



Fresh graduate 2020

Vector Calculus (The Chancellor, Masters, and Scholars of the University of Cambridge)



You are taking "Recruitment Test" as a timed test. The timer on the right shows the time remaining in the test. To receive credit for problems, you must select "Submit" for each problem before you select "End Test".

End Test

**0:45:17**

## Test Questions

### Searching in a BST

Suppose that we have numbers between 1 and 100 in a binary search tree and we want to search for the number 10. Which of the following sequences could not be the sequence of nodes examined ?

☐ [64, 51, 24, 3, 23, 11, 9, 10]

☐ [81, 75, 45, 3, 28, 10]

☐ [70, 8, 13, 9, 12, 11, 10]

☐ [34, 84, 18, 54, 4, 10]

Submit

You have used 0 of 1 attempt

## Inheritance

What should be the result of running the following pseudocode snippet?

```
class Class1:
    function function_1(self):
        print("a")

    function function_2(self):
        print("b")

class Class2:
    function function_1(self):
        print("c")

    function function_3(self):
        print("d")

class Class3:
    function function_2(self):
        print("e")

    function function_3(self):
        print("f")

class ClassA(Class3, Class1):
    function function_3(self):
        print("h")

class ClassB(Class2):
    function function_2(self):
        print("i")

    function function_3(self):
        print("j")

class ClassC(Class1):
    function function_2(self):
        print("k")

    function function_3(self):
        print("l")
```

```
ClassA().function_2()  
ClassB().function_3()  
ClassB().function_3()
```

You have used 0 of 1 attempt

## System Safe State

A system has 26 magnetic tape drives and 5 processes : P1, P2, P3, P4, P5. The allocation of resources and the need for the resources by the processes are described in the table. Which of the following is possible **safe state** of the system?

*Hint:* A system is in a **safe state** if there is a sequence in which all the processes can be executed without getting into a **deadlock**.

processes	Need	Allocated
P1	16	3
P2	15	4
P3	14	5
P4	18	1
P5	10	0

☐ [1, 4, 3, 5, 2]☐ [1, 2, 3, 4, 5]☐ [3, 4, 1, 2, 5]☐ [3, 5, 2, 4, 1]

You have used 0 of 1 attempt

## Not a topper

You are provided with a tables **"Students"** with their "name", "score" and respective **"country"** in a database.

### Students

ID	name	score	country
1	Aisha	297	US
2	Nabeel	260	CA
3	Wadood	290	CA
4	Maryam	305	US
5	Sohaib	297	CA
6	Noor	315	US

What names will the following query return?

**SELECT name FROM Students WHERE score IN (SELECT max(score) FROM Students GROUP BY country);**

☐ Maryam,Sohaib,Wadood☐ Aisha,Nabeel,Sohaib☐ Nabeel,Noor,Wadood☐ Aisha,Noor,Sohaib

You have used 0 of 1 attempt

## Make it a palindrome

How many iterations of characters are required to make **buqbxwhcob** a palindrome string? Consider alphabets to be a circular list, A comes next to Z

☐ 15☐ 79☐ 57☐ 25

You have used 0 of 1 attempt

## Identical Stacks

Each row below are the stacks of water bottles with their respective heights(n)

1. | 1 | 1 | 2 | 3 | 1 |

2. | 2 | 5 | 4 | 1 | 5 | 3 | 3 | 2 |

3. | 1 | 4 | 2 | 5 | 2 | 2 |

The rightmost element shows the top of the stack. Adding up the heights of the bottles on a stack will give you the overall height of the stack. You can pop the bottles from each stack any number of times to change the height of the stack.

Determine the maximum height of each stack where all of the three stacks are equal in terms of height.

☐ 6☐ 17☐ 4☐ 7

You have used 0 of 1 attempt

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## Process Scheduling

A CPU scheduler executes processes in time quantum of 100ms and then calculates the next process to execute after each quantum.  
3 processes are fed into our CPU's process scheduler with the following attributes

Process A

Arrival Time: 0

Execution Time Needed: 1300msec

Process B

Arrival Time: 200msec

Execution Time Needed: 300msec

Process C

Arrival Time: 700msec

Execution Time Needed: 1000msec

There are four main algorithms which our CPU uses to schedule processes:

FCFR: First Come First Serve

SJF: Shortest Job First

SRTF: Shortest Remaining Time First

RR: Round Robin

If the scheduler is using the FCFR algorithm to schedule processes, which processes would have been completed after 1600 ms?

