



Cornell University®

Big Red Math Competition
Proof Round

Name: _____

Student ID: _____

10/25/2025

9:30am–11:00am

INSTRUCTIONS — PLEASE READ THIS NOW

- This is a closed book exam. You are **NOT** allowed to use a calculator, computer, notes, or any other resources.
- **Show your work.** To receive full credit, your answers must be neatly written and logically organized.
- **Simplification.** Please simplify all answers as much as possible. For example, $\frac{\cos \pi}{\frac{1}{2}}$ can be simplified to -2 .
- **You have 90 minutes to complete this exam.**
- This is a closed book exam. You are **NOT** allowed to use a calculator, computer, notes, or any other resources.

Please sign below to indicate that you have read and agree to these instructions.

Signature of Student: _____

Please don't mark anything below on the page, it's for official use only.

Grader 1: _____	Grader 2: _____	Grader 3: _____
1. _____ / 10 _____	1. _____ / 10 _____	1. _____ / 10 _____
2. _____ / 15 _____	2. _____ / 15 _____	2. _____ / 15 _____
3. _____ / 25 _____	3. _____ / 25 _____	3. _____ / 25 _____
4. _____ / 30 _____	4. _____ / 30 _____	4. _____ / 30 _____
Total: _____ / 80 _____	Total: _____ / 80 _____	Total: _____ / 80 _____

1. Martin added up 5 consecutive numbers and got as a result an eight-digit number of the form $2a0a2a5a$ in base 10. Find all possible values of the digit a .

(This page is intentionally left blank to give you more space for your proof.)

2. We say a positive integer n is *balanced* if the set of its positive divisors can be partitioned into two sets of equal sum. Determine whether $2^{2025} \cdot 2025$ is balanced.

(This page is intentionally left blank to give you more space for your proof.)

3. Mickey and Minnie are having 2025 couples for dinner (so that there are 2026 couples—or 4052 people—in total). Once at the party, some people shook hands, but nobody shook hands with their partner. Minnie, who loves statistics, asked everyone (including Mickey, but not herself) in the party how many people they shook hands with and, to her surprise, all the responses she got were different. How many people did Mickey shake hands with?

(This page is intentionally left blank to give you more space for your proof.)

4. There are 2025 hunters standing with water guns on the plane. At the same time, each hunter shoots a hunter that is closest to them (where if multiple hunters are the closest, one is chosen at uniformly at random). What is the maximum possible number of shots that a single hunter could have received?

(This page is intentionally left blank to give you more space for your proof.)