**Part A: Actual Interview Questions**

**Topic Covered: Core Java**

1. Scenario based questions on **Rest API**.
2. Questions based on the Project
3. To find out what could be the output of a given function that takes an array as a parameter and performs certain other functions on it. To implement one of the sub functions of the given function and optimize it to O(n)
4. All Permutations of String, Time complexity, projects, multithreading, checked and unchecked exceptions, Normal Forms, Joins and Subqueries, Questions on joins and subqueries, Constraints, drop vs truncate vs delete
5. Regarding the project on ML algorithm and difference of logistic and linear

* Given a class employee and address the way to create an employee management system using it
* Array list and its implementation
* Sort elements of string-based array list
* Linked list implementation and optimized ways of reversing it
* Difference between stack and queue
* Way to solve the balanced parenthesis problem
* Optimized ways of implementing queue using stack
* Situation where to use BFS and DFS in the special graph to find the shortest path in the graph
* Code to clone a linked list of having next pointers as well as random pointers.
* Code to find the maximum sum of the sub array which runs in a linear run time
* Questions on Relational database and no SQL database when to use. Features missing out on both dbs.
* Object upcasting and down casting
* Multiple inheritance on java
* Acid property of db.

1. Final class, requirements to be taken care when declaring a class final, abstraction, interface, difference between abstract class and interface, internal working of HashMap, code to print array elements without using any kind of loop, SQL query to find the 2nd highest salary from each department where there are two tables and also the names of the salary holders, scenario when duplicate value is added in HashMap how does it function, implement a LinkedList code , ds questions conceptual ( when do you use LinkedList , tree)

* How to override final keyword?
* Hash map working and how to change the value using key?
* Difference between abstract class and interface and is it mandatory to have abstract method in abstract class?
* Write a query to fetch max salary from each department?
* How call by reference internally works in java?
* Abstraction vs Encapsulation
* Abstract Class vs Interface
* Problem Solving: <https://www.geeksforgeeks.org/trapping-rain-water/>
* Can you implement Trees?
* Can you solve problems using Dynamic Programming?
* LinkedList vs Array List
* What are Indexes in SQL? What are clustered and non-clustered indexes?



* What is node?
* What is V8 engine?
* How exactly a web page works?
* What happens when something is typed in URL bar?
* Which server would it approach and how would it know to approach that particular server only?
* Difference between Merge Sort and Quicksort.
* If given a chance which one would you use and why?

**Prog 1**: To find the first non-unique character from a given String

**Prog 2**: Find nth largest element from an array.

**Prog 3**: Read each line of a file and concatenate "welcome" to the beginning of each line and write it to the same file.



* Introduction
* Projects
* Apart from python which language you’re comfortable in.
* What is Encapsulation?
* Array list vs LinkedList.
* Final keyword
* What will you use for not updating the data?
* What is tree how will you implement tree.
* Difference between tree and graph.
* Difference between tree, graph and heap.
* Write a code to Move all zeroes to end of array and numbers to other end of the array.
* Which Data structure you use for finding the process of Facebook friend suggestions.
* Code for Library management system.

1. Elaborate regarding the project on ML algorithm and difference of logistic and linear?
2. What are the Data structures, Collections Implementation, Codes, SQL Queries, serialization concepts, My projects, details of the technologies in projects?
3. Discuss all basics of java (class, object, new, interfaces, abstract), polymorphism, program on abstraction, private, prg on interface, program on given situation using map, arrays

* Give a brief introduction about yourself.
* Description of the projects
* Details about technologies used
* More discussion about projects
* JSP and Servlets
* One problem solving question similar to the one asked yesterday but different equation; its output explanation/justify the answer with corner cases
* What do you know Time Complexity?
* Big 0 asymptotic notation discussion
* HashMap implementation code
* Hash codes, collision functions? how do they work?
* HashMap working
* Optimization based on array size scenario based
* More about projects; your approach
* Situation based Rapid-fire: answer without thinking:
* Individual Contributor or team player?
* Front-office work or back-end developer?
* Interested in finance/investment or development?
* What languages/technologies do u prefer?
* Where do u see yourself in 5 years?



* Tell me about yourself
* Final class
* Requirements to be taken care when designing final class as sde
* Print array without using any loop (I used recursion) in same order and reverse order.
* A code on LinkedList: finding the middle node
* SQL query to print highest salary in each department with name.
* Working of HashMap and which data structure is used internally and why only that ds is used
* Java Collection hierarchy

1. **Logical Questions**-

* Number of cubes of side 1unit that are required to make a bigger cube of side n. And if the side n cube is immersed in paint how many smaller cubes will have paint on them. Construct a Formula for the number of cubes having paint on them. If we have written java code for the same and analyze what all testcases you would use to test the code.
* Implementation of LinkedList with generic data and available to whole library and write insert element code.



* Introduction
* Difference between C and java.
* Why is C faster?
* Difference between JDK and JVM.
* A scenario-based question based on oops.
* Difference between is a relationship and has a relationship.
* Questions on project.
* What is red-black tree?
* What is lock?
* What is join () method?
* If b call a.join then which thread will wait?
* If a calls b.join and b calls a.join what will happen?
* What is semaphore?
* What is class level lock?
* What is private constructor?
* Can we do multithreading in singleton class?
* Collection hierarchy
* Internal working of HashMap?
* Updates in internal working of HashMap in java 8.
* What is HashSet?
* Internal working of HashSet?
* What is the key in HashSet?
* Asked -4 coding questions-

i) Factorial,

ii)Highest power of two

iii) Duplicate characters,

iv)Target sum

* What is difference between primary key and candidate key?
* SQL queries.



* Introduction
* Given a file you have to find the top 10 most repeated words - Write the method only.
* Give the ArrayList<String> as return type to the method you are making, what is Array List? How it works internally? What's the difference between Array List and LinkedList?
* Why have you used Array List instead of LinkedList?
* What is your approach of using HashMap and what's HashMap, and how is it implemented internally?
* What would be Keys and Values in your HashMap?
* What steps did you take for internal implementation, what is hashCode(), what is it and how is it implemented?
* What are the characteristics of ideal hashCode() method?
* If you have keys of integer type only, can you make a hashCode() which would return key+1, would that be an efficient way of writing hashCode()?
* How to put method checks, whether the entered key is duplicate or not?
* When you use getOrDefault(), discuss about that method usage?
* When you use PriorityQueue and what is the internal implementation and describe its usage?
* What is the time complexity of your code? It is O(n\*logn), can you improvise it further? Do you have to insert all the key, value pairs of HashMap into the priority queue?
* Can you double the performance of your program? Can you run the components of your code in parallel?
* What is garbage collector in java, and how it works?
* How does it decide to de-allocate the memory for an object? Would it de-allocate the memory for an object which is still getting referenced?



