

# Guidelines of the Online Judge System

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Note: some screenshots are based on a previous course (so you may see “CS141” instead of “CS190” in the screenshots), but all the links are up-to-date.

## 0. Register your account

Access the CodeForces website with URL <https://codeforces.com/enter>.

If you already have a CodeForces account, log in directly. If not, Click “Register” to register an account, then log in.



**Fill in the form to login into Codeforces.**  
You can use [Gmail](#), [Facebook](#) or [ICPC](#) as an alternative way to enter.

**Login into Codeforces**

Handle/Email

Password

Remember me for a month

[Forgot your password?](#)

[Use Gmail](#) | [Use Facebook](#) | [Use ICPC](#)

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The only programming contests Web 2.0 platform  
Server time: Sep/28/2020 02:05:22<sup>UTC-7</sup> (h1).  
Desktop version, switch to [mobile version](#).  
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# 1. Join Our Group as a Participant

After login, click here to join our group: <https://codeforces.com/group/SjRLpdL47L/contests>

**Remember to choose “Participant” as Membership type.** (The default option is “Spectator”, which will not allow you to submit your code.) Then click **“Join”**.

The screenshot shows the Codeforces website interface for joining a group. At the top, there is a navigation bar with links like HOME, TOP, CONTESTS, GYM, PROBLEMSET, GROUPS, RATING, EDU, API, CALENDAR, HELP, GRAKIN FORCES, and 10 YEARS! There is also a search bar and a Logout button. The main content area is titled "Join group" and displays the following information:

- Group name: **cs141**
- Group description:
- Group visibility: Private
- Membership type: **Participant** (highlighted with a red circle and a red arrow pointing to it from the text "Remember to choose 'Participant' (Default is 'Spectator')")

Below the membership type dropdown is a "Join" button. To the right, there is a summary box for the group "cs141" showing it is "Private" and has a "Spectator" membership type. Below this is a "Member management" section with a message: "You are not group member yet, but can request group join." and a "Join" button.

At the bottom of the page, there is a footer with the following text:

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Server time: Sep/27/2020 23:48:11<sup>UTC-7</sup> (f3).  
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Then you can see the home page of our group, each programming assignment will be released at the corresponding start time. Usually, this is the time that the corresponding assignment is released.

CONTESTS MEMBERS STATUS

Name	Start	Length	
CS141 Assignment #1	<a href="#">Sep/29/2020 00:00 UTC-7</a>	Before start 23:44:55	Prepared by <a href="#">syhlalala</a> Before registration 17:44:55 <small>* Highlighted contests are not public</small>

**CS141**

Private

Participant

★

→ **Member management**

You are the member of the group

Each programming assignment will be released at the corresponding start time

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Once it's released, the page will look like this:

CONTESTS MEMBERS STATUS

Name	Start	Length	
CS141 Assignment #1 <input type="button" value="Enter »"/>	<a href="#">Sep/28/2020 00:00 UTC-7</a>		<a href="#">Current standings</a> Running 4 weeks Prepared by <a href="#">syhlalala</a> <input type="button" value="Register »"/> x0 Until closing 4 weeks <small>* Highlighted contests are not public</small>

