

## Codeforces Online Judge

#### Prepared by: Mohamed Ayman

Algorithm Engineer at Valeo
Deep Learning Researcher and Teaching Assistant
at The American University in Cairo (AUC)
spring 2020





- sw.eng.MohamedAyman@gmail.com
- f facebook.com/cs.MohamedAyman
- in linkedin.com/in/cs-MohamedAyman
- github.com/cs-MohamedAyman
- codeforces.com/profile/Mohamed\_Ayman

## **Codeforces Online Judge Guide**

We will discuss in this lecture the following topics

- 1- Codeforces Online Judge
- 2- How to Create an Account
- 3- How to Solve a Problem
- 4- How to Learn from Other Solutions
- 5- How to Compete in Contest
- 6- How to Learn from Contest Tutorial





#### Section 1: Codeforces Online Judge

Section 2: How to Create an Account

Section 3: How to Solve a Problem

Section 4: How to Learn from Other Solutions

Section 5: How to Compete in Contest

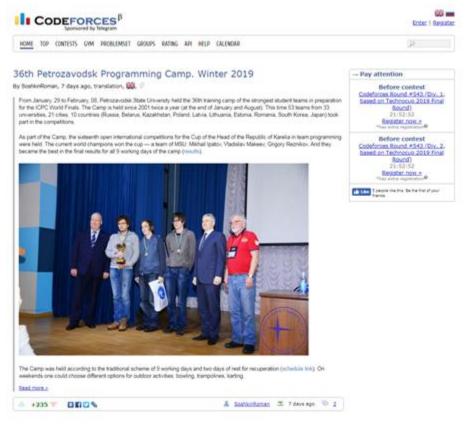
Section 6: How to Learn from Contest Tutorial



#### **Codeforces Online Judge**

CODEFORCES AtCoder

Codeforces is a website that hosts competitive programming contests. It is maintained by a group of competitive programmers from ITMO University led by Mikhail Mirzayanov.

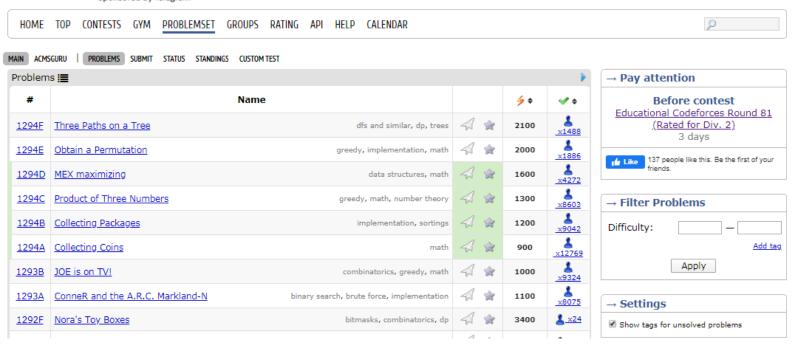


### **Codeforces Online Judge**













✓ Section 1: Codeforces Online Judge

#### Section 2: How to Create an Account

Section 3: How to Solve a Problem

Section 4: How to Learn from Other Solutions

Section 5: How to Compete in Contest

Section 6: How to Learn from Contest Tutorial



#### How to Create an Account



- 1- Go To Registration
- 2- Fill Your Data
- 3- Verify your Registration from your Mail
- 4- Log-in Your Account

### **Codeforces Registration**

# CODEFORCES AtCoder

#### **Select Register from this Link:** <u>codeforces.com</u>



#### Forethought Future Cup — Final Round

By Lewin, 3 days ago, 🎇, 🖉

Hello again Codeforces!

The Forethought Future Cup Final round will start on May 4th, 10:05am PDT. This round will be rated for everyone. There will be three separate rounds, one for onsite contestants, one for div1, and one for div2. Onsite and div1 will have the same problems. Each round will have 6 problems and be 2 hours long.

Here is a table of the onsite contestants.