* Where to use Abstraction?
* Where to use interface?
* Find duplicates char in array (code)
* Complexity of the code
* Changed the requirements and asked to code accordingly.
* Return the sub array with max sum
* Few questions on internal working of hash set
* Tree data structure
* How linked has set preserves the insertion order
* given the values find the hash code and the index where it will get store and explain how linked hash set will work in this scenario.
* Write SQL query to fetch the second highest salary.



* Tell me about yourself
* Talk about your project and how did you implement **oops** concepts in them
* Questions on interface and abstract class
* Move all the zero elements to the right
* BookMyShow app, design all the classes and its members, write a function
* bookTicket() to implement the requirements, use streams if possible



• A function with five sub tasks -

a) Find output of the function

b) Are you aware of time complexities, if yes, tell the complexity of the function

c) Can you implement one of the functions?

d) Can you optimize it further?



* Introduction
* Projects
* Rate yourself in java
* Given a list of elements with duplicate values give the max count of duplicate elements with element name (2-3 approaches, using HashMap)
* Also HashMap, hashset, arraylist
* Complexities for every approach
* Code for given approach
* Implementation of polymorphism
* Real world examples for each overriding, overloading
* Static keyword
* How to make class immutable
* How to update the value in HashMap



* Logical question on cube.
* Working of LinkedList (We should explain our visualization to him).
* Program for the linked list and changed the requirements.



* How does the internal working of priority queue happen and how do you explicitly change the max and min heap implementation?
* Find all the permutations of given string, and then the requirements were constantly changed. Like for reputations etc.



* Introduction
* Internal working of HashMap, hashtable, hashset (many in-depth Q's related to the answer)
* Write a program to count the 10 most occurring word in a file (kept on changing requirements and asked for an optimal approach)
* Complexity of various HashMap methods
* How to generate hashcode?
* What is rehashing, initial capacity, load factor
* Questions related to project.



* If there are 2 interfaces with default () and they are implemented in the same class than what will happen.
* There is an Array of integers, if you add any three numbers and it gives result zero than print true else false.
* Print the name of employees that are manager also.
* Print the name of mangers that are not null.
* Are the above 2 queries same.



* Introduce yourself
* In which sem are you in? When will it get over?
* Where are you now? Have you ever been to Bangalore?
* Interviewer shows me one function and asked to figure out the output. The complete method needs to be written.
* Internal working of HashMap
* Write the code for first occurrence of each element in an array.



* Questions on Oops concepts
* Predict the output for few codes
* Scenario based question i.e. for train tracking he asked what your approach will be and write the code for that



**Logical Question:**

* You have a cube of dimension 1 unit.

How many such cubes would u need to make a bigger cube of dimension 5 units.

* Now after getting the bigger cube if u immerse in paint

How many cubes of dimension 1 unit would have paint on them?

* Develop a formula to get the number of cubes that have paint on them?
* Assume we have written a java code for same?

What all testcases would u use to test the code for errors.

* Explain the working of LinkedList and what classes you would use to implement the same

Implementation of a LinkedList data structure for Morgan Stanley library available to everyone. It should be able to take generic data also.



* Introduce myself.
* Question to take input from a file and print the 10 words that occurred most number of times.
* Then asked another approach, just to tell it and not implement.
* Asked to optimize it.
* Asked questions on HashMap (what it is and working), LinkedList and arraylist (what they are).
* What happens when you type an URL and press enter?



* Write a program to merge two arrays in sorted order, inheritance, method overloading, method overriding, Realtime application of overriding, time complexity of search operation in HashMap, tree, array.



* What are oops concepts?
* Explain each oops concept
* Inheritance coding with different cases
* Multiple inheritance coding with different cases
* What is Default interface
* Can you write method body in interface?
* Difference between abstract class and interface
* Write a program to reshuffle an array element such that all the zero numbers should right and non- zero should be left and the non-zero elements sequence should not be changed.

(done this using array/ interviewer asked whether you can do with any other ds)

* Time complexity for above program. Explain
* BookMyShow app entities and implementation.

1. Given an algorithm, describing a method named "nub(X)". Questions regarding- what does that function do. Gave the algorithm for the methods inside that nub method, asking you to crack it, and get the meaning of the functionality of the nub method. Asked the time complexity, and how do you derive it.
2. Describe Class, objects, code for merging two sorted arrays, code for bst, exception handling, executor service, inheritance concepts, method over loading, method overriding

* Introduction
* HashMap Working
* Investment Banking
* SQL Query



* Explain swap in financial markets, list OOPs concepts and explain them in detail
* Write a SQL query for self join (Employee table was given which consists of empID, name, age, managerID, find all the employees reporting a particular manager with the help of managerID)



* Find the top 10 most occurring numbers in a file
* What is a HashMap?
* What is a priority queue?
* Multithreading concepts and implementation



* Introduction
* Questions related to project
* What is final class?
* How to make class final?
* Getter setter methods
* Constructor calling
* Immutable classes
* How to make a class immutable?
* Problem solving question: find the distance between the duplicate elements in the array and then find the minimum distance from the given set.
* Design the schema for Macdonald’s, create all the necessary tables and relationships between them and asked queries related to them.
* Functional programming in java after java8
* Functional interface
* Lambda
* Anonymous classes
* Runnable interface implementation before java8 and after java8.
* Indexes in SQL.



* Internal working of HashMap
* What is equity, derivatives, share.



* Questions on Date validation, indexing, Gmail data model, correlated queries, situational questions, joins



* Top 10 most occurring words in a file
* Internal Working of HashMap
* hashcode() and equals() method
* Time complexity of this code



* Tell me about yourself
* Java 8 features
* Normalization
* Difference between mongo DB and Firebase



* Given a sentence, reverse the word order while keep the punctuation in place.
* How would you search in a sorted array when you can never deduce by any way the size of it?



