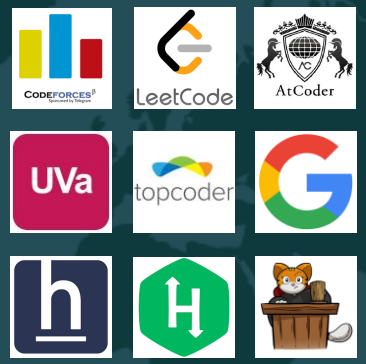
Problem Solving Training



Release 2023

github.com/cs-MohamedAyman/Problem-Solving-Training

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Introduction to Training

Training Summary

4 Levels

8 Online Judges

80 Sheets

10 K Problems

8 Solved Sheets

1 K Solved Problems

Training Levels Prerequisites

Level 1

The prerequisites for level 1 of this training are the basic knowledge for any programming language like (Variable Types - Basic Operators - Conditions - Loops - Functions - Lists/Arrays - Strings).

The objective of this level is to apply best practice on the basic programming language topics.

Level 2

The prerequisites for level 2 of this training are the basic knowledge for Data Structures and Algorithms like (Linear Data Structures - Non-Linear Data Structures - Searching Algorithms - Sorting Algorithms - Divide and Conquer).

The objective of this level is to apply best practice on the basic data structures and algorithms topics.

Training Levels Prerequisites

Level 3

The prerequisites for level 3 of this training are the advanced knowledge for Data Structures and Algorithms Analysis like (Disjoint Sets - Trie - Segment Tree - Binary Indexed Tree - Graph Algorithms - Greedy Algorithms - Mathematical Algorithms - Dynamic Programming).
The objective of this level is to apply best practice on the advanced data structures and algorithms topics.

Level 4

The prerequisites for level 4 of this training are completing at least Level 1, 2

Training Content and Timeline

Level 1

(4 Online Judges) (12 sheets)

github.com/cs-MohamedAyman/Problem-Solving-Training/tree/master/level-1

Interviews Preparation

HackerRank OJ (2 sheets)
each sheet of them divided into
(Introduction, Conditionals and Loops, Arrays and Strings, Functions, Standard Libraries, Classes and Inheritance)

4 weeks

HackerEarth OJ (4 sheets)
each sheet of them divided into
(Input/Output, Bit Manipulation, Recursion, Operators)

8 weeks

Programming Competitions

AtCoder OJ (2 sheets)
each sheet contains beginner contests
(easy contests)

8 weeks

Codeforces OJ (4 sheets)
each sheet of them divided into (Basic Operators, Conditions, Loops, Lists/Arrays, Strings)

8 weeks

Level 1 Sheets

HackerRank sheets

The HackerRank OJ sheets:

phase-1-cpp, phase-1-python, each sheet of them divided into (Introduction - Conditionals and Loops - Arrays and Strings - Functions - Standard Libraries - Classes and Inheritance). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~80 problems.

2 sheets * 80 problems

AtCoder sheets

The AtCoder OJ sheets:

phase-1-(1,2), These sheets contain beginner contests (easy contests) and each sheet contains ~180 problems.

2 sheets * 180 problems

Level 1 Sheets

HackerEarth sheets

The HackerEarth OJ sheets:

phase-1-(1,2,3,4), each sheet of them divided into (Input/Output - Bit Manipulation - Recursion - Operators). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~100 problems.

4 sheets * 100 problems

Codeforces sheets

The Codeforces OJ sheets:

phase-1-(1,2,3,4), each sheet of them contains A-Div2 problems and divided into (Basic Operators - Conditions - Loops - Lists/Arrays - Strings). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~125 problems.

