

Guidelines and advice to the teams and the Jury of the ITYM

A. The Jury

There are three types of jury members:

1. *Expert Jury*:
 - Independent mathematicians with experience in the ITYM
 - Members of the IOC
2. *Temporary Jury* invited by the LOC:
 - Local mathematicians new to the ITYM
 - Team leaders
 - Guests and observers
3. *Jury Advisors* not participating in the ITYM:
 - Authors of the problems
 - External experts

The Expert Jury and Jury Advisors write reports on the problems before the beginning of the tournament, indicating the difficulty of the problems, known solutions and background.

The IOC decides the composition of the Jury in every Round and the Finals by the following rules:

- ideally, half of the jury consists of Expert Jury;
- in each group the chairman of the jury is chosen among the Expert Jury;
- the jury should be as international as possible,
- for each reported problem there should be a specialist in the field;
- team leaders cannot be members of the jury in the group where their teams participate;
- the jury for the Final consists of the most experienced mathematicians including team leaders.

Before each Round and Finals, there should be a meeting of the Jury discussing the solutions of the teams.

B. Team Leaders

The team leaders have two main tasks: scientific and managerial. As scientific advisors, the team leaders

- teach students mathematical background;
- give directions of research;
- indicate sources of related theory;
- explain how to write a paper or a review, and how to make a presentation;
- read and correct drafts of the written materials;
- help to understand other teams' materials.

However, the team leaders are not supposed to solve the problems for the students. Also, they are not allowed to help the team during the Rounds and the Finals (they may seat in the same room but not too close to the team).

C. Written Materials

Question: Is it necessary to solve all the points of the problem according to the published requirement or it is enough to solve the general one?

Answer: Undoubtedly, if the general point is solved and the solution of the rest points obviously results from it (on condition it is pointed in the report), the jury will assume that all points are solved. But it is important to remember that the Reporter should make his presentation understandable for the audience. Sometimes it becomes possible only when the solution is explained with the help of the simplest points.

Question: Is it possible to solve another problem instead of the one given in the published list?

Answer: Generally speaking, yes, it is possible. The team can deviate from the given statement of the problem if it helps to get a really interesting and meaningful result: e.g. solution of a more difficult problem, well-done solution of a similar problem or a number of solutions for a simpler problem. However,

- a new problem should be closely related to the initial one,
- it must be clear that the team has done its best on solving the initial problem.

It is the prerogative of the jury to consider and evaluate all these actions.

D. The Roles

D.1. The Reporter

The Reporter should give a brief but elaborate presentation of the results obtained by the team while solving the problem.

A good presentation would concentrate on:

- the team's own major results,
- all essential ideas,
- methods and techniques,
- illustrative examples.

The presentation should aim to be clear and self-contained, that is understandable to the people not familiar with the written materials.

The Reporter should give an outline of the work either in the beginning or in the end of the talk.

The report of the team should agree with the written materials.

Question: What to do in case you found a mistake in your solution before the presentation?

Answer: Be honest and admit it during your performance. You can present minor and quick corrections. As for the substantial errors and gaps,

mention them without the details or proofs, just saying whether you can resolve them. Before the presentation you may submit an appendix to your written materials with the appropriate corrections. Be aware that the jury might not accept it. The Jury's marks for the Reporter may not be affected by your changes. But they might have impact on the discussion with the Opponent.

Question: Which theoretical questions can be asked by the Opponent, the Reviewer or the Jury?

Answer: Any. However, the Jury expects you to know the theory directly involved in your solution. If your results are strongly based on known statements, methods or ideas, then you should understand them. On the contrary, if the asked questions are not connected to your solution but rather deal with more advanced theory, and you are not sure of the correct answer, then you can honestly say, for example: "We have not relied on or used this information in our report".

D.2. The Opponent

The Opponent analyses the Reporter's solution and presentation, pointing to inaccuracy and errors in the report, as well as to advantages of Reporter's proofs. One of the main goals of the Opponent is to initiate and maintain a fruitful discussion.

The Opponent should ask questions to the Reporter in the following situations (for example):

- you do not understand some passages in the written materials, and would like to clarify them;
- you found a mistake in the solution, and wonder how it affects the work and whether it is possible to fix it;
- some proofs are difficult, and you would like to see whether the Reporter could explain them in an easier way;
- the solution uses advanced theory, and you would like to check whether the Reporter understands it.

The results of the Reporting team must be evaluated as follows:

- correct and proven;
- correct with minor inaccuracies;
- correct but not proven (a proof is missing or there are crucial mistakes);
- doubtful;
- wrong.

A good performance of the Opponent would:

- start with appropriate and interesting questions to the Reporter;
- include a general evaluation of the Reporter's work, stating both weak and strong points in the Reporter's solution and presentation;
- not turn the discussion into an explanation of his/her own solution;
- be held in a polite and respectful way.

Question: What to do in case you haven't found any mistakes in the Reporter's work?

Answer: You could do the following:

- ask appropriate questions based on the report,
- mention the novelty of the Reporter's results and the perspective of further research,
- mention the possibility to improve, develop and apply Reporter's results in other cases,
- give a general evaluation of the Reporter's performance.

D.3. The Reviewer

The Reviewer plays the role of a referee for the discussion between the Reporter and the Opponent.