* Describe Oops pillars
* Design HashMap using your own data structure
* Questions on SQL queries, stream, merge two sorted arrays, time complexity, trees, time complexity, indexing, clustered indexes, project related queries



* Questions on Arrays, trees, HashMap, indexes, pillars of oops, SQL queries



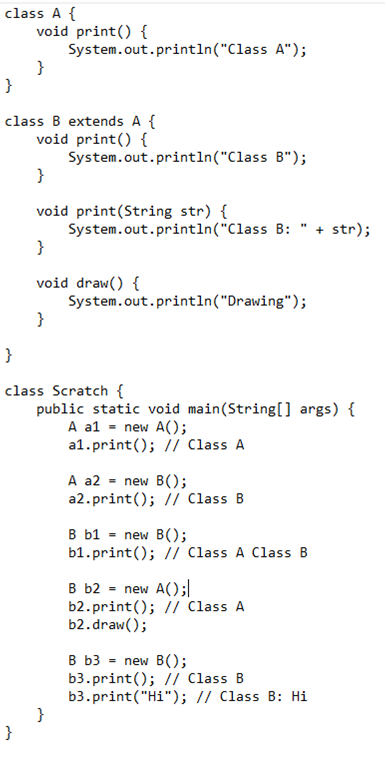
* Introduction
* Difference between primary markets and secondary markets
* Explain derivatives, future and options
* Working of HashMap
* Difference between arraylist and LinkedList, immutability, given an employee table and asked to write query (self join)



* Write a method to merge two sorted arrays into a third sorted array, Explain the method in detail?
* Explain what is inheritance and difference between class and interface? Provide some practical examples as well to elucidate.
* Differences between class v/s interface
* What are default methods in Java 8?
* Explain the internal working of a HashMap, how it works?
* What are hash codes and equals methods.
* What is an Object class and what methods are part of the object class?
* Explain different ways to create a thread
  1. Extend a thread class and implement Runnable. What is Callable?
  2. How to wait for a thread to complete in main program.
* Showcase your strong knowledge with fundamentals
* Rate your familiarity with outside of some core Java concepts.

1. Write a method to merge two sorted arrays into a third sorted array
   1. Discuss time/space complexity concepts.
   2. Time complexity of hash maps and lists.
2. Provide strong knowledge and conceptual understanding on basics of computer science and familiarity with libraries and frameworks that are used extensively in day to day development. These include Spring framework and testing libraries.
3. **OOPS**:

Scenario based questions on runtime polymorphism around identifying which function get invoked in different cases.



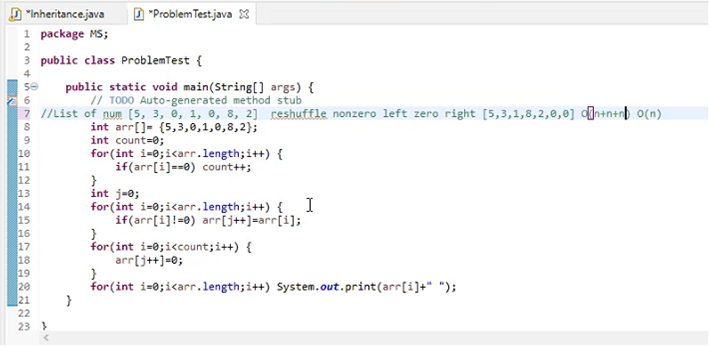
1. **OOPS:**

* Scenario based questions on inheritance around multiple inheritance combination of interfaces and abstract classes.
* Elaborate the understanding of the principle being used



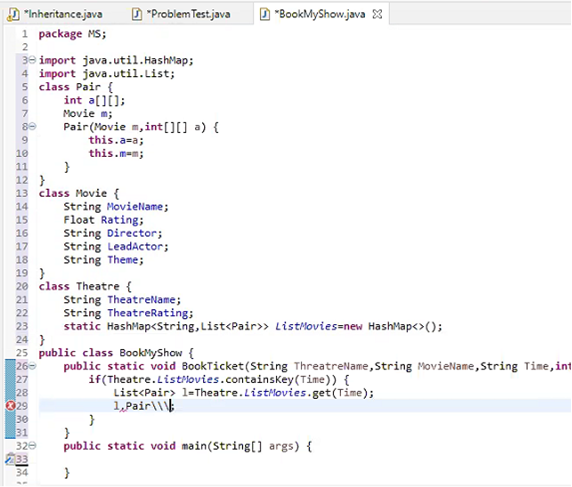
1. **Problem Solving:**

* Move all zeros to the end of the list without changing the order of other non-zero numbers without extra space in O(n) time.
* Recommended data structure for storing the input to aid the algorithm where swapping elements is an expensive operation.



1. **Design and Implementation:**

* Design a Movie Booking system in a theatre where a user can request to book a movie for a specific show in a specific theatre.
* Try to figure out the entire logic for booking ticket functionality.



1. **OOPS:**

* Explain how encapsulation can be achieved in OOP languages and different modifiers that enable encapsulation in Java. Explain singleton design pattern.

1. **Problem Solving:**

* Move all zeros to the end of the list without changing the order of other non-zero numbers without extra space in O(n) time.

Identify the brute-force O(n2) logic and try to improve on the solution to satisfy the constraint of no extra space.

* Recommended data structure for storing the input of numbers to aid the algorithm.

1. **Data Structure:**

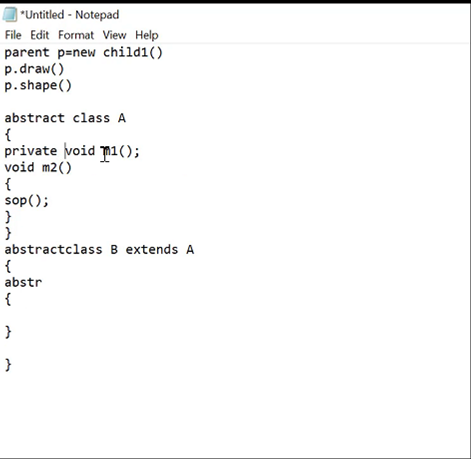
* Propose a data structure that fits well to figure out recommended friends for a user available on social media platforms.
* What is the distinction b/w graph and tree?
* Recommended data structure for storing the users and the connected friends.
* Depict how a heap is represented as a data structure.

1. **Design and Implementation:**

* Design a Book Library system where a user can request for a book to be issued or return back an issued book.

1. **OOPS**

* Scenario based questions on polymorphism, provide explanation around the design principle.
* Scenario based questions on inheritance and around difference between an interface and abstract class. Try hands on multiple inheritance related questions.



1. **Data Structures and Problem Solving:**

* Design a data structure to store average temperature of a city for past years and provide implementation for adding a new entry and querying average temperature for a city on particular year.

1. **OOPS:**

* Scenario based questions on runtime polymorphism around identifying which function get invoked in different cases.

1. **OOPS:**

* Scenario based questions on inheritance around multiple inheritance combination of interfaces and abstract classes.

1. **Problem Solving:**

* Move all zeros to the end of the list without changing the order of other non-zero numbers without extra space in O(n) time.

1. **Design and Implementation:**

* Design a Train Locator system where if provided with Train details we can identify which station the train has departed last and which station the train will arrive next.

1. **OOPS:**

* Scenario based questions on runtime polymorphism around identifying which function get invoked in different cases.

1. **OOPS:**

* Scenario based questions on inheritance around multiple inheritance combination of interfaces and abstract classes.

1. **Problem Solving:**

* Move all zeros to the end of the list without changing the order of other non-zero numbers without extra space in O(n) time.
* Recommended data structure for storing the input to aid the algorithm where swapping elements is an expensive operation.

1. **Design and Implementation:**

* Design a Movie Booking system in a theatre where a user can request to book a movie for a specific show in a specific theatre.

