics.java. | Change each while-loop to a for-loop; add a Physics.graph() method that prints array using ‘\*’ characters; change TestPhysics to use the .graph() method. |  | 3: Booleans and if statements  4: Iteration  6: Arrays | Read/summarize:  Chap 3 “Use Break to Exit a Loop” – “Nested Loops”  Code snippets and screenshot:  3-3 |
| National Day Holiday Week | Sep 30 – Oct 4 |  |  |  |  |  |  |
| Test 1 Week | 7  Oct 7-11 |  | Test 1: three 2019 MCQ questions (changed slightly) | Counts as homework  Extra credit is markdown analysis of each problem |  |  |  |
| Module 3 | 8  Oct 14-18 | IO  CLI | 1. Create a StringContainer class with getInt() method. 2.open a text file (passed as a CLI argument) and read each line as a string into an ArrayList. 3. Create a new file and print integer values. | Change program to do the following:   1. Change StringContainer to parse and hold the value as a double 2. Create a MovingAverage filter class that “slides” an array holding 5 StringContainer objects along the containers array and prints the average value to filtered-numbers.txt. 3. Use provided “noisy” waveform, create a smoothed waveform, and plot in provided Excel sheet “Moving Average Filter.xlsx” | Re-write the TestPhysics class to receive variables from the command line arguments. Output to CSV file. Graph using Excel. | 2: Objects  3: if statements  5: Writing classes  7: ArrayList<> | Read/summarize:  Chap 4 “Class fundamentals” – “The this Keyword”  Code snippets and screenshot:  4-1  4-2 |
| Q2 Start |  |  |  |  |  |  |  |
| Module 3 | 9  Oct 21-25 | Data  Graph | write GraphModel and Line classes. write TestGraphModel class that creates two GraphModel objects, plots y=x^2 from -10 to 10 on one model and loads 2 stand-alone Lines on the other, and print both models using toString(). | 1. write comments (in your own words) for each method. 2. add getLines(), minX(), minY(), maxX(), maxY(), and endPlot() methods. 3. Change toString() of GraphModel to only print Line objects, and change output to CSV compatible. 3. Copy/past output into CSV file and graph using Excel. | In TestGraphModel, write code/method that creates new lines between pairs of parabola Points (horizontal lines). | 2: Objects  3: if statements  5: Writing classes | Read/summarize:  Chap 5 “Arrays” – “Try This 5-2”  Code snippets and screenshot:  5-1  5-2 |
| Module 3 | 10  Oct 28 – Nov 1 | Sim  Ball | Write the Physics.trajectory() method (based on code from ThrowBall.java in module 1) and test in TestPhysics.java using the .graph() method. re-implement ThrowBall.java to use Physics.java to print trajectories of 4 different balls using A,B,C,D. (0.1s interval). Optional: throw a ball in front of a grid on the wall, record a movie, and loop through possible velocities to match distance (determine angle and initial height from movie). | ######### TODO! #########  Re-wite Physics.java to be object-oriented. Re-write ThrowBall.java to create 4 instances of Physics object. | Loop through angles for each of your 4 balls (differing heights and velocities), and find optimum angles. | 2: Objects  3: if statements  5: Writing classes  8: 2D Arrays | Chap 5 “The For-Each Style for Loop” – The ? Operator”  5-3 |
| Test 2 Week | 11  Nov 4-8 |  | Test 2: **two** of the 2015 FRQ questions (changed slightly) + three 2019 MCQ questions (changed slightly) | Counts as homework  Extra credit is markdown analysis of each problem |  |  |  |
| Half Week (ISC Ed Conf) |  |  |  |  |  |  |  |
| Module 4 | 12  Nov 18-22 | IO  Files | write a program to read from a text file using Scanner and read into a 2D array. Write the text file to a CSV file. | ######### TODO! #########  transpose and print 2D array and write to a CSV file. | ######### TODO! ###  output the transposed array as an HTML table, and pipe to an .html file. | 2: Objects  3: if statements  5: Writing classes  8: 2D Arrays | * Model-View-Controller model * Interfaces   Abstract classes  Chap 6 “Controlling Access to Class Members” – “Try This 6-2”  6-1  6-2 |
| Module 4 | 13  Nov 25-29  (Sci Fair) | Data  Graph | implement GraphView interface as GraphViewText class. write ScreenTransformation class and a GraphController class that instantiates GraphModel and GraphViewText objects, calls plotLine() with 4 Points (creates 3 Lines), and shifts the 1st intersection of the lines (creating a zig-zag). | 1. write comments (in your own words) for each method. 2. draw axes in the refresh() method 3. Convert each for -loop into a for-loop (where possible). 4. Re-write the drawLine() method to plot x(y) instead of y(x) for slopes greater than 1, 5. Plot y = -0.02x^2 + 2x + 200, at resolution (50,50). | draw lines from the origin to each point in the parabola. | 2: Objects  3: if statements  5: Writing classes  8: 2D Arrays | Chap 6 “Constructor” – “Varargs: Variable-Length Arguments”  6-3 |
| Module 4 | 14  Dec 2-6 | Sim  Rocket | extend Point as Vector, create a FreeBody class and extend as Rocket class. Test Rocket with TestRocket class. Display height, velocity, distance curves by calling toString() on the location Vectors.  TODO: add time delays to display the rocket in motion | 1. copy Point, Line, GraphView, GraphViewText, GraphController from the Data track, 2. Instantiate model/view to display locationY(locationX) and model/view to display locationY(time). | ########## | 2: Objects  3: if statements  5: Writing classes  7: ArrayList<>  8: 2D Arrays  9: Inheritance | Chap 7 “Inheritance Basics” – “The Object Class”  7-1 |