4 sheets * 125 problems

Training Content and Timeline

Level 2

(5 Online Judges) (20 sheets)

github.com/cs-MohamedAyman/Problem-Solving-Training/tree/master/level-2

Interviews Preparation

HackerRank OJ (2 sheets)
each sheet of them contains linear and non-linear data structures problems, and basic algorithms problems

4 weeks

LeetCode OJ (6 sheets)
each sheet of them divided into (Array, LinkedList, Stack, Queue, Binary Tree, Heap Tree, Hash Table) (Binary Search, Sorting, Divide and Conquer, Greedy, Bit Manipulation)

24 weeks

HackerEarth OJ (4 sheets)
each sheet of them contains linear and non-linear data structures problems, plus searching and sorting algorithms

8 weeks

Programming Competitions

AtCoder OJ (2 sheets)
each sheet contains regular contests (medium contests)

4 weeks

Codeforces OJ (6 sheets)
each sheet of them divided into (Data Structure, Mathematics, String, Greedy, Brute Force)

12 weeks

Level 2 Sheets

HackerRank sheets

The HackerRank OJ sheets:

phase-2-data-structures, phase-2-algorithms-basics, each sheet of them contains linear and non-linear data structures problems, and basic algorithms problems. These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~120 problems.

2 sheets * 120 problems

AtCoder sheets

The AtCoder OJ sheets:

phase-2-(1,2), These sheets contain Regular contests (medium contests) and each sheet contains ~60 problems.

2 sheets * 60 problems

Level 2 Sheets

LeetCode sheets

The LeetCode OJ sheets:

phase-2-linear-data-structurs-(1,2), phase-2-nonlinear-data-structurs-(1,2), phase-2-basic-algorithms-(1,2), each sheet of them divided into (Array - LinkedList - Stack - Queue - Binary Tree - Heap Tree - HashTable) plus (Binary Search - Sorting - Divide and Conquer - Greedy - Bit Manipulation). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~190 problems.

6 sheets * 190 problems

Codeforces sheets

The Codeforces OJ sheets:

phase-2-(1,2,3,4), each sheet of them contains B-Div2 problems and divided into (Data Structure - Mathematics - String - Greedy - Brute Force). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~120 problems.

For the last 2 sheets: div3/4-contests that focus (easy contests), and educational-contests, that focus on (medium contests). Finally, each sheet contains ~125 contests.

6 sheets * 120 problems

Level 2 Sheets

HackerEarth sheets

The HackerEarth OJ sheets:

phase-2-linear-data-structures, phase-2-non-linear-data-structures, phase-2-algorithms-searching, phase-2-algorithms-sorting, each sheet of them contains linear and non-linear data structures problems, plus searching and sorting algorithms. These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~100 problems.

4 sheets * 100 problems

Training Content and Timeline

Level 3

(5 Online Judges) (26 sheets)

github.com/cs-MohamedAyman/Problem-Solving-Training/tree/master/level-3

Interviews Preparation

HackerRank OJ (4 sheets)
each sheet of them divided into (String, Number Theory, Algebra, Graph, Greedy, Mathematics, Bit Manipulation, Dynamic Programming)

8 weeks

LeetCode OJ (6 sheets)
each sheet of them divided into (Binary Search, Divide and Conquer, Sort, Greedy, Graph, Breadth/Depth First Search, Backtracking, Dynamic Programming)

24 weeks

HackerEarth OJ (8 sheets)
each sheet of them divided into (String, Graph, Greedy, Mathematics, Number Theory, Dynamic programming)

16 weeks

Programming Competitions

AtCoder OJ (2 sheets)
each sheet contains grand contests (hard contests)

4 weeks

Codeforces OJ (6 sheets)
each sheet of them divided into (Divide and Conquer, Graph, Data Structure, Math and Number Theory, String, Greedy and Brute Force, Dynamic Programming)

12 weeks

Level 3 Sheets

HackerRank sheets

The HackerRank OJ sheets:

phase-3-mathematics-(1,2), phase-3-graph-string, phase-3-dynamic-programming, each sheet of them divided into (string, number theory, algebra, graph, greedy, mathematics, bit manipulation, and dynamic programming). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~130 problems.

