

# Rocky Mountain Regional Competition University of Alberta Site Instructions

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2017 ACM ICPC Rocky Mountain Regional Contest

Welcome to the University of Alberta site for the 2017 Rocky Mountain Regional Competition, part of the ACM International Collegiate Programming Contest. This is a chance for you and your teammates to demonstrate your problem-solving and programming prowess. Competition will be intense: about 50 teams from about 17 different universities across two provinces in Canada and eight US states will be competing at several different sites. Ours is the only Canadian site.

Our schedule for events is given in Table 1. Note that an orientation and a debriefing surround each of the competitions (practice and regional). Also note that this year we will use three labs (**CSC 1-25, 1-29, and CSC 1-59**) to accommodate 15 teams. **The assignment of teams** to one of the three labs will be announced in the **orientation sessions**, and it may change between the Friday practice and the main competition on Saturday.

Table 1: Schedule of Events  
(Updates at [www.cs.ualberta.ca/~contest/RMRC2017](http://www.cs.ualberta.ca/~contest/RMRC2017))

<i>Friday – November 10</i>		
Registration & Supper	6:30 PM– 7:15 PM	CSC open area
Practice Session	7:15 PM– 9:00 PM	
Welcome and Orientation	7:15 PM– 7:25 PM	CSC open area
Practice Competition	7:30 PM– 9:00 PM	CSC 1-25, 1-29, 1-59
<i>Saturday – November 11</i>		
Breakfast	8:30 AM– 9:30 AM	CSC open area
Regional Competition	9:30 AM– 3:45 PM	
Orientation	9:35 AM– 9:50 AM	CSC open area
Regional Competition	10:00 AM– 3:00 PM	CSC 1-25, 1-29, 1-59
Coaches’ room		CSC 1-53
Lunch	12:01 PM–	CSC open area
Scoreboard Disabled	2:00 PM	
Debriefing	3:10 PM– 3:45 PM	CSC open area
Banquet, Awards, and Presentation of Solutions	5:15 PM– 7:00 PM	Aurora Room: Lister Centre 11613 87 Ave NW

Practice session supper and the competition lunch are come and go as you wish. **Food and drinks are not allowed in the labs – please eat outside the room in the open area on the first floor of CSC.**

## 1 Rules

**Disclaimer:** This document is prepared for your convenience. While we made every effort to communicate accurate information, if there is a discrepancy between this document and the official rules or the judge system then this documentation should be considered incorrect.

This competition is regulated by the rules and procedures set out at the ACM ICPC website, <http://icpc.baylor.edu>. A brief summary of some of these rules is given below.

In today's competition, your team (of at most three qualified students<sup>1</sup>) will be given three (3) copies of *about* ten (10) programming problems: some will be simple, others will be quite difficult. But each problem has equal weight; solving a simple problem counts as much as solving a difficult one. You must solve as many of them as you can, in any order, and in the shortest amount of time you can.

Solutions to problems submitted for judging are called *runs*. Each run is judged as accepted or rejected by a judge, and the team is notified of the results. Notification of accepted runs may be suspended at an appropriate time to keep the final results secret. A general announcement to that effect will be made during the contest. Notification of rejected runs will continue until the end of the contest.

A contestant may submit a claim of ambiguity or error in a problem statement by submitting a *clarification request* to a judge. If the judges agree that an ambiguity or error exists, a clarification will be issued to all contestants. The judges may choose not to respond to a clarification request,

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<sup>1</sup>A student is qualified if and only if they

- are willing and able to compete in the World Finals, and
- are enrolled at least half-time in a degree program at the sponsoring institution (excepting internships, co-op programmes, and exchange students), and
- compete for only one institution during a contest year, and
- have not competed in two World Finals nor in five Regional Contests, and
- began post-secondary studies in 2013 or later **or** was born 1994 or later.

Extensions of eligibility for those failing the last item may be granted by the ICPC Manager. Please see <https://icpc.baylor.edu/regionals/rules> for complete details.

if they believe that no ambiguity or error exists. Do not pause your efforts awaiting a reply — it may take some time before a clarification is posted, or it may never arrive.

