



CMIMC Format and Scoring

This document will outline how scoring for the math contest portion of the Carnegie Mellon Informatics and Mathematics Competition (CMIMC).

Structure

The math contest is split into 5 sections, 3 of which are individual and 2 of which are done with your team.

- **Individual:**
 - Algebra/Number Theory
 - Geometry
 - Combinatorics and Computer Science
- **Team:**
 - Team
 - Theoretical Computer Science

All rounds except Theoretical Computer Science (TCS) consist of 10 questions that will be graded (plus tiebreakers). For these tests, we use a formula to decide how many points each question is worth. If a proportion A (where $0 \leq A \leq 1$) of students got question n correct, its weight is

$$w(n, A) = 2^{\frac{n+1}{9}} - \ln((1 - k) \cdot A + k) + 2.$$

For the TCS round, we have 3 problems, each worth 100 points. Each problem will generally have its own scoring system. The scoring for it will be given out with the individual problems, and most of them will be trying to find the best bounds/algorithms to solve specific problems.

Cumulative Scoring

Individual

For each of the individual rounds, scores will start by being normalized. Specifically,

$$\text{Normalized Score on round X} := 100 \cdot \frac{\text{score}}{\text{maximum score on round X}}.$$

Individuals will be ranked by summing their normalized scores across the three individual tests. Ties will be broken via tiebreaker questions.

There will also be leaderboards for each individual test, which has a self explanatory ranking system.

Team

The team score will be affected by a team's performance on the original rounds as well as the Team/TCS rounds.

The individual score aggregate will be the sum of the normalized individual scores across the team. The aggregate TCS and Team scores will be the raw scores.

For each of these figures, we calculate a normalized score the same way we did for the individual rounds.

We will then calculate each team's score as follows:

$$\frac{2 \cdot \text{Normalized Individual Aggregate} + \text{Normalized TCS Score} + \text{Normalized Team Score}}{4}.$$