Answer as a comma separated list e.g. A,B or B,C,A

Submit

You have used 0 of 1 attempt

## Hash Clash

*An array is used here to represent a Hash Table. Array index starts from **0** and ends at **size\_of\_array - 1***

Which slot would the number 50 hash to, in the following Hash Table?



48	31	41		40		50				
----	----	----	--	----	--	----	--	--	--	--

size\_of\_table = 11

The hash function is :

***hash(number) : number % size\_of\_table***

For collision resolution use the following rehash function:

***new\_hash\_value : rehash(old\_hash\_value)***

***rehash(position) : (position + 1) % size\_of\_table***

Enter slot number

Submit

You have used 0 of 1 attempt

## Secret Key

```

INT mySecretKey(INT num)
[
    print<<num
    IF num < 22
    [
        mySecretKey( mySecretKey( mySecretKey( ++num ) ) )
    ]
    return (num)
]

```

The above pseduocode can generate a secret key for you. What would be the output secret key of the function mySecretKey(20)?

☐ The secret key is 2021222222222222

☐ The secret key is 20212222222222

☒ The secret key is 202122222222

☐ The secret key is 21222222222222

Submit

You have used 1 of 1 attempt

**i** Answer submitted.

## Die roll probability

A **5** sided die is rolled **4** times. What is the probability of getting all outcomes as unique?

☐ 0.24

☒ 0.19

☐ 0.94

☐ 0.44

☐ 0.72

You have used 1 of 1 attempt

Submit

**i** Answer submitted.

## Binary search steps counter

How many iterations of binary search are required to find **836** in **[30, 54, 118, 163, 227, 283, 325, 383, 394, 475, 566, 735, 807, 836, 863, 972, 995]**?

☐ 4☐ 5☐ 1☐ 6Submit

You have used 0 of 1 attempt

## Valid Binary Search Tree

Suppose that we have numbers between 1 and 100 in a binary search tree and we want to search for the number 18. Which of the following sequences could not be the sequence of nodes examined ?

☐ [6, 58, 42, 11, 30, 26, 17, 23, 21, 20, 18]☐ [33, 21, 17, 18]☐ [36, 21, 88, 15, 26, 29, 86, 18]

☐ [47, 2, 41, 12, 33, 15, 20, 18]

Submit

You have used 0 of 1 attempt

## Character Analogies

**H** is to \_\_\_ what **N** is to **Z**?

You can select only one option.

☒ T

☐ G

☐ V

☐ I

Submit

You have used 1 of 1 attempt

**i** Answer submitted.

## Round robin scheduling

Round Robin is a CPU scheduling technique in which each process is assigned a fixed time slot(quantum) in a cyclic way consider the processes

**p0, p1, p2, p3, p4**

having arrival times

**0, 5, 1, 2, 5**

and burst times

**6, 10, 8, 5, 9**

respectively.

Suppose the time quantum = 3

**Process will complete in sequence with**

☐ p0,p3,p1,p4,p2

☐ p0,p3,p4,p2,p1

☐ p0,p3,p2,p1,p4

☐ p0,p3,p2,p4,p1

Submit

You have used 0 of 1 attempt

## Customer orders

Find out the Customers (CustomerName, Address) who have placed greater than 40 orders.

Customers	Orders
CustomerID	OrderID
CustomerName	CustomerID
Address	ShipperID
City	OrderDate
PostalCode	

