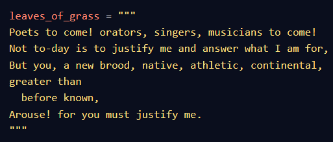
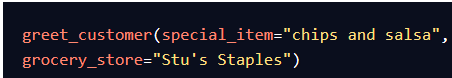
**Python 3.**

**Summary:**

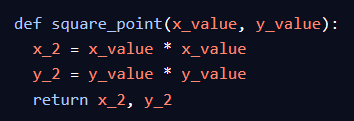
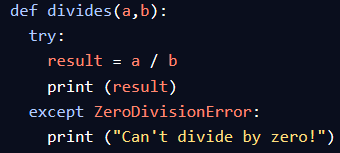
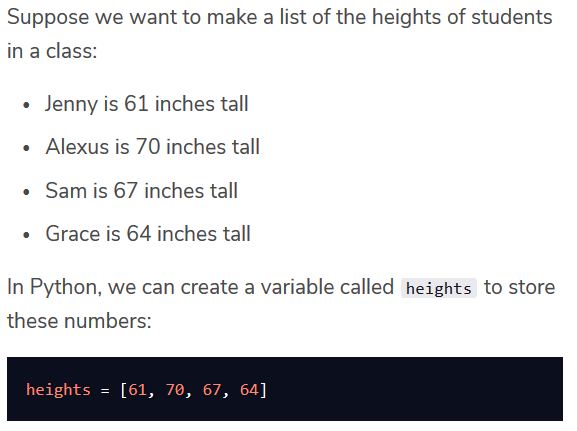
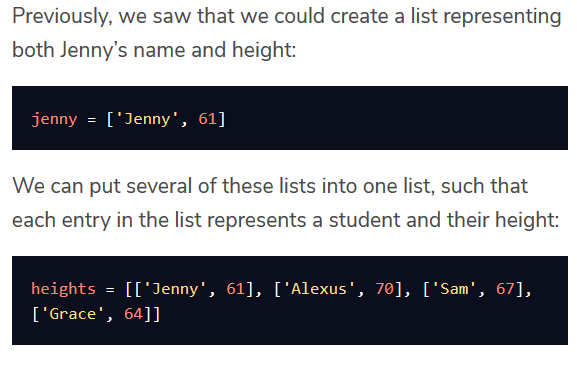
* General purpose versatile popular programming language. Concise and easy to read, also good language to have in programmer stack as can be used for everything from web dev to software dev and data science