**CS141**

Private

Participant

★

→ **Member management**

You are the member of the group

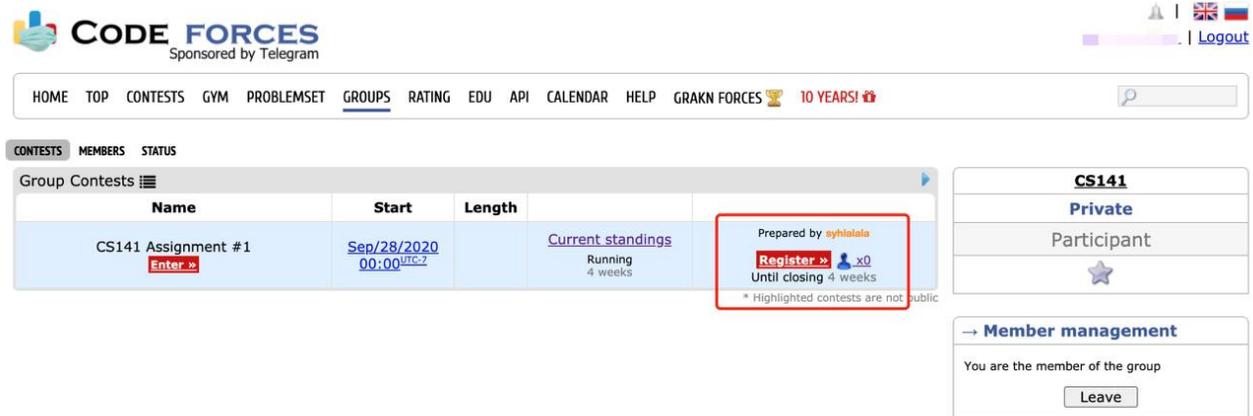
Supported by



## 2. Registration for the Contests

After it's released, you can see the page above.

**Click “Register” to register for the contest. You should be registered for the contest to be able to submit.**



The screenshot shows the Codeforces website interface. At the top, there is a navigation bar with links for HOME, TOP, CONTESTS, GYM, PROBLEMSSET, GROUPS, RATING, EDU, API, CALENDAR, HELP, GRAKN FORCES, and 10 YEARS! There is also a search bar. Below the navigation bar, there are tabs for CONTESTS, MEMBERS, and STATUS. The main content area displays a table of group contests. The first row is for 'CS141 Assignment #1', which is highlighted in blue. The 'Register' button for this contest is circled in red. To the right of the table, there is a sidebar for the contest details, showing 'CS141', 'Private', 'Participant', and a 'Member management' section with a 'Leave' button.

Continue clicking “Register”, then you will receive a message that “You have been successfully registered”.



The screenshot shows the registration page for the 'CS141 Assignment #1' contest. The page title is 'Registration for the contest CS141 Assignment #1'. Below the title, there is a 'Terms of agreement:' section with a list of rules. At the bottom, there is a 'Take part:' section with a radio button selected for 'as individual participant' and a 'Register' button circled in red.

Terms of agreement:

The registration confirms that you:

- \* will not communicate with other participants, share ideas of solutions and hacks;
- \* will not use third-party code, except stated in <http://codeforces.com/blog/entry/8790>;
- \* will not attempt to deliberately destabilize the testing process and try to hack the contest system in any form;
- \* will not use multiple accounts and will take part in the contest using the only and single account.

Take part:  as individual participant

Register

### 3. Start Programming

Before starting programming, make sure you can see "Registration Completed" displayed here, which means you have successfully registered. If not, try to repeat the registration step.

Then, **click "Enter"**.

The screenshot shows the Codeforces website interface. At the top, there is a navigation bar with links like HOME, TOP, CONTESTS, GYM, PROBLEMSSET, GROUPS, RATING, EDU, API, CALENDAR, HELP, and GRAKN FORCES. Below this, there are tabs for CONTESTS, MEMBERS, and STATUS. The main content area displays a table of group contests. The first row is for 'CS141 Assignment #1', which is highlighted in blue. The 'Enter' button in this row is circled in red. To the right of the table, there is a sidebar with information about the contest: 'CS141', 'Private', 'Participant', and a star icon. Below this, there is a 'Member management' section with a 'Leave' button.

You will see the programming problems for this assignment.

The screenshot shows the Codeforces website interface, specifically the 'Problems' section for the 'CS141 Assignment #1' contest. The 'Merge Them!' problem is highlighted with a red box. The sidebar on the right shows the contest details: 'CS141', 'Private', 'Participant', and a star icon. Below this, there is a section for 'CS141 Assignment #1' with the status 'Contest is running' and '4 weeks' duration. The 'Contestant' role is also shown.

Click on the name to enter. Then you can see the whole problem.

### 1. Merge Them!

time limit per test: 1 second  
memory limit per test: 256 megabytes  
input: standard input  
output: standard output

It's not easy to be a teacher - because you need to make all students happy. Yihan is asked to order a list of students by their exam score (from lowest to highest). Now all the students stands in a row in front of her. She has learned the merge sort algorithm, so that's exactly how she plans to do: she will divide the students into the left half and the right half, sort each of them respectively, and then merge them into a sorted row.

