CMIMC 2019 Official Contest Information

CMIMC Staff

Latest version: November 7, 2018

1 Introduction

1. This document is the official contest information packet for the 2019 **Carnegie Mellon Informatics and Mathematics Competition** (**CMIMC**). The most recent version of this document takes authority over all other documents.
2. The 2019 CMIMC is to be held on **January 26, 2019** at **Carnegie Mellon University** in **Pittsburgh, PA**.

2 General Test Rules

1. Use of electronics during a round is forbidden. This includes the use of all calculators, such as any type of four-function, scientific, or graphing calculator.
2. Any communication is forbidden during non-collaboration rounds. Communication between members of different teams is forbidden during all rounds.
3. No clarifications will be given on questions during the rounds. Contestants may **not** ask for help during the contest at any time.
4. Problems may be disputed by submitting a written protest to CMIMC staff; disputes will be handled in a consistent and fair manner. Written protests must be submitted prior to the end of lunch for individual rounds and prior to the faculty talk for the team round.
5. Solutions to individual and team rounds will be posted on-site shortly after the conclusion of each round. They will be made available on the CMIMC website after the end of the competition.

3 Contest

The contest consists of five rounds: **power round**, **team round**, and three **individual rounds**.

3.1 Power Round

1. The power round presents an interesting topic with all the necessary background information.
2. This round consists of some number of **proof-based** problems, to be solved in **60 minutes**, all related to the same interesting topic and which build off of each other. Problems will have varying difficulty; the number of points each problem is worth will be roughly proportional to the difficulty of the problem.

3. Competitors are allowed to collaborate with their team members on this round, but collaboration across teams is still prohibited.
4. Partial solutions will be awarded partial credit as deserved.

3.2 Team Round

The team round will be **60 minutes** long, with **fifteen short-answer** problems.

3.3 Individual Rounds

1. The individual rounds each consists of **ten short-answer** problems, to be solved in **60 minutes**.
2. Each competitor takes all three individual rounds: **Algebra and Number Theory**, **Combinatorics and Computer Science**, and **Geometry**. More information to come at a later date.

4 Scoring

More information to come at a later date.

5 Awards

1. Awards will be given to the 10 top-scoring competitors in each individual round, the 5 top-scoring teams on the power round, and the 5 top-scoring teams overall.

6 Conventions

1. Answers to problems may or may not be integers. In other words, the answer to any problem can be expressed in terms of basic arithmetic operations, parentheses, exponents, factorials, trigonometric functions, binomial coefficients, and any other notations which are dictated by the problem in question. More information on answer submissions can be found in the acceptable answers format document.

   Note that on the Computer Science test, answers may also be strings.
2. Diagrams are not necessarily drawn to scale.
3. Polygons' vertices appear in the order by which the polygon is named. For example, polygon $ABCDE$ has vertices appearing in that order.
4. $\sqrt{x}$ refers to the positive square root of an integer. It is only defined for $x \geq 0$.
5. $\log x$ is defined as $\log_{10} x$. $\ln x$ is defined as $\log_e x$.
6. The letter i is used for the imaginary unit, i.e. $i^2 = -1$.
7. Divisors (or factors) of an integer refer to positive integer divisors only. Proper divisors of an integer are its divisors other than itself.
8. Prime numbers refer to positive primes only. 0 and 1 are not primes.
9. When letters are used to represent digits, they are overlined. For example, $\overline{x}01\overline{y}$ where $x = 2$ and $y = 7$ refers to the number 2017.

10. All angles are measured in radians unless otherwise indicated.
11. $-\frac{\pi}{2} \leq \sin^{-1} x \leq \frac{\pi}{2}$, $0 \leq \cos^{-1} x \leq \pi$, and $-\frac{\pi}{2} \leq \tan^{-1} x \leq \frac{\pi}{2}$.
12. The sum of the elements of the empty set is 0; the product of the elements of the empty set is 1.
13. a^{a^a} denotes $a^{(a^a)}$.
14. Computer science definitions, pseudocode conventions, and any necessary formulas are defined on the Computer Science Reference Sheet, which will be provided during the computer science individual round, team round, and computer science finals. This will be released shortly.

7 Events

1. There may be events after the team round. More info will come later as the contest approaches.

8 Registration

1. The competition is open *only* to high school students. Competitors do *not* have to be from the United States.
2. Competitors register on teams of at most six individuals. Teams must be accompanied by at least one adult coach. Competitors who are minors will need to have a parent or guardian sign and submit the competition's permission and liability waiver in order to compete.
3. While teams of any size are permitted, we will attempt to combine teams of size three or smaller so that students are not severely disadvantaged during the Team and Power rounds. These students will still represent their original teams for individual round purposes.
4. Teams do *not* have to be regional. That being said, we highly discourage team stacking, and in extreme cases it can lead to disqualification.
5. Teams participate in individual and team events.
6. The registration fee is \$15 per competitor. This is to be paid by mail by a date to be later determined, or onsite with the late fee. The late fee is \$8 per competitor. Payment must be in the form of a check **payable to "Carnegie Mellon University" with the memo information as your team name**, mailed in to:

   CMIMC
   c/o MCS Associate Dean's Office
   Doherty Hall 1324
   Carnegie Mellon University
   5000 Forbes Avenue
   Pittsburgh, PA 15213

   Please include the team name as the memo on the check.

9 Schedule

7:30am - 8:30am	Registration
8:30am - 8:50am	Opening Remarks
9:15am - 10:15am	Power Round
10:30am - 11:30am	First Individual Round (A/NT)
11:45pm - 12:45pm	Second Individual Round (GEO)
1:00pm - 2:00pm	Lunch
2:15pm - 3:15pm	Third Individual Round (C/CS)
3:30pm - 4:30pm	Team Round
4:45pm - 5:45pm	Events/Faculty Talk
5:45pm - 6:30pm	Closing/Awards

10 Travel

1. Carnegie Mellon University is located at **5000 Forbes Avenue, Pittsburgh, PA 15213**.
2. Official travel information is to be found at www.cmu.edu/about/visit/accommodations.shtml.

11 Sponsors

CITADEL CITADEL | Securities D E Shaw & Co

TWO SIGMA Jane Street WOLFRAM COMPUTATION MEETS KNOWLEDGE expii