**SYNTAX**

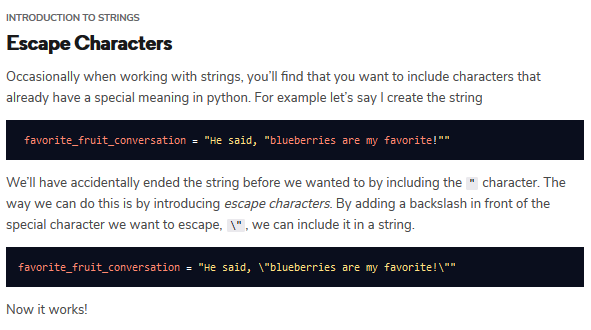
* Comments
  + Text written in prog, but not run by cpu called comment.
  + Python interprets anything after a # as a comment.
  + Provides context for why something is written way it is
* Spacing
  + In python amount of whitespace tells cpuu what is part of a function and what is not part of it.
  + Tabs are not the same as 2 spaces or 4 by default.
  + Stay consistent with using tabs or spaces
* Print
  + print( “whatever u want in here” )
  + print can print anything, no need to convert to string
  + unless doing mix of str and another datatype
* Strings
  + Blocks of text.
  + Can be surrounded with double or single quotes, **JUST BE CONSISTANT**
  + Can create string with repeated string by doing
    - String a=anotherString\*3; #repeats anotherstring 3 times in a
  + **Multi-Line Strings**
    - If want to write string spanning multiple lines use ‘’’ or “””
    - This lets compiler know string doesn’t end till next ‘’’.
* Variables
  + Way to store data for reuse. Assign variables with = sign in python.
    - Example
      * message\_string=”Hello There”
      * print(message\_string)
  + After var assigned to initial val, it CAN be reassigned to new val with dif data type from initial.
  + Can check type of a var using the type(var\_name) and print to get result displayed
* Errors
  + When error occurs, python will point it out with a ^ character.
  + When prog throws error we don’t expect to encounter, call those BUGS.
  + TWO COMMON ERRORS
    - SyntaxError:
      * Something wrong with way your prog written
        + Punctuation does not belong
        + Command where not expected
        + Missing parenthesis
    - NameError
      * Python Interpreter sees word does not recognize.
      * Code that contains something that looks like var but was never defined will throw error
* Numbers
  + Python has few numeric data types.
  + Int
    - Whole number, no decimal point and contains counting numbers as well as negative and the number 0
    - An\_int=2
  + Floating-Point number (float)
    - Decimal number. Can be used to rep fractional quantities.
      * Ex: average test score, length of wall…
      * A\_float=2.1
* Calculations
  + Performs standard +, - , \* , /
  + When doing devision, result has a decimal place. This is because Pyton converts all ints to float before performing division. (2.8 and up) version
  + DIVISION CAN THROW ZERODIVISIONERROR
  + EXPONENTS
    - Use the notation \*\*
    - Example: print(2 \*\* 10) # 2 to the 10th power
  + Modulo
    - %
    - Give remainder of division calc
    - If number divisible, then modulo operator will be 0
      * Ex: 29%5=4
      * 25%5=0
  + CONCATENATION (+)
    - Doesn’t just add numbers, CAN ADD STRINGS
    - Concatenating strings can create brand new string compromised of contents of first and second string…
    - IF WANT TO CONCATENATE A STRING WITH A NUM HAVE TO MAKE NUM A STRING FIRST USING str()
    - Ex:
      * Age=10;
      * Print(“I am” + str(age)+” years old”)
  + PLUS EQUALS
    - Shorthand for updating vars.
    - When have num saved in var and want to add curr value of var can use +=
    - Example:
      * Num\_hiked=12
      * numHiked+=2;
    - CAN BE UESD FOR STRING CONCATENATION TOO
* **Input**
  + Can assign val to var through user input.
  + We use keyword input()
    - Example:
      * Like\_snakes=input(“Do you like snakes”)
* **Functions** 
  + Usually created if some process or calculation have to be repeated.
  + Can save time from having to rewrite code
  + General Format:
    - def function\_name() :
      * #code here
  + PARAMETERS
    - Vars that can pass into function
    - Can do this
    - def function\_name(par1,par2…):
    - These called positional arguments…assignment depends on order placed in
    - Can use keyword arguments where explicitly refer to what each arg is assigned to in function call
    - Ex:
    - Can also define default args for function so if nothing placed inside, has defaukt.
      * Example:



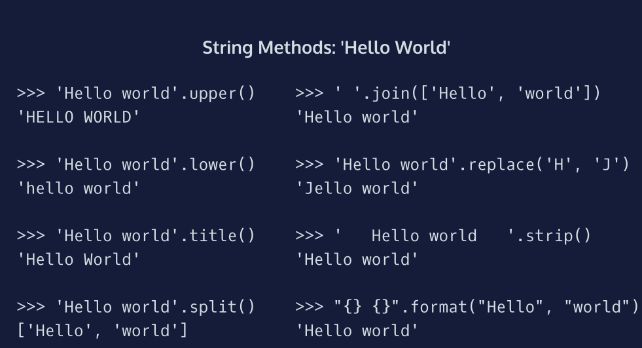
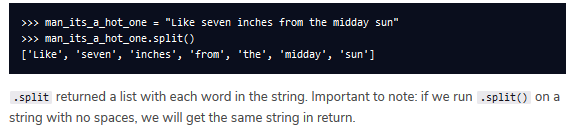
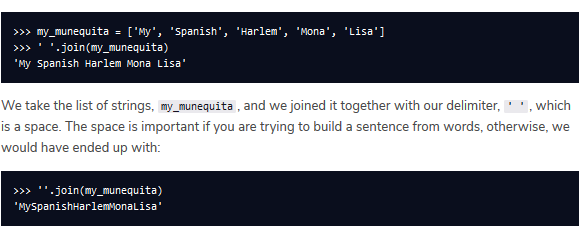
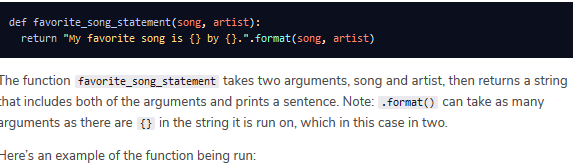
NOTE: KEYWORD ARGUMENTS WRITTEN SO THEY COME AFTER ALL POSITIONAL ARGUMENTS IN FUNCTION DEFINITION

