92

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Software Engineer

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scored in CodePath TIP103: Unit 4 Assessment - Fall 2024 in 28 min 46 sec on 14 Oct 2024 05:53:12 PDT

Candidate Information

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Test	CodePath TIP103: Unit 4 Assessment - Fall 2024
Candidate Packet	View
Taken on	14 Oct 2024 05:53:12 PDT
Time taken	28 min 46 sec/ 90 min
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Skill Distribution

No.	Skill	Score

1	Problem Solving Basic	100%

Tags Distribution

Stacks	100%	Queues	100%
Arrays	100%	Data Structures	100%
Easy	100%		

Questions

Status	No.	Question	Time Taken	Skill	Score
✓	1	Paintings On Display Multiple Choice	1 min 11 sec	-	5/5
✗	2	Lookup Operations in a Hash Table Multiple Choice	15 sec	-	0/5
✓	3	Number of Students Unable to Eat Lunch Coding	2 min 39 sec	-	50/50
✓	4	Guess this Complexity Multiple Choice	29 sec	-	5/5

✓	5	Guess this Complexity Multiple Choice	20 sec	-	5/5
✓	6	Find an item in a hash table containing n items Multiple Choice	51 sec	-	5/5
✓	7	Given the head of a linked list, remove the nth node from the end of the list and return its head. Multiple Choice	7 min 9 sec	-	5/5
✓	8	Two-dimensional array Multiple Choice	52 sec	-	5/5
✗	9	True or False: Heap Multiple Choice	42 sec	-	0/5
✓	10	What can be determined about the contents of the list array? Multiple Choice	2 min 9 sec	-	5/5
✓	11	What is the FIRST and LAST output from this program segment? Multiple Choice	1 min 7 sec	-	5/5
✓	12	Accessing Elements In An Array Multiple Choice	1 min 3 sec	-	5/5
✓	13	Sorted Array Multiple Choice	3 min	Problem Solving (Basic)	5/5

✓	14	Memoized Word Break Multiple Choice	3 min 51 sec	-	5/5
✓	15	Inserting an element into a binary min heap Multiple Choice	30 sec	-	5/5
✓	16	Finding the maximum value in a binary min heap Multiple Choice	2 min 29 sec	-	5/5

1. Paintings On Display

✓ Correct

Multiple Choice

Question description

Suppose you were implementing a data structure to store information about the paintings on display at an art dealer's showroom. Of the following data structures, which one is the right one to use?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ Unordered array
- ○ Sorted array
- ○ Linked list

- Heaps
- It depends ✓

No comments.

2. Lookup Operations in a Hash Table

Incorrect

Multiple Choice

Question description

There are several factors that affect the efficiency of lookup operations in a hash table. Which of the following is not one of those factors?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- Number of elements stored in the hash table
- Size of elements stored in the hash table ✓
- Number of buckets in the hash table
- Quality of the hash function

All of the above factors affect the efficiency of hash table lookups

No comments.

3. Number of Students Unable to Eat Lunch

Correct

Coding Stacks Queues

Question description

The school cafeteria offers circular and square sandwiches at lunch break, referred to by numbers `0` and `1` respectively. All students stand in a queue. Each student either prefers square or circular sandwiches.
The number of sandwiches in the cafeteria is equal to the number of students. The sandwiches are placed in a **stack**. At each step:

- If the student at the front of the queue **prefers** the sandwich on the top of the stack, they will **take it** and leave the queue.
- Otherwise, they will **leave it** and go to the queue's end.

This continues until none of the queue students want to take the top sandwich and are thus unable to eat.
You are given two integer arrays `students` and `sandwiches` where `sandwiches[i]` is the type of the `i` th sandwich in the stack (`i = 0` is the top of the stack) and `students[j]` is the preference of the `j`th student in the initial queue (`j = 0` is the front of the queue). Return *the number of students that are unable to eat.*

Example 1:

Input: students = [1,1,0,0], sandwiches = [0,1,0,1]
Output: 0
Explanation:
- Front student leaves the top sandwich and returns to the end of the line making students = [1,0,0,1].
- Front student leaves the top sandwich and returns to the end of the line making students = [0,0,1,1].
- Front student takes the top sandwich and leaves the line making students = [0,1,1] and sandwiches = [1,0,1].
- Front student leaves the top sandwich and returns to the end of the line making students = [1,1,0].

- Front student takes the top sandwich and leaves the line making students = [1,0] and sandwiches = [0,1].
- Front student leaves the top sandwich and returns to the end of the line making students = [0,1].
- Front student takes the top sandwich and leaves the line making students = [1] and sandwiches = [1].
- Front student takes the top sandwich and leaves the line making students = [] and sandwiches = [].
Hence all students are able to eat.

