GCIS-123 Final Exam Study Guide

This is a review for the GCIS-123 final exam. This study guide can help you prepare for the final exam. Do your best to complete as many of these questions as you can.

The sections are as follows:

- **Unit 1: Computer Literacy**
- **Unit 2: Intro to Python**
- **Unit 3: Incremental Development and Testing**
- **Unit 4: Strings and Loops**
- **Unit 5: Files and Exception Handling**
- **Unit 6: Arrays, Searching, & Sorting**
- **Unit 7: Sorting**
- **Unit 8: Python Lists**
- **Unit 9: Dictionaries and Sets**
- **Unit 10: Classes & Objects**
- **Unit 11: Methods & Equality**
- **Unit 12: Stacks & Queues**

Feel free to work with each other to complete this guide. This can be great reference for studying for the final exam, so be sure to take a look at this document when you are studying for the exam.

If you think of anything else that you believe will help you study for the exam, feel free to fill in the "other" section at the bottom of the document.

You can find all of the coding activities from previous SI Sessions on this page: https://github.com/zmb6893/GCIS-123-16-Fall-SI-Activities

Activity point breakdown:

#. 1 point	**Note that all written answers are 1 pt**
#. 3 points	
#. 5 points	
#. 10 points	
#. 15 points	

Unit 1: Computer Literacy

Question	Answer
What structure are files organized in?	Tree
Does each file have a unique absolute path?	True
What command can you use to open or create a new file called “hello.txt”?	Windows: notepad hello.txt Mac/Linux: touch hello.txt
What command is used to move into a directory?	cd
How can you find a txt file that starts with the letter “a”? What is this called?	a*.txt. Wildcard
What is the workflow of git?	add>commit>push
What git command is used to copy the contents of a remote repository to a local repository?	Git clone
What do you call the github copy of a repository?	Remote repository
Why do we use version control?	To be able to rollback to previous changes
How do you check what files have been staged to be pushed? When should you use the command?	Git status. Use this command before the add in the git workflow.
How do you get changes from a previous version of your program?	Git checkout
What is a detached head?	When your local repository is disconnected from your remote repository.
What are environment variables?	Affects the running processes on a computer.

Unit 1 Activities:

1. Create a repository called `GCIS-123-final-review`. Clone and navigate to that directory.
2. Create a file called `unit01.txt`
3. Make files called `Axolotl.txt`, `apple.txt`, `abc.txt`
4. List **all** of the files that have a name that starts with the letter ***a***. On the first line in your `unit01.txt`, type in the title *"List of Files Starting with the Letter a"*. Copy and paste these contents on the next line.
5. Check your git log and paste the contents under a title "Git Log". Do the same with a git status.
6. Create a new directory called `Files-and-Git`
7. Move `unit01.txt` to the `Files-and-Git` directory.
8. Rename the `unit01.txt` to `responses.txt`
9. Use the git workflow while completing the rest of the activities.
10. **THIS IS NOT REQUIRED:** Clone the repository from https://github.com/zmb6893/GCIS-123-16-Fall-SI-Activities. For extra practice, you can practice activities from any of these repositories

Unit 2: Intro to Python

Question	Answer
How do you define a python string?	A_string = “”
What are invalid python variable names?	
What do you use to send information to standard output?	print()
What does DRY stand for?	Don’t repeat yourself
How do you define a python function?	def function():
How does python handle typing?	Dynamically typed
Where do you execute your code?	main
What is a literal?	Hard coded values
What is the difference between a parameter and an argument?	Parameters are in the function declaration, arguments are passed through
What is scope? How do you determine scope?	How to access different parts of a program at different points in the code
What notation is used to access functions from an outside file or library?	Dot notation