**Hint**: Try to identify the entities involved and provide class design for them. When trying to implement the book ticket function, try to get improved on the design of show and seat management.

**Part B: Other suggested interview questions**

# **Technical questions**

## **Java**

1. Describe about – Sdlc lifecycle phase, Java and OOPS – questions related to array, abstraction, vector, collection, Multithreading.
2. Describe – Generator concept - lambda function - loops and how they work?
3. Explain DDL, Garbage Collector, Heap Memory, Stack Memory, Malloc.
4. Differentiate between C and C++, Stacks and Queue related problems.
5. Questions will be asked on Maps and Dictionary, Data structure, Scenario based questions.
6. Advantages of java
7. What is polymorphism, encapsulation, entry point in java code, jvm, jre, ,jdk
8. Question related to data structure, java, design and analysis of algorithm will be asked.
9. How threads are handled in java? Concept of oops, Overriding and overloading, cloud technology.
10. What is heap memory?
11. What is an array, how to find unique elements, what is duplicate element?
12. Define link list, implementation of link list, left view of a binary search.
13. What is threading, multi-threading, how do you approach.
14. What will you do if the web page doesn’t work – how do you check connectivity?
15. How to find a file which contains the word "error" in it?
16. How to replace a word and display it – how to find the number of word present in the file – how to find a file which contain two words "error" and "second word" – how to replace word from second line only?
17. How would debug a piece of code?
18. Have you ever worked with Loggers?
19. How would you approach it if your code was not performing?
20. Have you worked with any debug/ testing/ performance optimization software?
21. What is the difference between a static and non-static method in Java?
22. Suppose you have a table with students, and they belong to departments, which is stored in another table. Draw what the tables can look like? Using the table above, how would you display the number of students in each department?
23. How do you reverse a String in Java?
24. Write a simple method in Java to print out student names if you are passed a List of names.
25. Suppose I have a bouncy ball that is dropped from a given height. Each time it bounces, it recovers half of its original height. How many times will it bounce before stopping? (The trick with that one is that from a theoretical perspective, the answer is always infinite since you can't divide by 2 and get 0, so the interviewer was more interested if I noticed and could figure out how to work around it than he was in the actual code)
26. What other languages besides Java are you comfortable in?
27. What is the difference between Java and JavaScript?
28. What are some of the features of Java?
29. What are the four core concepts of object-oriented programming and explain each one?
30. How is the static keyword used in Java?
31. What is binary tree and how does it work?
32. Explain the difference between DFS and BFS?
33. What is the definition of a balanced binary (search) tree?
34. How do you insert a new node to a balanced binary (search) tree?
35. How do you re-balance such a tree if it is not balanced anymore?
36. Applications of balanced binary search tree?
37. What are exceptions and what are the advantages of applying exceptions?
38. Are exceptions mandatory in a language paradigm?
39. What is synchronized in Java and what is the usage of it?
40. Difference between Array List and LinkedList in Java?
41. What scenarios are they most suitable for?
42. SOLID principles in Object-Oriented Programming?
43. Explain functional programming?
44. Difference between functional programming and object-oriented programming?
45. Advantages of functional programming?
46. Given a customer (each with their own shopping list) how can we store these in a data structure?
47. Given a list with more than 1000 numbers, how can we get the largest 10 numbers that are in that list better than O(n)?
48. What is the difference between primitive and object types?
49. You have a program that talks to a servlet to request orders but you either get 1 or multiple requests. What might be the issue?
50. Given 2 arrays, find the intersection of both of them (with duplicates)?
51. Can you have more than 1 public class in a Java file?
52. How would you create a class in Java that doesn't allow subclasses to be made from it?
53. If you had an infinite loop where you added an element to an array in every iteration, would the garbage collector remove elements from the array?
54. How would you check to see if a key already exists in a Map?
55. You have two files with a list of words. How can you get the common words?

between them, and unique words for each file? A duplicate word in the same file is still considered unique.

**a**. When using a HashMap, how we can keep the words in the same order they were in their files.

**b.** What is the time complexity for your algorithm?

1. What is the difference between an abstract class and an interface?
2. Difference between checked and unchecked exceptions?
3. What are interfaces? How do they differ from abstract classes? Where would you use an interface.
4. Give a design pattern that uses an interface. Explain its implementation?
5. Difference between == and .equals() ?
6. What is a HashMap? Efficiency of an HashMap if the hashing always returns the same index?
7. Given a string containing a sentence, design an algorithm that produces a list of words in descending length?
8. Given a directory (folders and files), design an algorithm that serialize this directory in a string following this format:

foldername(foldername(), filename)?

1. What are exceptions and what are the advantages of applying exceptions?
2. Are exceptions mandatory in a language paradigm?
3. What is synchronized in Java and what is the usage of it?

## **Python**

1. MS Python dictionaries, lists – their time and space complexities, - situation based questions will be asked.
2. When a situation is described how will you search for the root cause of the problem?
3. What is the difference between singly and doubly linked list, sorting algorithm, quick sort and merge sort, tuple and list, mutable and immutable?
4. What can be used in terms of key value pair in python, how to list no of multiple duplicates word?
5. Find the count of unique numbers using python.
6. Django - how they work - how do you create a template.
7. What is beautiful soup and some modules in python you are aware of.

## **Common Questions**

1. Describe about References, Pointers, Java vs C++ – advantage & disadvantage, difference between Union and Union all, list and dictionary.
2. What is list, string slicing - Malloc and calloc - data structure - best sorting algorithm - bubble and quick sort difference.
3. One problem solving question. how to find circular sub strings from a given string.
4. What is Binary search and how does it work?

**SQL**

1. Few basic SQL cmds like grant revoke, Bash grep and filter commands and few questions on database configuration will be asked.
2. Basic database questions all related to the project will be asked.
3. Which connection swing you used to connect your project from database?
4. What do you mean by constraints?
5. What do you understand by primary key and foreign key?
6. What is referential integrity constraint?
7. What are DML commands?
8. What are the Characteristics of DBMS?
9. Define Paging, cross join, self-join.
10. What is cartesian product?
11. Define ACID properties of DBMS
12. What will you do if database works slow?
13. SQL queries.
14. What is index?
15. How you will find duplicate records in table?
16. What is the disadvantage of index in SQL?
17. What do you understand by locking?
18. Auto committed commands in SQL
19. Define different types of joins?
20. What is cross join?
21. What DROP does?
22. Define different types of joins?
23. What is cross join?
24. Difference between union and union all.
25. What is SQL?
26. Why it is interpreter language not a compiler language?
27. What is the difference between truncate and delete in MySQL?
28. What is delete and truncate, difference, advantage of database?
29. Scenario based questions on - combinations of table, how to extract and modify the table – delete vs  truncate – when do we use drop – how to find out duplicate data in a table – how to find duplicate data in a column – how will you apply primary key on a table – how to show all the folders in root (along with subfolders) – how will you get a process id(ps) - give a process id in a tree structure(pstree)
30. Scenario based questions –

(a) let's consider a table with 5 columns, containing 5 columns with redundant data in it (like the word laptop is repeated in table multiple times across many columns) – so how will you find and remove that keywords or redundant data?