Example 2:

Input: students = [1,1,1,0,0,1], sandwiches = [1,0,0,0,1,1]
Output: 3

Candidate's Solution Language used: **Python 3**

```
#!/bin/python3

import math
import os
import random
import re
import sys



#
# Complete the 'countStudents' function below.
#
# The function is expected to return an INTEGER.
# The function accepts following parameters:
#  1. INTEGER_ARRAY students
#  2. INTEGER_ARRAY sandwiches
#

def countStudents(students, sandwiches):
    # Write your code here
    j = 0
    n = len(students)
    while True:
        i = 0
        while i < len(students) and students[i] != sandwiches[j]:
            i += 1
```

```
28
29          if i == len(students):
30              break
31
32          students = students[i + 1:] + students[:i]
33          j += 1
34
35          if j == n:
36              break
37
38      return n - j
39
40  if __name__ == '__main__':
41      fptr = open(os.environ['OUTPUT_PATH'], 'w')
42
43      students_count = int(input().strip())
44
45      students = []
46
47      for _ in range(students_count):
48          students_item = int(input().strip())
49          students.append(students_item)
50
51      sandwiches_count = int(input().strip())
52
53      sandwiches = []
54
55      for _ in range(sandwiches_count):
56          sandwiches_item = int(input().strip())
57          sandwiches.append(sandwiches_item)
58
59      result = countStudents(students, sandwiches)
60
61      fptr.write(str(result) + '\n')
62
63      fptr.close()
64
```

TESTCASE	DIFFICULTY	TYPE	STATUS	SCORE	TIME TAKEN	MEMORY USED
Testcase 0	Easy	Sample	Success	10	0.0884 sec	14.6 KB

Testcase 1	Easy	Sample	Success	10	0.0856 sec	14.6 KB
Testcase 2	Easy	Hidden	Success	10	0.0895 sec	14.7 KB
Testcase 3	Easy	Hidden	Success	10	0.087 sec	14.6 KB
Testcase 4	Easy	Hidden	Success	10	0.0837 sec	14.6 KB

No comments.

4. Guess this Complexity

Correct

Multiple Choice

Question description

What is the time complexity to count the number of elements in the linked list?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- O(1)

- [x] O(N)
- [ ] O(logN)
- [ ] none of the above

No comments.

5. Guess this Complexity

Correct

Multiple Choice

Question description

Consider the following function *f:*

```
int f(int n){
 int s = 0;
 while(n > 1){
  n = n/2;
  s++;
 }
 return s;
}
```

What is the complexity of *f* in terms of n?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ O(N log N)
- ○ O(N)
- ○ O(N^2)
- ● **O(log N)** ✓
- ○ O(1)

No comments.

6. Find an item in a hash table containing n items

Correct

Multiple Choice

Question description

Assuming that the hash function for a table works well, and the size of the hash table is reasonably large compared to the number of items in the table, the expected (average) time needed to find an item in a hash table containing *n* items is...

Candidate's Solution

Options: (Expected answer indicated with a tick)

- [x] O(1)
- [ ] O(log N)
- [ ] O(Nlog N)
- [ ] O(N)

No comments.

7. Given the head of a linked list, remove the nth node from the end of the list and return its head.

Correct

Multiple Choice

Question description

In the following code, we are given the `head` of a linked list. What is the missing piece of code needed to remove the n^{th} node from the end of the list and return its head?

```
/**
 * Definition for singly-linked list.
 * public class ListNode {
 *     int val;
 *     ListNode next;
 *     ListNode() {}
 *     ListNode(int val) { this.val = val; }
 *     ListNode(int val, ListNode next) { this.val = val; this.next = next; }
 * }
 */
```

```
class Solution {
    public ListNode removeNthFromEnd(ListNode head, int n) {
        int count = 1;
        ListNode c = head;
        while(c.next!=null){
            count++;
            c=c.next;
        }

        if(n == count){
            head = head.next;
            return head;
        }

        ListNode ln = head;
        int i= 0;
        while(++i<count-n){
            ln = ln.next;
        }
        // insert code here

        return head;
    }
}
```

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ln.next = ln.head.next;
- ln.head = ln.next.next;
- head = head.next;

ln.next = ln.next.next;

No comments.

8. Two-dimensional array

Correct

Multiple Choice

Question description

Consider the following two-dimensional array declaration.

```
int[][] matrix = new int[4][5];
```

Which of the following statements will assign the correct size to colSize?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- int colSize = matrix[0].length;
- int colSize = matrix[1].length;
- int colSize = matrix[2].length;

int colSize = matrix[3].length;

all of the above

No comments.

9. True or False: Heap

Incorrect

Multiple Choice

Question description

Building a heap from an array of N items requires O(n log n)

Candidate's Solution

Options: (Expected answer indicated with a tick)

True

False

No comments.

