Top 50 Data Structure and Algorithms (DSA) Interview Questions for Programmers (2025)

Preparing for Programming job interviews? Here are 50+ Data Structure and algorithm problems you can practice to revise key concepts for coding interviews.

javinpaul · Follow

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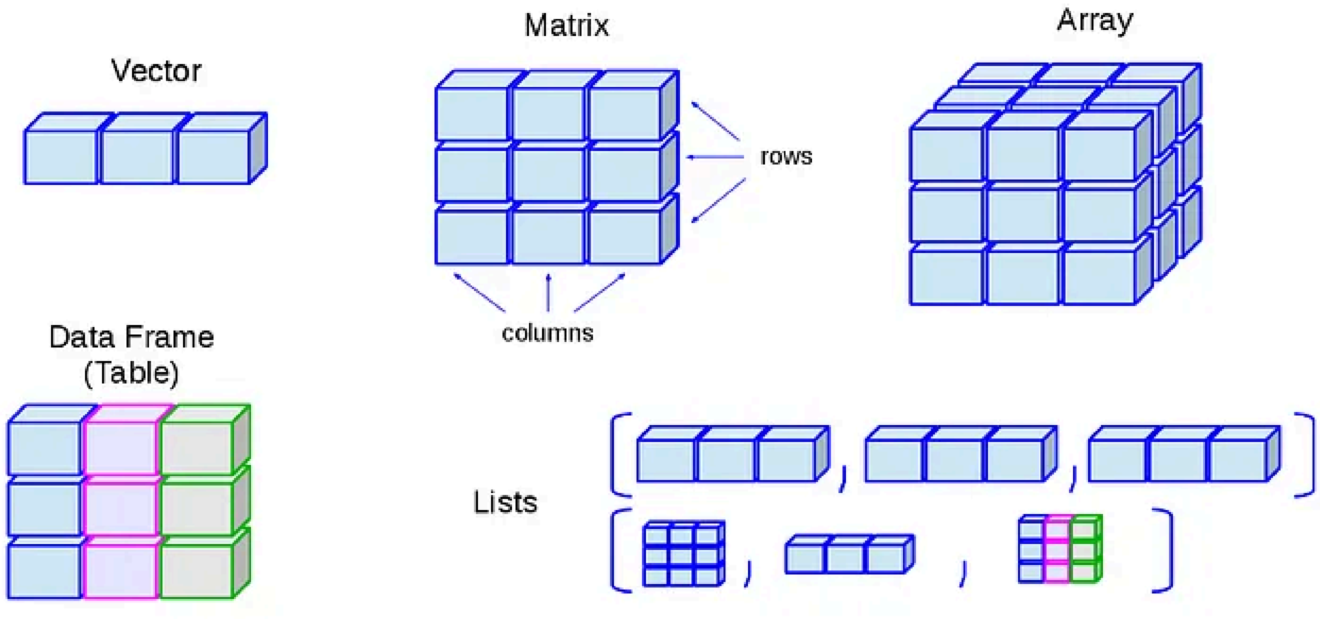

Data Structures and Algorithms: Deep Dive Using Java

There are a lot of computer science graduates and programmers applying for programming, coding, and software development roles at startups like Uber and Netflix and big organizations like Amazon, Microsoft, and Google.

They are also quite popular on service-based companies like Infosys, TCS, or Luxsoft, but many of them have no idea of **what kind of programming interview questions to expect** when you're applying for a job with these companies.

Things have also changed a lot in the last few years and coding interviews have become tougher. Now you need to go through a couple of coding interview rounds but you also need to prepare for System design problems which wasn't normal in the last decade.

That's why it's important not just to prepare for Data Structures and Algorithms questions but also for System design questions.

In this article, I'll share some *frequently asked programming interview questions* from different interviews with programmers at different levels of experience, **from people who have just graduated from college to programmers with one to two years of experience**.

Coding interviews are comprised mainly of data structure and algorithm-based questions as well as some logical questions such as, *How do you swap two integers without using a temporary variable?*

I think it's helpful to divide coding interview questions into different topic areas.

The topic areas I've seen most often in interviews are array, linked list, string, binary tree, as well as questions from algorithms (like string algorithm, sorting algorithms like quicksort or radix sort, and other miscellaneous ones), and that's what you will find in this article.

I have also updated the article to include System Design interview questions, both theory-based as well as System Design problems like how to design Twitter, Netflix, WhatsApp, or YouTube.

I have also updated the post to include dynamic programming, matrix, and recursion-based questions so that you can prepare even better for your next coding interviews.

It's **not guaranteed** that you will be asked these coding or data structure and algorithmic questions, but they will give you enough of an idea of the kinds of questions you can expect in a real programming job interview.

Once you have gone through these questions, you should feel confident enough to attend any telephonic or face-to-face interviews.

Btw, there is no point in attempting these questions if you don't have sufficient knowledge of **essential Data Structures and Algorithms** or you have not touched them for ages.

In that case, you should take a good course like **Algorithms and Data Structures Part 1 and 2 By Robert Harvick on Pluralsight or Data Structures in Java: An Interview Refresher** course on Educative to refresh your DS and algorithms skills.

Data Structures for Coding Interviews in Java - Learn Interactively

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Top 50 Data Structure, Algorithms, and Coding Interview Questions

Without any further ado, here is my list of some of the **most frequently asked coding interview questions from programming job interviews:**

1. Array Coding Interview Questions

An array is the most fundamental data structure, which stores elements at a contiguous memory location.

It is also one of the darling topics of interviewers and you will hear a lot of questions about an array in any coding interview, like reversing an array, sorting the array, or searching elements on the array.

