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Computer Olympiad

# The background and history of the Computer Olympiad

Computer programming involves the solving of problems by writing solutions in one of the programming languages. As high school learners are generally competitive, the idea of a computer programming competition was developed.

## General information

The International Olympiad in Informatics is a competition for high school learners in which they are required to solve problems by programming. The competition was started in 1980 by David Levy, with the first great international contest taking place in London in 1989. The competition usually takes place over two days.

During a competition the learners are typically given 4 problems which they have to solve in 5 hours on their own, by writing a computer program. During this time they may not communicate with other learners or teachers and hey may not use books or any other resources.

Learners usually write the programs using programming languages such as C, C++ or Pascal. These programs are marked by the judges who run a secret set of test data to check whether the solution is a valid one and whether it will work under all circumstances.

The newer trend is to divide the tasks into subtasks which are arranged with a growing difficulty level.

In the final round of the International competition, a live scoreboard has been used since 2010 which displays scores in real time as the programs are run and the results tested.

The prize giving is also different from many other competitions. The medals are not given to the highest three scorers, but rather according to the percentage achieved. After scoring each competitor individually over the two days the scores are added together to get the final result. The top 50% of competitors in the competition earn medals. For every 12 learners entered into the competition one will get a gold medal, two will get silver medals and three will receive bronze medals. 6 out of every 12 learners will not earn a medal at all.

## The Computer Olympiad in South Africa

The South African Computer Olympiad is one of the oldest in the world. The idea of this type of competition also took off in South Africa with the South African Computer Olympiad which has been running since 1984. The Olympiad in South Africa aims to find and develop talent and to stimulate learners to solve problems by writing computer programs.

It started on a very small scale with fewer than 100 competitors during the first two years in which the competition ran. However, the completion has grown greatly. By 2003 there were more than 11 000 entries in the competition and by 2005 it had already grown to 15000. Another leap in the number of competitors was noted in 2006 when a total of 32000 learners entered this competition. This huge growth is ascribed to the change in the format of the competition which now takes place in two rounds.

No computer is required for the first round of the South African Computer Olympiad which is essentially a talent search or aptitude test. The organizers of the competitions want to help schools and learners to identify learners who should take Information Technology and Computer Applications Technology in the higher grades, by identifying the learners who show talent in solving problems even though they do not have any experience of programming computers or using programming languages. Before the written first round of the competition was introduced only learners in grade 11 and grade 12 entered the competition when it was too late to give an input to the subject choices of learners.

In South Africa, learners can write their programs in any one of the following programming languages during the school-based round of the competition:

* + - Python
    - Java
    - Delphi/Pascal
    - C/C++

In the National round of the competition learners may not use Delphi to write their programs.

Learners who use Python are given bonus prizes sponsored by Mark Shuttleworth.

As in the International Olympiad in Informatics, the South African Computer Olympiad requires learners to solve problems in a given period of time. The programs are then marked by running the programs with certain test data to see if the program/solution will work with all types of data.

Another round of the competition was introduced in 2010 to give the opportunity for problem solving and competing against other learners in applying their computer skills to learners who do not take Information Technology and therefore do not program solutions but rather use the office package to solve problems.

## The Olympiad in other countries of the world

Since most learners like the challenge of a competition the Olympiad has grown from the first one to about 100 countries now offering similar competitions to their learners. About 80 countries compete in the annual International Olympiad in Informatics which has a different venue every year.

## The Olympiad at our school

Our school has been participating in the programming Computer Olympiad since 2006 and in the Computer Applications Olympiad since 2010.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year |  | Talent Search boys | Talent Search girls | Programming Senior Boys | Programming Senior girls | Applications Senior Boys | Applications Senior girls |
| 2008 |  | 95 | 75 | 5 | 6 |  |  |
| 2009 |  | 100 | 86 | 8 | 3 |  |  |
| 2008 |  | 112 | 89 | 9 | 5 |  |  |
| 2009 |  | 134 | 92 | 11 | 6 | 25 | 34 |
| 2010 |  | 144 | 100 | 14 | 7 | 31 | 40 |
| 2011 |  | 144 | 112 | 12 | 6 | 35 |  |
| 2012 |  | 146 | 115 | 15 | 8 | 40 |  |

# CAT and the Computer Olympiad

Although the Computer Olympiads were started to offer a competition for high school learners in problem solving by creating computer programs, a need has developed to offer a competition where learners solve problems by using existing software, i.e. an Office Package containing a word processing program, a spreadsheet application and a database application.