There is one correct option

- ☐ SELECT Customers.CustomerName, Customers.Address, Orders.OrderID AS NumberOfOrders FROM Orders, Customers WHERE Orders.CustomerID = Customers.CustomerID GROUP BY CustomerName ORDER BY NumberOfOrders asc HAVING COUNT(Orders.OrderID) > 40;
- ☐ SELECT Customers.CustomerName, Customers.Address, COUNT(Orders.OrderID) AS NumberOfOrders FROM Orders INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID GROUP BY CustomerName WHERE COUNT(Orders.OrderID) > 40 ORDER BY NumberOfOrders asc;
- ☐ SELECT Customers.CustomerName, Customers.Address, COUNT(Orders.OrderID) AS NumberOfOrders FROM Orders INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID GROUP BY CustomerName ORDER BY NumberOfOrders asc HAVING COUNT(Orders.OrderID) < 40;
- ☐ SELECT Customers.CustomerName, Customers.Address, COUNT(Orders.OrderID) AS NumberOfOrders FROM Orders INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID GROUP BY CustomerName HAVING COUNT(Orders.OrderID) > 40 ORDER BY NumberOfOrders asc;
- ☐ SELECT Customers.CustomerName, Customers.Address, COUNT(Orders.OrderID) AS NumberOfOrders FROM Orders WHERE Orders.CustomerID = Customers.CustomerID GROUP BY CustomerName HAVING NumberOfOrders > 40 ORDER BY NumberOfOrders asc;

Submit

You have used 0 of 1 attempt

Min Heap

A **min-heap** is a heap where the value of each internal node is smaller than or equal to the values of its children. Consider a binary **min-heap** implemented using an array as follows: The root is stored in the first location, **a[0]**, nodes in the next level, from left to right, is stored from **a[1]** to **a[2]**. The nodes from the second level of the tree from left to right are stored from **a[3]** location onward... Which one of the following array represents a binary min-heap?

There is one correct option

- ☐ 10, 19, 25, 29, 69, 55, 115, 95, 77, 127, 126, 171, 174, 117, 147
- ☐ 10, 19, 25, 55, 29, 127, 95, 171, 69, 126, 77, 115, 174, 117, 147
- ☐ 10, 19, 25, 29, 69, 77, 95, 115, 55, 127, 126, 171, 174, 117, 147
- ☐ 10, 19, 25, 29, 69, 95, 115, 55, 174, 77, 171, 126, 127, 117, 147

Submit

You have used 0 of 1 attempt

## Another Linked List

Let's assume we have a singly linked lists: **P->L->G->A->C->U->K->W->J**. What would be the output and resultant list after running **func(list.head, 6)**. NOTE: This function is written in some hypothetical language and you can assume it's syntactically correct.

```
function List func(head, i) {  
    if (i == 0) {  
        temp = head.next;  
        return temp;  
    }  
  
    print head.data  
    head.next = func(head.next, i-1)  
}
```

☐ **Output:** PLGACU **List:** J->W->U->C->A->G->L->P

☐ **Output:** PLGACU **List:** P->L->G->A->C->U->W->J

☐ **Output:** PLGACU **List:** P->L->G->A->C->U->K->W->J

☐ **Output:** UCAGLP **List:** P->L->G->A->C->U->W->J

Submit

You have used 0 of 1 attempt

## XOR and XNOR

Let **A** : "01111010" , **B**=?, If { **A (Ex-or) B** } is a resultant string of **ALL ONES** [ 11111111 ] then:

☐ 10000101

☐ 10010101

☐ 00011100

Submit

You have used 0 of 1 attempt

## Stacks and Queues

There are two storage systems present, one is a stack and the other queue. The content of the stack is [0, 7] and the content of the queue is [29, 19, 27, 22, 24, 15, 21, 28, 26, 17] (the first item in both represent the first item stored). The number on each item represent the ID of item.



We have to balance these storage systems (move items between storages so that there are equal number of items in both). Keeping in mind the functionalities of stacks and queues, we have to balance them!

STACK STORAGE: *oldest* **[0, 7]** *newest*

QUEUE STORAGE: *oldest* **[29, 19, 27, 22, 24, 15, 21, 28, 26, 17]** *newest*

**What is the newest item in stack storage after balancing the storages?**

You can select only one option.

☐ 22

☐ 15

☐ 0

☐ 7

Submit

You have used 0 of 1 attempt

## Employee salaries

**Table: employee\_age**

emp_id	age
100	21
103	38
101	28
102	26

**Table: employee\_salary**

emp_id	salary
105	49000
102	54000
100	60000
103	45000

With given tables what would be output of following SQL query:

```
SELECT
    MIN(eSal.salary)
FROM
    employee_age as eAge INNER JOIN employee_salary as eSal
ON
    eAge.emp_id = eSal.emp_id

WHERE eAge.age > 21
GROUP BY eAge.emp_id
HAVING MIN(eSal.salary) > 45000
```

☐ None

☐ 49000

☐ 54000

☐ 60000

Submit

You have used 0 of 1 attempt

## Inheritance Code Snippet

What will be the output of this code snippet? (\_\_init\_\_ is constructor of class)

```
class A:
    def __init__(self):
        self.calc_i(260)

    def calc_i(self, i):
        self.i = 53 * i;

class B(A):
    def __init__(self):
        super().__init__()
        print("i from B is", self.i)

    def calc_i(self, i):
        self.i = 36 * i;

b = B()
```

You can select only one option.

