

## Topics

- 1 [Analysis of Algorithms](#)
- 2 [Searching and Sorting](#)
- 3 [Greedy Algorithms](#)
- 4 [Dynamic Programming](#)
- 5 [Pattern Searching](#)
- 6 [Other String Algorithms](#)
- 7 [Backtracking](#)
- 8 [Divide and Conquer](#)
- 9 [Geometric Algorithms](#)
- 10 [Mathematical Algorithms](#)
- 11 [Bit Algorithms](#)
- 12 [Graph Algorithms](#)
- 13 [Randomized Algorithms](#)
- 14 [Quizzes on Algorithms](#)
- 15 [Misc](#)

## Analysis of Algorithms:

- 1 1 [Asymptotic Analysis](#)
- 2 2 [Worst, Average and Best Cases](#)
- 3 3 [Asymptotic Notations](#)
- 4 4 [Analysis of Loops](#)
- 5 5 [Solving Recurrences](#)
- 6 6 [Amortized Analysis](#)
- 7 7 [What does 'Space Complexity' mean?](#)
- 8 8 [NP-Completeness Introduction](#)
- 9 9 [A Time Complexity Question](#)
- 10 10 [Time Complexity of building a heap](#)

[Quiz on Analysis of Algorithms](#)

[Quiz on Recurrences](#)

## Searching and Sorting:

- 10 1 [Binary Search](#)
- 11 2 [Selection Sort](#)
- 12 3 [Bubble Sort](#)
- 13 4 [Insertion Sort](#)
- 14 5 [Merge Sort](#)
- 15 6 [Heap Sort](#)
- 16 7 [QuickSort](#)
- 17 8 [Bucket Sort](#)
- 18 9 [ShellSort](#)
- 19 10 [Interpolation search vs Binary search](#)
- 20 11 [Stability in sorting algorithms](#)

21	12	When does the worst case of Quicksort occur?
22	13	Lower bound for comparison based sorting algorithms
23	14	Which sorting algorithm makes minimum number of memory writes?
24	15	Find the Minimum length Unsorted Subarray, sorting which makes the complete array sorted
25	16	Merge Sort for Linked Lists
26	17	Sort a nearly sorted (or K sorted) array
27	18	Iterative Quick Sort
28	19	QuickSort on Singly Linked List
29	20	QuickSort on Doubly Linked List
30	21	Find k closest elements to a given value
31	22	Sort n numbers in range from 0 to $n^2 - 1$ in linear time
32	23	A Problem in Many Binary Search Implementations
33	24	Search in an almost sorted array
34	25	Sort an array in wave form
35	26	Why is Binary Search preferred over Ternary Search?
36	27	K'th Smallest/Largest Element in Unsorted Array
37	28	K'th Smallest/Largest Element in Unsorted Array in Expected Linear Time
38	29	K'th Smallest/Largest Element in Unsorted Array in Worst Case Linear Time
39	30	Find the closest pair from two sorted arrays
40	31	Find common elements in three sorted arrays
41	32	Given a sorted array and a number x, find the pair in array whose sum is closest to x
42	33	Count 1's in a sorted binary array
43	34	Binary Insertion Sort
44	35	Insertion Sort for Singly Linked List
45	36	Why Quick Sort preferred for Arrays and Merge Sort for Linked Lists?
46	37	Merge Sort for Doubly Linked List

[Quiz on Sorting](#)

[Quiz on Searching](#)

### **Greedy Algorithms:**

47	1	Activity Selection Problem
48	2	Kruskal's Minimum Spanning Tree Algorithm
49	3	Huffman Coding
50	4	Efficient Huffman Coding for Sorted Input
51	5	Prim's Minimum Spanning Tree Algorithm
52	6	Prim's MST for Adjacency List Representation
53	7	Dijkstra's Shortest Path Algorithm
54	8	Dijkstra's Algorithm for Adjacency List Representation
55	9	Job Sequencing Problem
56	10	Quiz on Greedy Algorithms
57	11	K Centers Problem