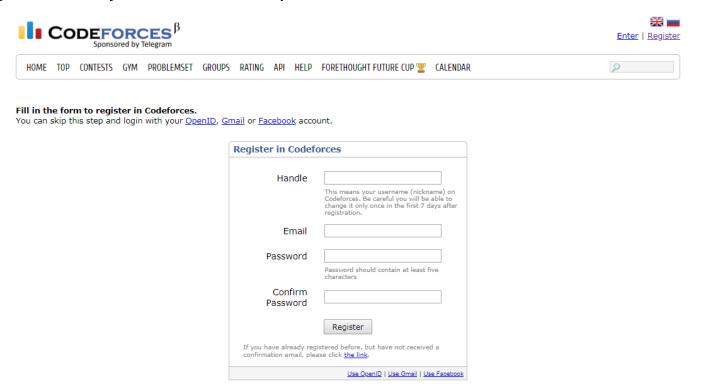
scott_wu	neal	ACRush	Fdg	Ra16bit
Kenny_HORROR	liymbear	II931110	xiaowuc1	Suzukaze
yzyz	stevenkplus	pmnox	OpalDshawn	NEU20133823
tap_tapii	Svlad_Cjelli	Emiso	davidberard	gojira
dinosaurs	batyrkhan14	robot-dreams	kfqg	



### **Registration Form**



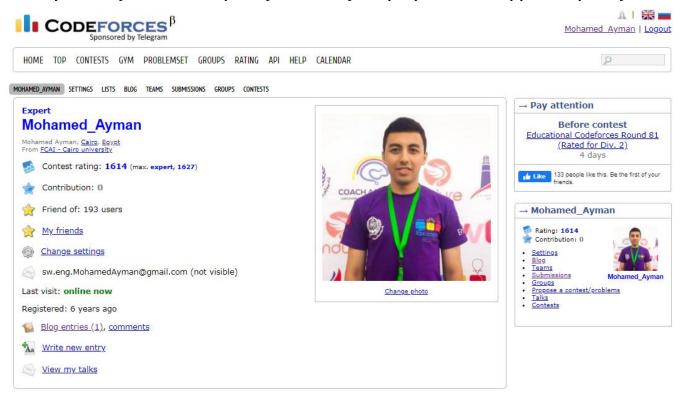
#### Fill your data and you will receive a verification mail



## **Your Profile**

## CODEFORCES AtCoder

#### After verification your account from your mail, your profile will be appeared from you





- ✓ Section 1: Codeforces Online Judge
- ✓ Section 2: How to Create an Account

Section 3: How to Solve a Problem

Section 4: How to Learn from Other Solutions

Section 5: How to Compete in Contest

Section 6: How to Learn from Contest Tutorial



#### How to Solve a Problem

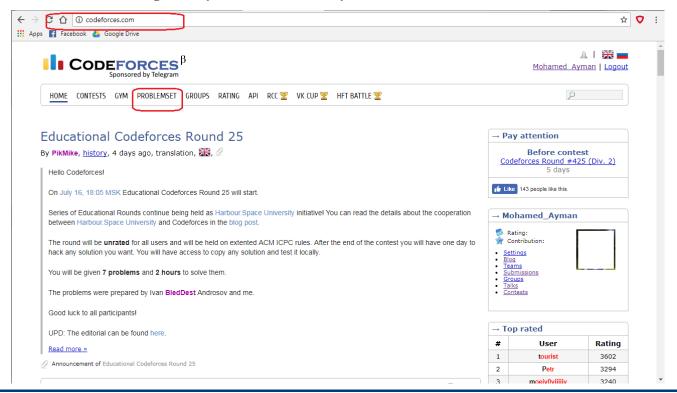


- 1- Read the Problem Statement
- 2- Think for a Problem Solution
- 3- Implement an Efficient & Correct Algorithm
- 4- Test Your Solution
- 5- Submit Your Solution
- 6- Go to Step 1 Till You Get Accepted