Unit 3: Incremental Development and Testing

Question	Answer
What is incremental development?	The process of committing small amounts of code often
What is a helper function?	A function that is used within another function in order to make a program less complex
How often should you commit?	Every few lines of code
Why do we do incremental development?	So that we can fall back on recent changes when something breaks
How do you send information out of a function?	Use return
As an interpreted language, when is python syntax verified?	At execution
What are the three main types of errors?	Syntax, Semantic, and Runtime
What is the most recent function call in the stack trace?	The bottom line
What is a variable with a value that doesn't ever change?	Global variable
What is TDD?	Test driven development
What are the three steps of TDD?	Fail, pass, refactor
What is stubbing?	Declaring a function with minimal code.
What are two qualities a unit test should have?	Small and fast
What are three components of a test?	Setup, invocation, and analyzation

Unit 4: Strings and Loops

Question	Answer
What is a boolean?	A variable that is either true or false
Is else if valid syntax in Python?	Absolutely not
What is used to tell how much code has been tested?	Code coverage
When does the debugger stop running code?	breakpoints
What is an iteration?	One run of a loop
What is an escape sequence used for?	Adding special characters in a string
What does len() do?	Returns the length of a sequence type variable
A_string = “no way”. What character is A_string[2]?	“ “
While loops can break your computer and your mind when what happens?	Infinite loop
Why would you use a while-loop over a for-loop?	While loops are more flexible
What are some good ways to refactor your code?	Eliminate duplicate code, use a more efficient algorithm, break large functions up into smaller functions.
Can you use a for loop to iterate over characters in a string? how?	Yes. for character in string

Unit 5: Files and Exception Handling

Question	Answer
How do you make a file accessible in your python code?	open(filename)
Can a file be seen as a sequence of lines in a for loop?	yes
Why should you close a file after you're done modifying it in your program?	When the file is open, other processes cannot access that file.
What can you do to open and close a file in one line of code?	With open(filename) as file
What function eliminates white space?	strip()
Do runtime errors cause exceptions to be raised? Semantic errors? Syntax errors?	Yes. no. no.
How would you create an exception?	Raise exceptionname
Can you catch specific exceptions? All exceptions?	Yes. yes.
What happens when you don't handle an error that has been raised?	Your program crashes
Why would you want to reraise an error?	In case there is an error that happens independent of the first error.
How do you read from a csv file in python?	Import csv module and open the csv with a csv reader.
Why would we want to use a csv reader over split?	A csv reader allows you to go through "dirty" data (if there is unexpected syntax)
What the heck is a regular expression?	Symbols that define a search pattern in a string

Unit 2-4 Activities:

1. In your `GCIS-123-final-review` repository, make a directory called `Flowers`.
2. Make a file called `flower_pictures.py`. Stub out a function called `draw_petal(size, color)`. Stub out a function called `draw_flower(size, layers, color)`. Stub out a function called `draw_and_print_flower(size, layers)`. Keep in mind that `draw_petal(size, color)` will return the coordinates for the tip of the petal as a tuple. `draw_flower(size, layers, color)` will return the coordinates of the tip of each petal as a list of tuples. `draw_and_print_flower(size, layers, color)` will return a string with the following format in the terminal:

```
A red flower of size 30 is being drawn with 3 layers…

    Location of each tip:
        (0,30)
        (16,16)
        (0,-30)
        . . .
```

3. Make a file called `test_turtle_activities.py`.
4. Make a tests for the following scenarios, **you don't need to do all of these, but keep in mind that this is how you would do unit testing**:
    a. Calling `draw_petal(10, "red")`
    b. Calling `draw_petal(50, "red")`
    c. Calling `draw_petal(100, "red")`
    d. Calling `draw_flower(30, 3, "red")`
    e. Calling `draw_flower(30, 5, "blue")`
    f. Calling `draw_and_print_flower(10, 3, "red")`
    g. Calling `draw_and_print_flower(30, 1, "blue")`
5. Make sure that your test is failing when you run it.
6. Implement `draw_petal(size)`
7. Run your tests and note which ones are passing.
8. Implement `draw_flower(size, layers)`
9. Run your tests and note which ones are passing.
10. If all your tests are passing, call `draw_and_print_flower(30, 3, "red")` from `main`.