4 sheets * 130 problems

AtCoder sheets

The AtCoder OJ sheets:

phase-3-(1,2), These sheets contain Grand contests (hard contests) and each sheet contains ~60 problems.

2 sheets * 60 problems

Level 3 Sheets

LeetCode sheets

The LeetCode OJ sheets:

phase-3-(breadth/depth)-first-search, phase-3-graph-advanced-data-structures, phase-3-math-string, phase-3-dynamic-programming, interviews-questions, liked-questions, These sheets contain string, graph, bfs, dfs, mathematics, backtracking, and dynamic programming problems, in addition to advanced data structures. These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~190 problems.

6 sheets * 190 problems

Codeforces sheets

The Codeforces OJ sheets:

phase-3-(1,2,3,4), each sheet of them contains C-Div2/A-Div1 problems and divided into (Divide and Conquer - Graph - Data Structure - Math and Number Theory - String - Greedy and Brute Force - Dynamic Programming). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~125 problems.

6 sheets * 125 problems

Level 3 Sheets

HackerEarth sheets

The HackerEarth OJ sheets:

phase-3-mathematics-strings-(1,2), phase-3-graph-(1,2), phase-3-dynamic-programming-(1,2), phase-3-advanced-data-structures-(1,2), each sheet of them divided into (string, graph, greedy, mathematics, number theory, dynamic programming, advanced data structures). These sheets were ordered based on the problem difficulty and grouped by the problem topic. Finally, each sheet contains ~120 problems.

8 sheets * 120 problems

How to Practice on Online Judges

HackerRank Online Judge

8 sheets

HackerRank Online Judge

Level 1

cpp	70 Problems
Introduction	20 problems
Arrays and Strings	10 problems
Functions and Libraries	10 problems
Structs and Classes	30 problems

python	95 Problems
Introduction	25 problems
Collections	25 problems
Functions and Libraries	35 problems
Classes	10 problems

Level 2

data-structures	110 Problems
Arrays & Linked Lists	20 problems
Stacks & Queues	10 problems
Balanced Binary Tree	20 problems
Heap & Disjoint Set	10 problems
Advanced I	25 problems
Advanced II	25 problems

algorithms-basics	125 Problems
Warm-up & Recursion	20 problems
Sorting	15 problems
Search	25 problems
Implementation I	20 problems
Implementation II	20 problems
Implementation III	25 problems

HackerRank Online Judge

Level 3

mathematics-1	125 Problems
Fundamentals	10 problems
Number Theory	35 problems
Combinatorics	25 problems
Algebra	25 problems
Geometry	30 problems

mathematics-2	125 Problems
Fundamentals	10 problems
Number Theory	35 problems
Combinatorics	25 problems
Algebra	25 problems
Geometry	25 problems

graph-string	135 Problems
Graph Theory I	30 problems
Graph Theory II	30 problems
Greedy	25 problems
Strings I	25 problems
Strings II	25 problems

dynamic-programming	140 Problems
Bit Manipulation	30 problems
Dynamic Programming I	40 problems
Dynamic Programming II	30 problems
Dynamic Programming III	30 problems
Constructive Algorithms	10 problems

AtCoder

AtCoder Online Judge

6 sheets

AtCoder Online Judge

Level 1

Phase 1-1	180 Problems
2016-2017 Beginner Contests I	20 problems
2018-2019 Beginner Contests I	30 problems
2020-2021 Beginner Contests I	40 problems
2016-2017 Beginner Contests II	20 problems
2018-2019 Beginner Contests II	30 problems
2020-2021 Beginner Contests II	40 problems

Phase 1-2	180 Problems
2016-2017 Beginner Contests I	20 problems
2018-2019 Beginner Contests I	30 problems
2020-2021 Beginner Contests I	40 problems
2016-2017 Beginner Contests II	20 problems
2018-2019 Beginner Contests II	30 problems
2020-2021 Beginner Contests II	40 problems

