

# Rules of the Mathematical Battle

## 1. Structure of the Math Battle

A math battle is a competition between two teams in solving non-standard problems selected by the jury, in the ability to present their solutions at the board, and in the ability to critique and verify the opponent's solutions.

Both teams receive the same set of problems and work on them separately in different rooms for a fixed amount of time. After that, the 2 teams and the jury, which consists of 2 members, gather all together for the discussion and verification of solutions.

Thus, the math battle consists of two parts: problem solving and the battle itself.

To determine who will present which problem, the teams make "*challenges*": one team names the number of the problem whose solution it wants to hear, and the other team announces whether the challenge is accepted. Usually, teams challenge each other alternately.

If the challenged team agrees to present, it assigns a *speaker*, while the other team appoints an *opponent* to review the solution. Teams may be granted *one-minute breaks* to assist their speaker or opponent.

If the jury accepts the presented solution, the discussion moves on to another problem. If it is not accepted, see the sections "*Role Reversal*" and "*Validity of a Challenge*".

If the challenged team refuses to present a solution, the challenging team must present the solution itself. If, during this process, the opponent proves that the presenter has no solution, the challenge is considered *invalid*, and the challenging team must issue another challenge.

A team may decline to make its next challenge (if it has no solved problems left and does not wish to make an invalid challenge). In that case, the other team gains the right to present the remaining unsolved problems.

After each presentation, the jury awards points to the teams for both presentation and opposition.

## 2. Problem Solving

There is a gentleman's rule: before solving begins, teams must inform the jury of all problems, solutions of which they already know (a math battle is not a quiz show). The

jury then excludes or replaces these problems after verifying that the team truly knows the main idea of the solution.

In case of questions, a team representative can come up to the juries and ask a question. Each clarification given to one team must immediately be communicated to the other team as well.

The jury must not provide any information about the difficulty of the problems. During the solving period and during the battle, teams must not communicate with each other or know how many problems their opponents have solved.

### 3. Course of the Battle

When the problem-solving time is over, the teams and the jury assemble together.

Communication between participants is restricted according to the official scheme (for example, the opponent may speak only with the speaker and the jury, while the captain may speak only with his or her own team and the jury).

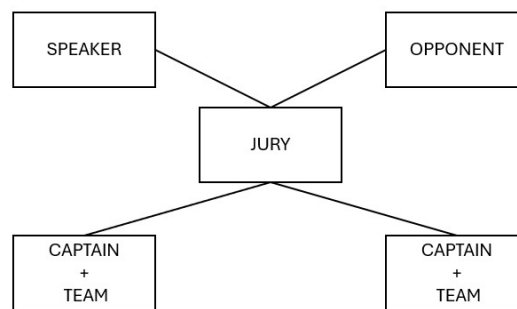


Figure 1: Seat arrangement

### 4. Captains' Contest

Before the battle begins, it must be determined which team will make the first challenge. For this, a Captains' Contest is held. The two captains come to the board and receive either a simple logic problem that requires only an answer, or a short game with no obvious winning strategy. The captains are asked who wishes to start or play second; whoever answers first determines the order.

The contest ends when one of the captains gives an answer or wins the game. If the answer is correct, that captain wins; if it is incorrect, the other captain wins.

The winning captain then announces which team will make the first challenge.

## 5. Challenge Procedure

The captain of the challenging team announces the number of the problem, solution of which the team wishes to hear, and the other team replies whether the challenge is accepted.

If the challenged team accepts, it appoints a speaker, while the challenging team appoints an opponent to verify the solution.

If the challenged team refuses, the challenging team must present the solution itself (appointing its own speaker, while the other team provides an opponent). In this case, the *validity of the challenge* is examined.

## 6. Speaker and Opponent

Ideally, the speaker first presents the solution, and when he's done he says the words "*The report is finished*", after which no adjustments (without losing points) can be made; then the opponent asks questions; afterward, the opponent gives his assessment of the solution (for example: "The solution is not accepted, since this statement is not proved and this question was not answered satisfactorily"). Only after that does the jury start questioning the speaker.

During the presentation, the opponent and the jury should try not to interrupt the speaker, only using remarks such as: "This is obvious, no need to prove," or "Please repeat this point."

The speaker may postpone answers to the opponent's questions until the end of the presentation, but at the request of the opponent or the jury must provide the overall plan of the solution.

The opponent must not require proofs of statements from the regular school curriculum or other well-known facts. In disputed cases, the jury makes the final decision.

The time allowed to think over a question at the board is one minute (for the opponent – to formulate it; for the speaker – to answer).

Teams may assist their speaker or opponent only during their *one-minute break* (the other team also uses this minute). During their break, a team may replace its speaker or opponent (each appearance at the board is counted).

If, within one minute given to think over a question deemed essential by the jury, the speaker does not prepare an answer and the team does not take a break, it is considered that the solution contains a gap ("hole").

## 7. Role Reversal

If the opponent finds gaps in the solution, then, after the jury finishes its questions to the speaker and the speaker finished answering them (whether it was successful or not), the

challenging team (opponent) has the right (but not the obligation) to fill those gaps — but only those found by the opponent himself, not by the jury. The opposing team is not allowed to present its own full solution.