### **Dynamic Programming:**

58	1	<a href="#">Overlapping Subproblems Property</a>
59	2	<a href="#">Optimal Substructure Property</a>
60	3	<a href="#">Longest Increasing Subsequence</a>
61	4	<a href="#">Longest Common Subsequence</a>
62	5	<a href="#">Edit Distance</a>
63	6	<a href="#">Min Cost Path</a>
64	7	<a href="#">Coin Change</a>
65	8	<a href="#">Matrix Chain Multiplication</a>
66	9	<a href="#">Binomial Coefficient</a>
67	10	<a href="#">0-1 Knapsack Problem</a>
68	11	<a href="#">Egg Dropping Puzzle</a>
69	12	<a href="#">Longest Palindromic Subsequence</a>
70	13	<a href="#">Cutting a Rod</a>
71	14	<a href="#">Maximum Sum Increasing Subsequence</a>
72	15	<a href="#">Longest Bitonic Subsequence</a>
73	16	<a href="#">Floyd Warshall Algorithm</a>
74	17	<a href="#">Palindrome Partitioning</a>
75	18	<a href="#">Partition problem</a>
76	19	<a href="#">Word Wrap Problem</a>
77	20	<a href="#">Maximum Length Chain of Pairs</a>
78	21	<a href="#">Variations of LIS</a>
79	22	<a href="#">Box Stacking Problem</a>
80	23	<a href="#">Program for Fibonacci numbers</a>
81	24	<a href="#">Minimum number of jumps to reach end</a>
82	25	<a href="#">Maximum size square sub-matrix with all 1s</a>
83	26	<a href="#">Ugly Numbers</a>
84	27	<a href="#">Largest Sum Contiguous Subarray</a>
85	28	<a href="#">Longest Palindromic Substring</a>
86	29	<a href="#">Bellman–Ford Algorithm for Shortest Paths</a>
87	30	<a href="#">Optimal Binary Search Tree</a>
88	31	<a href="#">Largest Independent Set Problem</a>
89	32	<a href="#">Subset Sum Problem</a>
90	33	<a href="#">Maximum sum rectangle in a 2D matrix</a>
91	34	<a href="#">Count number of binary strings without consecutive 1's</a>
92	35	<a href="#">Boolean Parenthesization Problem</a>
93	36	<a href="#">Count ways to reach the n'th stair</a>
94	37	<a href="#">Minimum Cost Polygon Triangulation</a>
95	38	<a href="#">Mobile Numeric Keypad Problem</a>

See [Dynamic Programming Tag](#) for more problems, [Quiz on Dynamic Programming](#)

#### **Pattern Searching:**

96	1	<a href="#">Naive Pattern Searching</a>
97	2	<a href="#">KMP Algorithm</a>
98	3	<a href="#">Rabin-Karp Algorithm</a>
99	4	<a href="#">A Naive Pattern Searching Question</a>

- 100     5   [Finite Automata](#)
- 101     6   [Efficient Construction of Finite Automata](#)
- 102     7   [Boyer Moore Algorithm – Bad Character Heuristic](#)
- 103     8   [Suffix Array](#)
- 104     9   [Anagram Substring Search \(Or Search for all permutations\)](#)
- 105    10   [Pattern Searching using a Trie of all Suffixes](#)

#### **Other String Algorithms:**

- 106     1   [Manacher's Algorithm – Linear Time Longest Palindromic Substring – Part 1, Part 2, Part 3,](#)
- 107     2   [Longest Even Length Substring such that Sum of First and Second Half is same](#)
- 108     3   [Print all possible strings that can be made by placing spaces](#)

#### **Backtracking:**

- 109     1   [Print all permutations of a given string](#)
- 110     2   [The Knight's tour problem](#)
- 111     3   [Rat in a Maze](#)
- 112     4   [N Queen Problem](#)
- 113     5   [Subset Sum](#)
- 114     6   [m Coloring Problem](#)
- 115     7   [Hamiltonian Cycle](#)
- 116     8   [Sudoku](#)
- 117     9   [Tug of War](#)
- 118    10   [Solving Cryptarithmic Puzzles](#)

#### **Divide and Conquer:**

- 119     1   [Introduction](#)
- 120     2   [Write your own pow\(x, n\) to calculate x\\*n](#)
- 121     3   [Median of two sorted arrays](#)
- 122     4   [Count Inversions](#)
- 123     5   [Closest Pair of Points](#)
- 124     6   [Strassen's Matrix Multiplication](#)

See this for more, Quiz on Divide and Conquer

#### **Geometric Algorithms:**

- 125     1   [Closest Pair of Points | O\(nlogn\) Implementation](#)
- 126     2   [How to check if two given line segments intersect?](#)
- 127     3   [How to check if a given point lies inside or outside a polygon?](#)
- 128     4   [Convex Hull | Set 1 \(Jarvis's Algorithm or Wrapping\)](#)
- 129     5   [Convex Hull | Set 2 \(Graham Scan\)](#)
- 130     6   [Given n line segments, find if any two segments intersect](#)
- 131     7   [Check whether a given point lies inside a triangle or not](#)
- 132     8   [How to check if given four points form a square](#)

