

Microsoft

Stages:

1. Coding round. Top few students qualified directly for interviews.
2. Group fly round.
3. Interviews (typically 3 interviews)

Rajan Garg (Interview stage):

Round 1-

- 1) Given a tree, print the elements in the order of level from root to last level. Write pseudo code.
<http://www.geeksforgeeks.org/level-order-tree-traversal/>
- 2) What are all the tree traversals. Explain BFS algorithm. Write pseudo code on paper.
<http://www.geeksforgeeks.org/breadth-first-traversal-for-a-graph/>
- 3) Given a string of words, reverse the string w.r.t to words. For ex-
Input- "how are you" Output- "you are how"
Do it in $O(n)$ time and without using extra space. Write pseudo code
- 4) Write pseudo code to reverse a string taking all the boundary cases in as optimized way as you can.

Round 2-

- 1) Given 2 sorted arrays, find the median of the array formed with these arrays.
<http://www.geeksforgeeks.org/median-of-two-sorted-arrays/>
I had seen the question and answered three approaches(merging, binary search on both arrays, binary search on index of first array). Interview could not understand binary search approach and i had to explain him full algorithm step by step.
- 2) What is time complexity of above algorithm?. ($\log n$)
Interviewer was not satisfied with this answer so i had to explain him full method how binary search takes $\log(n)$ time.

GS

Stages:

1. Online test having 29 questions: 9 CS + 10 quant + 10 ML
2. Varying no. of interviews for each candidate depending on in how many sections he/she did well.

Online test questions :

1.1) A graph was drawn with few negative edges. Determine for which all vertices Dijkstra's algo will produce the right answer.

Note: There was no negative cycle so atleast we could apply the algo. You need to simulate the running of algo for that graph to check.

1.2) Sucessor of an element having a right subtree in a BST can be: (4 options)

Ans: A leaf node or a node with no left child

2.1) You have 40 coins and play a casino game where a coin is tossed and you gain a coin on each head and lose on tail. Game ends on 0 or 100 coins. What is the probability that you lose your money?

Ans: 0.6

(Will add rest questions later)

Nitish Garg (Interview stage):

Gave 6 interviews. (Missing out 1 or 2 more questions)

1. There is a 2-D array where all the rows and columns are in sorted order. How will you find an element?
-> Since top-left element will be smallest and bottom-right largest, start from bottom-left and go up for finding smaller element than current and right for larger.
2. How to find shortest path in a graph with no negative edges?
-> I told about Dijkstra's algo, explained its logic and details.
3. Now, in this graph, I have the option to half the weight of any one edge. Find shortest path with this modification.
-> I initially told that we will half the heaviest edge of shortest path which will work for some cases. Then suggested to store half weight and original weight for each edge and pass a boolean parameter in recursive call to indicate whether we have already halved a edge or not. If we haven't already halved the weight of an edge till now, we always make two recursive calls with and without halving next edge and if already halved, only option is to take next edge with original weight. Showed simulation of this logic on a sample graph.
4. You have n bins and throwing balls one by one. There is equal prob. of a ball to fall in any bin. What is the expected no. of throws so that each bin has atleast one ball.
-> Knew the approach so explained it and solved mathematically. Answer is $n \cdot \log(n)$
5. There are m balls on a table n meters wide. Balls are moving left or right with 1 m/s. What will happen?
-> Balls will fall off the table eventually.
Give an upper bound on time when all balls will fall off.
-> First gave the loose bound of n^2 with logic. After a while, told the right answer i.e. n seconds but with a non-convincing logic. The interviewer hinted to think about shadows and then I immediately told the logic.
6. There is a unit circle on which 3 points are chosen randomly thus we have 3 arcs.
What is the probability of (1,0) lying on the longest arc.
-> Gave answer as $\frac{1}{3}$. Couldn't prove. Just gave intuition type logic.
What is the expected length of arc on which (1,0) will lie?
-> Told that PDF will be constant so weighted avg will be $2 \cdot \pi / 3$
What is the expected length of arc on which (1,0) will lie when that arc is longest?
-> Initially thought that PDF will still be constant but was wrong. Couldn't solve.
7. Given a random generator function which gives 0 and 1 with equal probability, use it to make a random generator giving 0 with prob. $\frac{1}{4}$. generalise it for p/q.
-> Approach 1: Take 2 outputs as 1 and 2 outputs from original function. Return one of these 4 outputs randomly with equal prob. (Original function itself can be used to return 1 of 4 indexes in array by using twice)
Approach 2: If output is 1, return otherwise call original function again. (Do for maximum of 4 times)
8. You have a coin giving head with prob. $\frac{1}{3}$. Find probability of odd no. of heads in n tosses.
-> Hinted to use induction. Started solving, got stuck 1-2 times before getting final expression with further help from interviewer.
9. 2 linked lists are given which represent decimal numbers. Make a linked list of their sum.
First gave the approach of reversing both linked lists, adding and reversing result. Was asked to write code for reversing linked list taking care of all corner cases.
Then was asked to do it without reversing. Explained the recursive method and wrote the code for this also. Also took the case when length of 2 linked lists is different.
10. A tree represents office hierarchy. People are to be fired with the rule that to fire a person, all its sub-ordinates (i.e. childs) must be fired. In how many ways can firing be done?
-> Calculation is done from leafs to root. Explained the method and calculated the answer for sample drawn.