#### **Codeforces Wall**

## CODEFORCES AtCoder

#### Select Problemset Tab to get all problems in codeforces



#### **Problem Set Tab**



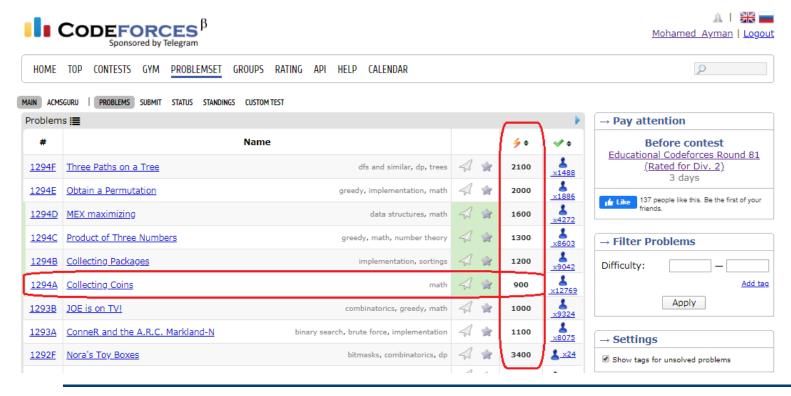
Any problem has an ID, name, difficulty degree and number of users who solved it.

	CODEFORCES $^{eta}$ Sponsored by Telegram				Mohamed Ayman   Logout
НОМЕ	TOP CONTESTS GYM <u>Problemset</u> groups rating api Help Calendar				ρ
MAIN ACMS	GURU   PROBLEMS SUBMIT STATUS STANDINGS CUSTOM TEST				
Problem	s≣			•	→ Pay attention
#	Name		<b>∮</b> ♦	<b>✓</b> •	Before contest Educational Codeforces Round 81
1294F	<u>Three Paths on a Tree</u> dfs and similar, dp, trees	4 🛊	2100	<u>x1488</u>	(Rated for Div. 2)  3 days
<u>1294E</u>	Obtain a Permutation greedy, implementation, math	4 🛊	2000	x1886	Like 137 people like this. Be the first of your
<u>1294D</u>	MEX maximizing data structures, math	4 😭	1600	<u>x4272</u>	friends.
<u>1294C</u>	Product of Three Numbers greedy, math, number theory	4 😭	1300	<u>x8603</u>	→ Filter Problems
<u>1294B</u>	Collecting Packages implementation, sortings	4 😭	1200	<u>x9042</u>	Difficulty:
<u>1294A</u>	Collecting Coins math	4 😭	900	<u>x12769</u>	Add tag
<u>1293B</u>	JOE is on TV! combinatorics, greedy, math	4 🛊	1000	<u>x9324</u>	Apply
<u>1293A</u>	ConneR and the A.R.C. Markland-N binary search, brute force, implementation	4 🛊	1100	<u>x8075</u>	→ Settings
1292F	Nora's Toy Boxes bitmasks, combinatorics, dp	4 🛊	3400	<u> </u>	✓ Show tags for unsolved problems
		1 -		-	

#### **Problem Set Tab**



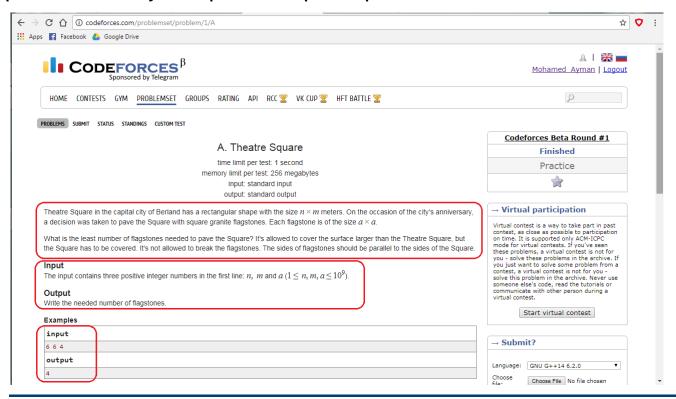
#### When you select [difficulty degree] the problems will be sorted according to it's difficulty