In a good performance, the Reviewer would:

- sum up the discussion;
- evaluate the performance of the Opponent (see the role of the Opponent), its correctness and objectivity;
- evaluate the answers of the Reporter,
- ask questions to both parts to clarify some points of the discussion;
- give his/her opinion, if there is a discussion where both parts disagree;
- point out all **important** elements, omitted by the Opponent, and check whether the Opponent was aware of them;
- not turn the discussion into an explanation of his/her own solution;
- behave in a polite and respectful way.

Question: What if the Opponent has done a great job and found all the mistakes in the Reporter's written materials?

Answer: Remember that your main role is to evaluate the discussion between the Opponent and the Reporter.

Question: Are the Opponent and the Reviewer allowed to talk about their own results?

Answer: The Opponent and the Reviewer shouldn't present their own results and solution of the discussed problem. The exception is the case when the results serve as an argument in debates, e.g., if the provided materials make it difficult to evaluate credibility of the proof and their own results contradict to those of the Reporter. With the permission of the Jury, team's own results and ideas can be briefly described in concluding reports and only with the purpose of a comparative analysis of the level of Reporter's results. The quality and quantity of the results provided by the Opponent, Reviewer and Observer during the discussion will not influence their final marks.

D.4. The Observer

The Observer shouldn't participate in the discussion unless something **crucial** was omitted or

misinterpreted by all other parts of the debate. Remember, if the Observer wastes time, the Jury may evaluate the performance by negative marks.

The Observer can give a particular counterexample or significant error in the logical or analytical chain of reasoning (preferably prepared in advance and available on the slide or poster). And that's it, no more! All the comments should be concrete, there should be no ambiguous or hypothetical reasoning. It may be possible to ask the jury for a permission to give a team participating in the debate an opportunity to comment on the mentioned fact(s), or the jury can ask a presenter (or other teams) themselves.

E. Marks

MARKS FOR THE REPORTER

1. Scientific part (0 to 4)

- correctness of results and proofs
- depth and originality of methods and results
- difficulty of the problem

2. Written materials (0 to 2)

- logical structure
- clarity and style (is it carefully written?)

3. Oral presentation and slides (-2 to 2)

- logical structure
- clarity and style (is it carefully explained?)
- correspondence to the written materials

4. Discussion (-2 to 3)

- answers to the questions
- comprehension of the material, knowledge of the corresponding mathematical field
- ethical behaviour

In the above table, the marks serve as a guidance. The total mark ranges from 0 to 10 and is relative to the other stages of the Round or the Final. Negative marks are especially for the violation of the regulations such as ethical misbehaviour, plagiarism and inappropriate deviation of the oral presentation from the written materials.

MARKS FOR THE OPPONENT

1. Written review (0 to 4)

- finding mistakes and determining their impact on the solution
- evaluation of the Reporter's results (depth, originality)
- clarity and style

2. Discussion (-2 to 5)

- relevance of the questions
- ability to maintain the discussion
- answers to the questions
- comprehension of the material, knowledge of the corresponding mathematical field
- ethical behaviour

3. General overview of Reporter's work (0 to 2)

In the above table, the marks serve as a guidance. The mark for the Written Review ranges from 0 to 4, and the total mark for the Discussion and General Overview — from 0 to 6. The marks are relative to the other stages of the Round or the Final. Negative marks are especially for the violation of the regulations such as ethical misbehaviour.

MARKS FOR THE REVIEWER

1. Written review (0 to 4)

- finding mistakes and determining their impact on the solution
- evaluation of the Reporter's results (depth, originality)
- clarity and style

2. General overview of the discussion (0 to 4)

- ability to sum up
- ability to evaluate the work of the Opponent and the Reporter

3. Discussion (-2 to 3)

- relevance of the remarks and questions
- answers to the questions
- comprehension of the material, knowledge of the corresponding mathematical field
- ethical behaviour

In the above table, the marks serve as a guidance. The mark for the Written Review ranges from 0 to 4, and the total mark for the Discussion and General Overview — from 0 to 6. The marks are relative to the other stages of the Round or the Final. Negative marks are especially for the violation of the regulations such as ethical misbehaviour.

MARKS FOR THE OBSERVER

1. Written review (0 to 4)

- finding mistakes and determining their impact on the solution
- evaluation of the Reporter's results (depth, originality)
- clarity and style

2. Remarks (-3 to 3)

- relevance and significance of the remarks and questions
- ethical behaviour

In the above table, the marks serve as a guidance. The mark for the Written Review ranges from 0 to 4 and the total mark for the Remarks — from -3 to 3. The marks are relative to the other stages of the Round or the Final. Negative marks are especially for waisting time and for the violation of the regulations such as ethical misbehaviour.

F. The stage time limits¹

Preparation of the Reporter

Presentation of the Jury (1st stage)

***Presentation of the Reporter* • 10 min**

Questions of the Opponent to the Reporter, answers of the Reporter, and

***Performance of the Opponent* • 8 min**

Reply of the Reporter • 2 min

Questions of the Reviewer to the Reporter and to the Opponent, answers to the questions, and

***Performance of the Reviewer* • 5–7 min**

Non-obligatory actions:

Additional remarks of the Opponent • 2 min

Additional remarks of the Reviewer • 2 min

Questions and remarks of the Observer • 3 min

Concluding remarks of the Reporter • 2 min

Questions and remarks of the Jury • 7 min

After the stage:

Pause. Discussion of the Jury • 20 min

In the end of the Round:

The Jury shows the marks. Participants may ask questions to jurors • 15 min

¹ The time limit for the presentation of the Reporter is strict (at most 10 minutes). The other time limits can be extended by the chair of the Jury if the debate is crucial.