## Mathematical Algorithms:

- |     |    |  |
|-----|----|--|
| 133 | 1  | Write an Efficient Method to Check if a Number is Multiple of 3                            |
| 134 | 2  | Efficient way to multiply with 7   |
| 135 | 3  | Write a C program to print all permutations of a given string                              |
| 136 | 4  | Lucky Numbers  |
| 137 | 5  | Write a program to add two numbers in base 14  |
| 138 | 6  | Babylonian method for square root  |
| 139 | 7  | Multiply two integers without using multiplication, division and bitwise operators, and no |
| 140 | 8  | Print all combinations of points that can compose a given number                           |
| 141 | 9  | Write you own Power without using multiplication(*) and division(/) operators              |
| 142 | 10 | Program for Fibonacci numbers  |
| 143 | 11 | Average of a stream of numbers   |
| 144 | 12 | Count numbers that don't contain 3   |
| 145 | 13 | MagicSquare  |
| 146 | 14 | Sieve of Eratosthenes  |
| 147 | 15 | Find day of the week for a given date  |
| 148 | 16 | DFA based division   |
| 149 | 17 | Generate integer from 1 to 7 with equal probability  |
| 150 | 18 | Given a number, find the next smallest palindrome  |
| 151 | 19 | Make a fair coin from a biased coin  |
| 152 | 20 | Check divisibility by 7  |
| 153 | 21 | Find the largest multiple of 3   |
| 154 | 22 | Lexicographic rank of a string   |
| 155 | 23 | Print all permutations in sorted (lexicographic) order                                     |
| 156 | 24 | Shuffle a given array  |
| 157 | 25 | Space and time efficient Binomial Coefficient  |
| 158 | 26 | Reservoir Sampling   |
| 159 | 27 | Pascal's Triangle  |
| 160 | 28 | Select a random number from stream, with O(1) space  |
| 161 | 29 | Find the largest multiple of 2, 3 and 5  |
| 162 | 30 | Efficient program to calculate $e^x$   |
| 163 | 31 | Measure one litre using two vessels and infinite water supply                              |
| 164 | 32 | Efficient program to print all prime factors of a given number                             |
| 165 | 33 | Print all possible combinations of r elements in a given array of size n                   |
| 166 | 34 | Random number generator in arbitrary probability distribution fashion                      |
| 167 | 35 | How to check if a given number is Fibonacci number?  |
| 168 | 36 | Russian Peasant Multiplication   |
| 169 | 37 | Count all possible groups of size 2 or 3 that have sum as multiple of 3                    |
| 170 | 38 | Tower of Hanoi   |
| 171 | 39 | Horner's Method for Polynomial Evaluation  |
| 172 | 40 | Count trailing zeroes in factorial of a number   |
| 173 | 41 | Program for nth Catalan Number   |
| 174 | 42 | Generate one of 3 numbers according to given probabilities                                 |
| 175 | 43 | Find Excel column name from a given column number  |
| 176 | 44 | Find next greater number with same set of digits   |

177	45	Count Possible Decodings of a given Digit Sequence
178	46	Calculate the angle between hour hand and minute hand
179	47	Count number of binary strings without consecutive 1's
180	48	Find the smallest number whose digits multiply to a given number n
181	49	Draw a circle without floating point arithmetic
182	50	How to check if an instance of 8 puzzle is solvable?
183	51	Birthday Paradox
184	52	Multiply two polynomials
185	53	Count Distinct Non-Negative Integer Pairs (x, y) that Satisfy the Inequality $x*x + y*y < n$
186	54	Count ways to reach the n'th stair
187	55	Replace all '0' with '5' in an input Integer
188	56	Program to add two polynomials
189	57	Print first k digits of 1/n where n is a positive integer
190	58	Given a number as a string, find the number of contiguous subsequences which recursively

