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PYTHON LAB

BINARY REGISTER

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Overview & Introduction

- Task: Get an input string from the user in the form of 1's and 0's and convert it to a list of Integers, and then an actual binary number.
- This lesson and Lab is to bring together the basic Python constructs, including:
  - Conditional IF statements
  - For loops
  - While Loops
- Using Top Down design flow to break a coding problem down

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SEE APPENDIX A, FOR LICENSING & ATTRIBUTION INFORMATION

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Resources & Materials Needed

- Raspberry Pi or Laptop to with Python 3 installed and updated
- Interactive Notebook or Google doc to create Top Down design flow diagram

WHAT YOU WILL KNOW…

- Prior Knowledge
  - How to open and run Python on a Raspberry Pi or other device
  - Familiarity with Python constructs like if, elif, else, while, for loops
  - Debugging skills to break down a python coding challenge

- What You Will Know & Be Able To Do
  - Use your Debugging skill to construct a top down flowchart to describe the python coding challenge
  - Impalement Python code to solve the coding challenge
  - Describe to classmates how you solved the coding challenge

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How will you be measured

- Individual Students will submit working code
- Students teams will present diagram of Top Down design flow chart, and this will be graded
- Students teams will present orally how they solved the coding challenge, and depth of understanding will be graded

NEW WORDS...

- Binary

Introduction – The Coding Task

- Get a input string from the user that is only 1's and 0's
- Convert it to a list of integer values
- Then convert it to an actual Binary number

Identify the smaller tasks of this challenge, and create a modular flow diagram

Implement the code in a modular function based method that will allow for easy modification

First Challenge - Get an Input

- Challenge 1: - Get a input string from the user that is only 1's and 0's, Then Convert it to a list of integer values

```
STEAM-Clown@STEAM-Clown-PC ~/myPython
$ python3 logicworkCellSimulation.py
Enter a Binary value 10011100
This is the Input String:  10011100
This is the Input as a List of numbers:  [1, 0, 0, 1, 1, 1, 0, 0]

STEAM-Clown@STEAM-Clown-PC ~/myPython
$
```

- Before you run off to Google to find code, please take some time to solve this on your own.

Hint:

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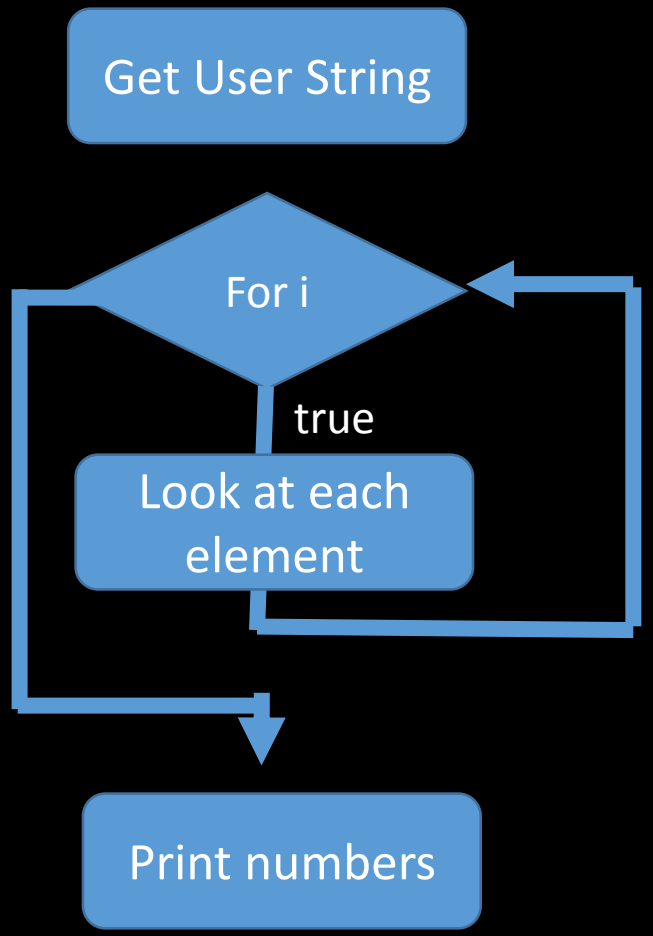
Break the Problem Down