(b) consider a=1, b=2, .......z=26, given the string input "India" the output must be (number-number-number-number-number), Explain the logic in any language you are comfortable with? (c) will you print the folder names in tree format that is easy for human eyes.

1. Different scenarios in project will be asked and how you will handle the database in such condition – Group By, Order By, Second salary, Aggregate Functions – how do you handle failures in database - if number of users increase how will you manage them – how to validate the user – how do you ensure that users information are handled safely – how dynamic your project is, etc.?
2. SQL, Bash, Scenario based questions – ITIL, Joins (2 tables, 3 tables , 4 tables using sets), SQL constraints(primary key, foreign, unique etc.), Duplicate values in database, Aggregate functions (min,max, count etc.), queries using Rdbms commands (union, intersect, minus etc.,),Types of joins, The highest salary, The second highest salary, the nth highest salary using max function and nested queries, Order byTop limit etc., Transaction commands (savepoint, commit, roll back), bash - awk commands, removing duplicates, grep command, itil -incident management, issue and incident scenario-application slow down issue, SQL, indexes and it's kinds?
3. What are the Constraints in SQL, Bash scripting: shebang, starting line of script and its meaning, different kinds of ways of taking input?
4. Few basic SQL cmds like grant revoke, Bash grep and filter commands and few questions on database configuration will be asked.
5. Basic database questions all related to the project will be asked.
6. Which connection swing you used to connect your project from database?
7. What do you mean by constraints?
8. What do you understand by primary key and foreign key?
9. What is referential integrity constraint?
10. What are Dml commands?
11. What are the Characteristics of Dbms?
12. Define Paging, cross join, self join.
13. What is cartesian product?
14. Define ACID properties of DBMS
15. Different scenarios in project will be asked and how you will handle the database in such condition – Group By, Order By, Second salary, Aggregate Functions – how do you handle failures in database - if number of users increase how will you manage them – how to validate the user – how do you ensure that users information are handled safely – how dynamic your project is, etc.?
16. Questions will be asked on – Bash Coding – almost all commands, Mkdir, Rmdir, how to check logs, check space of file /directory, Grep, Awk, Sql queries.
17. Situational questions including Linux commands and their application will be asked.
18. What is index?
19. What is indexing and give its types?
20. What is delete, drop, truncate?
21. What is the disadvantage of index in SQL?
22. What do you understand by locking?
23. Auto committed commands in SQL
24. Define different types of joins?
25. What is cross join?
26. Difference between union and union all.
27. What is SQL, Linux, Bash?
28. Questions on Project – purpose of project – does your project have any encryption for data? Why cloud, Steps on how cloud works, Cloud services – how cloud can be improvised in your view?
29. What is the difference between truncate and delete in MySQL?
30. What is ITIL framework?
31. What is delete and truncate, difference, advantage of database?
32. Questions will be asked on – Database engineering, concepts of MySQL, stored procedures, SQL query to find duplicate in table, Blocking SQL, Networking commands, Bash scripting, importance of bash scripting, regular expressions, ITIL concepts, SQL types of join, server related questions, SED commands, file matching, disk commands in bash.
33. Scenario based questions on - combinations of table, how to extract and modify the table – delete vs truncate – when do we use drop – how to find out duplicate data in a table – how to find duplicate data in a column – how will you apply primary key on a table – how to show all the folders in root (along with subfolders) – how will you get a process id(ps) - give a process id in a tree structure(pstree)
34. What are default permission of a file (666 or rw-rw-rw) – how will you change the permissions of the file (chmod and umask............chhmod -x) for giving executable permission (i.e. rwx-rwx-rwx) – why is awk command used – how to print last 5 lines of a text file (tail command)?
35. Scenario based questions –

(a) let's consider a table with 5 columns, containing 5 columns with redundant data in it (like the word laptop is repeated in table multiple times across many columns) – so how will you find and remove that keywords or redundant data?

(b) consider a=1, b=2, .......z=26, given the string input "India" the output must be (number-number-number-number-number), Explain the logic in any language you are comfortable with?

(c) will you print the folder names in tree format that is easy for human eyes.

1. SQL, Bash, Scenario based questions – ITIL, Joins (2 tables, 3 tables , 4 tables using sets), Sql constraints(primary key, foreign, unique etc.), Duplicate values in database, Aggregate functions (min,max, count etc.), queries using Rdbms commands (union, intersect, minus etc.,),Types of joins, The highest salary, The second highest salary, the nth highest salary using max function and nested queries, Order byTop limit etc., Transaction commands (savepoint, commit, roll back), bash - awk commands, removing duplicates, grep command, itil -incident management, issue and incident scenario-application slow down issue, sql, indexes and it's kinds,
2. What are the Constraints in SQL, Bash scripting: shebang, starting line of script and its meaning, different kinds of ways of taking input?
3. Why it is interpreter language not a compiler language?

**Linux**

1. What is Netstat command in Linux
2. What is grep command in Linux?
3. How to find process with specific name
4. What is the use of grep command, ping command?
5. Differentiate find vs grep
6. How can you connect a database from Linux?
7. Questions on Linux - general commands like mkdir, ssh, zshh, grep, egrep etc.
8. Explain: Linux - deep dive, admin tools, every command, 50-60 commands from Linux, SAR commands/ changing the options/ AWT commands, admin tools.
9. How will you find the disk usage?
10. How will you find the process id?
11. What is the command to find the total memory?
12. What is swap memory?
13. What is cache memory?
14. Process of incident management?
15. ps-ef command
16. 3 states of vi editor
17. What is swap memory
18. What is cache memory
19. What is shell? What is kernel?
20. Situational questions including Linux commands and their application will be asked.
21. What are default permission of a file (666 or rw-rw-rw) – how will you change the permissions of the file (chmod and umask............chhmod -x) for giving executable permission (i.e. rwx-rwx-rwx) – why is awk command used – how to print last 5 lines of a text file (tail command)?
22. Why do you use # in #!/bin/bash at the top line inside the file?
23. How do you mount a file?
24. What are the OSI layers?
25. What are top commands, commands for disk storage?
26. Difference between DF & DU.
27. What is Shebang in bash scripting?
28. What are the commands to show all current process and pstree?
29. Tell us Some of the basic commands you know in Linux, how can you check memory occupied by a process in Linux? What is ls, ps command and some of their options?
30. What are the commands to list files and hidden files, how to check for directories?
31. Questions will be asked on – Bash Coding – almost all commands, Mkdir, Rmdir, how to check logs, check space of file /directory, Grep, Awk
32. Piping of Linux commands such as grep, ls and ps?
33. Traceroute on Linux and how it works?
34. kill command.
35. How get process id of a certain task.
36. Change mode command.
37. crontab command.
38. Linux terminal pipelining