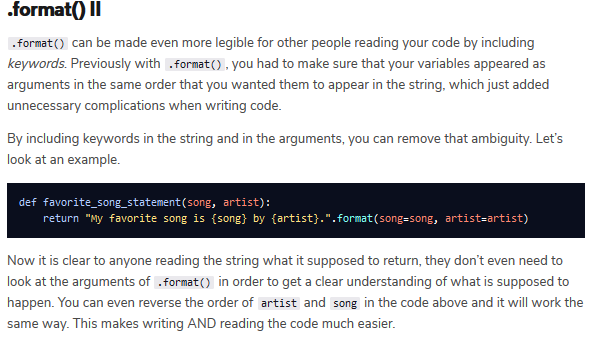
* + RETURNS
    - Functions can return a val to user so that this val can be modified or used later using “return” keyword
    - Can return multiple return values by separating them with a comma
      * 
    - Can get these values by doing:
      * X\_squared,y\_squared=square\_point(1,3)
      * When returning mult vals separated by commas, all vals listed actualy wrapped in a tuple (1,2,3…) that tuple is returned containing each val.
      * Can tuple unpack where if tuple has mult vals, can assign same num of vars to number of elements in tuple.
* **Boolean Expressions**
  + To add control flow to program, want to eval if statement true or not.
  + Can assign true or false to vars using var\_name=True… # or False
  + Notice first letter capitalized
  + Relational operators:
    - == #equals, compares two items return true or flase
    - != #not equals
    - > …….. >=
    - <………<=
  + Boolean Operators
    - and
    - or
    - not #this is actual word, not ! like in Java
  + Conditional Statements
    - If(some condition):
      * Do stuff…
    - Elif(some condition):
      * Do stuff
    - Else:
      * Do stuff
    - TRY EXCEPT STATEMENS
      * try:
        + #some statement
      * except ErrorName:
        + #some statement
      * Statement under try will execute, if there is an exception then goes to except statement and executes that and try terminates.
    - Can raise errors using “raise” keyword
* **Lists**
  + Ordered set of objects in Python
  + Can make list of anything, even combine multiple data types
    - Even list of lists
  + ZIP
    - If want to create list of lists that paired together  
      , can use zip.
    - EXAMPLE:
      * Name\_and\_heights=zip(names,heights)
      * #names and heights are each a ist.
      * #can print out by casting to list print(list(name\_and\_heights))
    - Can create empty list be leaving empty brackets
    - Can add element to list using .append()
    - Ex:
      * Empty\_list.append(1) #adds to end of list
    - CAN combine two lists using +
    - Ex: added\_lists=list1+list2
    - Range
      * If want to create list of consecutive nums.
        + Ex: my\_range=range(10)
        + Gens number from 0-> n-1
      * If pass in two args, can create list starting at dif nums.
        + Ex: range(2,9)
      * If pass in 3 args, can create diff starting, and interval number
        + Ex: range(2,9,2) will skip increments of 2 from 2-> 8
    - Length
      * Can find length of list using len keyword
        + Ex: print(len(my\_list))
    - Indexes
      * Python is zero indexed
      * Can access each element in list using list[index#]
      * **Can use index -1 to select last item of list**
    - Slice
      * can slice list if don’t want all of it using list
        + ex: sublist=letters[1:6]
        + print(sublist) //will print to index-1 so if want index 6 need to do letters[1:7]
      * If want to select last few elements of a list can do:
        + Print(fruits[-3:]) for example
    - Count
      * If want to know how many times something appears in list can use count function
        + Ex: letters.count(‘I’)
    - Sorting
      * If want to sort numerical or alphabetical can use .sort()
      * Sort does not return anything
      * Can also use sorted(list) this returns a sorted list instead so the original list stays the same
  + Tuples
    - DS in python, allowing store mult data inside it.
    - VERY SIMILAR TO LIST, but IMMUTABLE
      * Once create, elements,order,how many they are cant be changed.
    - Ex: my\_inf=(‘Mike’,24,’Programmer’) 🡸 tuple
    - Can be used like lists, if want to access info can do
      * My\_info[0]… etc.
      * Tuples immutable, so can’t change! Can’t add or remove.
      * What u see is what u get.
    - Can unpack….
      * What this means is that the info in tuple can be stored in var.
      * Ex: name,age,occupation=my\_info
      * So it gets the info from my\_info tuple and store into these created variables.
      * As long as number of vars created for elements in tuple, can do this!
    - SPECIAL CASE
      * Creating one element tuple
      * Ex: one\_elmeent\_tuple=(4)
      * Notice we only get value 4, it doesn’t create tuple
      * THIS BECAUSE in math can surround num in parenthesis like math….
      * SO IF WANT TO CRAETE ONE ELEMENT TUPLE,
      * Have to do
        + One\_elmeent\_tuple(4,)
        + NOW itll be a tuple.
    - When to use?
      * Store data meant to be together but not necessarily similar.
      * So example the data like my\_info describes me so it should be together…..
      * Order MATTERS FOR tuples, so unpacking for example has to be in order…
  + Loops
    - Iteration especially through lists
    - General format
      * For <temp\_var name> in <list var name>:
        + <do some actions>
  + **Can use in range to iterate through certain amount**
    - Ex: for I in range(num):
      * Do stuff
  + Infinite loops defined as:
    - For temp\_var\_name in list\_name:
      * List\_name.append(something)
        + List will never end since appending so never terminate
  + Can use break keyword to break out of loop early
  + Continue keyword can be used to skip values and move to next iteration
* While Loops
  + While(sum condition):
    - Do stuff
  + If have list of lists, can iterate by doing:
    - for temp\_name\_1 in list\_name:
      * for(temp\_name\_2 in temp\_name\_1:
        + do stuff
* **List Comprehension**
  + 