11. There is a cube. You are standing on a vertex and need to reach the diagonally opposite vertex. There is equal probability to move to any of the 3 adjacent vertices at any step. Find the expected no. of steps needed.
- > Started off writing probability for 3 steps, 5 steps so on. He said to think of a non-calculative way. Gave the hint to think of type of vertices and I was able to build the solution gradually by reducing graph to just 2 vertices with few more hints.

Prashant Gudipudi (Interview stage) :

Gave 5 interviews (Missing some questions)

1. 1.1) First one was the [two egg problem](#). I knew the solution to the problem, so he skipped it.
1.2) Implement a [queue using two stacks](#). I was starting to solve the problem, but he stopped me and asked the next question.
1.3) Say you have a coin which has been tossed 1731 times. You win if there are more heads than tails, and the interviewer wins otherwise. Find the probability that he wins.
-> The answer intuitively looks like $\frac{1}{2}$, and is $\frac{1}{2}$.
1.4) You have m red balls and n black balls in a bucket. You pick two balls randomly at a time. You remove the two balls, and add one accordingly:
 - a) If both balls are different in color, add a red ball
 - b) If both are of the same color, add a black ballSo we see that the number of balls in the bucket decreases by one each time. So find the possible colors of the last ball.
2. 2.1) You have 100 people with ages 1-100 all distinct. You have 25 benches, placed one after the other. Each bench can seat 4 people. On each bench, the people sit in decreasing order from say, left to right. Find the possible arrangements of the people.
-> Solution: Select any four people, so arranging them can be done in only one way. So for each bench select four people from the people set and arrange them in one way.
2.2) You have two linked lists, which represent two numbers. It looks like this: if the number is 100, the LL is head -> 1 -> 0 -> 0 -> NULL. So without using reverse, and max using one integer as extra space, add the two numbers. (Hint: Also take care that both LLs may not be of the same length)
-> Solution: Find the larger of the two lists, say of length n. The smaller be m. So we use recursion till we reach the end, add them and get the carries to the higher digit places. Till $n > m$, just call the same func again, and add its carry to the digit and return any carry if present. Once they become equal, add the two corresponding digits, add carry from the recursive call, and return the carry.
2.3) You are given an array, where all except one repeat, i.e, there's exactly one unique number. Find that unique number in $O(n)$. No extra space. Hint: use XOR.
2.4) Given an array and a number x, find two numbers in the array adding to x. [Link](#)
2.5) Given an array and a number x, find the set of numbers whose sum is less than x, but closest to it. (Hint: DP)
3. 3.1) You are given a blank grid. Some of the cells are colored. Given that a cell's adjacent locations are the the cell above, below, left and right to it. If two of a cell's adjacent locations are colored, then that cell also becomes colored. Find the minimum number of cells required to be colored so that an $n \times n$ grid becomes colored. (Hint given: look for an invariant in all steps).
-> I did some trial and error and found the answer to be color all the diagonals. Answer: n. Show that the answer is minimum. Hint2:(The invariant is that the perimeter remains constant. So using that for n-1 colors gives max perimeter to be $4(n-1)$ which cannot be $4n$.
3.2) You are given n buckets and infinite balls. You fill one random bucket at a time. The expected number of balls required so that all buckets are not empty.
3.3) You are given a list of numbers: 1 to 50. You randomly choose two numbers, say a and b. You remove them, and add the number $|a-b|$ to the list. Repetitions are fine in the list. The size of the list

reduces by one each time. Find the possible numbers of the last element remaining. (Ans: All odd numbers in 1,50)

4. 4.1) [Link](#)

4.2) You are a burglar, and are given a few houses in a row, with the amount of money in each house. If you rob a house, you can't rob the house(s) adjacent to it. Maximize the amount of money you can rob. Hint: (DP)

4.3) Given two strings, one length m and one n. You wish to transform one to the other. The operations are: add a letter, delete a letter, transform a letter. Cost of all operations is 1. Find the minimum cost. Hint: (DP)

5. HR round

Here the interviewers told me that the internship will not be very interesting in terms of CS, it would be just programming. You may get to learn about Finance, but you wouldn't be a part of the research or something very exciting. So would you still take the intern.

I think I messed this part up by not being firm about my interest in finance and GS in particular.

They asked me if I had an interest in pursuing higher studies in CS. I think the answer they were looking for is a clear NO.

So if you wish to join GS or any financial institution, be firm about your interest in finance and mentioning that CS is a tool for you to get there (even if that is not your intention) or something on that lines.