### Bit Algorithms:

191	1	Find the element that appears once
192	2	Detect opposite signs
193	3	Set bits in all numbers from 1 to n
194	4	Swap bits
195	5	Add two numbers
196	6	Smallest of three
197	7	A Boolean Array Puzzle
198	8	Set bits in an (big) array
199	9	Next higher number with same number of set bits
200	10	Optimization Technique (Modulus)
201	11	Add 1 to a number
202	12	Multiply with 3.5
203	13	Turn off the rightmost set bit
204	14	Check for Power of 4
205	15	Absolute value (abs) without branching
206	16	Modulus division by a power-of-2-number
207	17	Minimum or Maximum of two integers
208	18	Rotate bits
209	19	Find the two non-repeating elements in an array
210	20	Number Occurring Odd Number of Times
211	21	Check for Integer Overflow
212	22	Little and Big Endian
213	23	Reverse Bits of a Number
214	24	Count set bits in an integer
215	25	Number of bits to be flipped to convert A to B
216	26	Next Power of 2
217	27	Check if a Number is Multiple of 3
218	28	Find parity
219	29	Multiply with 7
220	30	Find whether a no is power of two

221	31	<a href="#">Position of rightmost set bit</a>
222	32	<a href="#">Binary representation of a given number</a>
223	33	<a href="#">Swap all odd and even bits</a>
224	34	<a href="#">Find position of the only set bit</a>
225	35	<a href="#">Karatsuba algorithm for fast multiplication</a>
226	36	<a href="#">How to swap two numbers without using a temporary variable?</a>
227	37	<a href="#">Check if a number is multiple of 9 using bitwise operators</a>
228	38	<a href="#">Swap two nibbles in a byte</a>
229	39	<a href="#">How to turn off a particular bit in a number?</a>
230	40	<a href="#">Check if binary representation of a number is palindrome</a>

### [Quiz on Bit Algorithms](#)

## **Graph Algorithms:**

### ***Introduction, DFS and BFS:***

231	1	<a href="#">Graph and its representations</a>
232	2	<a href="#">Breadth First Traversal for a Graph</a>
233	3	<a href="#">Depth First Traversal for a Graph</a>
234	4	<a href="#">Applications of Depth First Search</a>
235	5	<a href="#">Detect Cycle in a Directed Graph</a>
236	6	<a href="#">Detect Cycle in a an Undirected Graph</a>
237	7	<a href="#">Detect cycle in an undirected graph</a>
238	8	<a href="#">Longest Path in a Directed Acyclic Graph</a>
239	9	<a href="#">Topological Sorting</a>
240	10	<a href="#">Check whether a given graph is Bipartite or not</a>
241	11	<a href="#">Snake and Ladder Problem</a>
242	12	<a href="#">Biconnected Components</a>
243	13	<a href="#">Check if a given graph is tree or not</a>

### ***Minimum Spanning Tree:***

244	1	<a href="#">Prim's Minimum Spanning Tree (MST)</a>
245	2	<a href="#">Applications of Minimum Spanning Tree Problem</a>
246	3	<a href="#">Prim's MST for Adjacency List Representation</a>
247	4	<a href="#">Kruskal's Minimum Spanning Tree Algorithm</a>
248	5	<a href="#">Boruvka's algorithm for Minimum Spanning Tree</a>

### ***Shortest Paths:***

249	1	<a href="#">Dijkstra's shortest path algorithm</a>
250	2	<a href="#">Dijkstra's Algorithm for Adjacency List Representation</a>
251	3	<a href="#">Bellman–Ford Algorithm</a>
252	4	<a href="#">Floyd Warshall Algorithm</a>
253	5	<a href="#">Johnson's algorithm for All-pairs shortest paths</a>
254	6	<a href="#">Shortest Path in Directed Acyclic Graph</a>

- 255 7 [Some interesting shortest path questions](#)  
256 8 [Shortest path with exactly k edges in a directed and weighted graph](#)

**Connectivity:**

- 257 1 [Find if there is a path between two vertices in a directed graph](#)  
258 2 [Connectivity in a directed graph](#)  
259 3 [Articulation Points \(or Cut Vertices\) in a Graph](#)  
260 4 [Biconnected graph](#)  
261 5 [Bridges in a graph](#)  
262 6 [Eulerian path and circuit](#)  
263 7 [Fleury's Algorithm for printing Eulerian Path or Circuit](#)  
264 8 [Strongly Connected Components](#)  
265 9 [Transitive closure of a graph](#)  
266 10 [Find the number of islands](#)  
267 11 [Count all possible walks from a source to a destination with exactly k edges](#)  
268 12 [Euler Circuit in a Directed Graph](#)  
269 13 [Biconnected Components](#)  
270 14 [Tarjan's Algorithm to find Strongly Connected Components](#)

