# Math 184 Exam 1

Fall 2022

**Instructions:** Do not open until the exam starts. The exam will run for 45 minutes. The problems are roughly sorted in increasing order of difficulty. Answer all questions completely (though pay attention to exactly what the question is asking for). You are free to make use of any result in the textbook or proved in class. You may use up to 6 one-sided pages of notes, and may not use the textbook nor any electronic aids. Write your solutions in the space provided, the blank page after this one, or on the scratch paper provided (be sure to label it with your name). If you have solutions written anywhere other than the provided space be sure to indicate where they are to be found.

Please sit in the seat designated below.

**Name:**

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**ID Number:**

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**Seat:**

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| Problem | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| Score | | | | | |

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**Question 1** (Partition Computation, 25 points)**.** *What is* $p_2(1000)$?

**Question 2** (Three Digit Counting, 25 points)**.** *How many odd, three digit numbers have all three digits distinct? Note: the first digit of the number cannot be a leading 0.*

**Question 3** (Square Cycles, 25 points)**.** *Let $\pi$ be the $n$-cycle permutation $(123\ldots n)$. What are the lengths of the cycles of $\pi^2$? Justify your answer.*

*Hint: The answer will depend on whether $n$ is even or odd.*

**Question 4** (Dice Repeats, 25 points)**.** *One hundred and twenty-seven people each roll four six-sided dice and record their results. Prove that at least two of these people got exactly the same results (the same four numbers, but possibly in a different order).*