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SLOVENIAN COMPETITIONS IN LOGIC

Abstract. Slovenia, although a small European country, has a long tradition in organizing competitions in many scientific disciplines. The competition in logic seems to be a peculiarity of the country. In the paper the general information of the competitions is given: the reason of starting them, the sources of posed problems, aims to be achieved, and organization problems. International Olympiad via Internet has also been organized.

1. Introduction

All of us who are involved in organizing various mathematical competitions are aware of the influence the competitions have upon student's future professional career. The best students on national competitions can expect to get a university job, the best on International Olympiad are able to achieve research results of a very high standard.

Besides that, to achieve its role mathematics needs a huge number of devoted teachers and applied mathematicians. For many teachers it is true that they haven't reached high scores on competitions and as consequence many of them don't even mention the existence of competitions to their students.

Some students that have high scores on junior level competitions later get interested in other disciplines, not necessarily connected with mathematics. They can't compete with students devoted to mathematics. Aren't we obliged to take care of deductive abilities of these students? The answer to this question must be "yes", since in such a way we enlarge the mathematical culture in other disciplines.

To achieve this goal the competitions must not involve difficult mathematics, it is better to emphasize the difficulty of deduction. This can be reached by competition in logic.

2. Who is competing?

Mathematics is usually the subject where pupils get best opportunity to develop their logical thinking. This is particularly true during axiomatic development of geometry. The weakness of such an approach is meeting simultaneously two subjects, namely logic and mathematics. Because of increasing difficulty of mathematics many children lose their interest for it and in this way the opportunity to learn logic is lost as well.

A better way to exercise thinking is solving logical problems that are independent of particular subject.

In regular curriculum logic is usually represented by a few hours inside mathematics. On the other side the importance of logic outside mathematics is growing – in computer science, law, medicine etc.

With the appearance of Smullyan's logical puzzles books the opportunity to systematically present logic as a set of problems has occurred. Therefore one of the aims we

posed to ourselves was to translate as many books as possible, the books that adequately introduce children to logic.

To stimulate solving of logical puzzles a competition in logic has been organized. The first national competition took place in 1986 with 123 competitors divided into three groups (aged from 13 to 15). The first round of the competition in this year was attended by more than 20000 competitors aged from 12 to 20.

Three logical problems were posed and had to be solved in 90 minutes. A score was dependent on quality of explanations.

3. Where are posed problems?

The problems were taken from foreign literature which was not available to our pupils. We use books [1–11], which have been translated into Slovenian language as well as some other sources [20–23]. Occasionally some original problems have been introduced. We have also developed some computer programs that generate logic problems. Many of them are based on an idea in [20] and are now available on web [12–19]. Here is an example of computer generated problem:

Knights and Knaves. There is an island in which certain inhabitants called "knights" always tell the truth and others called "knaves" always lie. It is assumed that every inhabitant of the island is either a knight or a knave.

In the problem there are 9 inhabitants, who are denoted by A, B, C, The first 8 of them make a statement.

A: H is a knight or D is a knight.

B: H is a knight and E is a knave.

C: I is a knight and A is a knight.

D: If I is a knave, then B is a knight.

E: F is a knave or C is a knave.

F: D is a knight and G is a knight.

G: H is a knight or C is a knave.

H: B is a knave and F is a knave.

Who is a knight and who is a knave?

Three books with problems on competitions have been also published. The competition is not connected with school curriculum and takes place at the beginning of each school year, with the intention that pupils prepare for it during summer vacations.

We have developed a curriculum for logic in elementary school as optional course. But only a few pupils take this subject.

The same problems are posed to two different age groups in order to get some information about how much the logical abilities depend on age. We get small differences with older generations and some more differences with younger generations.

4. International Olympiad in Mathematical Logic

We have started to organize competitions via Internet some ten years ago [24]. Among them are school, national, and international olympiads in mathematical logic. The advantage of such competitions is automatic scoring. This means that the number of competitors is unlimited. But so far only a few hundred competitors have been involved every year.

The task is to find the truth value of up to 100 statements in randomly chosen world of figures in less than 7 minutes. The penalty for wrong answer is 20 seconds. Your answer must be correct to continue. Except for the first discipline there is a switch »hide world«, »show world«. If the world is shown, time runs two times faster. For answering you may use N and M on the keyboard. Pressing »start again« stops the current trial and begins a new one with no need to fill the form. The world of figures uses basic ideas of Tarski's World by J. Barwise and J. Etchemendy [20]. We use only two dimensional geometric figures: triangles, squares, pentagons... A figure is small, medium or large. So a medium triangle is larger than a small pentagon. A figure is either white or grey. A figure is to the left of the other figure if the column of the first is to the left of the column of the latter one. For more information see [24].

Score

6

Place taken

Hide world B

Start again

TRUE N

FALSE M

Either figure D is not medium or figure C is large.

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