- Get User input string
- Create a Loop to walk through the input string and convert each element to an integer number
- Print the numbers



Answer Slide – Post after Students have had a chance to work the challenge

Challenge 2- Now make a decision if bit element 3 is a 1

- Print something if a specific bit is “asserted”
  - If bit 7 is a 1, then print something

```
STEAM-Clown@STEAM-Clown-PC ~/myPython
$ python3 logicworkCellSimulation.py
Enter a Binary value 11010001
This is the Input String:  11010001
This is the Input as a List of numbers:  [1, 1, 0, 1, 0, 0, 0, 1]
bit 7 is a  1
```

Hint: if you need help understanding the median see: https://www.khanacademy.org/

Challenge 3- Now make a decision if 2 bits are something

- Print something if a 2 bits are what you expect
  - If bit 6 and 7 are expected, then do something

```
STEAM-Clown@STEAM-Clown-PC ~/myPython
$ python3 logicworkCellSimulation.py
Enter a Binary value 10011110
This is the Input String:  10011110
This is the Input as a List of numbers:  [1, 0, 0, 1, 1, 1, 1, 0]
Turn Right Motor on forward 1 0

STEAM-Clown@STEAM-Clown-PC ~/myPython
$
```

Hint: if you need help understanding the median see: https://www.khanacademy.org/

Challenge 3- Now make a decision if 2 bits are something

- See where I'm going with this?

```
STEAM-Clown@STEAM-Clown-PC ~/myPython
$ python3 logicworkCellSimulation.py
Enter a Binary value 11010110
This is the Input String:  11010110
This is the Input as a List of numbers:  [1, 1, 0, 1, 0, 1, 1, 0]
Turn Right Motor on forward 1 0
Turn Left Motor on reverse 0 1

STEAM-Clown@STEAM-Clown-PC ~/myPython
$
```

Hint: if you need help understanding the median see: https://www.khanacademy.org/

Challenge 4 – Now make the int numbers actually a binary number

- Convert the List of integer 1's and 0's to an actual binary number… Mr. Burnham has not figured this out
- Why? So you can do bitwise operations on the binary number

Hint: https://www.tutorialspoint.com/python/bitwise_operators_example.htm

ASSESSMENT

- Assessment Type(s):
  - ✓Demonstrations
  - ✓Rubrics

- C = working challenge 1 code
- B- = working challenge 2 code
- B+ = working challenge 3 code
- A = working challenge 4 code

Turn in
1. Link to Code (this can be github, google docs, or upload txt files

+1 extra point = add odd random set of numbers rather than user input

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REFERENCE SLIDES

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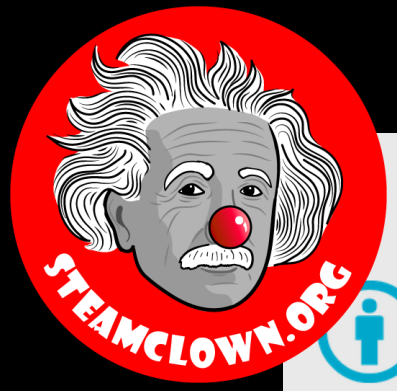
APPENDIX

Appendix A: License & Attribution

- This interpretation is primarily the Intellectual Property of Jim Burnham, Top STEAM Clown, at STEAMClown.org
- This presentation and content is distributed under the Creative Commons License CC-by-nc-sa-3.0
- My best attempt to properly attribute, or reference any other sources or work I have used are listed in Appendix B



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Appendix B: Attribution for Sources Used

WHAT TO FIX FOR NEXT TIME