

# Regulations of math battle

## Overview

A math battle is a competition between two teams solving math problems. It consists of two parts. At first, teams receive problems and a time limit to solve them. While solving problems a team may use any paper books (not any electronic sources including mobile phones, computers, electronic books, etc). A team may not communicate with anybody except the jury. When the time limit elapses, the battle begins, and the teams present their solutions to each other. While a team is presenting their solution, another team is opposing it, i.e. searching for errors. If there is no solution, the other team possibly proposes theirs. The jury assesses the speaker's and opponent's presentations by awarding them points. If the teams fail to solve the problem completely or discover the errors after they discuss the suggested solution, the jury may choose to keep some points (or all of them).

When the battle finishes, there is a draw if the teams' scores differ by 0, 1, 2 or 3 points. Otherwise, the team which scores more points wins.

If the battle cannot result in a draw, an additional competition ('blitz-battle') may be announced.

## First challenge. Duel between captains.

The team which has won in the 'duel between captains' decides which of the two teams will issue the first challenge. The 'duel' takes place at the beginning of the battle. The captains receive a problem. The captain who informs the jury that (s)he would like to answer, gets this right. If (s)he gives the right answer, (s)he wins. If it is wrong, his (her) opponent wins. The jury may propose that the captains play a game instead of giving them a problem. In this case (s)he who wins the game is the winner of the 'duel'.

## Challenges

A battle consists of several rounds.

At the beginning of each round a team challenges another to present one of the problems, the solutions to which have not been presented yet. (For example, 'We challenge an opposing team to present problem #8.') After that, the challenged team declares whether it accepts the challenge or not, i.e. whether it agrees to present the solution to this problem. If so, it assigns a speaker who must present the solution. The challenging team assigns an opponent who must

search for errors in the solution. If not, the challenging team must assign a speaker, and the team which refused to answer must assign an opponent. A team willing to 'keep' their entrances by the board may refuse to assign their opponent. Then it does not take part in this round and may not change its decision.

## **Round procedure**

### *Report*

The speaker presents his (her) solution at the beginning of each round. (S)he has to give the answers to all the questions posed in the problem and prove their correctness and completion. In particular, the speaker has to prove each statement made by him (her) or refer to it as generally known. The speaker has to pursue clarity in his (her) statements. In particular, (s)he has to repeat any part of his (her) report at the request of the opponent or jury.

The time limit for a report is 15 minutes. If the speaker exceeds the time limit, the jury decides whether to allow him (her) to proceed or not.

A discussion begins after the report. (The speaker has to say 'My report is finished.')

The speaker may:

- put all the necessary information (drawings, calculations, etc) on the board before the presentation begins;
- ignore opponent's questions posed during the report;
- ask the opponent to clarify his (her) question (in particular, the speaker may propose his (her) alternative to the question: 'Am I right that you asked about ...')
- refuse to answer any question by saying that:
  - (a) s(he) has no answer to this question;
  - (b) s(he) has already answered this question (explaining when and how);
  - (c) the question is not appropriate or relevant to the set problem.

In case the opponent disagrees with reasons (b) and (c) the jury passes its judgment.

The speaker does not have to:

- explain the way in which (s)he got the answer if (s)he can prove its correctness and completion in another way;
- compare his (her) way of solution with other possibilities, in particular in terms of conciseness, beauty and appropriateness for solving other problems.

### *Opposing*

While the report is being presented, the opponent may ask questions with the speaker's agreement and may ask to repeat a part of the report or allow the speaker not to prove any facts considered obvious from the opponent's point of view. After the report is finished, the opponent may ask the speaker questions. Not more than a minute is given to consider both questions and answers to them.

By way of asking a question the opponent may:

- ask the speaker to repeat any part of his (her) report;
- ask to clarify any of the speaker's statements, in particular:
  - (a) ask to define any term ('What do you understand by...')
  - (b) paraphrase a speaker's statement in his (her) own words and ask for a confirmation ('Am I right that you claim the following:...')
- ask the speaker to prove an unobvious statement, i.e. the one which is not common knowledge (in case of controversy, the jury determines whether an issue is obvious or common knowledge; in any case, facts studied in a public high school are considered common knowledge);
- express his (her) satisfaction or well-reasoned dissatisfaction with the answer after it has been given.

The opponent must:

- ask his (her) questions in a polite and appropriate way;
- refrain from criticizing the speaker while criticizing his (her) report;
- repeat and specify his (her) questions at the request of the speaker or jury.

Following the results of the report presentation and answers the opponent may give his (her) assessment of the report and discussion in any of the ways below:

- (a) recognize the solution as correct;
  - (b) recognize the solution (answer) as mainly correct although having inaccuracies and/or problems with a necessary reference to them;
  - (c) recognize the solution (answer) as incorrect by referring to the errors in the speaker's justification of the report highlights or giving counterexamples to them, or pointing out significant gaps in the solution justification or its plan.
- If the opponent agrees with the solution, (s)he and his (her) team do not take part in this around anymore.