The key benefit of an array data structure is that it offers a **fast O(1) search** if you know the index, but **adding and removing an element from an array is slow** because you cannot change the size of the array once it's created.

In order to create a shorter or longer array, you need to create a new array and copy all elements from old to new.

The key to solving array-based questions is having a good knowledge of array data structure as well as basic programming constructors such as loop, recursion, and fundamental operators.

Here are some of the popular array-based coding interview questions for your practice:

1. **How do you find the missing number in a given integer array of 1 to 100? (solution)**
2. **How do you find the duplicate number on a given integer array? (solution)**
3. **How do you find the largest and smallest number in an unsorted integer array? (solution)**
4. **How do you find all pairs of an integer array whose sum is equal to a given number? (solution)**
5. **How do you find duplicate numbers in an array if it contains multiple duplicates? (solution)**
6. **How are duplicates removed from a given array in Java? (solution)**
7. **How is an integer array sorted in place using the quicksort algorithm? (solution)**
8. **How do you remove duplicates from an array in place? (solution)**
9. **How do you reverse an array in place in Java? (solution)**
10. **How are duplicates removed from an array without using any library? (solution)**

These questions will not only help you to develop your problem-solving skills but also improve your knowledge of the array data structure.

If you need more advanced questions based upon array then you can see also see **Master the Coding Interview: Data Structures + Algorithms** **by Andrei**

Negaoie, a bootcamp style course on algorithms, especially designed for interview preparation to get a job on technical giants like Google, Microsoft, Apple, Facebook, etc.

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BECOME A CODING INTERVIEW PRO.
GET HIRED.
</>

Btw, you would need a **ZTM membership** to watch this course which costs around $29 per month but also provides access to many super engaging and useful courses like this *JavaScript Web Projects: 20 Projects to Build Your Portfolio* course. You can also use my code FRIENDS10 to get a 10% discount on any subscription you choose.

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And, if you feel 10 is not enough questions and you need more practice, then you can also check out this list of **30 array questions**.

2. Linked List Programming Interview Questions

A linked list is another common data structure that complements the array data structure. Similar to the array, it is also a linear data structure and stores elements in a linear fashion.

However, unlike the array, it doesn't store them in contiguous locations; instead, they are scattered everywhere in memory, which is connected to each other using nodes.

A **linked list is nothing but a list of nodes** where each node contains the value stored and the address of the next node.

Because of this structure, **it's easy to add and remove elements in a linked list**, as you just need to change the link instead of creating the array, but the search is difficult and often **requires O(n) time to find an element i**n the singly linked list.

This article provides more information on the difference between an array and linked list data structures.

It also comes in varieties like a singly linked list, which allows you to traverse in one direction (forward or reverse); a **doubly-linked list**, which allows you to traverse in both directions (forward and backward); and finally, the circular linked list, which forms a circle.

In order to solve linked list-based questions, a good knowledge of recursion is important, because **a linked list is a recursive data structure**.

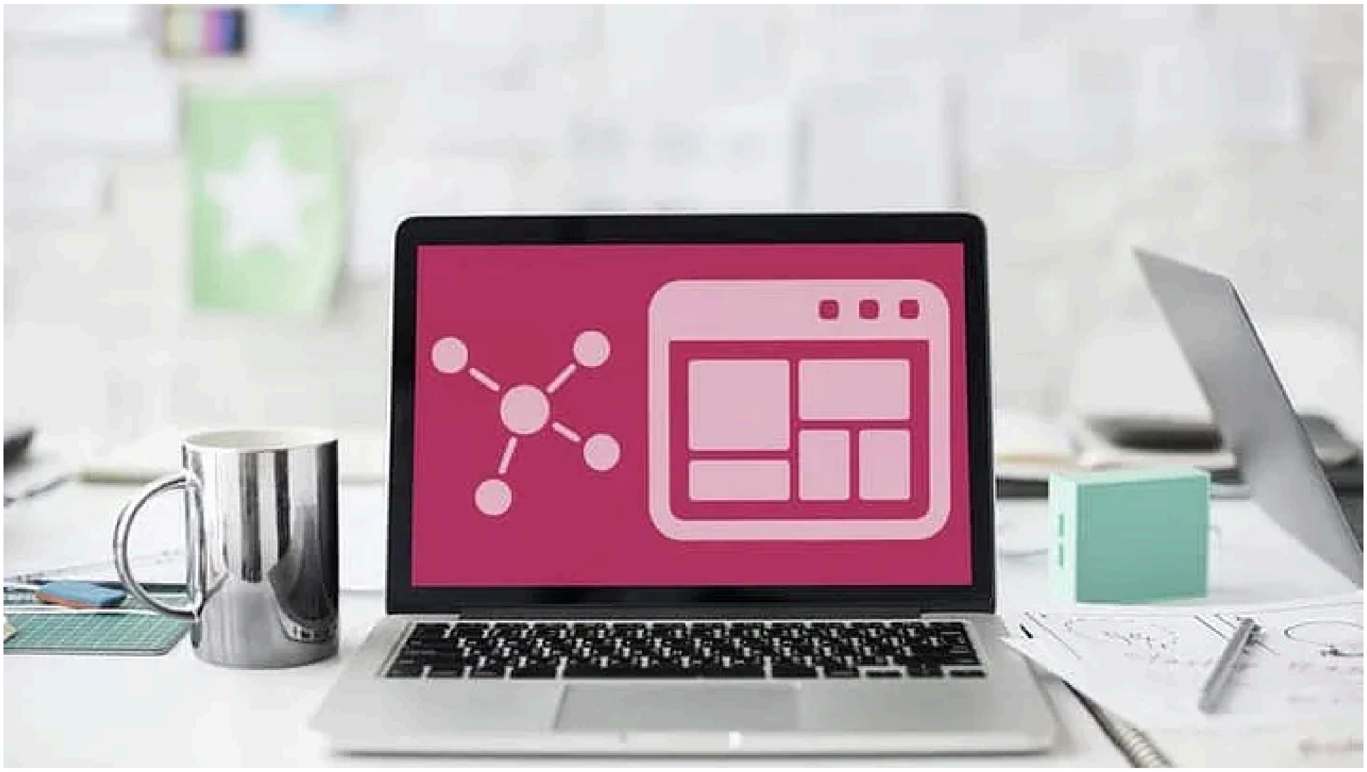
If you take one node from a linked list, the remaining data structure is still a linked list, and because of that, many linked list problems have simpler recursive solutions than iterative ones.

