

Allowed Materials

You may use writing and drawing instruments, including pens, pencils, erasers, rulers or straightedges, and compasses. Unless otherwise noted, no other materials may be used.

In particular, books, notes, reference tables, graph paper, calculators, protractors, computers, phones, smart-watches, and other electronic or communication devices are prohibited.

Rounds

- **Computational Round.** This round consists of 10 problems to be solved in 75 minutes. Only the final answer written on the answer form will be graded, and crossed-out answers will not be graded. Each problem is weighted according to N , the number of people who solve it, and p , the problem number, in the formula

$$e^{p/20} + \max(5 - \lfloor \ln N \rfloor, 2)$$

- **Proof Round.** This round consists of 8 problems worth a varying number of points to be solved in 150 minutes. Each problem is worth the number of points indicated next to it. A complete solution must include a rigorous proof, and simply writing down an answer will not receive full points. Standard mathematical results may be used without proof, but any nonstandard result essential to the solution must be proved. Partial credit may be awarded for correct and meaningful progress.

Computational Round Submission

Answers must be exact and reasonably simplified. Mathematically equivalent forms may be accepted at graders' discretion.

- Basic arithmetic, parentheses, exponents, factorials, trigonometric and inverse trigonometric functions, and binomial coefficients are allowed. Do not use summation or product notation.
- Perform routine arithmetic; in particular, evaluate simple arithmetic and products less than 10^4 . Large powers and factorials need not be expanded.
- Rational numbers and radicals must be simplified. Denominators need not be rationalized, and nested radicals are allowed.

Proof Round Submission

Each submitted page must have the following header at the top:

ID: _____	Problem #: _____	Page ____ of ____
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- Write your assigned **ID** on every submitted page. **Failure to include your ID may prevent your work from being attributed to you.**
- **Do not write your name or any other identifying information anywhere on your proof-round submissions.**
- Write the problem number and page number on every page. For example, a three-page solution should be labeled "Page 1 of 3," "Page 2 of 3," and "Page 3 of 3."