* Strings
  + Thought of as list of chars
  + Each char has index and can access like java
  + Favorite\_fruit[0] gives first letter of string
  + Can also select chunks using:
  + String\_name[firstindex:lastindex] …
    - Last index NOT included
  + Can also use len() method to find length of string
    - Can slice last several characters using len()
    - So string\_name[length-#] where # is how many yaw anna slice off
    - ORRRR we can just use negative indexes where
    - -1 is last letter of string, -2 is second to last, etc….
  + STRINGS IMMUTABLE, each time we slice or concatenate we perform and create entirely new string.
  + Escape characters
    - 
  + ITERATION
    - Can easily iterate through string like for loop
      * Ex:
        + For letters in string\_name:

…

* + - CAN SEE IF CHAR IN STRING using in keyword
      * In checks if one string part of another.
      * Works with entire strings!!
  + STRING METHODS
    - Python comes with built-in string methods giving you power to perform complicated tasks on strings quickly and efficiently Allow to change case, split, join, combine…
    - Typically use by string\_name.string\_method(arguments) # general form
    - FORMATTING METHODS:
      * .lower() all lower
      * .upper() all upper
      * .title() //first letter of each word caps
      * REMEMBER… STRING METHODS CREATE NEW STRINGS THEY DON’T CHANGE OG
      * .split() takes one argument, returns list of substrings found between given argument
        + The arg is whatever u want to split by whether its one space, a letter, etc… ex:
        + String\_name.split(‘ ‘)
        + Can also split with escape sequenes like \n or \t
      * .join() opposite of .split, joins list of strings together with given delimeter
        + Ex:
      * So delimiter .join(list name of strings to combine)
    - .strip()
      * When working with real data strings aren’t clean, find lots of whitespace icky linebreaks etc
      * This ethod removevs all whitespace chars from beginning and end.
      * Can also give char argument which will strip that char from either end of the string.
    - .replace()
      * Takes two args, replaces all instances of first arg in string with second arg.
    - .find()
      * Takes string as arg, searches string on the og string if true return index of first match
      * Ex: ‘smooth’.find(‘t’)
    - .format()
      * Takes var as argument and includes them in string that it is run on
      * 



* Modules
  + Love when code is reusable, most time we write code so it can be reusable for ourselves. But what if want to share?
    - Module is collection of Python declarations intended to be used as a tool.
    - AKA libraries or packages
    - TO USE A MODULE
      * From module\_name import object\_name
    - Library typically include lot of code we don’t need that may slow down program so makes sense to only import what you need.
    - One common library comes as part of Python STL is datatime.
    - Can use import \* to import everything in library.
      * Can be dangerous as it could pollute local namespace where same name could apply to two possible things.
  + If want to see useful functions that library has can utilize the
    - Dir() function example:
      * Import math
        + Print(dir(math))