Here are some of the most common and popular linked list interview questions and their solutions:

1. **How do you find the middle element of a singly linked list in one pass? (solution)**
2. **How do you check if a given linked list contains a cycle? How do you find the starting node of the cycle? (solution)**
3. **How do you reverse a linked list? (solution)**
4. **How do you reverse a singly linked list without recursion? (solution)**
5. **How are duplicate nodes removed in an unsorted linked list? (solution)**
6. **How do you find the length of a singly linked list? (solution)**
7. **How do you find the third node from the end in a singly linked list? (solution)**
8. **How do you find the sum of two linked lists using Stack? (solution)**

These questions will help you to develop your problem-solving skills as well as improve your knowledge of the linked list data structure.

If you are having trouble solving these linked list coding questions then I suggest you refresh your data structure and algorithms skills by going through **Data Structures and Algorithms: Deep Dive Using Java** course.



You can also check out this list of **30 linked list interview questions** for more practice questions.

3. String Coding Interview Questions

Along with array and linked list data structures, a string is another popular topic in programming job interviews. I have never participated in a coding interview where no string-based questions were asked.

A good thing about the string is that if you know the array, you can solve string-based questions easily because **strings are nothing but a character array.**

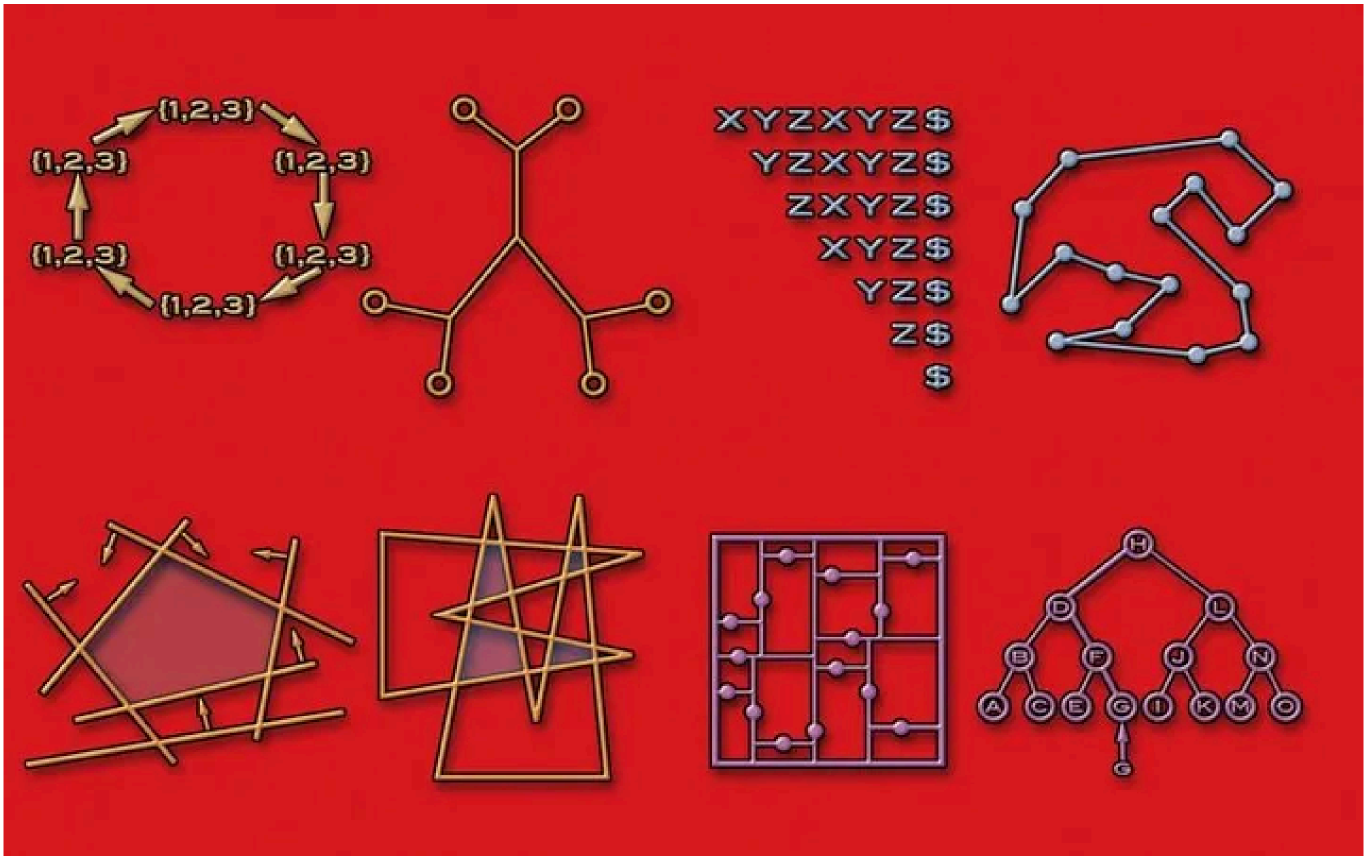
So all the techniques you learn by solving array-based coding questions can be used to solve string programming questions as well.