## 1.1 Judgements

When you submit a solution, the judges will reply with one of the following possible results for the submitted solution:

- **ACCEPTED** – accepted, time and penalty points are accumulated.
- **COMPILE ERROR** – solution failed to compile. On the submission details page you can inspect the exact error (this option might be disabled).
- **RUN TIME ERROR** – execution crashed, possibly because of memory exhaustion, segmentation faults, or division by zero.
- **TIME LIMIT EXCEEDED** – took too much time.
- **WRONG ANSWER** – incorrect output.
- **OUTPUT LIMIT EXCEEDED** – your program produced too much output and was terminated prematurely by the judge.
- **MEMORY LIMIT EXCEEDED** – your program tried to allocate more memory than was allowed for the problem, this is not the same as, say, `malloc` failing and returning a null pointer.

As a rule of thumb

*Judges will report the first mistake they notice.*

For more information, see the documentation here:

<https://rnc17.kattis.com/help/judgements>.

Contestants are not to communicate with anyone, except competitors on their team and personnel designated by the regional contest director. Systems support staff may advise contestants on system-related problems such as explaining system error messages. While the contest is scheduled for five hours, the regional contest director has the authority to alter the length of the contest in the event of unforeseen difficulties. Should the contest duration be altered, every attempt will be made to notify contestants in a timely and uniform manner.

A team may be disqualified by the regional contest director for any activity that jeopardizes the contest, including (but not limited to) dislodging extension cords, submissions which pose unnecessary risk to the contest computers, unauthorized modification of contest materials, possession of unauthorized materials, or distracting behavior.

Students are not allowed to:

- access the network;
- access any files except as explicitly specified in the problem statement;
- attack system security;
- execute other programs or create new processes;
- change file system permissions;
- work with subdirectories;
- create or manipulate any GUI items (windows, dialog boxes, etc.);
- work with external devices (sound, printer, etc.);
- unnecessarily exhaust system resources (file handles, memory, etc.)
- do anything else that can disturb the contest, including other contestants or the judging process.

As far as possible, problems will avoid dependence on detailed knowledge of particular application areas or particular contest programming languages. Opening and closing of files is not required. These standard file descriptors for console I/O are summarized along with the accepted programming languages in Table 2.

## 1.2 Scoring

A problem is solved when it is accepted by the judges. The judges are solely responsible for accepting or rejecting submitted runs. In consultation with the judges, the Regional Contest Director determines the winners of the regional contest. The regional contest director and judges are empowered to adjust for or adjudicate unforeseen events and conditions.

*The judges' decisions are final.*

Teams are ranked according to the most problems solved. For the purposes of awards, or in determining qualifier(s) for the World Finals, teams who solve the same number of problems are ranked by least total time. The total time is the sum of the times consumed for each problem solved.

The time consumed for a solved problem is

- the number of minutes elapsed from the beginning of the contest to the submission of the accepted run
- plus 20 penalty minutes for every rejected run for that problem regardless of submission time.

There is no time consumed for a problem that is not solved. For example, if you submit an incorrect solution to a problem at 15 minutes into competition and a corrected one 15 minutes later, your team has solved one problem and accumulated 50 points (30 minutes to accepted solution and 20 penalty minutes).

Any ties that still remain shall be broken in favour of the team who submitted their last accepted solution the earliest.

### 1.3 Complaints, Appeals, and Remedies<sup>2</sup>

If irregularities or misconduct are observed during the contest, team members or coaches should bring them to the attention of the contest officials so that action may be taken as soon as possible. After the conclusion of the contest and after the results have been made public, coaches may file complaints or appeals as follows:

#### **Within 1 day**

The coach may file a complaint by sending an email containing a text message with no enclosures to the Contest Manager. The Contest Manager<sup>3</sup> will forward the complaint to the Regional Contest Director, Super Regional Director, and Director of Regional Contests, copying the coach.

#### **Within 2 more days**

The Regional Contest Director shall respond to the complaint.

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<sup>2</sup><https://icpc.baylor.edu/regionals/rules>

<sup>3</sup>[manager@acmicpc.org](mailto:manager@acmicpc.org)

**Within 1 more day**

The coach may file an appeal by sending email to the Contest Manager who will forward the appeal to the Appeals Committee copying the coach and Regional Contest Director.

**Within 2 more days**

The Appeals Committee will investigate the circumstances of the appeal and notify the coach and Regional Contest Director of their decision.

This process is governed as follows:

- The results of the regional contest are not final until the complaints and appeals process has run its course.
- Only coaches may file complaints and appeals.
- An appeal must be based on one or more of the following circumstances:
  - violations of the Rules,
  - misconduct by teams, or
  - gross misconduct by contest officials with intent to do harm.
- The decisions of the judges are final. Specifically, a decision on a problem submission MAY NOT be appealed.
- The Appeals Committee overturns decisions only under extraordinary circumstances.
- The decision of the Appeals Committee is final.
- No additional finals invitations will be given to remedy to a complaint.
- All complaints will be acknowledged.