## **Project Management Concept**

1. Questions on Project – purpose of project – does your project have any encryption for data? Why cloud, Steps on how cloud works, Cloud services – how cloud can be improvised in your view?
2. Explain the process of change management.
3. How will you respond to a problem when a ticket is created?
4. What is ITIL framework?
5. What is agile model
6. What is agile and devops
7. Difference between production support role and developer role,
8. What is the relation between Incident and Problem as in what occurs first, Incident or Problem?
9. What is SDLC?
10. What do you understand by SRS?
11. How much part of timing you will invest in different stage if I gave you a project to make?
12. Which connection swing you used to connect your project from database?
13. Scenario based – When you are an employee in amazon and one of the customers couldn’t place order and complaining it, what would you do?

**Non-Technical Questions**

1. Tell me about yourself.
2. Regarding project mentioned in resume.
3. Tell me more about your last year projects
4. Can you work in domain different than your choice?
5. Where are you from?
6. Will you be ok to relocate?
7. Why did you choose to work for a software company or so if you are an EC student?
8. What are the things that you were taught in your training with Wiley?
9. What is the project that you worked on?
10. What's the best project you have done?
11. What's the least favorite project out of all the projects?
12. Think as if you are talking to a common man. Explain your best project from start to finish.
13. What difficulties you faced while doing project.
14. How did you resolve them?
15. What do you know about Production Support?
16. What is an Investment Bank?
17. What do you know about Financial Markets and Capital Markets?
18. How will you make the boring tasks interesting?
19. Let's just say your boss is an angry person and you find out an error your boss made. What would be your reaction to this?
20. What is incident management and Process of incident management
21. How much part of timing you will invest in different stage if I gave you a project to make?
22. What is the first thing that you do when you get a complaint from the user?
23. What you have learnt in your training?
24. Why do you want to work with Morgan Stanley and why do you want to work in production support?
25. One aptitude question - With four 8's using any mathematical operation on them how do you get the result as 24.
26. Mathematical Problem-solving questions.
27. What is problem management?
28. What are the basics of financial services?
29. What is equity, trade cycle, merge and acquisition?
30. What is called an incident, how will you manage? how will you monitor it?
31. Let's just say the server isn't responding and it needs to be fixed immediately what would you do?
32. Why join Morgan Stanley?
33. Why apply for production role when you can apply for development role instead?
34. Where do you see yourself in next five years?
35. What are the areas that you are interested in to work on?
36. How to know if a cronjob failed?
37. User complains that directory is full, while creating a new file or directory how to approach this issue?
38. What is agile and devops?
39. Tell me an example where you solved a problem.
40. One problem solving question. how to find circular sub strings from a given string.
41. What is beautiful soup and some modules in python you are aware of.

**Latest Questions:**

1. Given an array print unique numbers
2. Given an array and a number s, find a pair of numbers whose sum is equal to the number s.
3. Write pseudo code to find a file given root directory
4. Storing data in hash maps – space in memory, hashtables
5. What is access modifier, final in depth, string immutability
6. Why strings are immutable
7. JVM
8. Garbage Collector
9. Where to place system.gc() - Use equivalent in c
10. Java call by value or call by reference
11. LinkedList, Array list and their difference
12. Volatile
13. How hibernate creates tables internally
14. Normalization, cascade in database
15. Polymorphism – static and dynamic with examples
16. Advantages of polymorphism
17. Checked vs Unchecked exception
18. Interface and abstract class
19. String builder vs string buffer
20. Serialization
21. Synchronization concept
22. Data structures which you have used
23. Given an employee table with columns empid, empname, salary, managerid, write a query to display all the manager names.
24. Given a table with columns name, age, salary – find the people where age is between 20 and 30.
25. Given an employee table update salary where name starts with a.
26. OOPS and where you have used it in detail
27. Data structures which you have used
28. Collections and where you have used

**Possible Questions:**

1. Tell me more about your University final year projects?
2. What do you know about Production Support?
3. What is an Investment Bank?
4. What do you know about Financial Markets and Capital Markets?
5. Which connection swing you used to connect your project from database?
6. What do you mean by constraints?
7. What do you understand by primary key and foreign key?
8. What is referential integrity constraint?
9. Define ACID properties of DBMS?
10. What do you understand by locking?
11. Auto committed commands in SQL.
12. The difference between Truncate and Delete?
13. What DROP does?
14. Define different types of joins?
15. What do you understand by ITIL?
16. Name the books of ITIL?
17. What is a Dictionary in Python?
18. What is SDLC?
19. What do you understand by SRS?
20. How much part of timing you will invest in different stage if I gave you a project to make?
21. What is agile model?
22. How you will find duplicate records in table?
23. Process of incident management?
24. What is the relation between Incident and Problem as in what occurs first, Incident or Problem?
25. What is index?
26. How will you find the disk usage?
27. How will you find the process id?
28. What is the command to find the total memory?

**Example Situational Questions:**

**Scenario 1:** Imagine that you get a report of a critical process that failed during an order (or something in those lines). As a production support, how would you approach this?

**Scenario 2:** You identify that the process failed because of faulty hardware, how would you approach this?

**Scenario 3:** A person is using an app to send trading requests. Unfortunately, his request gets rejected by the exchange server, but he does not recognize the error message he got and neither do you. The person calls you and informs you of the issue. What would you do? Scenario 4: You see that more requests are rejected by the exchange server. What could be the issue? How would you approach this?

**Technical interview Questions**

**SQL:**

1. **Question: What is SQL?**

Answer: Structured Query Language, used to communicate with the Database.

1. **Question: How is data organised in a relational database?**

Answer: In tables.

1. **Question: What is a primary key?**

Answer: It is a single field or combination of fields that defines the uniqueness of a row. A primary key cannot be null.

1. **Question: What is a foreign key?**

Answer: field which can uniquely identify each row in another table.

1. **Question: What is a join?**

Answer: A join defines the relationship between two tables. It links fields from each table that contain matching data.

1. **Question: Imagine I had a table called table and I wanted to select all the data from it, what would the command be?**

Answer: select \* from table

1. **Question: Can you explain what a self join is and give an example?**

Answer: A self join is a join which allows the table to join to itself. An example could be an employee table with managers. A manager is also an employee and you would therefore have to join to itself to get a relationship between employee and manager.