Here is my list of frequently asked string coding questions from programming job interviews:

1. **How do you print duplicate characters from a string? (solution)**
2. **How do you check if two strings are anagrams of each other? (solution)**
3. **How do you print the first non-repeated character from a string? (solution)**
4. **How can a given string be reversed using recursion? (solution)**
5. **How do you check if a string contains only digits? (solution)**
6. **How are duplicate characters found in a string? (solution)**
7. **How do you count the number of vowels and consonants in a given string? (solution)**
8. **How do you count the occurrence of a given character in a string? (solution)**
9. **How do you find all the permutations of a string? (solution)**
10. **How do you reverse words in a given sentence without using any library method? (solution)**
11. **How do you check if two strings are a rotation of each other? (solution)**
12. **How do you check if a given string is a palindrome? (solution)**

These questions help improve your knowledge of string as a data structure. If you can solve all these String questions without any help then you are in good shape.

For more advanced questions, I suggest you solve problems given in the **Algorithm Design Manual by Steven Skiena**, a book with the toughest algorithm questions.



If you need more practice, here is another list of **20 string coding questions**.

4. Binary Tree Coding Interview Questions

So far, we have looked at only the linear data structure, but all information in the real world cannot be represented in a linear fashion, and that's where tree data structure helps.

The tree data structure is a data structure that allows you to store your data in a hierarchical fashion. Depending on how you store data, there are different types of trees, such as a binary tree, where each node has, at most, two child nodes.

Along with its close cousin binary search tree, it's also one of the most popular tree data structures.

Therefore, you will find a lot of questions based on them, such as how to traverse them, count nodes, find depth, and check if they are balanced or not.

A key point to solving binary tree questions is a strong knowledge of theory, e.g. what is the size or depth of the binary tree, what is a leaf, and what is a node, as well as an understanding of the popular traversing algorithms, e.g. pre-, post-, and in-order traversal.

Here is a list of popular binary tree-based coding questions from software engineer or developer job interviews:

1. **How is a binary search tree implemented? (solution)**
2. **How do you perform preorder traversal in a given binary tree? (solution)**
3. **How do you traverse a given binary tree in preorder without recursion? (solution)**
4. **How do you perform an inorder traversal in a given binary tree? (solution)**
5. **How do you print all nodes of a given binary tree using inorder traversal without recursion? (solution)**

6. **How do you implement a postorder traversal algorithm? (solution)**
7. **How do you traverse a binary tree in postorder traversal without recursion? (solution)**
8. **How are all leaves of a binary search tree printed? (solution)**
9. **How do you count the number of leaf nodes in a given binary tree? (solution)**
10. **How do you perform a binary search in a given array? (solution)**

If you feel that your understanding of binary tree coding is inadequate and you can't solve these questions on your own, I suggest you go back and pick a good data structure and algorithm course like **Grokking the Coding Interview: Patterns for Coding Questions** from DesignGuru, its one of the best course for learning coding patterns.

Grokking the Coding Interview: Patterns for Coding Questions

If you need language language-specific course then you can also find course like *Grokking the Coding Patterns in Java* or Python.

Educative is a relatively newer learning platform and it’s different from Udemy and Coursera in the sense that it’s interactive and text-based. It’s quite similar to CodeCademy and also has a subscription plan which is very affordable and provides access to their 100+ software engineering courses and interview preparation courses.

If you like Educative courses then you should go for **Educative Subscription** which cost around **$14.9/month** on their annual plan and I found it very cost-effective as individual courses are priced like $79 or $49 which means for the cost of a couple of courses you get access to their 500+ courses. They now also have AI powered courses for better learning.

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If you need some more recommendations, here is my list of useful data structure algorithm books and courses to start with.

5. Miscellaneous Coding Interview Questions

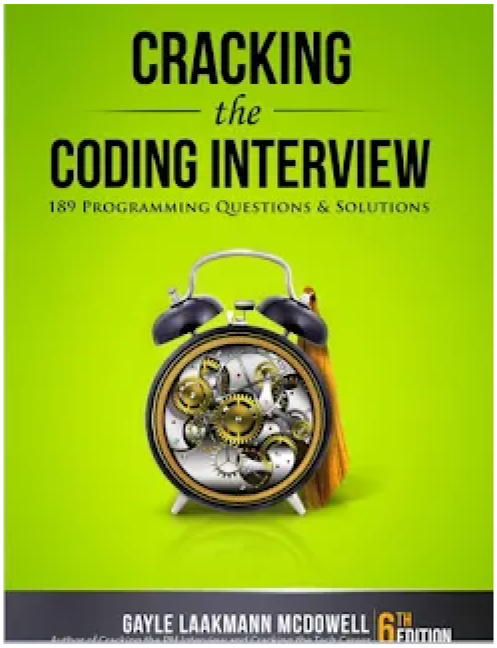
Apart from data structure-based questions, most of the programming job interviews also ask algorithm, design, bit manipulation, and general logic-based questions, which I’ll describe in this section.

It's important that you practice these concepts because sometimes they become tricky to solve in the actual interview.