How do you draw with maximum speed?
Use fibonacci to determine the number of petals on each layer or make your own way of determining petals in a layer.

Unit 6: Arrays, Searching, & Sorting

Question	Answer
What is an array?	A data structure that stores values at indices
Can you iterate over an array? Why or why not.	Yes. arrays are sequences.
What is a search algorithm?	An algorithm that searches to see if a value exists in a set of data
What is time complexity?	How fast a program runs.
What is the best, worst, and average time complexity of linear search?	O(C),O(n), O(n)
What is recursion?	Repetition by calling itself
Why would we use recursion in some cases?	Some problems hand themselves to recursive solutions more naturally.
What happens if you don't have a base case in a recursive function?	Your function will never end ;_;
What is a stack frame?	A snapshot of the programs state.One slice of recursion please!
What is the best, average, and worst time complexity of binary search?	O(C),O(logn),O(logn)
What is the precondition for binary search?	The data set must be sorted.
What is more efficient: logarithmic time or linear time?	Pssst… it's linear time

Unit 7: Sorting

Question	Answer
Can you pass a function name in as a parameter?	yes
What is sorting?	Arranging the elements in a data structure in some order
What is the best, average, and worst time complexity for an insertion sort?	O(n),O(n^2),O(n^2)
What is a comparator?	A function that compares to values and returns the result
What type of algorithm is merge sort?	Divide and conquer. recursive
What is the time complexity of split?	O(n)
What is the time complexity of merge?	O(n)
Why is merge sort an O(nlogn) algorithm?	Recursively sorts half-sized arrays. N's come from the split and merge.
Is merge sort more efficient than iterative and bubble sort?	yep.
What is the pivot in quicksort?	Where the data set is split into parts
How do you return and receive multiple values in python?	tuples
What is the best, average, and worst time complexity of quicksort?	O(logn), O(logn), O(logn)
Is the pivot always at the center of the data set?	nah

Unit 8: Python Lists

Question	Answer
What does it mean to be immutable? What are some immutable data types in python?	Immutable means not modifiable. int, float, decimal, bool, string, tuple, and range.
What are some mutable data types in python?	list, dictionary, set
How do you make a tuple?	()
What is a reference type?	Not directly modified when passed into a function. Modifies a copy of the object
How does list concatenation work?	It puts the lists together (treat sequences as lists) and stores them in a new variable (ie x = list1 + list2)
What is the average time complexity of popping and inserting into a list?	O(n)
Difference between deep and shallow equality>	Shallow equality sees if they are the same instance, while deep equality sees if they are the same internally
What is slicing?	Defining a range of indices
How do you slice?	sequence_type[start:stop:jump]
How do you specify order with .sort()?	sort(key=made_key)
How do you make a key?	You return depending on what you want the order to be
What makes a list and tuple different?	Tuples are immutable while lists aren't. Lists can also be extended.
What is list comprehension?	A powerful alternative to building lists that contain specific values
How do you do list comprehension?	[execution for element in sequence]

Unit 9: Dictionaries and Sets

Question	Answer
Why are sets unique?	They use hashes to store the elements
What is the keyword to check if there is an item in a set?	in
What is the time complexity of accessing an element in a set/dictionary?	O(c)
What is union?	A set that contains all other items in two sets.
What is an intersection?	A common subset between two or more sets.
What are two ways to make a dictionary?	dict() or [key:value, key:value, ...]
Are dictionary elements unique? What about the keys?	No. Yes
Are sets iterable? What about dictionaries?	Yes
How do you get the ASCII value from a string? What about the reverse?	ord(). chr()
Do sets or dictionaries use hashing?	both
What is a collision?	Two different values have the same hash
What are three characteristics of a good hash?	Fast, consistent, and minimizes collisions
What is the time complexity of resolving collisions?	O(n)
What is open addressing? Chaining?	

