HOW TO DESIGN A SYMBOL FOR A NEW MATHEMATICS OLYMPICS: A MATHEMATICS PROJECT FOR GRADE 11

Nyameka Kangela[1] & Xoliswa Mbelani[2]

[1]Rhodes University, [2]Kutliso Daniels High School

The aim of this presentation is to report on how we introduced and conducted a mathematics project with our Grade 11 learners. The context of the project was the Olympic Games which were held in London in 2012. The learners were required to design an original logo for a fictitious mathematics Olympics by using graphs to define the shapes of the logo. In this project, learners were required to apply their knowledge of shapes, symmetry, graphs and functions to design a symbol for a new mathematics Olympics. We will also share our experiences of using this activity in a Grade 11 class. Learners' designs will also be demonstrated during our presentation.

WHY WE CHOSE TO TALK ABOUT THIS?

According to Curriculum and Assessment Policy Statement (CAPS) FET Band, learners should be exposed to mathematical experiences that give them many opportunities to develop mathematical reasoning and creative skills in preparation for more abstract mathematics in higher/tertiary education institutions. We wish to share with you the mathematical opportunities that the Olympics project offered to our Grade 11 learners.

CONTENT

The specification of content according to CAPS FET Band is that Grade 11 learners should:

> generate as many graphs as necessary, initially by means of point to point plotting, supported by available technology, to make and test conjectures and hence generalise the effects of the parameter which results in a horizontal shift and that which results in a horizontal stretch and/or reflection about the y axis.

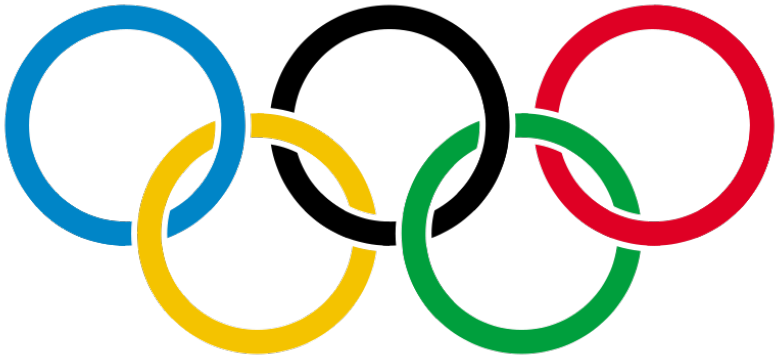
The project required learners to integrate GET mathematics such as shapes, symmetry and orientation and FET mathematics such as graphs, functions and algebra. The project encouraged learners to investigate and explore mathematical concepts in their effort to integrate various topics in the curriculum.

The worksheet that we used and given below was designed by Dr Duncan Samson and was workshopped with participating teachers of the FRF Mathematics Education Chair based at Rhodes University.

OLYMPIC SYMBOL

The symbol of the Olympic Games is composed of five interlocking rings, coloured blue, yellow, black, green, and red on a white field. The symbol was originally designed in 1912 by Baron Pierre de Coubertin, the founder of the modern Olympic Games.

Kangela, N. & Mbelani, X. (2013). How to design a symbol for a new mathematics olympics– a mathematics project for Grade 11. In Z. Davis & S. Jaffer (Eds.), *Proceedings of the 19th Annual Congress of the Association for Mathematics Education of South Africa*, Vol. 2. (pp. 91 – 93). Cape Town: AMESA.



TASK 1

You have been tasked with designing a symbol for a new *Mathematics Olympics*. Your design must adhere to the following criteria:

Your *Mathematics Olympics* logo must include at least 3 different shapes (e.g. circle, triangle, square, parallelogram, rhombus, kite, pentagon, hexagon, etc.)

The logo must contain elements of reflectional symmetry (i.e. it must have lines of symmetry – vertical and/or horizontal and/or oblique).

The logo must contain segments of at least three different graphs (e.g. straight lines, parabolas, hyperbolas, exponential functions, circles, etc.)

Adhering to the above criteria, draw a rough sketch of your design.

TASK 2

Now draw your rough sketch neatly on a Cartesian grid. *You* can decide where on the grid you would like to position your logo. Once you have drawn the logo, clearly indicate the co-ordinates of all important points (i.e. vertices of polygons, intercepts with the axes, turning points of graphs, etc.).

TASK 3

Label each graph segment in your design (including all straight line segments of any polygons) and provide the equation for each graph segment along with its domain (e.g. Graph 1 $y = 2x + 1$ where $x \in [-1; 3]$).

TASK 4

Write a detailed set of instructions that clearly explain how to draw your logo. Provide as much information as you think is necessary so that an independent party would be able to draw your logo from the written instructions.

DISCUSSION

Most of the learners enjoyed doing the project and managed to design a mathematics Olympics logo according to the given criteria. However the majority of the learners struggled to do Task 4. This could be attributed to challenges with English and

mathematical language. The majority of the learners did not understand fully what was required of them in this question. One could hardly draw the logo according to their set of instructions. Learners also found it interesting to draw a rough sketch of the logo, however, many struggled to transfer the rough sketch accurately onto a Catersian grid indicating the coordinates of all important points. This challenge presented a good opportunity for learners to learn how to use the Cartesian coordinate system to derive and apply equations such as straight lines, parabolas and other graphs. Educators found the designing of an appropriate assessment rubric that was compatible with the requirements of the project challenging and enriching.