10. What can be determined about the contents of the list array?

Correct

Multiple Choice

Question description

What can be determined about the contents of the list array?

```
import java.util.Random;

public class Program{
  public static void main(String args[ ]){
    int list[ ] = {0,1,2,3,4,5,6,7,8,9};
    Random r = new Random();
    for (int k = 0; k <= 5; k++)
      list[k] = r.nextInt(10);
      System.out.println();
  }
}
```

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ The original list array contains {0,1,2,3,4,5,6,7,8,9} and then every element of the list array is changed randomly to a value in the [0..9] range.
- ○ The original list array contains {0,1,2,3,4,5,6,7,8,9} and then random elements of the list array are changed to the current value of k.
- ○ The original list array contains {0,1,2,3,4,5,6,7,8,9} and stays unchanged throughout the program execution.

- ○ The original list array contains {0,1,2,3,4,5,6,7,8,9} and then the first five elements of the list array are changed to random values.
- ● **The last four elements of the list array remain unchanged with values 6,7,8,9.** ✓

ⓘ **No comments.**

---

11. What is the FIRST and LAST output from this program segment?

✓ Correct

Multiple Choice

Question description

What is the FIRST and LAST output from this program segment?

```
int IntNum[] = new int[100];
int J;
for (J=0; J<100; J++)
  IntNum[J] = J;
for (J=0; J<100; J++)
  System.out.println(IntNum[J]);
```

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ 0 and 100

- [x] 0 and 99
- [ ] 1 and 100
- [ ] 1 and 99
- [ ] ArrayIndexOutOfBounds error

No comments.

12. Accessing Elements In An Array

Correct

Multiple Choice

Question description

What is the output of solve()?

```
public static solve(){
  int list[ ];
  list = new int[10];
  for (int k = 0; k < 10; k++)
    list[k] = 0;
  for (int k = 0; k < 10; k++)
    System.out.print(list[k] + " ");
    System.out.println();
}
```

Candidate's Solution

Options: (Expected answer indicated with a tick)

- [x] 0 0 0 0 0 0 0 0 0 0
- [ ] 0 1 2 3 4 5 6 7 8 9
- [ ] 1 2 3 4 5 6 7 8 9 10
- [ ] 0 0 0 0 0 0 0 0 0

No comments.

13. Sorted Array

Correct

Multiple Choice | Arrays | Data Structures | Easy

Question description

Given an array, arr[0, 2, 3, 5, 4], and an integer x = 1, sort the array using the method below.

Each operation is: Choose a number i such that arr[i] > x. Swap the values of a[i] and x.

What is the minimum number of operations required to sort the array in ascending order?

Interviewer guidelines

array a[5] = {0,2,3,5,4} and X = 1 (initial values)

- Choose i = 2, as a_i > X , swap a_i and X updated array a[5] = {0,1,3,5,4} X = 2
- Choose i = 3, as a_i > X , swap a_i and X updated array a[5] = {0,1,2,5,4} X = 3

- Choose i = 4, as $a_i > X$, swap a_i and X updated array a[5] = {0,1,2,3,4} X = 5
After 3 steps the initial array is sorted.

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ 5
- ● **3** ✓
- ○ 4
- ○ 6

No comments.

---

14. Memoized Word Break

Correct

Multiple Choice

Question description

Given a string `s` and a dictionary of strings `wordDict`, what is the missing line of memoization code in order to return `true` if `s` can be segmented into a space-separated sequence of one or more dictionary words?

```
class Solution:
    def wordBreak(self, s: str, wordDict: List[str]) -> bool:
```

```
wordDict=set(wordDict)
memo={'':True}

def word_break(s): #recursive helper function
    if s in memo: return memo[s]
    candidates=[s[len(prefix):] for prefix in wordDict if s.startswith(prefix)]
    // add missing line here
    return memo[s]

return word_break(s)
```

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ memo[string] = False
- ○ if self._word_break(string[len(word):], words, memo):
- ● **memo[s]=any([word_break(suffix) for suffix in candidates])** ✓
- ○ memo[s] = any(s[:len(w)] == w and wb(s[len(w):]) for w in wordDict)

ⓘ **No comments.**

15. Inserting an element into a binary min heap

✓ Correct

Multiple Choice

Question description

Inserting an element into a binary min heap (implemented using an array) containing N elements requires what runtime?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ O(1)
- ○ O(n)
- ○ O(n log n)
- ● **O(log n)** ✓
- ○ none of the above

No comments.

16. Finding the maximum value in a binary min heap

Correct

Multiple Choice

Question description

Finding the maximum value in a binary min heap (implemented using an array) containing N elements requires what runtime?

Candidate's Solution

Options: (Expected answer indicated with a tick)

- ○ O(1)
- ● **O(n)** ✓
- ○ O(n log n)
- ○ O(log n)
- ○ none of the above

No comments.