The appeal will be automatically rejected if the above procedure is not followed.

**1.4 Advancing to World Finals**

Teams qualify to advance to the World Finals through Regional Contests and by satisfying all rules posted in *The Rules of the ACM-ICPC World Finals*<sup>4</sup>. Summarizing the details,

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<sup>4</sup><https://icpc.baylor.edu/worldfinals/rules>

- To qualify for the World Finals, the coach and all team members must be fully registered before competing in a regional event.
- Only one team from a given institution may advance to the World Finals.
- No team member on the qualifying team may have competed as a contestant in two previous World Finals.
- The coach of a qualifying team is the point-of-contact prior to and during World Finals activities. The coach must complete certification at the Team Certification Web Site within five business days of notification of advancing to World Finals.
- A team advancing to the World Finals will be comprised of the same three members as when it qualified.

## 2 Regional Contest Computing Environment

The programming languages for the regional contest are C, C++, Java, Python2, and Python3. For official documentation from the judges on how programs are compiled or run, see [rmc17.kattis.com/help](http://rmc17.kattis.com/help).

**WARNING FOR JAVA USERS:** the judges recommend running Java with an increased stack size as follows: `java -Xss64m`  
The judging platform will do so.

### 2.1 Judging Platform

The specific versions used for testing submissions are listed in Table 2. Judging will occur on a Dell Poweredge R620 server with 16 Intel Xeon E5-2660 CPUs and 128 GB RAM<sup>5</sup> with a 64-bit Linux kernel.

The judging platform will support C++11 but not C++14.

### 2.2 Team Platform

Each team will use either a single HP Compaq dc7900 or a single Dell 990. Note this difference is only for the local setup, all teams will have their code judged on the same platform when they submit their code. The following notable software is installed.

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<sup>5</sup>There will still be memory limits imposed on your programs



Table 2: Accepted Languages Details (Judging Platform)

Language & Version	Suffix	Input	Output
GNU C (gcc) 5.4.0	.c	stdin	stdout
GNU C++ (g++) 5.4.0	.cpp	cin	cout
OPENJDK (javac) 1.8.0_91	.java	System.in	System.out
PYTHON 2.7 (python) 2.7.12	.py	raw_input()	print
PYTHON 3.5 (python3) 3.5.2	.py	input()	print()

- 64 bit Ubuntu 16.04.3 LTS
- Editors: VIM, Emacs, gedit, Kate, eclipse - Neon.3 Release (4.6.3), VScode, Code::Blocks
- To invoke the respective editors, use the following  
vim, emacs, gedit, kate, eclipse, code, codeblocks
- Debuggers: GNU gdb, valgrind, GNU DDD, jdb

## 2.3 Compiling and Running

### C

The judges will compile C programs with gcc version 5.4.0 with the flags `-g -O2 -std=gnu99 -static {file} -lm`.

To compile a C file named, say, `prog.c` on our machines you would use:

```
gcc -g -O2 -std=gnu99 -static -o prog prog.c -lm
```

The executable file can be run and tested using `./prog`

### C++

The judges will compile C++ programs with gcc version 5.4.0 with the flags `-g -O2 -static -std=gnu++11 {file}`. Note, in particular, that C++11 is supported.

To compile a C++ file named, say, `prog.cpp` on our machines:

```
g++ -Wall -O2 -std=c++11 -o prog prog.cpp
```

The executable file can be run and tested using `./prog`

## Java

The compile with OpenJDK version javac 1.8.0\_131 with the flags `-encoding UTF-8 -sourcepath {path} -d {path} {files}`.

The judges use the following run time flags (read as one line):

```
-XX:+UseSerialGC -Xss64m -Xms{memlim}m
```

```
-Xmx{memlim}m -Dfile.encoding=UTF-8 -cp {path}
```

where `{memlim}` is the memory limit for the problem you are submitting to.

To compile java code in a file called `prog.java` code on our machines:

```
javac -encoding UTF-8 -sourcepath . -d . prog.java
```

You can then run it with: `java prog`

This assumes the `public class` that contains `main` is named `prog`. The name of the public class does not matter when you submit to the judge system, this comment is only about compiling on our machines.