#### **Problem Body**

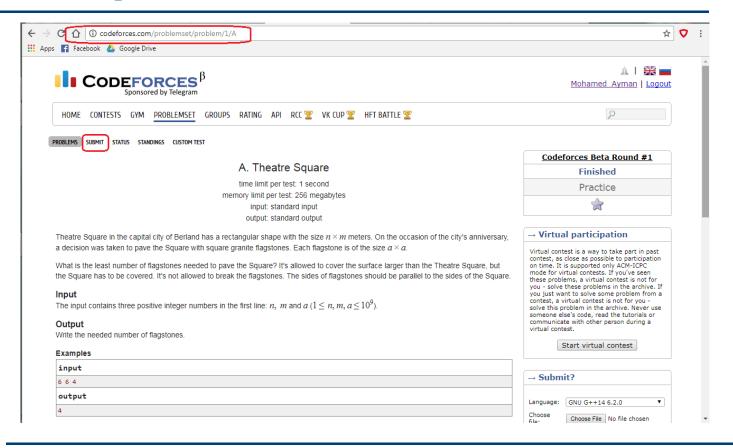
## CODEFORCES AtCoder

#### Any problem has a body description and input-output constraint and test case(s)



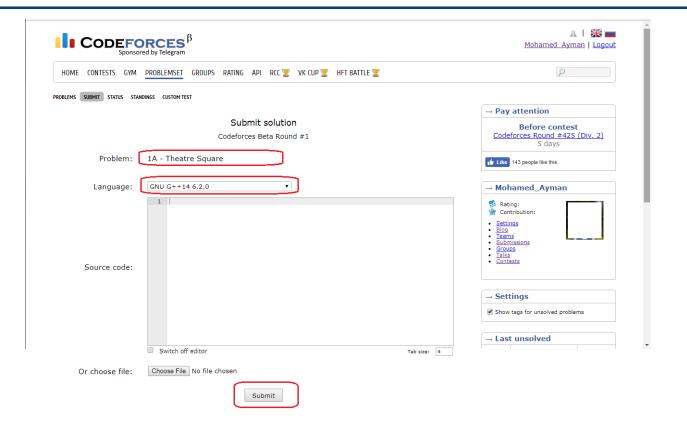
#### **Submitting Problem**





## **Submitting Problem**

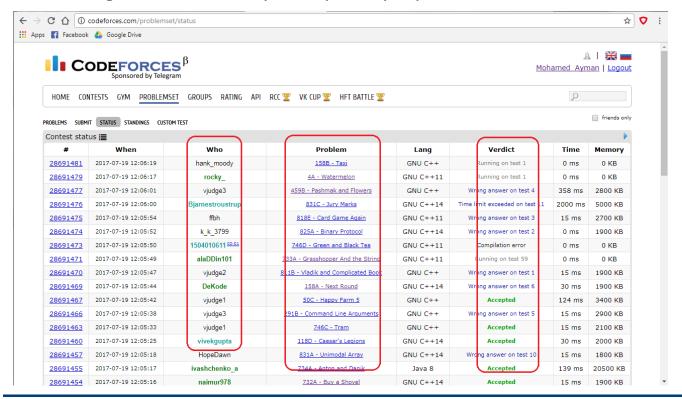




#### **Problem Verdict**

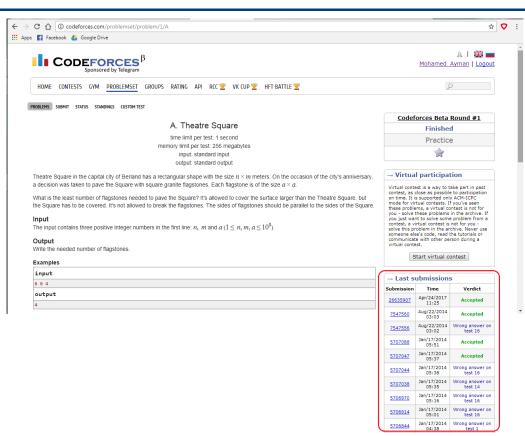
## CODEFORCES AtCoder

#### Your submitted algorithm will be accepted or fail in specific test case



## History of Problem Submission





Any Problem has a list of your submissions with it's judge.