☐ 7523

☐ 9360

☐ 18174

☐ 6532

Submit

You have used 0 of 1 attempt

## Mode, mean, median

M = [57, 4, 84, 57, 'N']

What is the value of N if the mode, mean and median of the list M are equal to each other? Express your answer to the nearest whole number.

Note:

- The mode of a set of data values is the value that appears most often.
- The mean is the average of the numbers: a calculated "central" value of a set of numbers.
- Median is the middle number in a sorted list of numbers.

You have used 1 of 1 attempt

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 Answer submitted.

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## John Wick's profession

John Wick has lost his memory in a car accident, sadly. But there is one help you can do for John Wick. Help him recall who he is.

### Hint:

If you get more 1's than 0's, John Wick is a doctor.

If you get more 0's than 1's, John Wick is a plumber.

If you get equal number of 1's and 0's, John Wick is a carpenter.

**function foo()**

print 1

**function soo()**

print 0

**function zoo()**

foo()

soo()

**function koo()**

foo()  
soo()  
soo()

**function loo()**

foo()  
foo()  
soo()

If the functions run in the following order, tell who is John Wick?

**zoo(), loo(), soo(), zoo(), soo(), loo(), loo(), zoo(), foo()**

- ☐ John Wick is a plumber.
- ☐ I am unable to help John Wick.
- ☐ John Wick is a carpenter.
- ☐ John Wick is a doctor.

Submit

You have used 0 of 1 attempt

## Round and round

We have come upon a 'longRunning' method in our code. In order to check its lengthy execution time, we are calculating its iterations it against different inputs.

Can you figure out the number of iterations it will take to execute the following input:

**[4, 19, 7, 5, 16]**

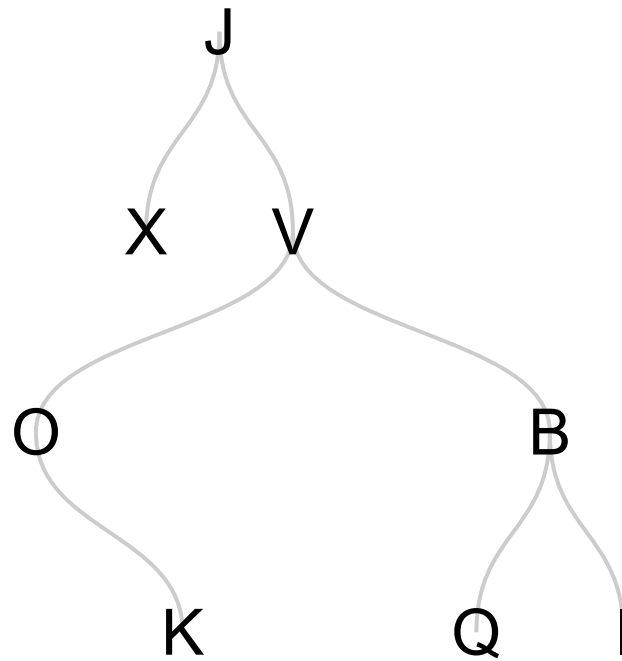
```
function longRunningFunction(array) {  
  for ( i = 0; i < length(array); i++ ) {  
    idx = i  
    for ( j = i + 1; j < length(array); j++ ) {  
      if ( array[idx] > array[j] ) {  
        idx = j  
      }  
    }  
    swap( array[i], array[idx] )  
  }  
}
```

☐ 3☐ 5☐ -2☐ 1

You have used 0 of 1 attempt

## Binary Tree Traversal

What is the pre-order traversal of the following binary tree?



