

**Time limit:** 15 minutes.

**Instructions:** This tiebreaker contains 3 short answer questions. All answers must be expressed in simplest form unless specified otherwise. You will submit answers to the problem as you solve them, and may solve problems in any order. You will not be informed whether your answer is correct until the end of the tiebreaker. You may submit multiple times for any of the problems, but **only the last submission for a given problem will be graded**. The participant who correctly answers the most problems wins the tiebreaker, with ties broken by the time of the last correct submission.

**No calculators.**

1. Compute the number of three digit numbers such that all three digits are distinct and in descending order, and one of the digits is a 5.
2. Compute the number of positive integers less than or equal to 10000 which are relatively prime to 2014.
3. A robot is standing on the bottom left vertex  $(0, 0)$  of a  $5 \times 5$  grid, and wants to go to  $(5, 5)$ , only moving to the right  $(a, b) \mapsto (a + 1, b)$  or upward  $(a, b) \mapsto (a, b + 1)$ . However this robot is not programmed perfectly, and sometimes takes the upper-left diagonal path  $(a, b) \mapsto (a - 1, b + 1)$ . As the grid is surrounded by walls, the robot cannot go outside the region  $0 \leq a, b \leq 5$ . Supposing that the robot takes the diagonal path exactly once, compute the number of different routes the robot can take.