

Fall 2025
Exam I (scaled to 30 points)
Thursday, October 2

**DO NOT OPEN THIS EXAM UNTIL YOU ARE
INSTRUCTED TO DO SO**

Name: _____ . Student ID No. _____

1. **NO TALKING FROM THE TIME YOU ENTER THE EXAM ROOM UNTIL YOU HAVE EXITED THE EXAM ROOM!** Any violation will earn you an F on the exam, at a minimum.
 2. If you have a question, come to the front of the room and whisper very quietly to the professor.
 3. Please note any concerns of interpretation of a question on your exam.
 4. **Write the exam with a dark colored pen or pencil.** Light colored pens or pencils do not scan well.
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- **Plagiarism** will earn you an F in the course and a recommendation of expulsion from the university.
 - a. You may not refer to any material outside of this exam.
 - b. That is, you may **not** refer to notes, books, papers, calculators, phones, watches, other electronic devices, classmates, classmates' exams, and so forth.
 - c. **Do not talk to fellow students at any time while in the exam room.**
 - Answer all questions on these pages. No code or pseudo-code is necessary – just a precise and concise explanation and justification.
 - *Unsupported work will receive no credit.*

Q1 (6 pts) Solve the following precisely by providing the integer result. Show your work.

$$\sum_{i=1}^{1000} i$$

Q2 (6 pts) Given the following:

- Algorithm A runs in time $T_1(n) = 2n^2 + 24n + 97$
- Algorithm B runs in time $T_2(n) = 12n + 14$
- Algorithm C runs in time $T_3(n) = 53n \log n + 73n + 1024$

Order the algorithms from fastest (best) to slowest (worst), based on their running times as n gets large. Justify your answer.

Q3 (6 pts) Given a CREW PRAM with n processors, such that processor P_i initially stores data value d_i , give an asymptotically optimal algorithm to compute the parallel prefix minimum of the n data values. Justify your answer.

Q4 (6 pts) Given a CREW PRAM with n data values initially stored such that memory location M_i contains data value d_i , give an asymptotically cost-optimal solution with asymptotically optimal running time to compute the sum of the n data values. Justify your answer.

Q5 (6 pts) Given a linear array with n pieces of data evenly distributed amongst the processors, give an asymptotically cost-optimal solution with asymptotically optimal running time to compute the sum of the n values. Justify your answer.

Extra Credit (1 pt) Circle an area of computer science that Dr Miller works in.

1. Artificial Intelligence
2. Data Analytics
3. Computational Geometry
4. Fluid Flow Optimization

Extra Credit (1 pt) Where did Dr Miller grow up?

1. Buffalo
2. Manhattan
3. Rochester
4. Long Island