Having practiced them before not only makes you familiar with them but also gives you more confidence in explaining the solution to the interviewer.

1. **How is a bubble sort algorithm implemented? (solution)**
2. **How is an iterative quicksort algorithm implemented? (solution)**
3. **How do you implement an insertion sort algorithm? (solution)**
4. **How is a merge sort algorithm implemented? (solution)**
5. **How do you implement a bucket sort algorithm? (solution)**
6. **How do you implement a counting sort algorithm? (solution)**
7. **How is a radix sort algorithm implemented? (solution)**
8. **How do you swap two numbers without using the third variable? (solution)**
9. **How do you check if two rectangles overlap with each other? (solution)**
10. **How do you design a vending machine? (solution)**

If you need more such coding questions you can take help from books like **Cracking The Code Interview, by Gayle Laakmann McDowell** which presents **189+ Programming questions and solutions.** A good book to prepare for programming job interviews in a short time.



By the way, the more questions you solve in practice, the better your preparation will be. So, if you think 50 is not enough and you need more, then check out these additional **50 programming questions** for telephone interviews and these books and courses for more thorough preparation.

6. Matrix Based Coding Interview Questions

Matrix based problems are similar to array based problems because you can use multi-dimensional array to create a Matrix.

By solving Matrix based problems you will learn how to solve mathematical questions using data structures like array.

I actually learned a lot by solving Matrix-related problems. I still remember the first Matrix based problem I solve was about how to multiply two matrices in Java and I learned a lot about multi-dimensional array and nested loop in Java by solving that problem.

The second problem I solved was about transposing Matrix and that was also quite challenging for me at that time but helped me to further solidify my knowledge about loops and array in Java.

Here are a couple of popular Matrix based coding problems you can solve:

1. Vertical Flip Matrix Problem

This is one of the less challenging Matrix problems to start with. In this question, you will be given an m x n 2D image matrix where each integer represents a pixel and you need to write a method `flipVerticalAxis()` to flip it in place along its vertical axis.

Examples

```
[[1, 0],
[1, 0]]
->
[[0, 1],
[0, 1]]
```

2. Horizontal Flip Matrix Problem

This problem is a variant of previous Matrix based coding problems. In this questions, you will be given an m x n 2D image matrix where each integer represents a pixel and you need to write a method `flipHorizontalAxis()` to flip it in-place along its horizontal axis.

If you can solve previous problem about vertical flip then this would be easier, both question follow same pattern.

Examples

```
[[1, 0],
[0, 1]]
->
[[0, 1],
[1, 0]]
```

3. Transpose a Given Matrix [Solution]

This is one of the easiest Matrix based problems you can get in any Coding interview. In this case, you will be given a square 2D image matrix where each integer represents a pixel.

Write a method `transposeMatrix()` to transform the matrix into its transpose —in—place.

One thing that is worth remembering is that the transpose of a matrix is a matrix that is formed by turning all the rows of the source matrix into columns and vice-versa.

In case you don’t remember this concept, you should ask about it from Interviewer, there is nothing wrong on that.

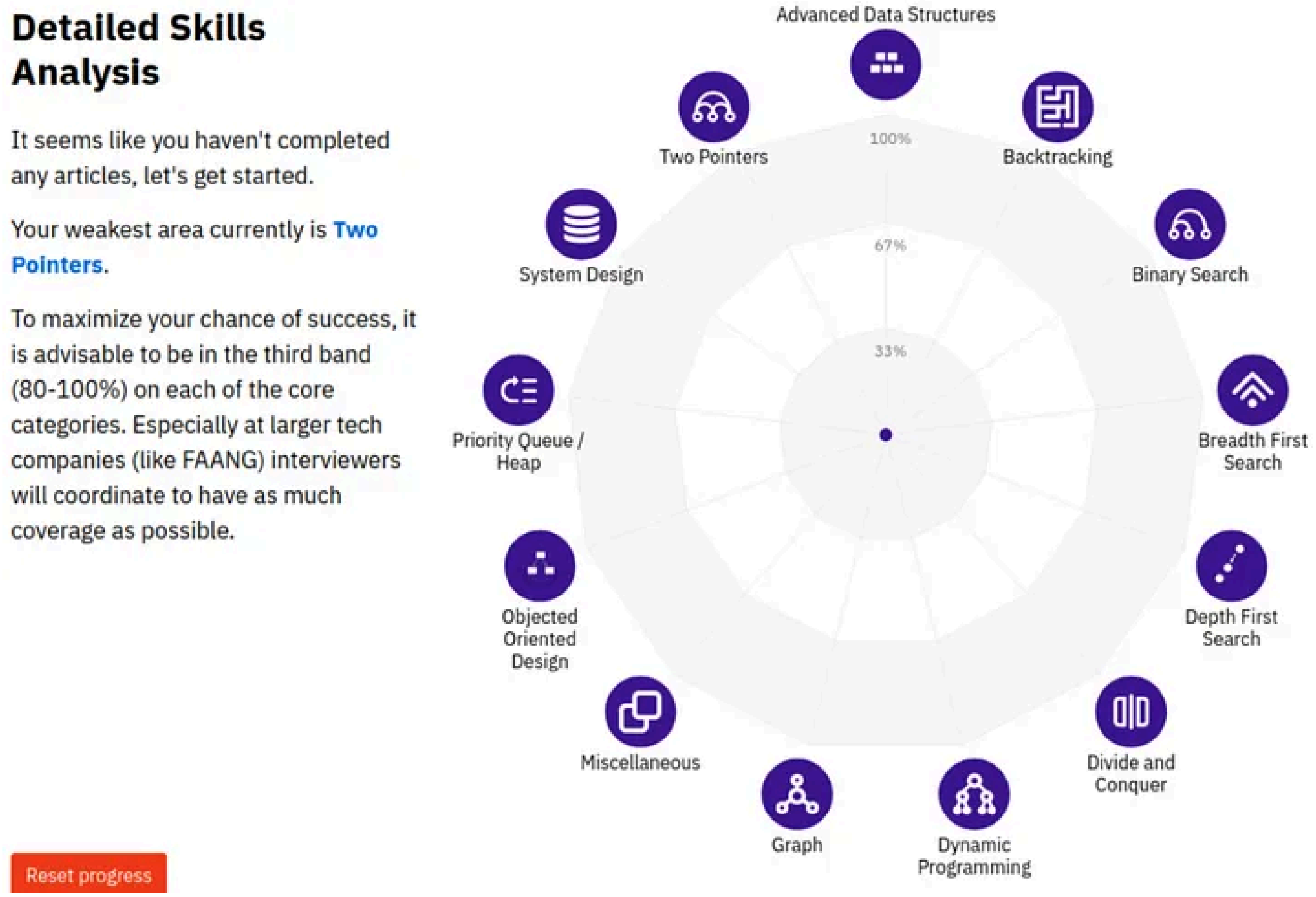
```
Examples
[[1, 2, 3, 4],
[5, 6, 7, 8],
[9, 0, 1, 2],
[3, 4, 5, 0]]
->
[[1, 5, 9, 3],
[2, 6, 0, 4],
[3, 7, 1, 5],
[4, 8, 2, 0]]
```