#outputs all attributes of math module

* + COMMON LIBRARIES:
    - datetime
    - random
      * if want to import all don’t need to add the from part so ex:
        + import random
    - matplotlib -for plotting things
    - decimal – for more decimal arithmetic accuracy
  + Namespace
    - A namespace isolates functions, classes, and vars defined in module from code in file doing the importing.
    - Python defaults to naming namespace after module being imported, but can be ambiguous sometimes.
      * Happens when conflicting name with object you already have defined within local namespace
        + TO FIX THIS:   
          can alias using as keyword ex:

Import module\_name as name\_you\_pick\_for\_module

* + - * + also useful if name really long and want to shorten
  + DATETIMES
    - Python object representing point in time
      * Point of time:
        + Year, month,day,hours,min,sec,millisec….
    - To import
      * From datetime import datetime
    - To create a day:
      * Birthday = datetime(year,month,day) 🡸create datetime obj
        + Can add additional args to rep time
        + Ex: datetime(year,month,day,hour,minute,seconds)
      * Can now do stuff like
      * Print(birthday.year)….month….day…hour….etc
      * Can figure out day using **birthday.weekday()** 
        + 0=Monday, Sunday=6
      * Can also create date using datatime.now()
        + Get access to current time right now
        + timeRN=datetime.now()
      * can subtract these datetimes
        + datetime(2018,1,1)-datetime(2-17,1,1)
        + shows different in time with days, seconds,minutes etc
      * Typically won’t have these clean dates or something… date stored as strings and stuff ex: “Jan 15, 2018” Python can convert this to a datetime!
        + Ex: parsed\_date=datetime.strptime(“Jan 15,2018”,..)

There is a second argument that asks how string is formatted.

If google python datetime provides directives on how to format

For Jan 15, 2018 use

“%b %d, %Y” #tells python format of our date string!

* + - * Can do opposite and convert date time to formatted strin using strftime
        + Ex: date\_string=datetime.strftime(dateTime, “directives like above” )
  + WHAT IS A VIRTUAL ENVIRONMENT?
    - Let’s say python developer and working on 2-3 projs for company.
    - These projs have dif libraries, dif versions of python…
    - Lets say one project uses request 2.20.1 … and lets say
      * For another project we use request version 2.18.2 …
      * These projects may use dif version of python, or libraries
      * VIRTUAL ENVIRONMENTS locally to specific projet that defines versions of python, libraries, dependencies,etc.
      * This env allows u to keep all organized without h aving to manually change version/files
      * TO CREATE VIRTUAL ENV
        + Create a directory
        + Go into directy
        + Type pipenv –three

This initializes python3 virt env.

Creates pipfile that has info about the virtual env and all packages and dependencies have in the folder.

To install shit can do pipenv install requests for example

To install specific version do

Requests==2.18.1 for example

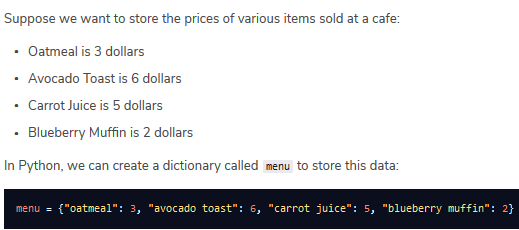
Where request is some module /library

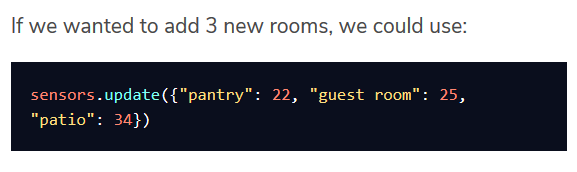
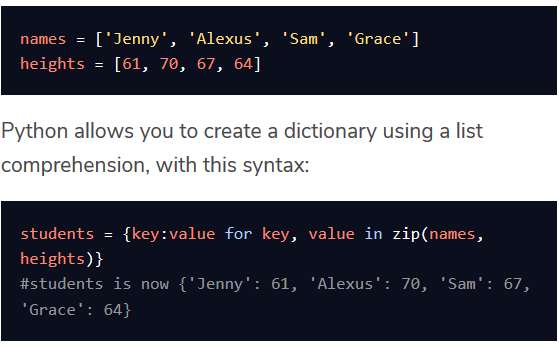
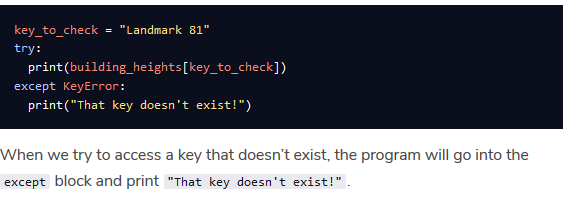
Now to access SHELL for the specific environment can do pipenv shell