## The aims of CAT

The subject CAT aims at teaching and improving problem solving skills using the office packages. Learners will learn practical techniques to use the computer software to solve everyday problems. Skills in word processing, spreadsheet and database will assist the learners to solve problems. Learners will also learn to gather data and to process it efficiently to present a solution to a problem.

## The challenge the Olympiad offers the CAT learner

Learners get the opportunity to solve real-world problems when doing the PAT component of the CAT curriculum. However, as competition is a real motivator of teenagers, there was no real platform for the learners who use applications and their end-user skills to solve problems to compete against other learners in order to better their performance.

The Computer Applications Olympiad also has two rounds and offer the leaners the opportunity to solve problems in a given period of time, but unlike the programming Olympiad, it does not require learners to develop their own solutions to a problem by using a programming language but rather by using database, spreadsheet and word processor functions.

While exams concentrate on skill and knowledge, the PAT concentrates on information handling and problem solving but over time, the Olympiad offers the learners the chance to compete using their problem solving and computer skills in a short time.

As competition encourages development of skill and knowledge the competition element of the Olympiad may prove to be very beneficial for the development of the CAT learners.

# Questions and problems that can be expected in the Olympiad

The South African Computer Olympiad organizers publish sample papers on their website to give learners the opportunity to understand what type of questions will be asked in the Olympiad.

## Rationale behind the type of questions asked

The questions are asked to stimulate an interest in Science and computing to develop skills and problem solving abilities.

## Computational thinking

Computational thinking is a way of solving problems that uses a method that is also used extensively in computer programming – it calls for the analysis and logical organization of data. It uses data modelling and abstractions. It formulates problems in a way that computers can assist in the solution of the problems. It identifies and tests various possible solutions to a problem. It uses computer applications to automate solutions and generalizes and applies the process under investigation to other problems.

This recalls some of the objectives of the PAT – the analysis of problems, getting data and organizing it logically. The formulations of problems that the computer can assist with is reflected in the way that surveys and other data is set up so that the computer applications can be used to assist with finding trends and information in the raw data. The production of a solution that can be generalized to other problems is also seen in the PAT.

Open-ended questions in exam papers also rely on and test the learners’ ability to think logically and algorithmically - step by step to lead to solution to the problem. It is also possible that there are different ways to reach a solution.

This type of approach is seen in the Computer Olympiad - therefore supporting the way in which the CAT learner is attempting to solve problems.

Computational thinking leads us to ask questions that were never asked before – and therefore finding solutions to problems.

## Examples of questions

The questions in the Olympiad require problem solving. In the first round some more general questions are asked such as finding the next number in a specific sequence, etc. Questions requiring the learners to ‘crack’ a code can also be asked – the main idea is that a form of encryption in its simplest form is asked and learners have to use computational thinking to solve this problem.

Questions also include using logic or computational thinking to find the location of an object in a grid and so on.

Learners are allowed to access the website to see what the types of questions are and to practice on that type of question. The questions and solutions of previous year’s Olympiads are also available online. The questions and solution of Olympiads from different countries are also available.

In Computer Applications part of the paper learners are given some data and are asked to solve a problem using the given data. The problem may be given as a series of questions that need to be answered on the given data. Learners then have to decide how best to approach the solution – they may use various functions and formulae in a spreadsheet application or they may decide that the data would be better analysed by exporting it to a database or even word processing application. The questions would usually require a combination of methods to arrive at a solution.

## Conclusion

The Computer Olympiad offers a stimulating way for high school learners to practice their problem-solving skills and their logical and computational thinking. The competition is stimulating to young persons who like the challenge.

*ThinkQuest* is another competition that learners may want to consider. Here learners work in teams to build educational that can be shared across the world. Along the way they learn about research, writing, teamwork, and technology skills.

# Bibliography