2 этап - письменный экзамен
пример заданий

Пожалуйста, прочитайте правила проведения тестирования.

- На решение задач отведено 120 минут.
- Задачи будут даны на английском языке.
- Потребуются развёрнутые решения задач, записанные на бумаге на английском языке.
- Правильные ответы без пояснений получат 0 баллов.
- За неполные решения или мелкие ошибки будут выставляться частичные баллы.
- Правильные чертежи для геометрических задач настоятельно рекомендуются.
- Для успешного прохождения не требуется решить все задачи, но постарайтесь решить как можно больше.
- Во время экзамена разрешается использовать ручку, карандаш и бумагу.
- Запрещено использовать калькулятор, помощь других людей, генеративные модели (ChatGPT, DeepSeek и т. п.).

Question 1. A globe is divided by 17 parallels and 24 meridians. How many regions is the surface of the globe divided into?

A meridian is an arc connecting the North Pole to the South Pole. A parallel is a circle parallel to the equator (the equator itself is also considered a parallel).

Question 2. Prove that in the product $(1 - x + x^2 - x^3 + \cdots - x^{99} + x^{100})(1 + x + x^2 + \cdots + x^{100})$, all terms with odd powers of x cancel out after expanding and combining like terms.

Question 3. The angle bisector of the base angle of an isosceles triangle forms a 75° angle with the opposite side. Determine the angles of the triangle.

Question 4. Factorise:
a) $x^2y - x^2 - xy + x^3$;
b) $28x^3 - 3x^2 + 3x - 1$;
c) $24a^6 + 10a^3b + b^2$.

Question 5. Around the edge of a circular rotating table, 30 teacups were placed at equal intervals. The March Hare and Dormouse sat at the table and started drinking tea from two cups (not necessarily adjacent). Once they finished their tea, the Hare rotated the table so that a full teacup was again placed in front of each of them. It is known that for the initial position of the Hare and the Dormouse, a rotating sequence exists such that finally all tea was consumed. Prove that for this initial position of the Hare and the Dormouse, the Hare can rotate the table so that his new cup is every other one from the previous one, they would still manage to drink all the tea (i.e., both cups would always be full).

Question 6. On the median BM of triangle ΔABC, a point E is chosen such that $\angle CEM = \angle ABM$. Prove that segment EC is equal to one of the sides of the triangle.

Question 7. There are N people standing in a row, each of whom is either a liar or a knight. Knights always tell the truth, and liars always lie. The first person said: "All of us are liars." The second person said: "At least half of us are liars." The third person said: "At least one-third of us are liars," and so on. The last person said: "At least $\frac{1}{N}$ of us are liars."
For which values of N is such a situation possible?

Question 8. Alice and Bob are playing a game on a 7 × 7 board. They take turns placing numbers from 1 to 7 into the cells of the board so that no number repeats in any row or column. Alice goes first. The player who cannot make a move loses.
Who can guarantee a win regardless of how their opponent plays?