## Python2

The judges use PyPy version Python 2.7.10. It is not necessary to add a shebang (e.g. `#!/usr/bin/python`) to the top of a Python solution.

Our machines support Python 2.7.12. To run a Python2 script named `prog.py` on our local machines use

```
python prog.py
```

Note our Python2 software is CPython whereas the judges use PyPy.

## Python3

The judges use CPython version Python 3.5.2. It is not necessary to add a shebang (e.g. `#!/usr/bin/python3`) to the top of a Python solution.

Our machines support Python 3.5.2. To run a Python3 script named `prog.py` on our local machines use

```
python3 prog.py
```

## 2.4 Login Information

Your user account for our lab machines is of the form `acm0XX` and password will be included with the envelope together with the problem sets. Note:

you will be using different accounts for Friday's practice contest and the main contest on Saturday.

Separately, you need login credentials to use the judging system. You should have received these by email. Write it down on a few pieces of paper and distribute between your teammates.

## 2.5 Permitted Resources

Contestants are permitted to bring any paper reference materials they wish; **but electronic aids are *prohibited*, including**

**watches, calculators, tablets, mobile phones, usb drives, etc.**

Use of unauthorized materials will result in immediate disqualification. To ensure no infractions occur, please leave your electronic devices outside of the competition area – your coach can sequester them, or we will lodge them with a staff member (at your risk).

Internet access will be restricted during the competition. Available are

- the local competition page ([www.cs.ualberta.ca/~contest/RMRC2017](http://www.cs.ualberta.ca/~contest/RMRC2017))
- the judging system

`rmc17.kattis.com` (for both the practice and main event)

- C, C++, STL, Java, and Python2/Python3 reference material (accessible through the local page)

in addition to UNIX `man` pages. Competitors are not permitted to speak to the judges directly during the contest and may not enter the judging area.

## 2.6 Printing

**Competitors must not approach any printer!** Competition staff will act as couriers and bring printed output to you. Print your source code using the command

```
paf filename | lpr -Pprn132
```

`paf` (print ASCII file) converts an ASCII text file to a PostScript file. This utility packs two pages of text onto a single PostScript page.

If you are having system difficulties, please ask one of the contest staff for help immediately. Don't waste contest time trying to figure out system problems yourself.

If you need to print from a browser, just use the print menu option with printer `prn132`.

Use the practice session to familiarize yourself with all features of the competitions systems: submit incorrect runs, request clarifications, and attempt printing. This will prepare you for the actual competition.

## 2.7 Submission Application

Submissions will be done through an internet connection to the judging system. The url for the judging system can be found at

`rmc17.kattis.com`

Your team account name and password for the submission system will be different from the `acm0??` accounts used for logging into the lab computer.

## 2.8 Starting Points

A starting point for each language is sketched in Figure 1.

When the contest is over, please make sure that all of your personal materials have been removed from your workstation area. If you wish to archive your files, please contact an official to enable email or other forms of data transfer at that time.

Good Luck!

```
// Java example           // NO PACKAGE SPECIFIED!!
import ...;
public class foo {
    ...
    public static void main(String args[]) {
        ... // TODO: solve the problem
    }
}
```

---

```
/* Python3 example */
... # no preamble, just solve the problem!
```

---

```
/* C example */           // C++ example
#include <stdio.h>         using namespace std;
#include <stdlib.h>        #include <iostream>
#include <assert.h>        #include <cstdlib>
                           #include <cassert>

int main() {              int main() {
    ... /* solve problem */    ... // solve problem
    return 0;                return 0;
}                             }
```

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Figure 1: Java, Python3, C, and C++ code skeletons for `foo.java`, `foo.py`, `foo.c`, and `foo.cc`

## 3 Maps

### 3.1 Parking

Rates may have changed since I last checked

- Stadium car park: <http://www.campusmap.ualberta.ca/>, then search for Stadium Car Park
- Parking information: <http://www.asinfo.ualberta.ca/ParkingServices>  
Visitor rates: <http://www.asinfo.ualberta.ca/ParkingServices/Visitor-Parking.aspx>
- Friday evening parking is \$5.00 maximum for arrivals **AFTER 4:30pm**.
- All day Saturday parking is \$5.00 maximum.