- Accepted
- Wrong Answer
- Time Limit Exceeded
- Memory Limit Exceeded
- Compilation error



- ✓ Section 1: Codeforces Online Judge
- ✓ Section 2: How to Create an Account
- ✓ Section 3: How to Solve a Problem

Section 4: How to Learn from Other Solutions

Section 5: How to Compete in Contest

Section 6: How to Learn from Contest Tutorial



### How to Learn from Other Solutions



- 1- Go To Round Problems
- 2- Go To Status Tab
- 3- Put You Criteria to Filter Submissions
- 4- Applying Your Filter
- 5- Show Your Target Solution

### Round Number in Problem Body



#### Output

Print YES, if the boys can divide the watermelon into two parts, each of them weighing even number of kilos; and No in the opposite case.

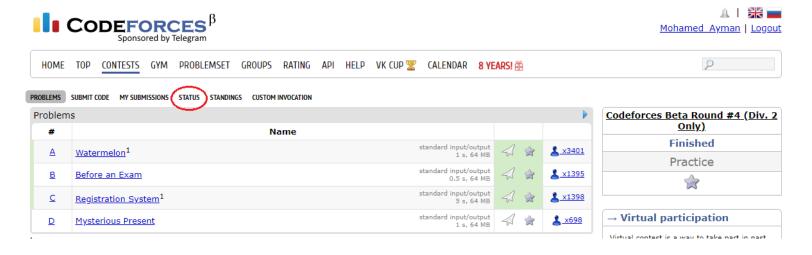
input	Сору
8	
output	Сору
YES	



— Virtual participation
Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ACM-ICPC mode for virtual contests. If you've seen your solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you solve this problem in the archive. Never use someone else's code, read the tutorials or

#### Problems of The Round

#### Select STATUS tab

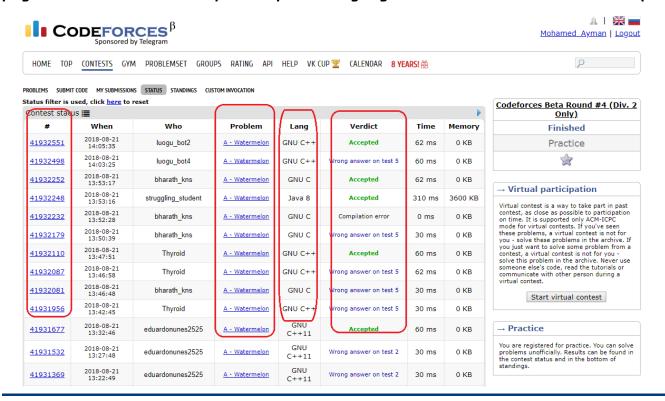




#### Status of The Round

# CODEFORCES AtCoder

#### This page will show all results of round for all languages and all verdicts and all round problems



## Filtration of The Round Status

## CODEFORCES AtCoder

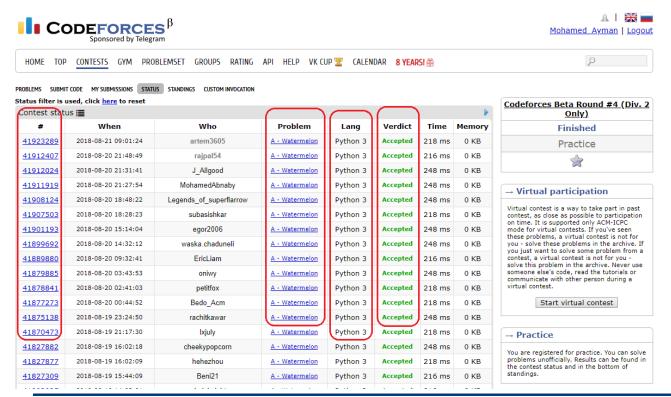
#### You can filter results for specific problem and specific language and specific verdict