**LINUX:**

1. **Question: What is Linux?**

Answer: An operating system based on UNIX which was written in the 1970s. there are lots of different “versions/flavours” – Red Hat, Ubuntu etc

1. **Question: What is the equivalent to the C directory in Windows?**

Answer: The root directory, represented by the forward slash, /

1. **Question: How do you view the contents of a directory in Linux?**

Answer: The ls command.

1. **Question: What are the 3 kinds of permissions that can be assigned to a file?**

Answer: Read, write and execute.

1. **Question: If I wanted to change the permission of a file so that absolutely everyone could read, write and execute the file what the command would be:**

Answer: “chmod 777 filename” or “chmod uog+rwx filename”

1. **Question: What command would you use to find a word in a file?**

Answer: grep (global regular expression print)

1. **Question: What command would I use to get the server name**

Answer: The hostname command

1. **Question: What command would I use to get the IP of the server**

Answer: The ipconfig command

1. **Question: If I wanted to get a list of all network connections going in and out of the server what command would I use?**

Answer: The netstat command

1. **Question: If I wanted to get a list of the processes running, what command would I run?**

Answer: The ps command

1. **Question: If I then want to get a list of all the running processes that have the word mthree in it, what command would I use?**

Answer: The ps command with a grep ie “ ps -ef | grep mthree” the “|” is called pipe. So they might literally say “ps minus e f pipe grep mthree”

1. **Question: What is crontab and why would you use it?**

Answer: Crontab is a “daemon” that allows commands at specific date/time. Kind of like windows scheduler.

**GENERAL CODING:**

1. **Question: Can you explain what the SOLID principles in programming are?**

Answer: SOLID is a mnemonic acronym for five design principles intended to make software designs more understandable, flexible and maintainable.

S - Single responsibility principle: A class should have only a single responsibility (i.e. changes to only one part of the software's specification should be able to affect the specification of the class).

O - Open/closed principle: “software entities … should be open for extension but closed for modification.

L - Liskov substitution principle - Objects in a program should be replaceable with instances of their subtypes without altering the correctness of that program.

I - Interface segregation principle - Many client-specific interfaces are better than one general-purpose interface.

D - Dependency inversion principle - One should “depend upon abstractions, [not] concretions.

1. **Question: What is a variable?**

Answer: A variable stores data that can be referenced and manipulated in a computer program. It can be considered as a label for a container that holds data (in memory).

1. **Question: What is the difference between a while loop and a do-while loop?**

Answer: A do while loop will execute at least once whereas a while may not execute at all.

1. **Question: What is the difference between a set and a list?**

Answer: Set – unordered and values are unique. List – ordered(indexed) and duplicates allowed.

1. **Question: What is a cache?**

Answer: an area of temporary storage where frequently accessed data can be held for rapid retrieval.

1. **Question: What is a buffer?**

Answer: A region of memory used to temporarily hold data while it is being moved from one place to another within a computer.

1. **Question: What is a deadlock?**

Answer: Deadlock describes a situation where two or more threads are blocked forever, waiting for each other. Deadlock occurs when multiple threads need the same locks but obtain them in different order.

**JAVA/CODING:**

1. **Question: Why is the Java platform independent?**

Answer: Java is called so because of its bytecode which can run on any system irrespective of its underlying operating system. The JVM provides a run-time environment in which java bytecode can be executed.

1. **Question: What class is the superclass for every other class?**

Answer: Object class.

1. **Question: Why is Java not considered to be 100% Object Oriented?**

Answer: Because it makes use of eight primitive datatypes (Boolean, byte, char, int, float, double, long, short) which are not objects.

1. **Question: What does a constructor do in Java?**

Answer: It is a block of code used to initialize an object. The keyword new calls the constructor.

1. **Question: What is a singleton class?**

Answer: Only one instance of a singleton class can be created at any given time. This is achieved by making the constructor private.

1. **Question: What is a static method?**

Answer: A static method belongs to the class rather than an object of a class. A static method can be invoked without the need for creating an instance of a class.

1. **Question: What are the four pillars of object orientation?**

Answer: Abstraction, Encapsulation, Inheritance, Polymorphism.

**ITIL:**

1. **Question: What is ITIL?**

Answer: IT Infrastructure Library.

1. **Question: Explain what Incident Management is?**

Answer: An incident is an unplanned interruption to a service, a reduction in the quality of a service or an event that has not yet impacted the service to the customer. The first goal of the incident management process is to therefore restore a normal service operation as quickly as possible and to minimize the impact on business operations.

1. **Question: Explain what Problem Management is?**

Answer: Problem Management includes the activities required to diagnose the root cause of incidents identified through the Incident Management process, and to determine the resolution to those problems. It is also responsible for ensuring that the resolution is implemented through the appropriate control procedures, especially Change Management and Release Management. It is basically to make sure the same Incident never ever happens again.

**Competency Interview Tips**

**RESEARCH & PREPARATION:**

• Research the clients’ website to familiarize yourself with their history and the areas they operate within. Also Look into their core values and how can you feel that you can relate to them.

• Looking into their share price as well current CEO and the board of Directors is most definitely worth looking into. This is rarely asked but will show that you have done your homework.

• Research current news to check any positive recent activity or movements with the client however please do AVOID any negative press that has occurred as this can put a negative twist on the interview.

• Read the Financial Times, CITY AM, BBC News etc. to see what is happening within the market sector is also useful.

• Review the hiring managers LinkedIn profile. Try to understand their background and if there anything on their profile that you can relate with. This can build strong rapport with the interviewer.

**REVIEWING YOUR CV:**

Your CV is the tool that initially will have caught their eye. They will use your CV as a platform for questions they will ask you, to review your academic background, skills, knowledge and past work experiences and more likely than not question you around your training here at mthree and what you will have achieved throughout.

It’s important that you can speak intelligently about all the information you have listed. If you stated, you achieved something make sure you can clearly explain how you achieved it. If you stated you have a certain skill, ensure you can speak about the skill so they confidently believe you can perform it.

Please speak to the Talent Acquisition/Client Services team if you do have any questions or concerns around your CV.

**DAY OF THE INTERVIEW:**

• Arrive on time - try to be at the interview location 10-15 minutes before the interview. If you arrive half an hour early walk around the block or go for a coffee nearby and try to relax. Contact your point of contact at mthree if any problems do arise. If you have a problem attending the interview, please let us know immediately so we can let the manager know ASAP.

• Positive body language - warm handshake, maintain eye contact, do not fidget, sit up straight, do not cross arms in defensive manner, try holding hands gently in your lap, convey enthusiasm and interest in the job.

• It’s entirely natural to feel a bit nervous and there’s no need to worry about that. The important thing is to be attentive, open and mindful. it’s a simple thing that can help to make a positive first impression.

• Take your time to answer questions, and don’t be afraid to say that you’re just taking a moment to think through your answer.

• It goes without saying that you should dress in a smart and professional way for any interview.

