1. Explain the heap property of a tree

No child can ever be larger than its parent.

2. List and describe the 3 methods most often associated with a stack.

Push: Push an item to the top of the stack

Pop: Removes and returns the top item of the stack

Peak: Look at the top without removing the item

3. Identify 3 errors in the following code snippet:

num = input()

def factorial[n]🡨 Should be parens:

if n == 0:

return 1; 🡨 No semi colon

else:

return n \* factorial(n-1)

num(factorial) 🡨 Parens on the method call

4. Suppose there are 2 circles on a cartesian plane at (1,1) and (4,1), with a radius of m and n respectively. Write psuedocode that determines if the two circles overlap.

The circles have an y axis of 1, which puts them directly in line.

The second circle with the coordinates (4,1) overlaps the first circle with the coordinates (1,1), because the second circles x axis is greater than the first circles.

If sum of radius is greater than 3, then the circles overlap

5. Use pseudocode to design a class that represents a car.

Class car():

Def character(self):

Self.wheels

Self.make

Self.model

Self.condition

Self.hp

Self.color

Self.fuel

Self.transmission

Def functions(self):

Self.drive

Self.driveMiles

Self.forward

Self.stop

Self.reverse

Self.honk

Def mpg(self):

Self.gallonsUsed

If Self.drive = True

return Self.drivemiles // self.gallonsUsed

6. Explain the meaning and use of the global keyword in python

Global is a scope type that means that a variable can be applied anywhere in a program. Must be defined that it is a specific global variable.

7. Draw a binary search tree containing the items added in order of [14, 5, 21, 3, 7, 8, 9, 1, 12]:

14

5 21

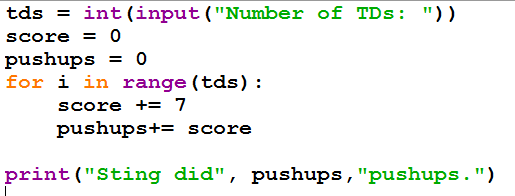
3 7

1 8

9

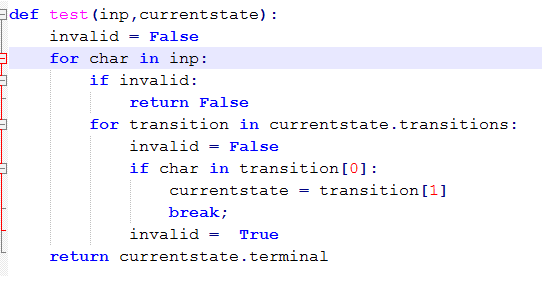
12

8. Give the Big-O performance of the following code fragment:



O(n)

9.Give the Big-O runtime of the following code snippet:

O(3n^4)

10. Write a python program that uses **a dictionary** to store the following states and capitals.

Des Moines, Iowa  
Jefferson City, Missouri  
Albany, New York  
Sacramento, California  
Austin, Texas  
Lincoln, Nebraska

Finally, print the capital of california from your dictionary.  
  
stateCapitals = {}

def addStates(num):

   for len (stateCapitals):

return California

print(StateCapitals)

11. Define the following terms in the context of computer science:

a. Complexity = Measure of the general case of the runtime of an algorithm. Measured thru big O.

b. Heuristic = A short cut to an otherwise challenging problem. Something that reduces the size of n.

c. Linear = Runtime of O(n^2). Performs poorly on large data sets. The elements form a sequence (Array, Linked List). The stored data in memory can be represented in a linear fashion such as Arrays.

d. Tree = Abstract data type that can be defined recursively as a collection of nodes. Each node is a structure consisting of a value. Each node can be referenced to nodes or “children”.

e. Stack = Last in first out data structure (LIFO), or a first in last out (FILO) data structure. A stack is an ordered list. The stack consists of three functions, push, pop, and peak. A stack can add and remove data.

f. Node = Data points within a larger network such as trees.

g. Graph = Representation of a set of objects where some pairs of objects are connected by links. The objects are connected by vertices. The links connected to the vertices are called edges. Each edge has a weight which can determine the least taxing way for data to move. Graphs also have what are called paths. Paths are paths that data can take to move from one vertex to another, such as A to G or A to B.

h. Queue = Queues are First in First Out (FIFO) data structures. Much like how a line at the grocery store works, the first piece of data in a queue is processed and returned out of the queue.

i. Quadratic = Runtime of O(n^2). Uses any exponent that is relevant, such as n^3

j. Exception = The process of catching and handling errors that happen within the code. Usually allows the program to run without crashing and changes the program flow.

k. Dictionary = An abstract data type. A collection of pairs that be referenced through their keywords. A dictionary can search, delete, and insert data into the dictionary.