<u>Python Questions</u>

1) Is Python an Object Oriented Programming Language? What is Object Oriented Programming?
   - Yes. OOP is a programming paradigm based on the concepts of objects which may contain **data in the form of fields** (also known as attributes), and **code in the form of methods** (also known as procedures).
   - OOP allows decomposition of a problem into smaller number of entities called objects and data and functions are built around these objects.

2) Please explain any 4 major concepts of Object Oriented Programming:
   - **Abstraction**: Exposing only required essential characteristics and behavior with respect to a context.
   - **Encapsulation**: Creating private fields/variables and thus making them unavailable outside the class.
   - **Inheritance**: Object can acquire same/all properties of another object.
   - **Polymorphism**: Objects are differently processed based on their data types. Supports overloading and overriding:
     - *Overloading*: 2 methods have same method names but different input parameters.
     - *Overriding*: Derived class implementing a method of the super class.

3) What is the difference between local and global variables in Python?
   - **Local:** Variables are specific inside the function and cannot be accessed outside the function or before being instantiated.
   - **Global:** Variables are mention in the class and are not function specific. They can be accessed inside the function. However, if the same variable name is given inside the function as the global name than the variable becomes local.

4) How do you define a protected or private member/field in python?
   __variablename for private (double underscore) and **_variablename for protected** (single underscore)

5) How can you make a copy of an object in Python?
copy.copy(object_name) for shallow copy and **copy.deepcopy(object_name)** for deep copy.

6) What is the difference between a function and a method?
- A **function** is a piece of code that is called by name. It can be passed data to operate on (i.e. the parameters) and can optionally return data (the return value). All data that is passed to a function is explicitly passed.
- A **method** is a piece of code that is called by name that is associated with an object. A method is implicitly passed the object on which it was called.

7) Is it possible to return 2 values from a function in Python? How? What will happen if I have 2 return statements?
- **Yes**. By separating them in the return statement with a comma.
- In case of 2 return statements, **only the value of the first return statement** will be returned.

8) What is the main method in Python?
When you run a module as a program, **execution starts at the main method**. It is an entry point to start the program. When the module is imported to another module, the other modules main method will be executed.

9) Explain the "self" keyword in Python
Self is the first parameter of the method and **is the instance the method is called on (itself)**. Self is just the object referring to itself by explicitly stating it.

10) What built-in data types are provided by Python?
- **Mutable:** List, Sets, and Dictionaries
- **Immutable:** Strings, Tuple, and Numbers

11) What is the difference between a List and a Tuple (2 differences)?
- Lists are mutable and Tuples are immutable.
- Tuples have $O(N)$ append, insert, and delete performance. Lists have $O(1)$ append, insert and delete performance. (Tuples are faster than lists).
- Tuples can be provided as keys to a Dictionary. Lists cannot.

12) How will you compare two lists in Python?
- **Option1:** Iterate over each element and compare using indices
- **Option2:** use the cmp(list1, list2) function with returns a score if list matches (-1,0,1)

13) What is negative indexing in Python?
Negative indexing is used to **access elements** of lists/data-structures **backwards**.

14) How do you randomize items placed in a list, function name is fine?
Use the **shuffle(list)** function.

15) What is a Dictionary in Python? Why is it fast?
- Dictionary is a **key-value pair** data type. **Keys must be of immutable** data types (keys need to be unique).
- Dictionaries are fast because they use **hash mapping** and are not inherently ordered. Furthermore, the hash function always gives the same value for an object and does not change depending on where the object is stored.

16) How do you enforce ordering in a Dictionary?
Python introduced an **OrderDict** function in the collections module which keeps tracks of dictionary items in order as the key is inserted.

17) What is list comprehension?
- List comprehensions provide a **concise way to create a list.**
- List comprehension contains brackets containing **an expression followed by the "for" clause and zero or more if clauses**.
- A list of tuples is returned.

18) What is the lambda function in Python?
- Lambda functions are "**anonymous functions**" which are not defined using the def keyword but instead the **lambda keyword is used**.
- Lambda function can take any number of arguments but c**an return only one argument.**
- Lamda functions **have their own local namespace** and variables cannot be accessed outside the function.

19) Are arguments in Python passed by reference or passed by value?
- **Passed by value**. Every value is a reference pointer to an object. If you pass a variable to a function, if simple assignment (e.g. `=`) on the parameter inside a function has *no* effect on the passed variable outside the function, it is pass-by-value.

20) What is the assert statement in Python?
- Assert statement **asserts if something is true or false**. Used for error checking and pointing if wrong input has occurred.

21) What is the difference between range and xrange in Python?
- **Range returns a list. Xrange returns an iterator object.**
- Thus, **xrange is less memory intensive** than range

22) What is web scraping? How do you achieve it?
- Web scraping involves **extracting data from the web**. Steps for scraping:
  - o Load the webpage using request module.
  - o Parse the webpage and extract information.
  - o Packages used: scrapy, BeautifulSoup.

23) How to generate random numbers in Python?
- The python module random implements random number generator. First **import random()** and then use **random.random()** to get a value between 0 and 1.

24) Explain exceptional handling in Python.
- Exception **prevents code from breaking during run-time** due to different types if errors such as mishandled input, data-type mismatch, etc. The main keywords are:
  - o **Try** – will try to execute the code block belonging to it and check for errors.
  - o **Except** – catches all errors in the try block.
  - o **Finally** – optional clause containing clean-up code

25) Why is the pass keyword used in Python?
- Pass keyword is **a no-operation statement** in Python. It signals no action is required. It is used for keeping statements intentionally blank.

26) How is memory managed in Python?
- Memory management involves a private heap that contains all python objects and data structures.
- The garbage collector will take care of memory management

27) What is the "None" keyword in Python?
- None keyword when assigned to **a variable resets the variable to its original and empty state.**
- **Printing** a None object results in a **NameError** since the variable is not defined (x = None, print x, will result in a NameError since Python does not recognize the name).

28) What does the zip function do in Python?
Zip() takes **multiple lists and transforms them into a single list of tuples** with corresponding elements next to each other. Example: l1 = [a,b], l2 = [1,2], zip(l1,l2) = [(a,1),(b,2)]

29) Is there a switch case statement in Python? How do you implement switch case?
No. There is no switch case.
Implement using if/elif or dictionaries.

30) Explain any one sorting technique you have used.