**Hard Problems:**

- 271 1 [Graph Coloring \(Introduction and Applications\)](#)  
272 2 [Greedy Algorithm for Graph Coloring](#)  
273 3 [Travelling Salesman Problem \(Naive and Dynamic Programming\)](#)  
274 4 [Travelling Salesman Problem \(Approximate using MST\)](#)  
275 5 [Hamiltonian Cycle](#)  
276 6 [Vertex Cover Problem \(Introduction and Approximate Algorithm\)](#)  
277 7 [K Centers Problem \(Greedy Approximate Algorithm\)](#)

**Maximum Flow:**

- 278 1 [Ford-Fulkerson Algorithm for Maximum Flow Problem](#)  
279 2 [Find maximum number of edge disjoint paths between two vertices](#)  
280 3 [Find minimum s-t cut in a flow network](#)  
281 4 [Maximum Bipartite Matching](#)  
282 5 [Channel Assignment Problem](#)

**Misc:**

- 283 1 [Find if the strings can be chained to form a circle](#)  
284 2 [Given a sorted dictionary of an alien language, find order of characters](#)  
285 3 [Karger's algorithm for Minimum Cut](#)

[Quiz on Graph](#)

[Quiz on Graph Traversals](#)

[Quiz on Graph Shortest Paths](#)



## Quiz on Graph Minimum Spanning Tree

### Randomized Algorithms:

- 286 1 [Linearity of Expectation](#)
- 287 2 [Expected Number of Trials until Success](#)
- 288 3 [Karger's algorithm for Minimum Cut](#)
- 289 4 [K'th Smallest/Largest Element in Unsorted Array | Set 2 \(Expected Linear Time\)](#)
- 290 5 [Reservoir Sampling](#)
- 291 6 [Shuffle a given array](#)
- 292 7 [Select a Random Node from a Singly Linked List](#)

### Quizzes on Algorithms:

- 293 1 [Analysis of Algorithms](#)
- 294 2 [Sorting](#)
- 295 3 [Divide and Conquer](#)
- 296 4 [Greedy Algorithms](#)
- 297 5 [Dynamic Programming](#)
- 298 6 [Backtracking](#)
- 299 7 [Misc](#)
- 300 8 [NP Complete](#)
- 301 9 [Searching](#)
- 302 10 [Analysis of Algorithms \(Recurrences\)](#)
- 303 11 [Recursion](#)
- 304 12 [Bit Algorithms](#)
- 305 13 [Graph Traversals](#)
- 306 14 [Graph Shortest Paths](#)
- 307 15 [Graph Minimum Spanning Tree](#)

### Misc:

- 308 1 [Commonly Asked Algorithm Interview Questions | Set 1](#)
- 309 2 [Given a matrix of 'O' and 'X', find the largest subsquare surrounded by 'X'](#)
- 310 3 [Nuts & Bolts Problem \(Lock & Key problem\)](#)
- 311 4 [Flood fill Algorithm – how to implement fill\(\) in paint?](#)
- 312 5 [Given n appointments, find all conflicting appointments](#)
- 313 6 [Check a given sentence for a given set of simple grammar rules](#)
- 314 7 [Find Index of 0 to be replaced with 1 to get longest continuous sequence of 1s in a binary array](#)
- 315 8 [How to check if two given sets are disjoint?](#)
- 316 9 [Minimum Number of Platforms Required for a Railway/Bus Station](#)
- 317 10 [Length of the largest subarray with contiguous elements | Set 1](#)
- 318 11 [Length of the largest subarray with contiguous elements | Set 2](#)
- 319 12 [Print all increasing sequences of length k from first n natural numbers](#)
- 320 13 [Given two strings, find if first string is a subsequence of second](#)

321	14	<a href="#">Snake and Ladder Problem</a>
322	15	<a href="#">Write a function that returns 2 for input 1 and returns 1 for 2</a>
323	16	<a href="#">Connect n ropes with minimum cost</a>
324	17	<a href="#">Find the number of valid parentheses expressions of given length</a>
325	18	<a href="#">Longest Monotonically Increasing Subsequence Size (N log N): Simple implementation</a>
326	19	<a href="#">Generate all binary permutations such that there are more 1's than 0's at every point in al</a>
327	20	<a href="#">Lexicographically minimum string rotation</a>
328	21	<a href="#">Construct an array from its pair-sum array</a>
329	22	<a href="#">Program to evaluate simple expressions</a>
330	23	<a href="#">Check if characters of a given string can be rearranged to form a palindrome</a>
331	24	<a href="#">Print all pairs of anagrams in a given array of strings</a>



ted



Part 4

loops

$\gamma$  add up to 9







array

l permutations