Answer (e.g. ARBISOFT)

jvobxkqi

Submit

You have used 1 of 1 attempt

**i** Answer submitted.

## The queue and the stack

Consider a circular queue and a stack of size 5 and 7 respectively. Circular queue also performs following operations:

1. After Enqueue(x):

- Push(x)
- Push(x mod 3)

2. After x = Dequeue():

- y = Pop()
- Push(x + y)

What will be the representation of stack after performing following operations:

enq	enq	de	enq	enq	enq	de	de	enq
ueu	ueu	qu	ueu	ueu	ueu	qu	qu	ueu
e(8	e(6	eu	e(1	e(1	e(1	eu	eu	e(12
)	)	e()	0)	6)	3)	e()	e()	)

☐ [8, 5, 9, 11, 13, 2, 35]

☐ [8, 7, 11, 13, 15, 3, 37]

☐ None of the above

☐ [8, 2, 6, 8, 10, 1, 32]

☐ [8, 6, 10, 16, 13, 12]

Submit

You have used 0 of 1 attempt



## Novel Arrangement

Anaya has three Urdu novels (**F, D, A**) and Four English novels (**C, B, E, G**). She wants to arrange her novels in a way that following conditions must be met:

- No english novel can be placed immediate after another english novel.
- A must be placed earlier than E.
- B and E must be separated from each other by at least one novel.
- B must be placed immediately before or after F.
- F must be placed immediately after C, but not if D is placed earlier than C.

Choose the best sequence of novels:

☐ C, A, G, D, B, F, E

☐ D, A, B, G, E, F, C

☐ E, F, B, A, G, D, C

☐ G, D, C, A, B, F, E

Submit

You have used 0 of 1 attempt

---

## Max Heap

What will be the max heap of the following heap:

**[48, 48, 3, 5, 42, 37, 34, 16, 31]**

☐ [48, 48, 37, 31, 42, 3, 34, 16, 5]

☐ [48, 48, 42, 37, 34, 31, 16, 5, 3]

☐ [48, 48, 37, 31, 3, 5, 42, 34, 16]

☐ [3, 16, 34, 42, 5, 48, 48, 37, 31]

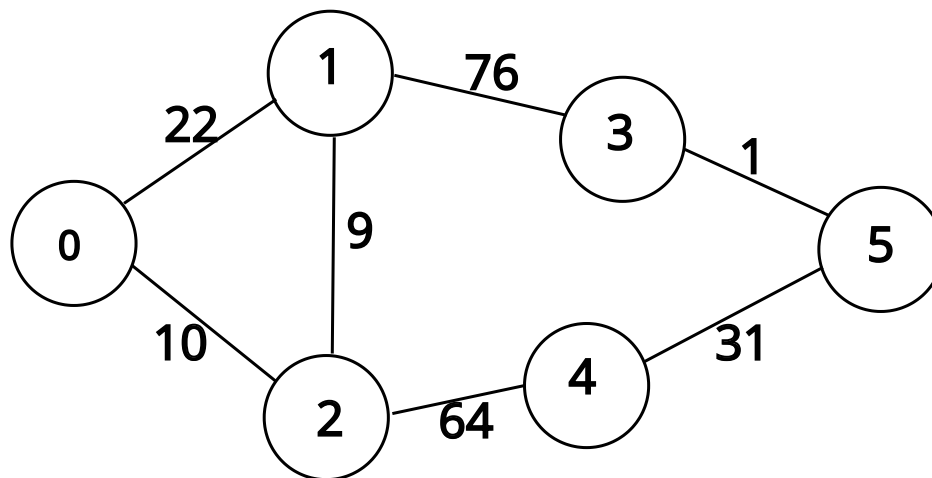
Submit

You have used 0 of 1 attempt

## Graph adjacency

If we represent the following undirected graph in adjacency matrix **M** what would be the sum of **1st** row of **M**.

NOTE: Counting starts from 0 as (0th, 1st, 2nd, 3rd, 4th, 5th ...)



☒ 32

☐ 83☐ 77☐ 107

You have used 1 of 1 attempt

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**i** Answer submitted.

---

## Profit Issues

**A, B and C** enter into a partnership with an investment in which **A's** contribution is **\$12000**. if out of a total profit of **\$1100**, A and B get **\$400** and **\$100** respectively, then what is **C's** capital?

☐ 17800.0☒ 18000.0☐ 18050.0☐ 18350.0

You have used 1 of 1 attempt

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**i** Answer submitted.