MBMT Geometry Round — Erdös

March 9, 2025

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.** What is the ratio between the area and circumference of a circle with a radius of 10?

_____ **2.** Three points A, T, and W lie on a circle. A and W are the endpoints of the circle's diameter, and T is equidistant from A and W. What is the measure, in degrees, of $\angle ATW$?

_____ **3.** A triangle has two sides of length 5 and 6. What is the maximum possible area for such a triangle?

_____ **4.** 4 points in the plane form the vertices of a convex quadrilateral. There are exactly four unique triangles that can be formed using three of four points. If the sum of the areas of these four triangles is 24, what is the area of the quadrilateral?

_____ **5.** A rectangular prism has dimensions $2 \times 3 \times 4$. An octahedron is formed whose vertices are the centers of the faces of the rectangular prism. What is the volume of the octahedron?

_____ **6.** Rectangle $ABCD$ has side lengths $AB = 2$ and $BC = 1$. E and F are the midpoints of AB and CD, respectively. A circle is drawn with center F that passes through points E and C. Another circle is drawn with center D and passes through points A and F. What is the area of the region bounded by AE, FD, arc AF, and arc ED?

The original problem statement was incorrect. The revised version is here:

Rectangle $ABCD$ has side lengths $AB = 2$ and $BC = 1$. E and F are the midpoints of AB and CD, respectively. A circle is drawn with center F that passes through points E and C. Another circle is drawn with center D and passes through points A and F. What is the area of the region bounded by AE, FC, arc AF, and arc EC?

_____ **7.** A circle of radius 17 is centered at the origin. Another circle is centered at the point $(21, 0)$, and the two circles share a common chord of length 16. What is the radius of the second circle?

8. $YONG$ is a square with side length 10. Let A be the midpoint of YO and B be the midpoint of NG. Let C be the intersection of YB and GA, and D be the intersection of NA and OB. What is the radius of the circle inscribed in rhombus $ABCD$?