### **Jury participation in discussion**

After the speaker and the opponent finish their discussion, the jury asks their questions. If necessary, they may interfere earlier, too.

### **Speakers and teams**

Teams may not communicate with the speaker and the opponent during their discussion by the board. This may be done only during a half-minute break

which a team's captain may take at any moment (likewise, the opponents may also make use of this time). Each team may take no more than 6 half-minute breaks during one battle.

### **Swapping roles. Inappropriate challenging. Procedure of challenging**

If the opponent has proven that the speaker has no valid solution (this issue is resolved by the jury – see 'Awarding points' below), there are two possible options. If the challenge to participate in this round was accepted, the opponent gets the right to (but (s)he does not have to) present his (her) solution. This means that the speaker becomes the opponent and may score points for opposing. If the challenge to participate in this round was not accepted, the challenge is said to have been inappropriate. In this case the team which issued an inappropriate challenge must challenge an opponent again in the next round. In all other cases the team challenged in the current round issues a challenge in the next one.

### **Number of entrances by the board**

Every member of a team may appear by the board as a speaker or an opponent no more than two times during a battle. A team may substitute their speaker or opponent. Having said that, the appearance of the substituted one and his (her) substitute by the board each counts as an entrance. Apart from that, in case of substitution the time allocated to a team for breaks is reduced by one minute, i.e. 2 half-minute breaks (this minute may be used immediately before a substitution, though it is not necessary, in which case the opposing team may not use it either). Participating in the competition between captains does not count as an entrance by the board.

### **End of battle**

At any moment while a battle is in progress, the team which must issue a challenge may refuse to do so (it normally occurs when the team has no more solved problems and does not want to risk issuing an inappropriate challenge). Then the other team gets the right to (but it does not have to) present their solutions to the remaining problems. Having said that, the second team assigns an opponent and may get points for opposing, but it may not present their solutions even if they come up with some.

### **Awarding points**

Each problem is worth 12 points which are distributed between the speaker, the opponent and the jury following the results of the round. If the speaker has presented a correct and complete solution without relying heavily on leading questions and other reflections of the jury and/or the opponent, (s)he is awarded

all 12 points. If there are gaps discovered in the solution, the jury determines how many points they will cost the speaker following the results of the discussion. After that, the opponent immediately gets half of the worth of the gaps discovered by him. If some of these gaps were partly or completely filled during the discussion, the corresponding remaining part of their total worth is distributed between the speaker and the opponent according to their contribution to filling the gaps. However, what is recognized as an opponent's contribution can not only be the gaps filled by him (her) (in case of partial or complete role swapping), but also his (her) assistance allowing the speaker to fill the gaps by expressing heuristic arguments at the end of the report. The jury retains the rest of the points.

If the speaker himself (herself) refers to his (her) errors or gaps without his team's contribution, the opponent gets points for them as if (s)he had found them himself (herself). In particular, if the captain of the challenging team, after receiving rejection of the challenge, immediately admits that his (her) team has no solution, the opposing team gets 6 points for opposing (which in this case could come down to saying 'You have no solution'), and the challenge is recognized as inappropriate. In this case, the speaker and the opponent are not assigned and their entrances by the board do not count.

If the roles have not been swapped completely, the opponent may not get more than 6 points. The opponent who manages to prove the inappropriateness of the challenge gets 6 points regardless of the total worth of the gaps discovered.

### **Captain**

Only the captain on behalf of the team may address the jury and the opponents during a battle: issue or reject a challenge, ask for a break, etc. If the captain is by the board, (s)he leaves his (her) substitute who may address the jury. The names of the captain and his (her) substitute are to be given to the jury before problem solving begins.

While problems are being solved, the captain's main duty is to coordinate his (her) team's efforts so that as many problems as possible are solved. To this end, keeping his (her) teammates' preferences in consideration the captain distributes the problems to be solved between them, makes sure that each problem is being solved and that the found solutions are checked. The captain finds out beforehand who will be the speaker or the opponent handling a particular problem, determines the team's tactics for the forthcoming battle.

## **Jury**

The jury is the supreme interpreter of the battle regulations. It decides at its own discretion if it is beyond the scope of the regulations. Jury's decisions are mandatory for the teams.

The jury may disallow an opponent's question if it beside the point, cease a report or opponent's activities if they run over.

The jury keeps the minutes of a battle on the board. If one of the teams does not agree with a jury's decision concerning a problem, it may immediately demand a few-minute break to settle the controversy with the assistance of a jury member. After the following round begins, the score of the previous round may not be changed.

The jury maintains order. It may penalize a team for making noise, inappropriate conduct and communicating with its representative by the board. The jury must reason its decisions which do not result from the battle regulations.