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. Let $ABCD$ be a quadrilateral with $\angle DAB = \angle ABC = 120^\circ$. If $AB = 3$, $BC = 2$, and $AD = 4$, what is the length of CD?

2. Let $ABCD$ be a rectangle with $AB = 8$ and $BC = 6$. Point E is outside of the rectangle such that $CE = DE$. Point D is reflected over line AE so that its image, D', lies on the interior of the rectangle. Point D' is then reflected over diagonal AC, and its image lies on side AB. What is the length of DE?

3. Right triangle ABC with $\angle ABC = 90^\circ$ is inscribed in a circle ω_1 with radius 3. A circle ω_2 tangent to AB, BC, and ω_1 has radius 2. Compute the area of $\triangle ABC$.