	13:52:28	_						on time, it is supported only ACM-TCPC
41932179	2018-08-21 13:50:39	bharath_kns	A - Watermelon	GNU C	Wrong answer on test 5	30 ms	0 KB	mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If
41932110	2018-08-21 13:47:51	Thyroid	A - Watermelon	GNU C++	Accepted	60 ms	0 KB	you just want to solve some problem from a contest, a virtual contest is not for you -
41932087	2018-08-21 13:46:58	Thyroid	A - Watermelon	GNU C++	Wrong answer on test 5	62 ms	0 KB	solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a
41932081	2018-08-21 13:46:48	bharath_kns	A - Watermelon	GNU C	Wrong answer on test 5	30 ms	0 KB	virtual contest.  Start virtual contest
41931956	2018-08-21 13:42:45	Thyroid	A - Watermelon	GNU C++	Wrong answer on test 5	30 ms	0 KB	Start virtual contest
41931677	2018-08-21 13:32:46	eduardonunes2525	A - Watermelon	GNU C++11	Accepted	60 ms	0 KB	→ Practice
41931532	2018-08-21 13:27:48	eduardonunes2525	A - Watermelon	GNU C++11	Wrong answer on test 2	30 ms	0 KB	You are registered for practice. You can solve problems unofficially. Results can be found in the contest status and in the bottom of
41931369	2018-08-21 13:22:49	eduardonunes2525	A - Watermelon	GNU C++11	Wrong answer on test 2	30 ms	0 KB	standings.
41930949	2018-08-21 13:09:52	MayFloweryy	A - Watermelon	GNU C++14	Wrong answer on test 5	30 ms	0 KB	→ Clone Contest to Mashup
41930872	2018-08-21 13:07:08	MayFloweryy	A - Watermelon	GNU C++14	Accepted	30 ms	0 KB	You can clone this contest to a mashup.  Clone Contest
41930580	2018-08-21 12:57:52	bqx	C - Registration System	GNU C++11	Accepted	1682 ms	800 KB	
41930538	2018-08-21 12:55:45	luogu_bot2	A - Watermelon	GNU C++	Accepted	62 ms	0 KB	→ Status filter
41929696	2018-08-21 12:23:54	FAYJUL	C - Registration System	GNU C++11	Time limit exceeded on test	5000 ms	14100 KB	Problem: A - Watermelon ▼
41929373	2018-08-21 12:12:54	CtrlCV	A - Watermelon	GNU C++17	Accepted	62 ms	0 KB	Verdict: Accepted  Language:
41929198	2018-08-21 12:05:50	rubiks_spiedy	A - Watermelon	GNU C++14	Accepted	62 ms	0 KB	Python 3 Test:
41929158	2018-08-21 12:04:24	rubiks_spiedy	A - Watermelon	GNU C++14	Compilation error	0 ms	0 KB	Not used ▼  Apply Reset
41929116	2018-08-21 12:03:06	jarvis307	A - Watermelon	Java 8	Accepted	248 ms	3600 KB	
				CNIII				→ Contest materials

### **Appling Filtration**

# CODEFORCES AtCoder

#### After applying a filter results will be like that



This filter about:

