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THE ROLE OF GAMES AND PUZZLES IN THE POPULARIZATION OF MATHEMATICS

by Miguel de GUZMÁN

SUMMARY. The main features of popularization of mathematics are described first. Then a brief analysis of the relations between games and mathematics is presented. In the third place the uses of mathematical puzzles and games for the popularization of mathematics are indicated and finally attention is directed towards some objections to the use of mathematical games.

THE POPULARIZATION OF MATHEMATICS

In September 1989 the ICMI (International Commission on Mathematical Instruction) held an international meeting in Leeds (England) on the subject *The Popularization of Mathematics.* Almost one hundred participants from twenty different countries, including mathematicians, scientific journalists and writers of mathematics for a broad public gathered during a week in order to discuss the main features and problems of this activity called *the popularization of mathematics.* The main documents for study that arose for and from this meeting have been published by the ICMI [7] and by Cambridge University Press [4]. I shall borrow freely some of the very interesting ideas from these documents, above all from the introductory paper by Howson and Kahane, in order to better frame my own thinking about the role of games in this task of popularizing mathematics.

What is popularization?

Popularization is:

sharing mathematics, its beauty and its power, with a wider public, in some cases trying to demolish the prejudices and the traditional barriers between the *two cultures,* much sturdier around mathematics than around any other science;

ICMI lecture given at the 1990 International Congress of Mathematicians in Kyoto.

trying to change the attitudes toward mathematics of many who are in need of such a change, with the deep conviction that such attitudes are strongly harmful both for the development of mathematics and for the progress of human culture;

encouraging people to be more active mathematically, with the persuasion that this can lead them towards a more pleasurable and intellectually fuller life;

developing mathematics activity in freedom, not by compulsion, trying to get away from the odious feeling about mathematics that so many of the children and adults in our civilization share.

Why popularization?

1. Some people are driven to popularize:

by a sense of guilt, at the sight of the obvious failure of their work inside the educational system;

from a desire to survive from boredom, which is more deeply felt when one considers the richness of mathematics in contrast with the poverty of our educational programs;

out of a wish to make others participate in beauties of that part of mathematics that they can more clearly perceive, and this can happen at very many different levels;

because of the feedback one receives when one considers the strong effects of popularization on all kinds of people.

2. Some of the effects of popularization are:

more attention and support from different sources, when people in authority are able to better understand the connections of mathematics with many other aspects of our culture;

to bridge the existing gaps between the mathematical community and the ordinary citizen;

to increase the social status of mathematics within our civilization;

to improve the intellectual and cultural conditions of many people.

To whom should popularization be directed? What should be popularized? By whom?

Mathematics is a very complex structure. Very different kinds of persons and many types of mathematical activity could be profitably involved in its popularization, both in an active and a passive way:

Research mathematicians and university professors. They can be both transmitters and receivers of a certain kind of popularization, through expositions which could open a specific field to outsiders. Many new ideas appearing in one area can be very useful in neighbouring fields. Certain desirable conditions should be fulfilled: real reasonable accessibility to ideas without superfluous technicalities, from an expert who truly desires and knows how to communicate his knowledge to professional mathematicians unfamiliar with his field. In my opinion this is one of the most difficult tasks in the popularization of our mathematical knowledge. This difficulty and how far we are from the ideal are quite obvious when one attends our general International Congresses of Mathematicians and becomes aware of the failures of so many of our most outstanding mathematicians to give a moderately useful glimpse of what they have done to a wide audience of *professional* mathematicians. It is quite common to follow the easy path to talk to those (how many? perhaps 100 out of 4000?) who already know.

Teachers and university students. The general trends of contemporary mathematics should be made accessible to them by experts really competent both in the field and in the necessary skills to communicate at this level. Also the main highlights of the history and evolution of a field can be of great use to illuminate it for those who approach it for the first time.

Other professionals inside and outside the academic world. There are many aspects of mathematics they perhaps do not use in their work that could throw some new light on their way of thinking and solving their own problems.

High school students. The most important aspects of the history, evolution and applications of each one of the topics they are exposed to. The lifes of the most important men and women of mathematics. The cultural impacts of mathematics on the human history.

General public. Avoiding technicalities one should try to transmit as much as possible of the impact and methods of mathematical thinking about some special subjects. The biographies of dead and living mathematicians of deep interest. Applications, ideas and facts they should know as part of the human culture.

Small children. With a correct awareness of their possible interest and capacity, by those who know how to communicate with them with great enthusiasm. Through exhibits, competitions, games,...