If you are looking for coding patterns to solve such questions then you can also check out **AlgoMonsterI**, one of the best sites for coding interview preparation.

On this site, you will learn Coding interview patterns which can be used to solve 100+ Leetcode and Neetcode problems.

They also do your detailed skill analysis and give feedback to improve your weak areas.

If you are serious about your next coding interview, I highly recommend you to **join Algomonster**. You can also use discount code “JAVA” to get 10% OFF.



Detailed Skills Analysis

It seems like you haven't completed any articles, let's get started.

Your weakest area currently is Two Pointers.

To maximize your chance of success, it is advisable to be in the third band (80-100%) on each of the core categories. Especially at larger tech companies (like FAANG) interviewers will coordinate to have as much coverage as possible.

If you need more questions on Matrix you can also see this list of 10 popular Matrix Coding problems for interviews, where I have shared more coding problems on Matrix.

7. System Design Problems and Questions

Nowadays, every coding interview is asking about System design questions hence it is imperative for developers to also prepare for System design concepts and solve System Design problems.

In this list, I am going to share both System design problems but also concept-based questions like API Gateway vs Load Balancer or Microservice vs Monolithic. You can practice these system design problems and questions for interviews.

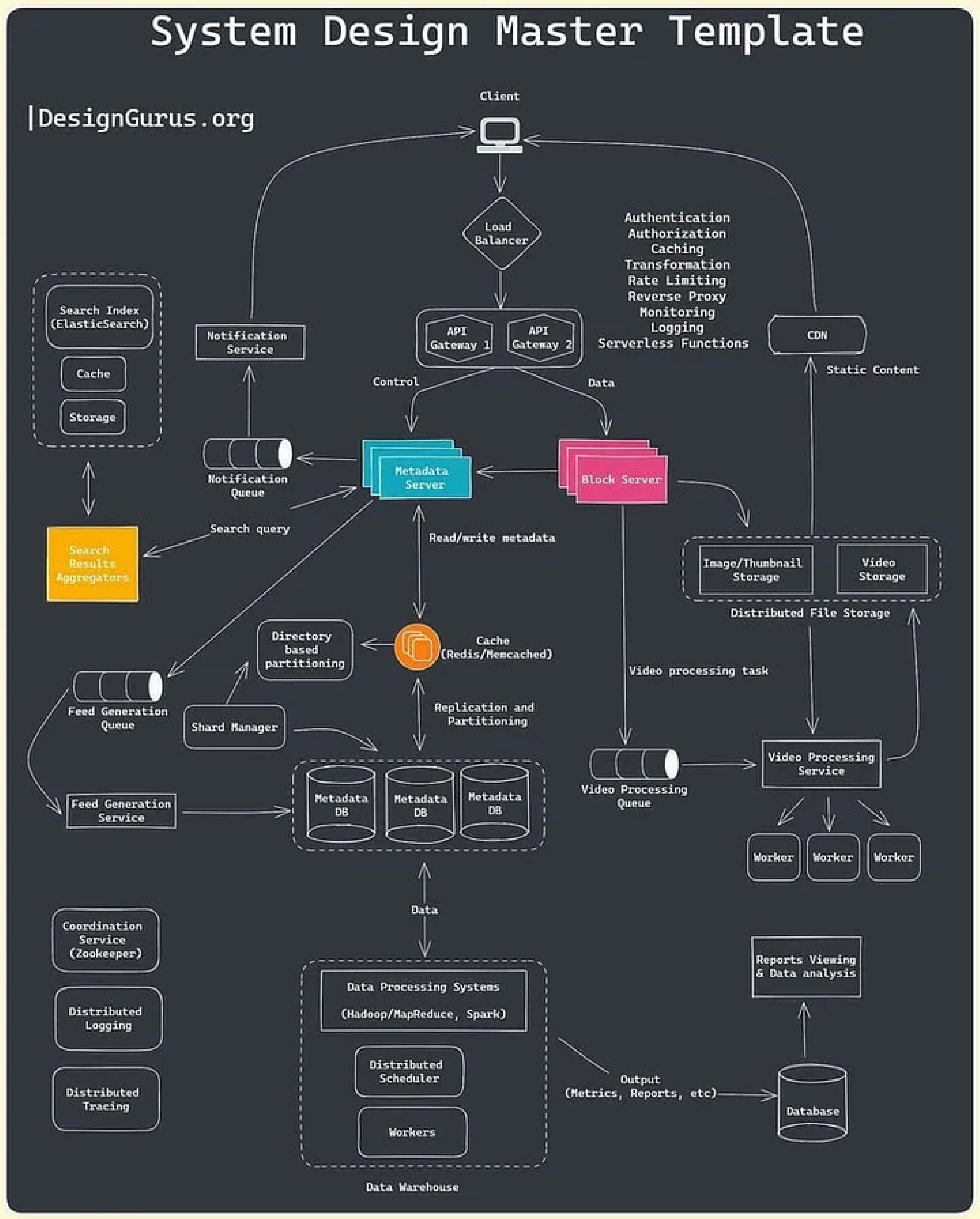
1. Difference between API Gateway and Load Balancer? [solution]
2. Difference between Reverse Proxy and Forward Proxy? (answer)
3. Difference between Horizontal scaling and vertical scaling? (answer)
4. Difference between Microservices and Monolithic architecture? (Answer)
5. What is the difference between vertical and horizontal partitioning?
6. What is a Rate Limiter? How does it work? (answer)
7. How does Single Sign On (SSO) work? (answer)
8. How does Apache Kafka work? why is it so fast? (answer)
9. Difference between Kafka, ActiveMQ, and RabbitMQ? (answer)
10. Difference between JWT, OAuth, and SAML? (answer)

