COP 4516 Tutorial to Use Programming Contest Websites (Codeforces, USACO, Kattis)

Codeforces (codeforces.com)
First, go to the website and create a login. After you do that, there are several ways to practice contest problems:

1. Register for a real contest and compete.
2. Run a contest in virtual participation.
3. Run a gym in virtual participation.
4. Solve random problems in the Problem Set.

Submitting Problems on Codeforces
Most codeforces problems use standard input (keyboard) and standard output (screen). Thus, if you're using Java, you just use a Scanner from System.in to read input and System.out.println for output. If you're using C++, just use cin and cout. If you're using C, just use printf and scanf. In Python, use print and input, without any prompt.

On occasion, some codeforces problems will use file input or file output. If they do, when you look at the problem, right underneath the title there will be a section labeled input and output and instead of saying "standard input" and "standard output", they will say which file to read from and which file to write to.

If you use Java on Codeforces and are working on a problem that has 10^5 pieces of input or more, don't use a Scanner, use a BufferedReader. Some UCF programming team members have written their own class, FastScanner, which uses a BufferedReader on the backend so that you can get the speed of BufferedReader but use the syntax of a Scanner.

So, when you see a problem, to submit a solution to it, on the bottom right portion of the problem description screen there's a box titled, "Submit?". In this box, there is a pull down menu to select your language and then a button to choose the source file you want to submit. Click the button, choose the file and then hit the "Submit" button. After you do this, depending on how you are using codeforces, you receive your feedback in slightly different ways. But usually, in a window, you'll see your submission with a status update, saying which case it's currently run on. After a decision, there will be a box by your name and submission ID with the result of your submission. You can get things like "Accepted", "Wrong Answer of case 37", "Time limit exceeded on case 4", "Run time error on case 12", or "Compile Error". Hopefully you never get the last one!

1. Live Contests on Codeforces
This is the most difficult because you must compete at a fixed point in time, and the live contests are only periodically scheduled. But #1 is the only way to get a rating and improve that rating. Also, for our class, COP 4516, for any codeforces activity to count towards the online contest grade, you must run a live contest.

To compete in a live contest, you must first register for the contest. When you login to codeforces, if there is a live contest in the near future, on the top right of the website, a little box will say, "Pay attention" and inside of it it'll have a "Register now" link. Click on that link and you are registered for the contest! Then, log onto Codeforces a few minutes before the contest. (When you register, there's a count down until when the contest starts, you can use that to determine the start time of the countest.) When you do, a few minutes before the contest starts, there will be a button on the top right that asks if you want to enter the contest. Click it. Then, when the contest starts, the page will refresh with links to the problem descriptions. Click on one of them. Codeforces is very good about having its real contest problems in order of difficulty. So, if you are a beginner, I strongly recommend just going in order instead of reading all the problems. Then,

when you think you have a solution to the problem, submit, as was previously explained. Here, you'll get your feedback in a window that only shows your submissions under a Status tab. If you don't get Accepted, you should probably debug your program, fix any issues you see and resubmit. You can resubmit as many times as you want. At first, I recommend not being deterred and resubmitting, but only if you changed something! (No point in doing so if you didn't change anything in your code.)

2. Virtual Participation on a Contest
The beauty of this is that you can practice on an old contest any time you want with the environment looking nearly identical to that of a real contest. To do this, click on Contests out of the top menu choices, then look in the contest history. If there is a contest you'd like to do (I recommend Division 3 for most students in COP4516), then hit the Virtual Participation Button. Then, it'll have a little message telling you when your contest will start and the rules. Just hit accept and in a minute or so, it'll look like a real contest and you just do everything as you would do for a live contest. The only difference here is that this won't affect your rating. But, for practice purposes, this is just as good as a live contest!

3. Virtual Participation on a Gym
This is the same as #2, but instead of competing on an old codeforces competition, you can compete on an old competition from somewhere else. Codeforces allows users to upload contests that occurred elsewhere (ACM ICPC Regionals or Olympiads or Company Sponsored contests or High School contests, etc.) to their platform. Relatively few people do this (it takes quite a bit of time), but the cool thing is that everyone can benefit from those users' work! So, to do this, go to Gym, find a contest and click the "Virtual participation" button. Most of these will probably be too difficult for most students in COP 4516, but I just wanted the tutorial to be somewhat complete.

4. Solve random problems in the Problem Set
This is what I did in class. Click on Problem Set at the top menu. Find a problem and click on it and submit if you think you've got a solution! You can Filter problems based on difficulty or the tags that show up by the name of the problems (which are problem categories like "Brute Force" or "Graphs"). You can also do what I did in class, which is sort the problems by 3 of users who have solved them, which is a proxy for sorting them by difficulty.

A sample solution to a problem Elephant, from a Codeforces contest, is linked on the course webpage outside of this tutorial. (In other years, I may solve other problems live for students. But the main page has a solution to the problem Elephant.)