Level 2

Phase 2-1	70 Problems
2016-2017 Regular Contests	30 problems
2018-2019 Regular Contests	15 problems
2020-2021 Regular Contests	25 problems

Phase 2-2	70 Problems
2016-2017 Regular Contests	30 problems
2018-2019 Regular Contests	15 problems
2020-2021 Regular Contests	25 problems

Level 3

Phase 3-1	55 Problems
2016-2017 Grand Contests	20 problems
2018-2019 Grand Contests	20 problems
2020-2021 Grand Contests	15 problems

Phase 3-2	55 Problems
2016-2017 Grand Contests	20 problems
2018-2019 Grand Contests	20 problems
2020-2021 Grand Contests	15 problems


CODEFORCES β
Sponsored by Telegram
Codeforces
Online Judge
16 sheets

Codeforces Online Judge

Level 1

Phase 1-1	125 Problems
Basic Operator	10 problems
Condition	20 problems
Loop	25 problems
String	30 problems

Phase 1-2	125 Problems
Basic Operator	10 problems
Condition	20 problems
Loop	25 problems
String	30 problems

Phase 1-3	125 Problems
Basic Operator	10 problems
Condition	20 problems
Loop	25 problems
String	30 problems

Phase 1-4	125 Problems
Basic Operator	10 problems
Condition	20 problems
Loop	25 problems
String	30 problems

Codeforces Online Judge

Level 2

Phase 2-1	120 Problems
Data Structure	20 problems
String	25 problems
Mathematics	35 problems
Greedy	30 problems

Phase 2-2	120 Problems
Data Structure	20 problems
String	25 problems
Mathematics	35 problems
Greedy	30 problems

Phase 2-3	120 Problems
Data Structure	20 problems
String	25 problems
Mathematics	35 problems
Greedy	30 problems

Phase 2-4	120 Problems
Data Structure	20 problems
String	25 problems
Mathematics	35 problems
Greedy	30 problems

div3-div4-contests	85 Problems
Div3 Contests I	25 problems
Div3 Contests II	25 problems
Div3 Contests III	25 problems
Div3 Contests IV	5 problems
Div4 Contests	5 problems

educational-contests	125 Problems
Educational Rounds I	25 problems
Educational Rounds II	25 problems
Educational Rounds III	25 problems
Educational Rounds IV	25 problems
Educational Rounds V	25 problems

gym-contests-1	120 Problems
GYM Contests 2	15 problems
GYM Contests 3 I	25 problems
GYM Contests 3 II	25 problems
GYM Contests 3 III	25 problems
GYM Contests 3 IV	30 problems

gym-contests-2	110 Problems
GYM Contests 2	10 problems
GYM Contests 3 I	25 problems
GYM Contests 3 II	25 problems
GYM Contests 3 III	25 problems
GYM Contests 3 IV	25 problems

Codeforces Online Judge

Level 3

Phase 3-1	125 Problems
Divide and Conquer	10 problems
Graph	15 problems
String	15 problems
Data Structure	20 problems
Math & Number Theory	30 problems
Greedy & Brute Force	25 problems
Dynamic Programming	10 problems

Phase 3-2	125 Problems
Divide and Conquer	10 problems
Graph	15 problems
String	15 problems
Data Structure	20 problems
Math & Number Theory	30 problems
Greedy & Brute Force	25 problems
Dynamic Programming	10 problems

Phase 3-3	125 Problems
Divide and Conquer	10 problems
Graph	15 problems
String	15 problems
Data Structure	20 problems
Math & Number Theory	30 problems
Greedy & Brute Force	25 problems
Dynamic Programming	10 problems