| Exam 1 | 15  Dec 9-13 |  | End of first semester:  Exam 1: **two** of the 2015 FRQ questions (changed slightly) + three 2019 MCQ questions (changed slightly) |  |  |  |  |
| Q3 Start |  |  |  |  |  |  |  |
| HS Finals Week | Dec 16-20 |  |  |  |  |  |  |
| Christmas Vacation | Dec 23-27 |  |  |  |  |  |  |
| Christmas Vacation | Dec 30 – Jan 3 |  |  |  |  |  |  |
| Module 5 | 16 | IO  Files | program to read all the files in a directory into an ArrayList and create a file containing lines with the name and length of each file. | change program to combine all files and save to one file in a different directory. | output to an HTML document with scrollable DIV elements displaying each file | * Reading & writing with File objects * ArrayList practice |  |
| Module 5 | 17 | Data  Graph | Write the GraphViewGUI class to implement GraphView using a GUI OS window. Run GraphController and display parabola in GUI window. | re-graph Physics track module 4 using GraphViewGUI.  TODO: time delays with screen refreshing | graph a 3rd order function and a sin wave. | introduction to Java graphics |  |
| Chinese New Year | Jan 20-24 |  |  |  |  |  |  |
| Chinese New Year | Jan 27-31 |  |  |  |  |  |  |
| Module 5 | 18 | Sim  SpringMass | Extend FreeBody as an Element of a cross-section of a membrane under tension. Each element has a small mass, and is accelerated up or down by the two other elements it touches. Create an ArrayList of Elements and “pluck” one Element, simulate for 10 seconds. export to CSV. | Modify code to export ArrayLists of Line objects (using locationList<Vector> as Points) and import a GraphModel object. Run simulation at real-time 0.1 sec intervals for 10 sec. Update the GraphViewGUI object to create an animated view of wave front and bouncing actions. | Create 3D (time) graph in Excel using CSV data. | * OOP Simulation & modeling |  |
| Test 3 | 19 |  | Test 3: **two** of the **2016** FRQ questions (changed slightly) + three 2019 MCQ questions (changed slightly) | Counts as homework |  |  |  |
| Module 6 | 20 | IO  Sockets | Open a ServerSocket and respond to a GET request with a simple HTML string. Test functionality using a web browser. | parse the GET string for a filename only (ignore directory paths), and use that to open a file and print that to the client. | allow GET string to include full directory filepaths (removing any “..”) for security. | * TCP/IP Sockets * String parsing |  |
| Module 6 | 21 | Data  Text | Sort (bubble) ArrayList of Distribution objects (containing mean, min, max, std\_dev methods) for each top 100 (in common) word. Read from a directory containing at least 10 texts by an author. Print CSV file with word,avg,min,max,std\_dev. | read from 3 directories (3 authors) and score 1 for each word that is less than 1 std\_dev from the other author. Print the score / total\_common\_words as a percent when comparing each pair of authors. | compare books of the bible in original Hebrew/Greek (provided) and evaluate whether there is strong evidence for books with common authorship. |  | * Research sorting algorithms |
| Module 6 | 22 | Sim  SpringMass | Extend standard Rectangle2D objects as PixelElement objects, with a color attribute to show their third dimension. Run membrane simulation in 3D and export PixelElement objects. Export as collection of CSV files (for each instant in time) into a folder. | Modify GraphModel to accept PixelElements (draw as colored filled rectangles), and use GraphViewGUI to display animation of wave front and bouncing action. | Add a drag coefficient to each PixelElement, and create a screen movie of waves bouncing and decaying. |  |  |
|  | 23 |  | Test 3: **two** of the **2016** FRQ questions (changed slightly) + three 2019 MCQ questions (changed slightly) | Counts as homework; first day of week work through the actual questions  Extra credit is markdown analysis of each problem |  |  |  |
|  | 24 |  | Practice MCQ 1: **ALL** of the **2014** MCQ questions (changed slightly) | Counts as homework; first day of week work through the actual questions  Extra credit is markdown analysis of each problem |  |  |  |
| Q4 Start |  |  |  |  |  |  |  |
|  | 25 |  | Practice exam: **ALL** of the **2017** FRQ questions (changed slightly) | Counts as homework; first day of week work through the actual questions  Extra credit is markdown analysis of each problem |  |  |  |
|  | 26 |  | Introduce a template (questions, dissection, etc) for analyzing FRQ problems.  Demonstrate with first 2 FRQ 2017 problems | Analyze last 2 FRQ 2017 problems |  |  |  |
| Spring Break | Apr 6-10 |  |  |  |  |  |  |
|  | 27 |  | Practice exam: **ALL** of the **2018** FRQ questions (changed slightly) | Counts as homework; first day of week work through the actual questions  Extra credit is markdown analysis of each problem |  |  |  |
|  | 28 |  | Demonstrate analyzing first 2 FRQ 2018 problems | Analyze last 2 FRQ 2018 problems |  |  |  |
| Exam 2 | 29 |  | End of **AP Year**:  exam is **ALL** of the **2019** FRQ questions (changed slightly) | First day of week: work through actual questions in class |  |  |  |
| AP Exams | May 4-8 |  |  |  |  |  |  |
| AP Exams | May 11-15 |  |  |  |  |  |  |
| Secondary Spring Trips | May 18-22 |  |  |  |  |  |  |
| Fun Week | 30  May 25-29 |  |  |  |  |  |  |
| Finals Week | Jun 1-3 |  |  |  |  |  |  |
| Graduation | Jun 4 |  |  |  |  |  |  |