



Vietnam International Mathematics Competition 2025

Danang City, 14th to 19th August 2025

Invitational World Youth Mathematics Intercity Competition

Team Contest

Time limit: 70 minutes

Information:

- You are allowed 70 minutes for this paper, consisting of 10 questions printed on separate sheets. For questions 1, 3, 5, 7 and 9, only numerical answers are required. For questions 2, 4, 6, 8 and 10, full solutions are required.
- Each question is worth 40 points. For odd-numbered questions, no partial credits are given. There are no penalties for incorrect answers, but you must not give more than the number of answers being asked for. For questions asking for several answers, full credit will only be given if all correct answers are found. For even-numbered questions, partial credits may be awarded.
- Diagrams shown may not be drawn to scale.

Instructions:

- Write down your team's name in the space provided on every question sheet.
- Enter your answers at the bottom right corners of the corresponding question sheets.
- During the first 10 minutes, the four team members examine the first 8 questions together and discuss them. After 10 minutes they distribute the questions among themselves, with every team member allotted at least 1 question.
- During the next 35 minutes, the four team members write down the solutions of their allotted problems on the respective question sheets, with no further communication or discussion.
- During the last 25 minutes, the four team members work together to write down the solutions of the last 2 questions on the respective question sheets.
- It is forbidden to use instruments such as protractors, calculators and electronic devices, smart watches.
- At the end of the contest, you must hand in the envelope containing all question sheets and all scrap paper.

English Version

Team: _____



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Team Contest

16th August, 2025, Danang City, Vietnam

Team : _____ Solver : _____ ID : _____

1. Let a , b and c be positive integers such that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$. What is the minimum possible value of a ?

Answer: _____



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2. Consider all the ordered triples of integers (a, b, c) satisfying the following properties:

- a, b and c are the roots of the equation $x^3 + px^2 + q = 0$ for some real numbers p and q .
- The absolute value of exactly two of them are prime numbers.

How many such triples are there?

Answer: _____ triples



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3. Consider the polynomial $p(x) = x^2 - 6x + 849$.

What is the sum of all integers m for which $p(m)$ is a perfect square?

Answer: _____



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4. For any real number x , let $[x]$ denote the largest integer that is less than or equal to x , and let $\{x\} = x - [x]$.

Now, consider all ordered triples of positive integers (n, p, q) satisfying $q > p > 3$, $n \leq 2025$ and

$$\left\{\frac{n}{2}\right\} + \left\{\frac{n}{3}\right\} + \left\{\frac{n}{p}\right\} + \left\{\frac{n}{q}\right\} = 3.$$

Out of all the ordered triples that achieve the minimum possible value for $p + q$, how many possible values of n are there?

Answer: _____



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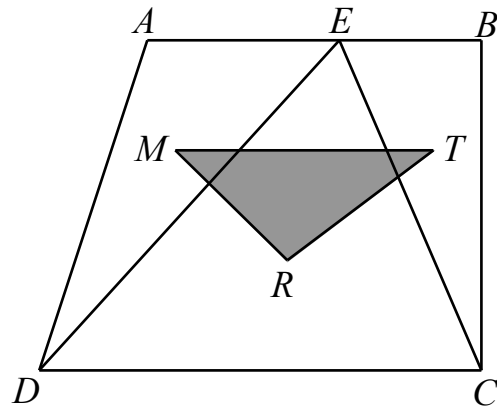
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5. In the diagram below, $ABCD$ is a trapezium of area 2025 cm^2 , where $AB \parallel CD$ and point E is on AB . Points M , R and T are the centroids of triangles ADE , CDE and BCE , respectively. What is the area, in cm^2 , of triangle MRT ?



Answer: _____ cm^2



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6. What are the last 10 digits of the base 2 representation of 47^{2025} ?

Answer: _____



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7. For the first win in a game, Alan scores 1 point, and for each consecutive win, he scores 1 more point than the previous one. However, if a loss occurs, the next win is again worth 1 point. Alan played 100 games, winning 80 of them. What is the minimum number of points he could have scored?

Answer: _____ points



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- 8.** A student camp took place over a period of 8 days. Each student was on kitchen duty on exactly 3 days, and no pair of students were on duty together more than once. What is the largest possible number of students that were at the camp?

Answer: _____ students



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9. Consider an isosceles trapezium where three of its sides have equal length and the radius of its circumcircle is equal to the difference in length of its two parallel sides. Determine all possible values of the measure, in degrees, of the acute angle of this trapezium.

Answer: _____



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- 10.** A famous restaurant in Đà Nẵng sells only 4 different dishes in their menu namely Bèo, Nậm, Bèo và Nậm Combo or Xèo.



Bèo



Nậm



Bèo và Nậm Combo



Xèo

A participant in IMC visited the restaurant on all 6 nights of the competition period (14 August to 19 August). On each of the 6 nights, he ordered exactly one of the 4 options (the combo counts as one option), and he did not eat the same type of dish on any two consecutive nights.

For example, if he eats Bèo on the first night, he will not order Bèo or Bèo và Nậm Combo on the second night. If he had Bèo và Nậm Combo on the fifth night, he would not have ordered Bèo, Nậm or Bèo và Nậm Combo on either the fourth night or the last night.

How many different possible orders are there over the course of the 6 nights?

Answer: _____ orders