### 3.2 Campus Map, Access to CSC and Lister Center

See Figure 2 for orientation. You will also receive a campus map as part of your registration materials. The CSC building is in quadrant D4, building 42 on the map. The doors to CSC are open 7am - 11pm on Friday and 7 am - 6pm on Saturday. All facilities used by our contest are on the first floor. For a floor plan, see: <https://www.ualberta.ca/computing-science/contact-us/csc-floorplans/>

The adjacent building, Athabasca Hall (Ath), has different opening hours and you may not be able to walk through it at all times.

Lister Centre (Saturday dinner and awards) is located at 11613 87 Ave NW. We will be in Arora Room. (See map tile H2).

REGIONAL INSTRUCTIONS

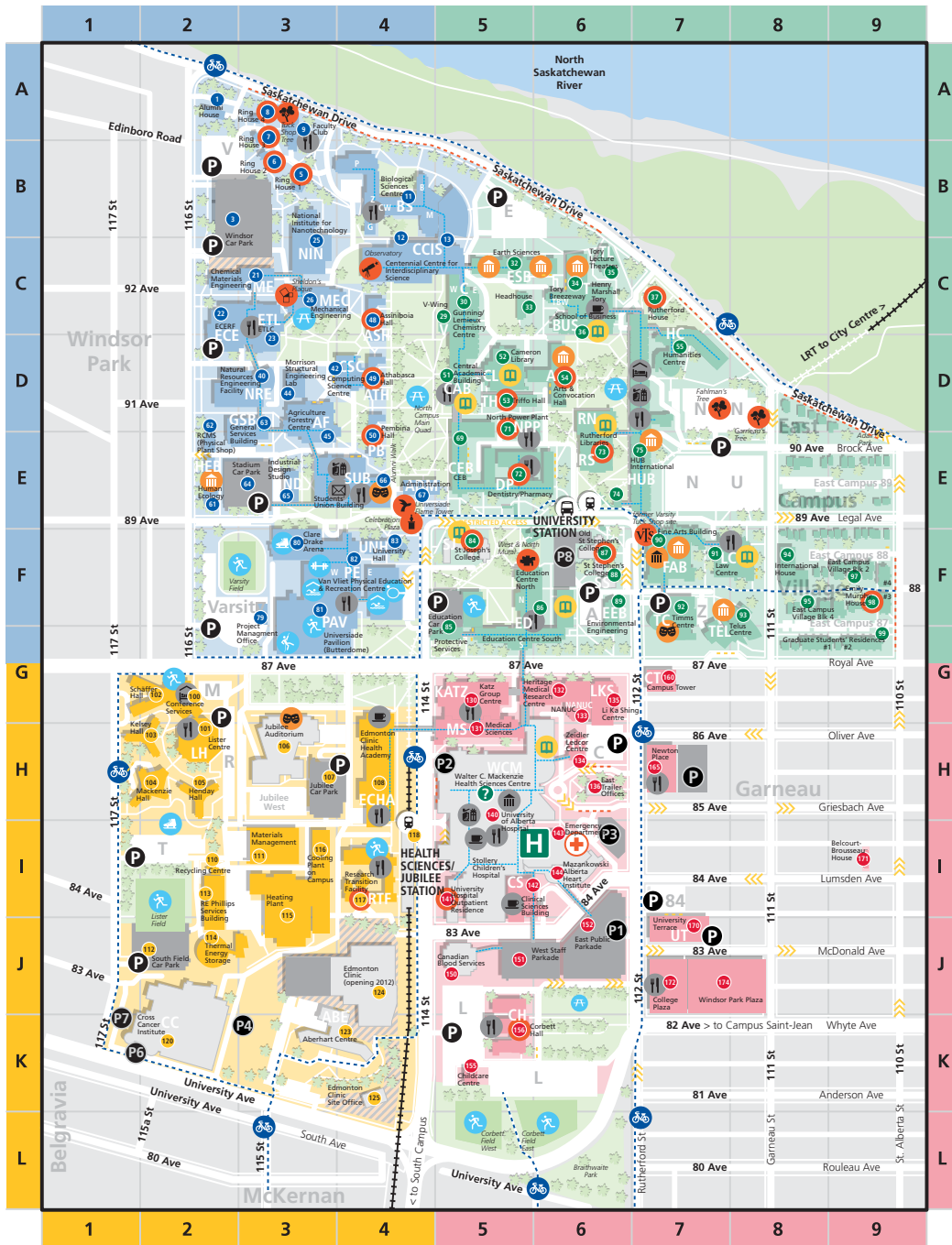


Figure 2: University of Alberta - map of main campus