

MOAA 2026: Team Round

October 10th, 2026

Rules

- Your team has 40 minutes to complete 15 problems. Each answer is a nonnegative integer no greater than 1,000,000.
- If m and n are relatively prime, then the greatest common divisor of m and n is 1.
- No mathematical texts, notes, or online resources of any kind are permitted. Rely on your brain and those of your teammates!
- Compasses, protractors, rulers, straightedges, graph paper, blank scratch paper, and writing implements are generally permitted, so long as they are not designed to give an unfair advantage.
- No computational aids (including but not limited to calculators, phones, calculator watches, and computer programs) are permitted on any portion of the MOAA.
- Individuals may only receive help from members of their team. Consulting any other individual is grounds for disqualification.

How to Compete

- **In Person:** After completing the test, your team captain should write your answers down in the provided Team Round answer sheet. The proctors will collect your answer sheet immediately after the test ends.
- **Online:** Log into the Classtime session to access the test. Input all answers directly into the provided form. Select for the test to be handed in once you are ready.

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Team Round Problems

- T1. [5] Compute

$$\sqrt{(2026^2 - 1^2)(2026 + 1)}.$$

- T2. [10] The numbers 1, 2, ..., 14 are to be entered into the 14 boxes shown below, so that each number is used exactly once:

$$P = (\square + \square + \square + \square + \square + \square + \square)(\square + \square + \square + \square + \square + \square + \square).$$

Find the maximum value of P .

- T3. [10] Let a and b be nonzero real numbers such that $(a - b)^2 = 3ab$. If $\left(\frac{a+b}{a-b}\right)^4$ can be written as $\frac{m}{n}$ for relative prime positive integers m and n , find $m + n$.
- T4. [15] Paige is reviewing a printed manuscript for the LIVE textbook. She notices that the sum of the page numbers on 26 consecutive pages is a perfect square. Find the smallest possible page number of the first page she looks at.
- T5. [15] Let ABC be a triangle with $AB = 11$, $BC = 9$, and $CA = 7$. Let A' be the reflection of A across the altitude from B to AC . If the circumcircle of $\triangle A'CB$ intersects the line AB again at D , the length of BD can be written as $\frac{m}{n}$ for relatively prime positive integers m and n . Find $m + n$.

- T6. [20] Find the sum of all values of n satisfying

$$n - \left\lfloor \frac{n}{2} \right\rfloor + \left\lfloor \frac{n}{4} \right\rfloor - \left\lfloor \frac{n}{8} \right\rfloor = 2026.$$

Note: $\lfloor n \rfloor$ denotes the largest integer less than or equal to n .

- T7. [20] Find the number of 7-digit numbers can be formed using each of the digits 1 through 7 exactly once such that the sum of any two adjacent digits is a prime number.
- T8. [25] Let ABC be an equilateral triangle with side length 10. Points D , E , and F are on sides BC , CA , and AB , respectively, such that $AE = CD = BF = k$. The three segments AD , BE , and CF bound a triangle Δ . Suppose that the incircle of ABC is the circumcircle of Δ . Then $k = a - \sqrt{b}$, where a and b are integers and b is square-free. Find $10a + b$.

- T9. [30] Let k be the largest real number such that the inequality

$$\sqrt{\frac{x^2 + y^2}{2}} - k \geq \frac{2}{\frac{1}{x} + \frac{1}{y}}$$

holds for all positive integers x and y with $x \neq y$. Then $k = \frac{m}{n}$, where m and n are relatively prime positive integers. Find $m + n$.

- T10. [35] Let $f(x) = \frac{4^x}{4^x + 2}$. Evaluate

$$2 \sum_{k=1}^{2025} f\left(\frac{k}{2026}\right).$$

- T11. [35] Let $ANDOVE$ be a regular hexagon, and let R be a point on segment $\overline{ON}$. Suppose that the quadrilateral $NERD$ has area 20 and the self-intersecting pentagon $RAVEN$ has area 26. Then the area of quadrilateral $DOVE$ can be written in the form $a + b\sqrt{c}$, where a , b , c are positive integers and c is square-free. Find $100a + 10b + c$.

- T12. [40] Call a pair of positive integers (a, b) *compatible* if a divides $12b + 1$ and b divides $12a + 1$. Compute the sum of $(a + b)$ across all compatible pairs (a, b) for which $a \geq b \geq 2$.
- T13. [45] Let $\mathcal{G}$ be a square lattice of dimension 20×26 consisting of $20 \times 26 = 520$ lattice points forming $19 \times 25 = 475$ unit squares. In each unit square, Oliver randomly draws in either one of the two diagonals, both diagonals, or nothing at all, with each of the 4 cases occurring with equal probability. Let N be the expected number of *finite* regions bounded by the segments Oliver drew. Find the integer closest to N .
- T14. [45] Let T_n be the number of ways to color some squares in a $3 \times n$ grid black such that no two black squares are adjacent. As n grows large, the ratio $\frac{T_{n+1}}{T_n}$ approaches some real number L . Let f be the unique monic polynomial with integer coefficients of lowest degree such that $f(L) = 0$. Find $f(10)$.
- T15. [50] Let ABC be a triangle with $AC = 3AB$. Let H be the orthocenter of ABC and M be the midpoint of BC . A point P is located inside of $\triangle ABC$ such that $\angle ABP = \angle ACP$. If $AM^2 = 10$ and the smallest possible value of PM^2 is 6, find the sum of all possible values of $\lfloor HM^2 \rfloor$.

Note: $\lfloor n \rfloor$ denotes the largest integer less than or equal to n .