And here are a few System design problems you can practice along

1. How to Design URL Shortener like TinyURL [solution]
2. How to Design a Text Storage Service like Pastebin? [Solution]
3. Design Content Delivery Network (CDN)? [Solution]
4. Design Parking Garage [solution]
5. Design Vending Machine [solution]

You can use these systems design questions and problems to learn essential System design topics for interviews.

By the way, if you are preparing for System design interviews and want to learn System Design in-depth then you can also check sites like **ByteByteGo**, **Design Guru**, **Exponent**, **Educative**, and **Udemy** which have many great System design courses



And, if you need more questions on System design, you can also check this list of 30 System Design problems for interviews.

100+ System Design Interview Questions and Problems for Software Engineers

A blog about Java, Programming, Algorithms, Data Structure, SQL, Linux, Database, Interview questions, and my personal…

javarevisited.blogspot.com

Now You're Ready for the Coding Interview

These are some of the most common questions outside of data structure and algorithms that help you to do well in your interview.

I have also shared a lot of these questions on my blog, so if you are really interested, you can always go there and search for them.

These **common coding, data structure, and algorithm questions** are the ones you need to know to successfully interview any company, big or small, for any level of programming job.

If you are looking for a programming or software development job in 2018, you can start your preparation with this list of coding questions.

This list provides good topics to prepare and also helps assess your preparation to find out your areas of strength and weakness.

Good knowledge of data structure and algorithms is important for success in coding interviews and that's where you should focus most of your attention.

Further Learning

Data Structures and Algorithms: Deep Dive Using Java

Grokking the System Design Interview

10 Books to Prepare Technical Programming/Coding Job Interviews

10 Algorithm Books Every Programmer Should Read

Top 5 Data Structure and Algorithm Books for Java Developers

7 Best Courses to Learn Data Structure and Algorithms

7 Free Books to learn Data Structure and Algorithms

20+ Binary Tree Interview Questions

21 String Programming Interview Questions

10 Courses to become a full-stack Web Developer

10 Free Courses to Become a Full-Stack Java Developer

10 Courses to learn SQL and Database for Beginners

From 0 to 1: Data Structures & Algorithms in Java

Data Structure and Algorithms Analysis — Job Interview

Grokking Dynamic Programming Patterns for Coding Interviews

Closing Notes

Thanks, You made it to the end of the article … Good luck with your programming interview! It’s certainly not going to be easy, but by following this roadmap and guide, you are one step closer to cracking your next Coding interview.

If you like this article, then please share it with your friends and colleagues, and don’t forget to follow javinpaul on Twitter!

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And, if you like to watch videos, here is the video where you can find the best data structure courses for both free and paid

and here are free courses

P.S. — If you need some FREE resources, you can check out this list of free data structure and algorithm courses to start your preparation.

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Responses (34)

What are your thoughts?

Respond

Jurann MacRae
about 6 years ago

This is such an outmoded way of thinking. It’s shameful to see that the typical programming interview process hasn’t moved ahead in 40 years despite that languages, frameworks and thinking on programming has moved ahead by leaps and bounds. Then……

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JetRuby Agency
about 6 years ago

Morning doesn’t start with coffee but with such a beautiful article. Great job, javinpaul! It’s published in our weekly digest!

30 1 reply Reply

Ryan Lambert
about 6 years ago

> Btw, there is no point in attempting these questions if you don’t have sufficient knowledge of essential Data Structure and Algorithms or you have not touched them from ages.

Kindly Disagree here.

As a non-cs trained person, this was the fastest way I went from knowing very little to knowing quite a lot in this realm.

There is quite a bit of incentive in solving a problem that you know is asked in an interview.