Phase 3-4	125 Problems
Divide and Conquer	10 problems
Graph	15 problems
String	15 problems
Data Structure	20 problems
Math & Number Theory	30 problems
Greedy & Brute Force	25 problems
Dynamic Programming	10 problems

div3-div4-contests	85 Problems
Div3 Contests I	25 problems
Div3 Contests II	25 problems
Div3 Contests III	25 problems
Div3 Contests IV	5 problems
Div4 Contests	5 problems

educational-contests	125 Problems
Educational Rounds I	25 problems
Educational Rounds II	25 problems
Educational Rounds III	25 problems
Educational Rounds IV	25 problems
Educational Rounds V	25 problems

Codeforces Online Judge

Level 3

gym-contests-1	130 Problems
GYM Contests 4 I	25 problems
GYM Contests 4 II	25 problems
GYM Contests 4 III	25 problems
GYM Contests 4 IV	25 problems
GYM Contests 4 V	30 problems

gym-contests-2	130 Problems
GYM Contests 4 I	25 problems
GYM Contests 4 II	25 problems
GYM Contests 4 III	30 problems
GYM Contests 4 IV	30 problems
GYM Contests 4 V	20 problems

gym-contests-3	125 Problems
GYM Contests 4 I	25 problems
GYM Contests 4 II	25 problems
GYM Contests 4 III	25 problems
GYM Contests 4 IV	25 problems
GYM Contests 4 V	25 problems

gym-contests-4	130 Problems
GYM Contests 4 I	30 problems
GYM Contests 4 II	25 problems
GYM Contests 4 III	25 problems
GYM Contests 4 IV	25 problems
GYM Contests 4 V	25 problems

LeetCode

LeetCode Online Judge

12 sheets

LeetCode Online Judge

LeetCode

Level 2

linear-data-structures-1	210 Problems
Array I	40 problems
Array II	40 problems
Array III	40 problems
Linked List	20 problems
Stack I	25 problems
Stack II	25 problems
Queue and Dequeue	20 problems

linear-data-structures-2	210 Problems
Array I	35 problems
Array II	40 problems
Array III	40 problems
Array IV	40 problems
Linked List	20 problems
Stack	10 problems
Queue and Dequeue	25 problems

non-linear-data-structures-1	170 Problems
Recursion	30 problems
Binary Tree	30 problems
Heap Tree	30 problems
Hash Table I	30 problems
Hash Table II	25 problems
Hash Table III	25 problems

non-linear-data-structures-2	170 Problems
Binary Tree I	30 problems
Binary Tree II	30 problems
Binary Tree III	30 problems
Heap Tree	30 problems
Hash Table I	25 problems
Hash Table II	25 problems

basic-algorithms-1	190 Problems
Binary Search I	35 problems
Binary Search II	35 problems
Divide and Conquer	20 problems
Sorting I	40 problems
Sorting II	40 problems
Greedy	20 problems

basic-algorithms-2	190 Problems
Binary Search	30 problems
Greedy I	40 problems
Greedy II	40 problems
Greedy III	40 problems
Bit Manipulation I	20 problems
Bit Manipulation II	20 problems

LeetCode Online Judge

Level 3

tree-graph-traversal	160 Problems
Breadth First Search I	25 problems
Breadth First Search II	25 problems
Breadth First Search III	25 problems
Depth First Search I	30 problems
Depth First Search II	30 problems
Depth First Search III	25 problems

graph + advanced-data-structures	190 Problems
Backtracking I	35 problems
Backtracking II	35 problems
Graph I	30 problems
Graph II	30 problems
Advanced Data Structures	40 problems
Geometry	20 problems

mathematics + strings	210 Problems
Math I	40 problems
Math II	40 problems
Math III	40 problems
String I	35 problems
String II	35 problems
String III	25 problems

dynamic-programming	200 Problems
Dynamic Programming I	35 problems
Dynamic Programming II	35 problems
Dynamic Programming III	25 problems
Dynamic Programming IV	35 problems
Dynamic Programming V	35 problems
Dynamic Programming VI	30 problems

interviews questions	170 Problems
Easy Problems	35 problems
Medium Problems I	35 problems
Medium Problems II	35 problems
Medium Problems III	35 problems
Hard Problems	30 problems

liked-questions	170 Problems
Easy Problems	35 problems
Medium Problems I	35 problems
Medium Problems II	35 problems
Medium Problems III	35 problems
Hard Problems	30 problems