**COMMON INTERVIEW QUESTIONS & ADVICE:**

The hiring manager or managers you will be meeting with will already have a good indication of your qualities, your background and your skillset based on the conversation they will have had with the Sales Team here at mthree. The interview is there to confirm that you have the right technical skills and experience to successfully perform in the role but equally assess how well you’re going to fit into their team.

Below are 4 of the most common questions that our current Alumni on site will have been asked but equally some solid advice on how to answer these questions in the most prompt and professional manor.

1. **“Can you tell me a bit about yourself?”**

This question, usually the opener, tops the list of typical interview questions. It's incredibly important, as you can provide the manager with a great first impression. Preparation is key, but your answer mustn't sound rehearsed. Focus on your skills, characteristics and successes, and how these enabled you to successfully become part mthree’ s graduate programme.

Keep your answer short, sweet and straight to the point. Generally, you should begin with an overview of your University background and your greatest achievements throughout, before running through your professional experience and giving examples of the skills that you've developed throughout your training period.

2. “**Why do you want to work for Morgan Stanley (example)?”**

Demonstrate that you've researched the role and the client by discussing the skills and interests that you would have seen from the job spec and from what we will have told you about the Client /Role/Team you’re Interviewing with.

Draw upon what you enjoy; use examples from University or any or extra-curricular life that suggest you're strongly motivated for the role and can relate closely to the client. Tell them what particular aspect of the job spec that excite you the most. Again, you can relate to the core values of the Bank and reflect on how you can relate.

3. “**What are your strengths?”**

Pick three or four attributes desired by the manager in the person specification that is on the job spec; teamwork, leadership, initiative and lateral thinking are good examples. Whichever strengths you pick, ensure that you can evidence them with examples.

4. **“What are your weaknesses?”**

You can turn a negative question into a positive answer by picking characteristics that you've taken steps to improve on. For example, you have previously had difficulty accepting criticism; but tell the hiring manager that you've learned to embrace constructive feedback as it allows self-improvement.

Alternatively, discuss how you overcame a potential downside of your greatest strength; for example, you might have had to learn how to cope with conflict if you're a great teamworker.

NEVER say that you have no weaknesses, that you're a perfectionist, or that you work too hard. These are clichéd responses that could portray you as arrogant or lacking in self-awareness.

**OTHER COMMON AND PREVIOUS QUESTIONS:**

1. Describe a situation in which you led a team

2. Give an example of a time you handled conflict in the workplace

3. How do you maintain good working relationships with your colleagues?

4. Tell me about a big decision you've made recently. How did you go about it?

5. What has been your biggest achievement to date?

6. Describe a project where you had to use different leadership styles to reach your goal?

7. Tell me about a time when your communication skills improved a situation

8. Give me an example of a challenge you faced in the workplace and tell me how you overcame it

9. Tell me about a time when you showed integrity and professionalism

10. Give an example of a situation where you solved a problem in a creative way

11. Tell me about a time that you made a decision and then changed your mind

12. Describe a situation where you were asked to do something that you’d never attempted previously

13. Tell me about a time when you achieved success even when the odds were stacked against you.

**INVESTMENT BANKING QUESTIONS:**

1. What is an Investment bank and how does it make money?

2. What is a Retail bank and how does it make money?

3. What is a trade?

4. Explain the Trade Lifecycle

5. What is a Cash Equity?

6. What is an Equity Derivative?

7. What is a Future and what is the difference between an Option and Future?

8. What is an FX?

9. What is an Interest Rate Swap?

10. What is a Credit Default Swap?

11. What is a Bond?

**QUESTIONS TO ASK:**

1. Having relevant and professional questions to ask at the end of the interview will make you look smart, switched on and hungry to succeed - all qualities they will be looking for when hiring an Alumni.

2. It also gives you one final chance to further highlight your relevant qualities and experience. Not having any questions to ask will give the impression of unpreparedness and a lack of interest in the role.

3. Below are some some great examples of questions that you can ask, but equally questions that our current Alumni have found to be affective:

4. “How could I impress you in the first three months and generally what do you look for when hiring an Alumni?”

5. This is a good question to ask managers at the end of the interview as it shows them that you're eager to make a positive contribution to the Client.

6. Pay close attention to the hiring managers response as it will tell you how they want you to perform and will highlight particular areas of the job you should be focusing on during the first few weeks of employment.

7. If this manager or team has previously hired an Alumni or a graduate, it’s good to ask what skillsets and personality traits these individuals had that have made them a success so far.

8. Are there opportunities to progress within the role and within the team/area of the Client I will be operating in?

9. Asking about development and growth opportunities demonstrates that you’re serious, passionate, hungry and committed to be a success. They will be investing a lot of time and training into your development within your initial 2 years on the programme, so they will certainly want you to be a long-term success and to grow and develop within their team.

10. What positive changes are currently occurring and where do you see the bank heading in the next five years?

11. Again, this is a great question to ask!! The response you receive will give you an insight into the clients’ progression plans and its current place in the market. You may also get some good insight and a heads-up on any major upcoming projects that you would be working on further down the line.

12. What attracted you to NatWest Markets (example) and what do you like about the Banks culture?

13. Every manager loves to talk about themselves and this question enables you to build up a sense of rapport with your interviewer but equally you can get a good overview of their background, where they started as a graduate themselves and how they have reached the position that they’re currently operating in today. You'll also get an insider's view of the company culture and working environment you could be going into.

**CONCLUSION:**

When it comes to preparing and giving your answers to competency-based questions, always keep the STAR technique in mind.

• **Situation** – Briefly set the scene so that your interviewer understands the context

• **Task** – What did you need to achieve?

• **Action** – What did you actually do? This should make up the core of your answer

• **Result** – What was the outcome? Make sure it’s appropriate to the question

**Tips and Links**:

•Prod Support: <https://www.mthree.com/news/production-support-the-best-career-in-tech-you-ve-never-heard-about/41255/>

•Morgan Stanley, What We Do: <https://www.morganstanley.com/what-we-do>

•Competency Based Questions: <https://www.how2become.com/blog/25-competency-based-interview-questions-and-answers/>

•What is Investment Banking: <https://www.mergersandinquisitions.com/investment-banking/>

•Linux Questions:

<https://www.guru99.com/linux-interview-questions-answers.html>

**Website Links:**

• What is Investment Banking: <https://www.mergersandinquisitions.com/investment-banking/>

• Morgan Stanley: <https://www.morganstanley.com/what-we-do>

• Morgan Stanley LinkedIn: <https://www.linkedin.com/company/morgan-stanley/>

**Useful Links for your Interview Preparation:**

− Tips from a Morgan Stanley Interviewer

− Morgan Stanley Giving Back Initiatives

− Advice on Competency Interviews

− Advice on using the STAR Technique to Answer Competency Questions

− Morgan Stanley Projects

− Morgan Stanley Diversity Information