DE Shaw

Stages:

1. Online coding test: 2 qstns , 50 mins
2. Interview stage: 2 tech, 1 HR round

Online coding round :

1) A road is n blocks long. Street lights are installed in a block which will light k blocks on either side. Find minimum no. of lights required to light the whole road.

2) There are n candidates each having some score. Each is awarded k prizes where k is the count of candidates having lesser score than that candidate. Find no. of awards for each candidate.

Nitish Garg (Interview stage) :

1. Was asked about recent project and the interviewers showed interest in it.
 - 1.1) There are n magnetic plates which were equidistant and exert force on a point d distance away with magnitude $1/d$. Find the equilibrium points.
-> First simply said center point due to symmetry. Made equation but a n degree equation is unsolvable. Then talked about finding equilibrium by gradient descent method. Basically my approach was kind of binary search but did not say the word "binary".
 - 1.2) There is a parking lot and people are constantly booking for a time range. For each request, you need to tell the free slots.

-> I initially thought this is database question so wrote a MySQL query. But the interviewers expected a data structure. I told interval trees and said that I have never coded it. Just know that it will be used in this situation.

1.3) Gave a triangle and asked to divide it in 10 equal areas.

-> Within a second, anyone will think of dividing base in 10 equal parts. But this seemed too trivial to speak so I kept on thinking some geometric way. Interviewer asked me what is the area of triangle which I answered. This hinted me that the interviewer was looking for that solution only. Told the logic of that approach and told why I didn't speak this method earlier.

2. Talked about few projects initially.

2.1) There is a 2-D array of letters/characters. If a column has letters in A.P. (like a,c,e,g,...), it is a valid column otherwise an invalid column. Find the longest streak of valid columns.

-> I was directly asked to write proper code. First did by using a bool array. Then optimised space by removing this array, took care of wrapping (y,z,a,b...)

3. HR just asked interests and expectations from internship. Just a conversation to know the candidate better.

Prashant Gudipudi (Interview stage) :

1. You need to design a system similar to the one used in Uber and Ola, where a user requests a cab and the drivers receive the request, accept it. Think in terms of range from user, traffic conditions, calculating distance between the cab and user, storing driver positions and so on. I think the question intended to use databases, but I hadn't worked with it so didn't convincingly answer the question.
2. Find number of steps to reach from (a,b) to (c,d) in an infinite grid. A step is defined as advancing in any diagonal direction by any length. Print -1 if it's impossible to reach at (c,d) $1 \leq a, b, c, d \leq 1e8$.
3. You are given 50 red and 50 black balls. Two buckets. You would you distribute them into the two buckets to maximize the probability of picking a red ball.

The other things in this round were practically useless.

Nutanix

Stages:

1. Online coding test: 2 qstns
2. Interview stage: Shortlisting after first round, second was debug round

Online coding round :

1) Question: <https://drive.google.com/file/d/0B5-GsYZi9MQFbEdSbUpreEJBSjA/view> (Qstn 8)

2) There are n letters which are used in lengthwise and lexicographic order to label boxes. Like if letters are a, e, n, labels will be: a, e, n, aa, ae, an, ea, ee, , aaa , ... , ane , Find the label of kth box.

Nitish Garg (Interview stage) :

1. You have to design a spell suggestor system so that the person can type the sentence with least typing. Assume english to have only those words which are given in the sample sentence.
Eg: "hi hill hilly hiller to the west" (gave something like this)
-> The approach I took with optimisations needs the user to type 1+2+4+5+1+2+1 i.e. 16 letters for this whole sentence. It had 3 parts: constructing the prefix tree, getting best suggestion for a type word and then calculation of letters required to type the whole sentence. First explained my approach and then wrote psuedo-code for all 3 parts.
2. One question was to find a potential error in the code which may be caused due to threading, otherwise the code is fine.

Another was to debug a normal competitive type question. A corner case was missing in it which could be corrected by an else if() clause.

Amazon

Stages:

1. Online coding round.
2. Two technical interviews.

Online coding round :

1. Given the diagonals(x,y coordinates) of two rectangles, tell whether they intersect. (Hint: when will they not intersect?)
2. A simple question based on finding $a^b \bmod m$. (linear method timed out.)

Abhinav Singh (Interview stage 1 & 2) :

First I was asked about my CV in both the interviews. Every coding question that was asked had to be written on paper. The interviewers wanted me to handle all the edge cases.

1. Reverse a stack using only recursion.
2. Given an infinite series S consisting of only natural numbers, X, and a drop array A. For every element in A remove multiples of A in the infinite series. Tell after how many iterations (ie after how many elements in A) does X get dropped from S.

Example:

A= [3,2,5]

X= 8

S= 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, ...

S1= 1, 2, 4, 5, 7, 8, 10, 11, 13, ...

S2= 1, 4, 7, 10, 13, ..

ANS: 2

3. Max sum path in binary tree.
<https://www.interviewbit.com/problems/max-sum-path-in-binary-tree/>
4. What is $x \sim (x-1)$?
5. How are sets, maps, and unordered maps implemented in C++?