# MBMT Geometry Round — Zermelo

**May 21, 2022**

Full Name _____

Student ID Number _____

# DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This round consists of **8** questions. You will have **30** minutes to complete the round. Each question is *not* worth the same number of points. Questions answered correctly by fewer competitors will be weighted more heavily. Please write your answers in a reasonably simplified form.

**1** Point $E$ is on side $AB$ of rectangle $ABCD$. Find the area of triangle $ECD$ divided by the area of rectangle $ABCD$.

**2** Garb and Grunt have two rectangular pastures of area 30. Garb notices that his has a side length of 3, while Grunt's has a side length of 5. What's the positive difference between the perimeters of their pastures?

**3** A scalene triangle (the 3 side lengths are all different) has integer angle measures (in degrees). What is the largest possible difference between two angles in the triangle?

**4** Let point $E$ be on side $\overline{AB}$ of square $ABCD$ with side length 2. Given $DE = BC + BE$, find $BE$.

**5** The two diagonals of rectangle $ABCD$ meet at point $E$. If $\angle AEB = 2\angle BEC$, and $BC = 1$, find the area of rectangle $ABCD$.

**6** In $\triangle ABC$, let $D$ be the foot of the altitude from $A$ to $BC$. Additionally, let $X$ be the intersection of the angle bisector of $\angle ACB$ and $AD$. If $BD = AC = 2AX = 6$, find the area of $ABC$.

**7** Let $\triangle ABC$ have $\angle ABC = 40°$. Let $D$ and $E$ be on $\overline{AB}$ and $\overline{AC}$ respectively such that $\overline{DE}$ is parallel to $\overline{BC}$, and the circle passing through points $D$, $E$, and $C$ is tangent to $\overline{AB}$. If the center of the circle is $O$, find $\angle DOE$.

**8** Consider $\triangle ABC$ with $AB = 3$, $BC = 4$, and $AC = 5$. Let $D$ be a point of $AC$ other than $A$ for which $BD = 3$, and $E$ be a point on $BC$ such that $\angle BDE = 90°$. Find $EC$.