**Verdict**: Accepted

Problem: A

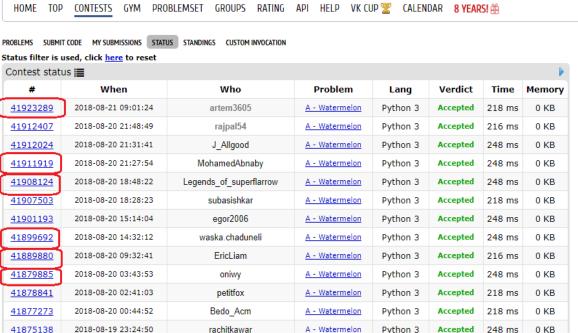
Language: Python 3

#### Solutions of The Others









Codeforces Beta Rour Only)	nd #4 (Div. 2
Finished	l
Practice	1

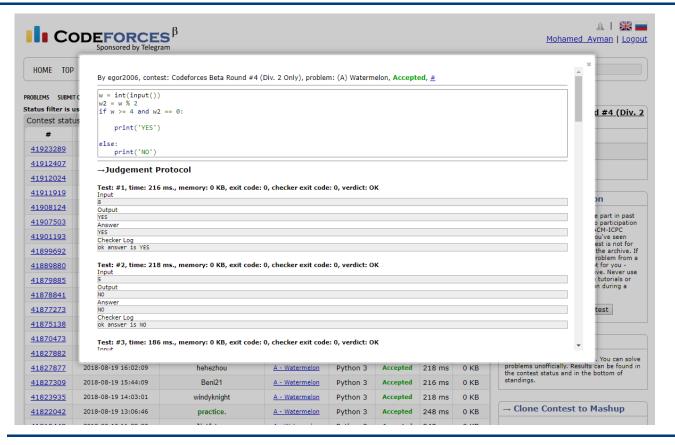
→ Virtual participation

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ACM-ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

## **Show Solutions of The Others**







- ✓ Section 1: Codeforces Online Judge
- ✓ Section 2: How to Create an Account
- ✓ Section 3: How to Solve a Problem
- ✓ Section 4: How to Learn from Other Solutions

Section 5: How to Compete in Contest

Section 6: How to Learn from Contest Tutorial



### Register in Previous Contest

## CODEFORCES AtCoder

#### Select CONTEST Tab





Current or upcoming contests					
Name	Writers	Start	Length		
Educational Codeforces Round 81 (Rated for Div. 2)		Jan/29/2020 16:35	02:00	Before start 4 days	Before registration 25:47:01
Codeforces Round #616 (Div. 1)		Feb/02/2020 16:05	02:00	Before start 8 days	Before registration 5 days
Codeforces Round #616 (Div. 2)		Feb/02/2020 16:05	02:00	Before start 8 days	Before registration 5 days
Codeforces Round #617 (Div. 3)		Feb/04/2020 16:35	02:00	Before start 10 days	Before registration 7 days
Kotlin Heroes: Practice 3		Feb/20/2020 14:35	7:00:00	Before start 4 weeks	Before registration 4 weeks
Kotlin Heroes: Episode 3		Feb/27/2020 15:35 <sup>LTC+2</sup>	02:30	Before start 5 weeks	Before registration 00:52:00

#### Register in New Contest

## CODEFORCES AtCoder

#### Register The Contest from Register now >> link





0

HOME TOP CONTESTS GYM PROBLEMSET GROUPS RATING API HELP CALENDAR





#### Contest history

Past contests <b>≡</b>					•
Name	Writers	Start	Length		
Codeforces Round #615 (Div. 3)  Enter ** Virtual participation **	MikeMirzayanov vovuh	Jan/22/2020 16:35 <sup>UTC+2</sup>	02:10	Final standings Solved: 4 out of 6	<u> </u>

#### Register in New Contest

## CODEFORCES AtCoder

#### Register The Contest from Register link

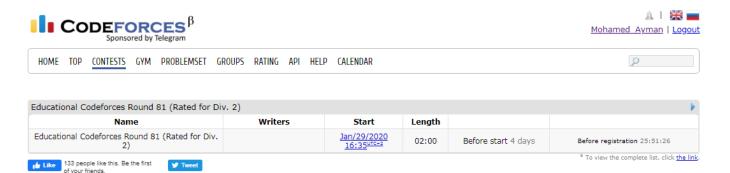
Registration for the contest

#### Codeforces Round #455 (Div. 2)



#### Register in New Contest





Before the contest 4 days

Codeforces (c) Copyright 2010-2020 Mike Mirzayanov
The only programming contests Web 2.0 platform
Server time: Jan/25/2020 21:02:31<sup>TC-2</sup> (e2).
Desktop version, switch to mobile version.
Privacy Policy