This process is called role reversal – the speaker becomes the opponent, and the opponent becomes the speaker. The new opponent (former speaker) may receive points for opposition, but another reversal cannot occur.

Only if the opponent has proven that the speaker’s team had no complete solution at all (and the jury agrees) — that is, the “hole” covers the entire solution — does the challenging team gain the right to present its own full solution, i.e. a role reversal takes place.

If the opponent finds no gaps - so he says the final words *"I agree with the solution"* - and their team does not take a one-minute break, the opponent sits down and his team no longer participates in the discussion of that problem.

During role reversal, either the former speaker or opponent may be replaced (each board appearance is recorded).

## 8. Validity of a Challenge

If a challenge is accepted (so the opposing team exclaims the words *"Challenge is accepted"*), its validity is not questioned (“An accepted challenge is always valid”).

If a challenge is not accepted (so the opposing team exclaims the words *"Check of correctness"*), the challenging team must present its own solution, and there are two cases:

1. The challenging team does not present a solution – the challenge is automatically invalid.
2. The challenging team presents a speaker – then the problem is discussed in the usual way, with the following distinctions:
  - a) No role reversal can occur, since the challenged team already refused to present a solution.
  - b) The key factor is the opponent’s answer to the jury’s question: “Is the solution accepted?” If the solution is not accepted, the opponent must clearly justify their objections.

A challenge is considered invalid in two cases:

1. The challenging team does not present a solution;
2. The challenging team presents a solution but explains less than half of it (worth no more than six points), and the opponent does not accept it (if the opponent accepted the solution to the problem without noticing that it was in fact nonsense, then the challenge is considered correct).

For an invalid challenge, the opponent receives six points, and the challenging team receives up to six points for correct ideas and must repeat the challenge.

## 9. Refusal to Make a Challenge

If a team has no solved problems left, it may refuse to make a challenge (to avoid making an invalid one). Then the other team gains the right to present all the remaining unsolved problems.

After refusing to challenge, a team loses the right to present solutions for the rest of the battle and becomes a “permanent opponent,” meaning it can only gain points for opposition.

## 10. Scoring System

Each problem is worth twelve points (to conceal the relative difficulty of problems). These points are distributed among the speaker, the opponent, and the jury (the jury keeps the remainder from twelve).

Points are awarded both for positive contributions to the solution and for finding mistakes and gaps/"holes".

A complete and correct solution earns twelve points, while fully successful opposition (proving the absence of any correct reasoning) earns six points.

The jury evaluates the explained portion of the solution, assigns a value to each gap/"hole," and distributes points accordingly.

**Example:** The speaker presents a solution. The opponent finds hole #1. The jury finds two more (holes #2 and #3). The speaker patches hole #2 at the board. The jury divides points: explained part – 2; hole #1 – 6; hole #2 – 2; hole #3 – 2.

A role reversal occurs, and further holes are assessed similarly, following the same principles for point calculation.

## 11. Results

After each challenge, the jury announces, explains, and records how many points each team has earned. The jury keeps a protocol including names of participants, problem number, challenge direction, time-outs, and scores. A simplified version (without names) is displayed on the board.

After the battle, each team's and jury's points are summed. If the difference does not exceed three points, the result is a draw. If time remains, the jury presents unsolved problems or shows better solutions.

## **12. Status of the Jury**

The jury is the supreme interpreter of the rules. If a situation is not covered, it decides at its own discretion, and its decision is binding.

It may dismiss irrelevant questions, stop prolonged discussions, and must justify every decision.

Comments on already discussed problems are reviewed after the battle. Scores cannot be changed retroactively.

## **13. Status of the Moderator - who is one of the 2 juries**

The moderator must maintain order and:

- give the floor to the speaker;
- announce transitions between stages;
- manage one-minute breaks;
- record questions, answers, and the opponent's opinions;
- prevent interruptions and maintain academic decorum;
- announce and explain point distribution.

## **14. Status of the Captain**

The captain organizes problem-solving, prepares participants, and defines team strategy.

The captain is the only team member who can issue challenges, take one-minute breaks, and communicate with the jury. If absent, a deputy acts in his place.

He assigns speakers and opponents for each problem and decides whether to take or give the first challenge.

## **15. Agreed Conditions**

1. Maximum appearances per participant: two (not counting the Captains' Contest).
2. Number of one-minute breaks: three.
3. Approximate presentation time: ten minutes.
4. Approximate discussion time: seven minutes.
5. Case of draw: three or less points difference.
6. Use of literature and calculators: not allowed.

7. Pre-written solutions at the board: not allowed.

## **16. Jury Guidelines**

1. The jury must know all solutions.
2. The jury shall remember, that by asking questions, it helps the speaker to finalize the solution and by interrupting the opponent, it takes away opponent's potential points.
3. If the jury (after the opponent finishes with his questions) sees a gap in the solution, it shall check whether the speaker can close it (if not - points are taken away).
4. First, the jury makes the organizational conclusions (the existence of a solution, the sufficiency of the opposition, etc.), then the points are given.
5. If the speaker is spouting complete nonsense, it's best to ask the speaker for a solution plan — nonsense never has a plan.
6. In similar cases, the jury should make consistent decisions (rule of precedent).