MBMT Team Round — Erdös

March 9, 2025

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This round consists of **15** questions. You will have **45** minutes to complete the round. Later questions are worth more points; point values are notated next to the problem statement. (There are a total of 100 points.) Please write your answers in the simplest possible form.

DO NOT TURN THE QUESTION SHEET IN!
Use the official answer sheet.

You are highly encouraged to work with your teammates on the problems in order to solve them.

MBMT Team Round Answer Sheet — Erdös

March 9, 2025

Team Name _____

Team Number _____

1. _____ **9.** _____

2. _____ **10.** _____

3. _____ **11.** _____

4. _____ **12.** _____

5. _____ **13.** _____

6. _____ **14.** _____

7. _____ **15.** _____

8. _____

1. **[4]** What is the smallest positive integer that has a remainder of 1 when divided by both 2 and 5?

2. **[4]** There are 5 red markers and some number of blue markers in a basket. Evan randomly chooses a marker from the basket. If the probability that he gets a red marker is $\frac{1}{3}$, how many blue markers are in the basket?

3. **[4]** Mr. Schwartz has 96 pringles and 120 pieces of candy. What is the largest number of students for which both pringles and candy can be split equally among them?

4. **[5]** It takes Gloria the Snail 40 hours to crawl around a rectangular basketball court and 46 hours to crawl around a rectangular tennis court, which has a perimeter 4 meters longer than the basketball court. If Gloria the Snail crawls at a constant speed, what is Gloria the Snail's speed in meters per hour?

5. **[5]** Let $a \star b = \frac{a+b}{a}$. What is $7 \star (8 \star 7) - 8 \star (7 \star 8)$?

6. **[5]** Kite $ABCD$ is inscribed in a circle. If the area of the kite is 48 square units and BD is 6 units long, what is the area of the circle?

7. **[6]** Valerie draws a right triangle with legs of length 1 and 8. Michelle draws a different right triangle with legs of integer length. To their surprise, the hypotenuses of both right triangles are the same length! What is the area of Michelle's right triangle?

8. **[6]** If $1^3 + 2^3 + 3^3 + \cdots + n^3 = 2025$, what is n?

9. **[7]** Square $ABCD$ has a side length of 2, and E is the midpoint of CD. Line BE is extended past E to point F such that $EF = 2BE$. What is the area of triangle DEF?

10. [8] Olivia thinks that two plus two equals five. As in, she believes there are solutions to the following equation:

$$\begin{array}{r} \text{T W O} \\ + \quad \text{T W O} \\ \hline \text{F I V E} \end{array}$$

In Olivia's equation, each letter represents a distinct digit. What is the maximum possible value of $FIVE$?

11. [8] Two ants start on the same vertex of a regular hexagon with side length 2 and begin running in opposite directions along the sides of the hexagon. If one ant runs 3 times as fast as the other, what is the distance from the point where they first meet to their starting location?

12. [9] What is the maximum number of intersection points between 3 ellipses and 3 lines?

13. [9] If positive integers a, b, and c satisfy $\gcd(a, b) = 30$, $\gcd(b, c) = 18$, and $\gcd(c, a) = 24$, what is the minimum value of abc?

14. [10] A rectangle with area 22 is inscribed in a circle with radius 5. What is the perimeter of the rectangle?

15. [10] A polygon has infinite vertices, located at $\left(\frac{1}{2^n}, \frac{1}{3^n}\right)$ for all nonnegative integers n. What is the area of the polygon?