Supported by





## Register in Previous Contest



#### You Can Compete in Previous Contests

Contest history

st contests 🧮					
Name	Writers	Start	Length		
Codeforces Round #615 (Div. 3)  Enter »  Virtual participation »	MikeMirzayanov vovuh	Jan/22/2020 16:35 <sup>uTC+2</sup>	02:10	Final standings Solved: 4 out of 6	<u> x1766</u>
Codeforces Round #614 (Div. 1)  Enter »  Virtual participation »	Akikaze low_ xuanquang1999	Jan/19/2020 15:35 <sup>uTC+2</sup>	02:00	Final standings	<u> </u>
Codeforces Round #614 (Div. 2)  Enter * Virtual participation *	Akikaze low_ xuanquang1999	Jan/19/2020 15:35 <sup>UTC+2</sup>	02:00	<u>Final standings</u>	<u> </u>



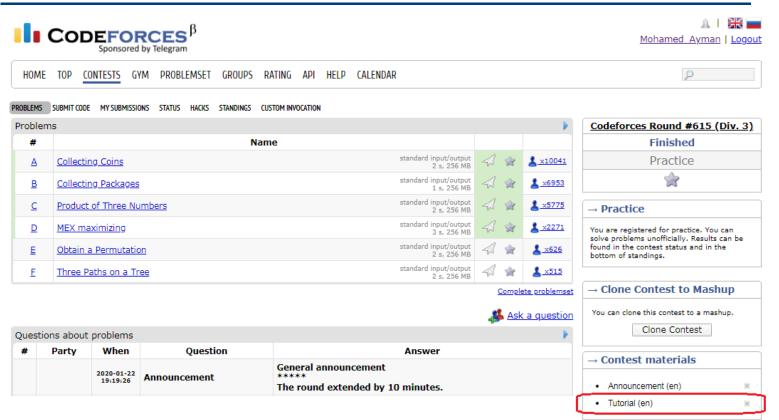
- ✓ Section 1: Codeforces Online Judge
- ✓ Section 2: How to Create an Account
- ✓ Section 3: How to Solve a Problem
- ✓ Section 4: How to Learn from Other Solutions
- ✓ Section 5: How to Compete in Contest

Section 6: How to Learn from Contest Tutorial



### How to Learn from Contest Tutorial





#### How to Learn from Contest Tutorial

 In Tutorial Section for each contest in codeforces there is a blog which explain the idea of the problems in this round with a solution example.

#### Codeforces Round #615 (Div. 3) Editorial

By vovuh, history, 2 days ago, 34, @

Thanks to Rox and \_overrated\_ for help with problem ideas and preparation!

1294A - Collecting Coins

Idea: MikeMirzavanov

Tutorial

#### 1294A - Collecting Coins

Suppose  $a \leq b \leq c$ . If it isn't true then let's rearrange our variables. Then we need at least 2c-b-a coins to make a,b and c equal. So if n < 2c-b-a then the answer is "NO". Otherwise, the answer if "YES" if the number n-(2c-b-a) is divisible by 3. This is true because after making a,b and c equal we need to distribute all remaining candies between three sisters.

Solution

1294B - Collecting Packages

Idea: MikeMirzayanov

Tutorial

#### 1294B - Collecting Packages

It is obvious that if there is a pair of points  $(x_i,y_i)$  and  $(x_j,y_j)$  such that  $x_i < x_j$  and  $y_i > y_j$  then the answer is "NO". It means that if the answer is "YES" then there is some ordering of points such that  $x_{i_1} \le x_{i_2} \le \cdots \le x_{i_n}$  and  $y_{i_1} \le y_{i_2} \le \cdots \le y_{i_n}$  because we can only move right or up. But what is this ordering? It is just sorted order of points (firstly by  $x_i$  then by  $y_i$ ).

So we can sort all points, check if this ordering is valid and traverse among all these points. For each k from 2 to n firstly do  $x_{i_k} - x_{i_k}$ , moves to the right then do  $y_{i_k} - y_{i_k}$ , moves to the up (because this order minimizing the answer lexicographically).

Time complexity:  $O(n \log n)$  or  $O(n^2)$ .

Solution





- ✓ Section 1: Codeforces Online Judge
- ✓ Section 2: How to Create an Account
- ✓ Section 3: How to Solve a Problem
- ✓ Section 4: How to Learn from Other Solutions
- ✓ Section 5: How to Compete in Contest
- ✓ Section 6: How to Learn from Contest Tutorial