The core part in merge sort is to merge two sorted arrays (subset of students) into one. However, students are incoordinated because some of them are unhappy to be sorted. Generally, anytime two subsets of students  $A$  and  $B$  are merged, the student with the lowest score in  $A \cup B$ , let's call the student  $X$ , will be very unhappy because now everyone knows that he or she didn't do well in the exam. Yihan has to give  $X$  some candies to make  $X$  happy again. In particular, the number of candies  $X$  needs is the difference between  $X$ 's score and the highest score in the merged result  $A \cup B$ . If there are multiple such students (i.e., with the same lowest score), they all need the same number of candies.

Yihan knows the initial order of the students and their scores. She wants to know how many candies she needs to prepare to finish the task of merge-sorting all the students's score, while keeping everyone happy.

#### Input

The first line is a single integer  $n$  ( $1 \leq n \leq 10^6$ ). Assume  $n$  is a power of 2 so that in merge sort we can always divide it into exactly halves.

In each of the next  $n$  lines, there is an integer that is the score  $s_i$  of the  $i$ -th student  $0 < s_i \leq 2^{31}$ .

#### Output

The first line contains the number of candies that Yihan has to prepare.

The next  $n$  lines each contains a positive integer, which is the sorted result of the input scores.

The output value is guaranteed to be within  $2^{31} - 1$ .

**CS141**  
Private  
Participant  
★

**CS141 Assignment #1**  
Contest is running  
4 weeks  
Contestant  
★

→ **Submit?**  
Language: GNU G++17 7.3.0  
Choose file: Choose File No file chosen  
Submit

To submit your code, **click “Submit Code”**. Don't forget to choose your language.

### Submit solution CS141 Assignment #1

Problem: 1 - Merge Them!  
standard input/output 1 s, 256 MB

Language: GNU G++17 7.3.0

Source code:

Switch off editor Tab size: 4

Or choose file: Choose File No file chosen

Submit

Choose your language

After finishing your code, click the **“Submit”** button to submit your answer.

Then you can see whether your answer is correct. If all test cases are passed, it will be judged as “**Accepted**”. If not, means you failed some test cases. You should go back to the “Submit Code” page, review your code, modify it, and resubmit it.

You won't be able to see the tests before the contest ends.

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HOME TOP CONTESTS GYM PROBLEMSET GROUPS RATING EDU API CALENDAR HELP GRAKN FORCES 🏆 10 YEARS! 🎁

PROBLEMS SUBMIT CODE **MY SUBMISSIONS** STATUS STANDINGS CUSTOM INVOCATION

My Submissions

#	When	Who	Problem	Lang	Verdict	Time	Memory
<a href="#">94070335</a>	01:18:52	██████████	<a href="#">1 - Merge Them!</a>	Java 11	Wrong answer on test 2	171 ms	0 KB
<a href="#">94061848</a>	01:08:08	██████	<a href="#">1 - Merge Them!</a>	GNU C++17	Accepted	202 ms	500 KB

"Accepted" means your answer passed all test cases  
"Wrong answer..." means you failed some of the test cases

With some of the core operations and functions covered above, you can try clicking on other buttons to explore other features that have not been introduced!

## Other Hints

Most major languages are supported, including C/C++, Java, Python, etc. You can find the list of languages supported here:

<https://codeforces.com/blog/entry/79>

All input/output are standard screen input/output (e.g., `std::cin/std::cout` for C++).

The standard libraries for each language are supported (e.g., STL in C++).

Time scaling is enabled: this means that if you are using languages that are usually considered as “less efficient”, the time limit will be adjusted accordingly. For example, for Python, the time limit is 6x the regular time limit (C++ is 1x).

See <https://codeforces.com/group/d1x0Mh7PUS/contest/311845/extraTimeFactors> for more details.

We also have a beginners cheatsheet for programming problems available:

<https://docs.google.com/document/d/1HKcyBmdZ45sb-Vq8v1ZM38Bzdh3DMmTRx74tlut62IE/edit?usp=sharing>

Happy Coding!