Unit 10: Classes & Objects

Question	Answer
What is the difference between a class and an object?	Classes are the definition and objects are instantiations of classes.
What is it called when you put information into a class?	encapsulation
What notation do you use to access a field from a class?	Dot notation
Why do we use encapsulation?	To keep related information together
Are you required to pass every slot item into the constructor?	Nope
What is self?	The reference to the object that is being created
Why do we use slots?	To ensure that random variables aren't being created.
Why use self over static attributes?	Self attributes are shallow, meaning that they can have different values for different instances.
What is state?	The information that is contained within a class
Why would we use Object Oriented Programming?	To break a problem down into easy to process information
Why do we use noun-verb analysis?	Helps break down the problem into an easier to program way.
What do verbs represent in noun-verb analysis?	Methods & behavior
What do nouns represent in a noun-verb analysis?	Classes and Fields

Unit 6-11 Activities:

For the csv files go here:

https://github.com/zmb6893/GCIS-123-16-Fall-SI-Activities/tree/master/final-review

1. In your `Flowers` directory, create a new file called `flowers.py`. Import your `flower_pictures.py` file.
2. Create a class for a `Flower` that has a name, color, size, and number of layers. Add a constructor and accessors.
3. Add a method called `preview_flower(flower)`. This should show a preview of what the flower looks like using a function you made in the **Unit 2-4 Activities**
4. Create a class for a `FlowerShop`, which will have a name, catalog, and rating. The catalog will have a list of prices associated with a flower. What data structure will you use for your catalog? **Check your answer with your SI Leader.**
5. Create flowers from the `flowers.csv`. Handle errors appropriately. Store the flowers in an appropriate data-structure. **Check your selected data-structure with your SI Leader.**
6. Create flower shops from the `flower_shops.csv`. Handle errors accordingly. How will you store these?
7. Allow the user to enter in a flower name to standard input. Display all the flower shops that hold that flower in order of ascending prices. The user should be prompted for input until they type in x, at which point the program exits.

```
Hello, would you like to browse our shops(B) or search for an
item?
     S
Type in the flower you would like to view:
     Daiisy
Sorry, none of our shops carry that; try entering something
else:
     Daisy
The following flower shops carry a daisy. You may choose to
view by price(P), value(V), or rating(R).

     Antique Flowers       5 stars: Daisy-$1.50

     Blooming Boutique     3 stars: Daisy-$1.50
     S
Here are your options!
```

Unit 11: Methods & Equality

Question	Answer
What is the difference between a method and a function?	A method is a function inside of a class.
Should methods always do something with the fields of a class?	yes
What are private fields in python? How do you make a private field?	Fields only accessible when referring to the specific object. __field__
How do you allow other classes to interact with private fields?	Use accessors and mutators
Should you make accessors and mutators for all private fields in a class?	No. Only make them for the fields that are necessary.
What is a special method?	A method that is built into python.
List 3 special methods with their parameters that are used for comparing objects.	__eq__(self, other); __lt__(self, other); __gt__(self, other)
What is the special method that is used when you print and object?	__str__
What is a downside to using pythons ability to dynamically add fields?	You might make a typo and end up with an unintentional field in one of your objects.

Unit 12: Stacks & Queues

Question	Answer
What order is a stack?	LIFO
Is a stack an iterative or recursive data structure?	recurrrrrrrsive
What data structure is the basis for a stack?	A node.
What are the components of a node and how are they used in a stack?	Value and next. Refer to next to get the next value in a stack.
How do you know if a stack is empty?	Either the top node is None or the size of the stack is 0
What type of data structure is a queue?	FIFO
Where are new values added during an enqueue?	To the back of the queue
What happens if the number of elements in your queue exceeds the size of the queue's array?	Bad things...
How does enqueue work on a node based stack.	The next of the last node becomes the new node and the new node becomes the last node.
What is an abstract data-type?	Defines the behavior of a data structure, not including implementation details
What are the main two methods of a queue?	enqueue() and dequeue()
What are the main two methods of a stack?	pop() and push()
What is the downside of using a node based list?	O(N) time for accessing stuff in the list
List some abstract data types.	List, Array, Queue, Stack, Set, Dictionary ...

Other:

Question	Answer