HackerEarth Online Judge

16 sheets

HackerEarth Online Judge

Level 1

Phase 1-1	100 Problems
Implementation I	25 problems
Implementation II	25 problems
Implementation III	25 problems
Implementation IV	25 problems

Phase 1-2	100 Problems
Implementation I	25 problems
Implementation II	25 problems
Implementation III	25 problems
Implementation IV	25 problems

Phase 1-3	100 Problems
Implementation I	25 problems
Implementation II	25 problems
Implementation III	25 problems
Implementation IV	25 problems

Phase 1-4	125 Problems
Input / Output	40 problems
Bit Manipulation	40 problems
Recursion	10 problems
Operators	35 problems

Level 2

linear-data-structures	115 Problems
Arrays 1D I	25 problems
Arrays 1D II	25 problems
Arrays Multi-dimensional	35 problems
Stacks	25 problems
Queues	5 problems

non-linear-data-structures	90 Problems
Binary Tree	10 problems
Binary Search Tree	10 problems
Heaps / Priority Queues	20 problems
Hash Tables I	25 problems
Hash Tables II	25 problems

algorithms-searching	120 Problems
Linear Search	15 problems
Binary Search I	35 problems
Binary Search II	35 problems
Ternary Search	5 problems

algorithms-sorting	135 Problems
Sorting	40 problems
Quick, Count, Heap	20 problems
Greedy Algorithms I	25 problems
Greedy Algorithms II	25 problems

HackerEarth Online Judge

Level 3

mathematics-strings-1	110 Problems
Basic Number Theory	30 problems
Primality Tests	30 problems
Totient Function	10 problems
String	40 problems

mathematics-strings-2	110 Problems
Basic Number Theory	30 problems
Primality Tests	30 problems
Totient Function	10 problems
String	40 problems

graph-1	150 Problems
Graph Representation	35 problems
Breadth First Search	35 problems
Depth First Search I	40 problems
Depth First Search II	40 problems

graph-2	150 Problems
Depth First Search	40 problems
Shortest Path	50 problems
Spanning Tree	30 problems
Min Cost & Max Flow	30 problems

dynamic-programming-1	110 Problems
Dynamic Programming I	25 problems
Dynamic Programming II	25 problems
Dynamic Programming 2D I	25 problems
Dynamic Programming 2D II	25 problems
DP and Bit Masking	10 problems

dynamic-programming-2	110 Problems
Dynamic Programming I	25 problems
Dynamic Programming II	25 problems
Dynamic Programming 2D I	25 problems
Dynamic Programming 2D II	25 problems
DP and Bit Masking	10 problems

advanced-data-structures-1	120 Problems
Disjoint Sets	30 problems
Trie	20 problems
Segment Tree I	35 problems
Segment Tree II	35 problems

advanced-data-structures-2	110 Problems
Segment Tree	30 problems
Binary Indexed Tree I	30 problems
Binary Indexed Tree II	30 problems
Suffix (Tree, Array)	20 problems

Environment Setup and Installations

Online Environments

codechef.com/ide

ideone.com ideone.com

leetcode.com/playground/new

mycompiler.io

tutorialspoint.com/
codingground.htm

onecompiler.com

geekflare.com/online-compiler

replit.com

IDEs & Editors

activestate.com/products/komodo-ide

code.visualstudio.com

jetbrains.com

eclipse.org

atom.io

visualstudio.microsoft.com

sublimetext.com

netbeans.apache.org


The way to get started is to quit
talking and begin doing.