Also……

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See all responses

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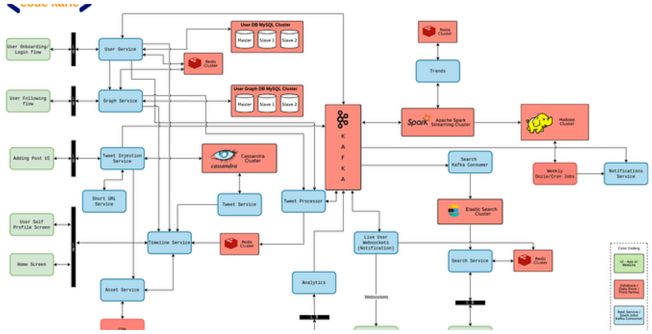

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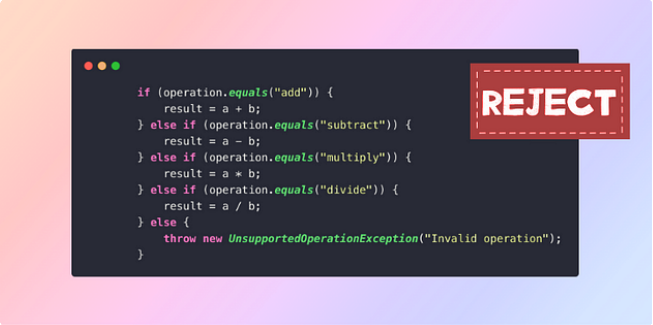

```
if (operation.equals("add")) {
    result = a + b;
} else if (operation.equals("subtract")) {
    result = a - b;
} else if (operation.equals("multiply")) {
    result = a * b;
} else if (operation.equals("divide")) {
    result = a / b;
} else {
    throw new UnsupportedOperationException("Invalid operation");
}
```

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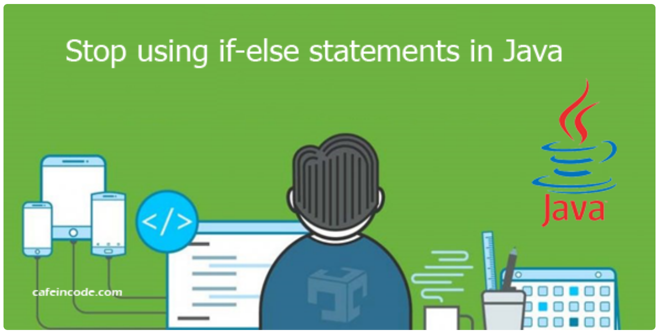

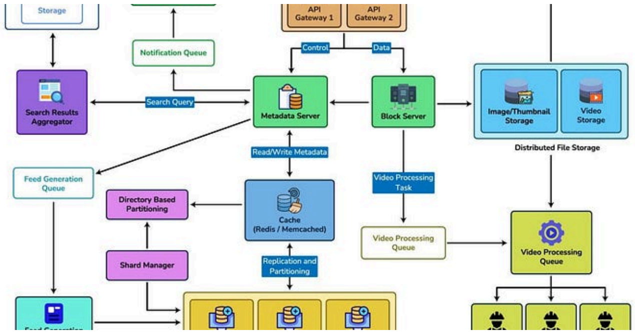

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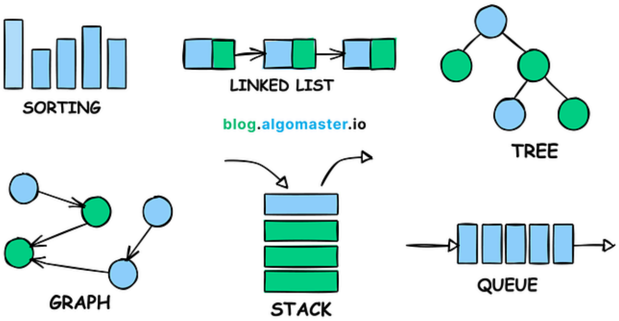

Himanshu Singour

DSA Patterns Sheet: Master in a Short Time

Here is a 10-line template that can solve most 'substring' problems.

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In AlgoMaster.io by Ashish Pratap Singh

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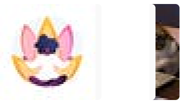

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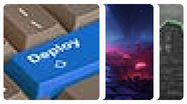

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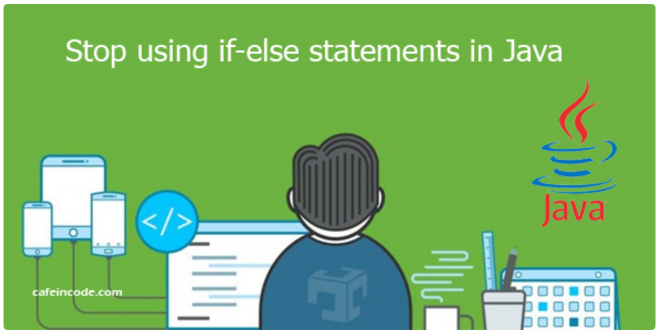

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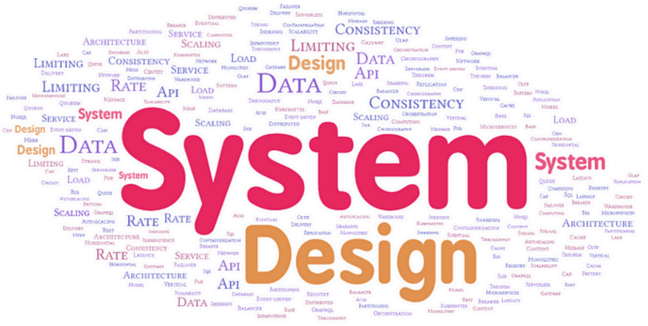

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