Inside this shell can execute python code

TO EXIT

Can just type exit()

This will take you back to pipenv shell then type exit to exit out back to cmd

* + DICTIONARY
    - Unordered set of key value pairs.
    - Notice begins with { brace. Each item consists of key value pair separated by comma
    - Good practice to put space after each comma
    - Can map a key to a list for example, etc…
    - Can mix and match values so one is a list another string, etc all in same dictionary
    - KEYS must always be unchangeable hashable data types
    - Can declare empty dictionary
      * Empty\_dict={} 🡸 the syntax
    - TO ADD TO DICTIONARY
      * My\_dict[“new key”]=”new value” #WERK
        + THIS CAN ALSO OVERWRITE A VALUE WITH THAT KEY IF ALREAD THERE
      * IF want to add multiple keys at once can use update function
    - DICTIONARIES CAN ALSO USE LIST COMPREHENSIONS
    - **If try to access a key that’s not there, will get KeyError**
      * Can check if key in dictionary by saying
      * If key\_to\_check in dictionary\_name:
        + Do stuff
      * OR can use a Try/Except
    - HOW TO GET A KEY?
      * Dicitionaries have a .get() method to searc for value instead of my\_dict[key] notation
        + Example: dictionary\_name.get(“key name”)

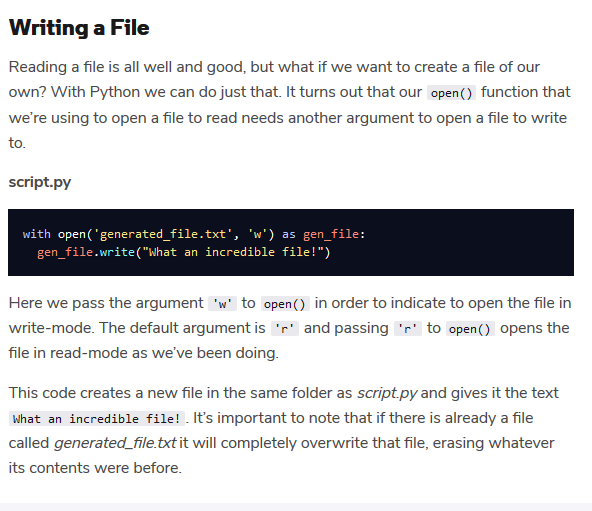
CAN SPECIFY WHAT TO RETURN IF key DNE using

Dictionary\_name.get(“key\_name,0”) 🡸return0

* + - * If want to get ALL keys can use list function on dictionary to get list of keys
        + Example: names=list(dictionary\_name)
      * OR can use a .keys() method to return a dict\_key obj.
        + This obj is view only can’t add or remove from this but can be used for iteration
        + Ex:

For student in test\_scores.keys():

#do stuff

* + - HOW TO REMOVE A KEY?
      * Use .pop(keyName,default\_value)
        + Like .get except we remove the key pair
    - HOW TO GET ALL VALUES?
      * Also has a .values() method to return a dict\_values obj
    - HOW TO GET BOTH?
      * Use .items() method. Returns a dict\_list obj.
      * Can iterate by doing:
      * For company, value in biggest\_brands.items():
      * Print(company+”has value of”+str(value))
* FILES
  + How to interact with files in python
  + If want to grab whole doc into single string use .read()
  + If want to save each line in a var user .readlines() to read text line by line
  + Can read write to file like picture. Where r=read, w= write, r+ is read.write
    - If don’t wanna delete whole file when writing, can use a instead which stands for append mode
    - The with kw calls the context manager for file that were callin open() on
    - For closing files, we have to tell Python when we are done so it can write to them (files outside of Python control)
    - The with syntax replaces older ways to access files where we need to call .close()
    - Using with is preferred since don’t’ have to explicitly close
  + Python can also read CSV files