USACO (usaco.org)

First, go to the website and create a login. After you do that, there are two ways to practice contest problems:

1. Register for a real contest and compete.
2. Solve individual problems from an old contest.

Submitting Problems on USACO

In the 2020-2021 season, USACO has changed to use standard input/standard output. In the past, USACO used file input/file output. This means that if you are running a live contest in 2021 or later, please use standard input and output. If you are practicing on an old problem prior to the 2020-2021 school year, please use file input and file output. The directions for using files is below:

Old File Input/Output Directions

For each individual problem, a filename is specified. The input file you read from must be the filename.in and the output you produce must go to the file filename.out. For example, in class, I went over a problem where the filename was greetings. Thus, my solution reads from greetings.in and writes output to greetings.out. Read up on File Input and File Output in your preferred language. My solution to greetings (which is available outside of this document on the course web page), shows one way to do File Input and Output in Java. When you are on the page of a USACO problem, there's a pull down menu at the bottom of the problem description for the language of your solution and a second button where you click to upload your source file. After you do that, just it the "Submit Solution" button. When you do, you'll see your results on each test case at the top of the problem description window. A test case your program solves correctly will be a green box with a '*' character and the amount of memory and time your program took on that case. All incorrect test cases are indicated with a red box, and the character in the box indicates whether the response is a Wrong Answer ('x'), Time Limit Exceeded ('t'), or Run Time Error ('!').

1. Live Contests on USACO

On the main USACO page there's a schedule on the top right. That shows four contests and the window of days for the contest. Each contest has a 4 day window. To compete in a contest, you must login during that four day window and then hit a button at the top of the page that says, "Compete in January 2021 Contest" (or something of that nature). Once you click on that, there will be another page that comes up with the contest rules, and if you scroll to the bottom, you can just hit the button "Start my 4 hour contest window now" (or something to that effect). Once you do that, three problems will pop up in your main browser window and you can click on any problem and read it. During contest, you can see your results as previously described. USACO does partial credit, so if you get some test cases green, you do get some points (not true on Codeforces). So, you may either choose to move on, or edit your program to see if you get more test cases correct. Your score will be based on your best submission to each problem. *I strongly recommend these for the course credit due to the flexibility of the four day window.* But to do these, you have to plan, since they are ONLY once a month for the next three months.

2. Solving Individual Problems from Old Contests

On the main USACO page, click on the menu for Contests. This brings up a list in reverse chronological order. Click on any of the contest links you like. When you do this, you'll see a summary of the contest and if you scroll down enough, you'll see the problems at each level, Platinum, Gold, Silver and Bronze. (If you look at a contest at or before the 2015 US Open, there will be no Platinum level.) For our class, I recommend you start with Bronze problems for practice until you feel they are too easy. Basically, you just click on a problem on any of these contests pages, and you can submit like previously discussed and see your results.

Kattis (open.kattis.com)
First, go to the website and create a login. After you do that, there are two ways to practice contest problems:

1. Register for a Practice Contest and compete.
2. Solve individual problems from the problem set.

Submitting Problems on Kattis
All Kattis problems use standard input and standard output. Thus, writing solutions to problems on Kattis is just like writing solutions to problems from Codeforces. To submit a problem, if you are on the problem description page, there is a green button labeled "Submit". Click on this button. Then, drag and drop your source file into the location indicated (or click and select the file to upload). Then, hit submit. There is a language tab, but the webpage automatically recognizes what language you used by the file extension. The feedback to a submission is a box that shows green check marks for each correct case and an x for the first incorrect case. Unlike USACO, where all test cases are always graded due to the partial credit grading system, Kattis will stop judging a response after it finds one case is incorrect. For each incorrect submission, the reason the first incorrect test case was so is provided.

1. Practice Contests on Kattis
Kattis doesn't host live contests for the general public. It just hosts official contests for some ACM ICPC regionals and a few other things. But, Kattis allows users to create practice contests and post them for anyone to participate in. A user can just log onto Kattis and create what's known as a mash up contest, where they choose a subset of problems from the Problem Set (labeled "Problems"). To compete in one of these practices, click on the menu item, "Contests". Then, look at the list titled "Upcoming". If there is a button "Join the contest", click it. Note the start time, and then when it's close to the start time, log in. Then go to the Contests page again and there should be a button to Enter the contest you signed up for. Once the contest begins, a page with a link to each problem description will show up. Typically in these contests, the problems are NOT necessarily in difficulty order, so it's good to read some of the descriptions without committing to a problem and look at the scoreboard (this is usually the best indicator of level of difficulty for contests where the problems aren't necessarily in order of difficulty). Kattis contests are scored using ICPC scoring. You get 1 point for each correct solution. You get penalty points associated with each problem you correctly solve. Specifically, for a single problem, the number of penalty points you get is the number of minutes after the contest has started plus 20 times the number of incorrect submissions. So a problem solved at minute 53, where there were two prior incorrect submissions would earn $53 + 2(20) = 93$ penalty points. Your total penalty is the sum of the penalty points on all problems solved correctly. Ties in score are broken by penalty points, with fewer # of penalty points earning a higher rank.

2. Solve Individual Problems on Kattis
Click on Problems. By default, they are in alphabetical order, but you can resort by difficulty, total or ratio, and then look at problems and do ones that seems interesting. Self-explanatory once you get the problem description up. This is probably the key weakness of Kattis - there is no very good system to search for particular types of problems.