GEOMETRY IN ART AND DESIGN

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TARGET AUDIENCE: Mathematics teachers in the Intermediate & Senior Phases.

DURATION: 2 HOURS

MAXIMUM NUMBERS OF PARTICIPANTS: Unlimited

MOTIVATION

- To enhance teachers' knowledge of mathematical concepts related to geometry in the plane.
- To foster teachers' appreciation of the role of geometry in art and design.
- To increase teachers' confidence to produce aesthetically pleasing two-dimensional original designs.
- To provide teachers with ideas that can be modified for use in primary and secondary classrooms.

CONTENT

Participants will explore:

- Tessellations occurring in art and design.
- Links between mathematics and the work of M C Escher.
- Lines of symmetry occuring in art and design and natural objects.
- Rotaional symmetry occuring in art and design and natural objects.
- Ways of incorporating art and design into their mathematics lessons.

Groves, S. (2013). Geometry in art and design. In Z. Davis & S. Jaffer (Eds.), *Proceedings of the 19th Annual Congress of the Association for Mathematics Education of South Africa*, Vol. 2. (pp. 24 – 26). Cape Town: AMESA.

PROPOSED TIME ALLOCATION FOR WORKSHOP ACTIVITIES

Activity	Time
Discussion of relevant aspects of geometry in the South African mathematics curriculum	5 minutes
Participants familiarise themselves with the MATHOMAT	5 minutes
Participants investigate tessellations in the plane, including: • Finding MATHOMAT shapes that tessellate • Finding all regular tessellations (3 in all) • Finding as many homogeneous tessellations as possibel in the time available (8 in all)	30 minutes
Discussion of the graphic works of M.C. Escher, including: • Illustrations of Escher's works • Connections to mathematics • Techniques for producing Escher-type tessellations • Examples of student work	20 minutes
Participants investigate lines of symmetry in two-dimensional shapes, including: • Finding lines of symmetry in MATHOMAT shapes • Classifying shapes according to the number of lines of symmetry • Finding the number of lines of symmetry in complex shapes	20 minutes
Participants investigate rotational symmetry, including: • Identifying rotational symmetry in MATHOMAT shapes • Classifyning shapes according to the number of rotational symmetries • Identifying rotational symmetry in complex shapes	20 minutes
Finite symmetry groups of two-dimensional figures • Introduction to finite symmetry groups • Participants identify finite symmetry groups of two-dimensional figures occurring in art and design	10 minutes
General discussion	10 minutes

HANDOUTS

Groves, S. & Grover, P. (1999). *Maths with MATHOMAT: A series of lesson plans for years 4 to 9 and beyond* (pp. 46; 87). Springvale, Vic: Objective Learning Materials.

ABSTRACT

This workshop will illustrate ways in which an analysis of geometry in art and design can be used to underpin a range of exciting lessons to address topics in the content area of Space and Shape (Geometry) of the South African *National Curriculum Statement*. Specifically, it will address Topic 3.3 *Symmetry* from the Intermediate Phase, and Topics 3.1 *Properties of 2-D shapes* and 3.4 *Transformations* from both the Intermediate and Senior Phases. Participants will undertake mini-investigations related to regular and homogeneous tessellations, lines of symmetry and rotational symmetry, using the MATHOMAT as a tool to aid their investigations. A particular focus will be the work of M.C. Escher.