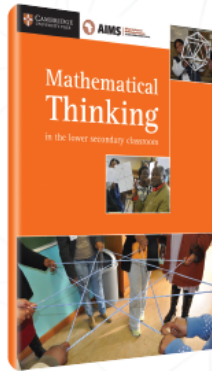


Mathematical Thinking in the Lower Secondary Classroom

MAPPING TO TYPICAL SCHOOL MATHEMATICS CURRICULUM



Written by experienced maths teachers and subject matter experts and trialled by teachers.



Mathematical Thinking in the lower secondary classroom

Edited by Christine Hopkins, Ingrid Mostert and Julia Anghileri

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"I discovered that mathematics is not only about numbers, it is a language in itself. Expressions and equations are a short way of narrating a story, they are not just numbers and symbols without meaning."

Mammudi Malatji, Lower Secondary Teacher

The first edition of the AIMSSEC series, this book is for teachers and educators who want to develop their maths teaching skills. It has been written by an international group of educators affiliated with AIMSSEC, the African Institute for Mathematical Sciences Schools Enrichment Centre.

The book has 20 chapters covering topics in number, algebra, geometry and measures, and data handling and probability. Each chapter covers one mathematical concept and addresses one of six teaching strategies. The chapters are divided into three sections:

- Workshop activities for teachers: information needed by a group of teachers for a 'self-help' workshop
- Classroom activities for learners: suggestions for a variety of activities to try in the classroom
- Changes in my classroom practice: practical advice about how to implement the teaching strategy as well as follow up activities

The books in the AIMSSEC series have been written to emphasise the use of cheap, practical resources and communication in the classroom. For example, find out how to:

- Make large 3D models from used A4 paper
- Use string to explore geometrical shapes and transformations
- Make graphs using the children themselves
- Get feedback on basic showboards made by laminating a sheet of paper
- Ask effective questions

This book provides:

- Practical support for mathematics teachers in the lower secondary classroom (ages 11-15) using cheap, practical resources
- Ideas for using technology to teach and learn mathematics – both in the classroom and away from the classroom
- Ideas for introducing mathematical concepts through an active learning approach and drawing on the activities on the NRICH website (www.nrich.maths.org) which has been built up over the last twenty years
- Activities that exemplify ways of teaching important mathematical concepts covered in all national curricula
- Material that is universally relevant, written by an experienced international writing team, all of whom have worked as teacher educators in more than one country

This book will be useful for:

- Setting up regular meetings of teachers for professional development in a district
- Encouraging independence in students training to be teachers, and can be used by:
 - Maths teachers meeting in a school or group of schools
 - Individual teachers

Each chapter in the book provides comprehensive guidance to enable teachers to run their own workshops and to advance their own professional development.

The blue links in this document go to enquiry based learning activities and to notes for teachers with solutions and suggestions for teaching the topics on the **AIMING HIGH TEACHER NETWORK**

<http://aiminghigh.aimssec.ac.za/>

In the AIMING HIGH online community teachers support each other and share ideas about teaching.

This document gives a mapping between a typical LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM and the sections in the AIMSSEC MATHEMATICAL THINKING BOOK that relate directly to each topic in the curriculum. The mapping is based on an academic year of four terms and on a spiral curriculum where the same topics are re-visited several times to reinforce and extend the knowledge and understanding of learners, but the order of work on the topics can be varied.

Buy the book online at <http://education.cambridge.org/aimssecmaths> then choose your country or region and ISBN 9781316503621 or on Amazon select aimssec maths.



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Learning activities in the AIMSSEC Mathematical Thinking Book relate directly to the topics in the school mathematics curriculum as indicated by Chapter (C) and Page (p) references.

Use the chapters in the first two years of secondary school in the early stages of work on these topics or in the third year of secondary school to review the topics and consolidate earlier learning.

Each chapter provides comprehensive guidance to enable teachers to run their own workshop, and advance their professional development, without the need of an expert leader. There are suggestions for learning and problem solving activities to use in teaching and for reflection and discussion about the underlying mathematical concepts together with discussion of teaching strategies appropriate to the topic.

The hyperlinks take you to learning activities on the AIMING HIGH Teacher Network together with solutions, Notes for Teachers and suggestions for teaching the topics, all related to the school curriculum.

LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM - AGE 11 - 12			
TERM 1	TERM 2	TERM 3	TERM 4
Whole numbers Counting forward and back C1p14 Multiples, factors, primes C1p16 Common factors & common multiples C1 Patterns of multiples seive	Common fractions Links between fractions, decimals, & pC3p29 Equivalent fractions C3p30 Fractions in a square Egyptian fractions	Functions and relationships Functions and inverse functions C8 Function Game	Integers Adding and subtracting negative numbers. Number lines C4p37 Extremes
Exponents Powerful Thinking 1	Decimal fractions Place value & decimal fractions C2p21 Divide Divide	Algebraic expressions Brackets, difference of squares C11p93 Think of Two Numbers	Numeric and geometric patterns Sequences & patterns C7p61 Calendar patterns
Construction of Geometric figures Viewing cubes	Functions and relationships Functions and inverse functions C8 Shifting times tables	Algebraic equations Word Problems, linear equations C10p85 Odd One Out	Functions and relationships Functions and inverse functions C8p69 Paper Weight
Geometry of 2D shapes Properties of 2D shapes C13p109 Triangles	Algebraic expressions From words to algebraic expressions. Brackets. C6p53 Variables C7p61 Odd squares	Graphs Teaching & Learning with Technology p173 Car Racing	Collect, organize and summarize data Asking Questions C19p157 Our Names
Geometry of straight lines Properties of parallels, angles in triangles & polygons C12p101 Ratty	Algebraic equations Developing Algebraic skills C9p77 Using algebra to solve problems C9 What's it worth?	Transformation geometry Transformations & tessellations C14p117 Transformation Art	Represent data Representing Data Graphically C20p165 Histogram
Numeric and geometric patterns Patterns on a number grid C1p15 Multiples, polygons and stars C1 Strip patterns	Area and perimeter of 2D shapes Area and perimeter C15p125 Square fence	Geometry of 3D objects Polyhedra & other 3D objects C16p133 Cube Nets	Interpret, analyse and report data Averages, bar charts & pie charts C20p165 For Younger for Older
	Surface area & Volume of 3D objects Surface area and volume C17p141 Painted Cube		Probability Provoking discussion of probability C18p149 Games of Chance



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LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM - AGE 12-13			
TERM 1	TERM 2	TERM 3	TERM 4
Whole numbers Ratio & proportion. Solving problems C5p45 One of Thirty Six	Algebraic expressions Temperature	Common fractions The Greedy Algorithm	Functions and relationships Steps
Integers Adding and subtracting negative numbers. Number lines C4p37 Target Game	Algebraic equations Symmetricality	Decimal fractions Links between fractions, decimals, % C3p29 Repetitiously	Algebraic equations Letter Land
Exponents Powerful Thinking 2 Power Matching	Construction of Geometric figures Constructing Geometrical Patterns	Theorem of Pythagoras Riding on Pythagoras 1	Graphs Teaching & learning with Technology p 173 Graphical Triangle
Numeric and geometric patterns Sequences & patterns C7p61 Sierpinski Number and Shape Patterns	Geometry of 2D shapes Properties of 2D shapes C13p109 Properties of quadrilaterals Tri-fold	Area and perimeter of 2D shapes Area and perimeter C15p125 Not So Square Fence	Transformation geometry Transformations & tessellations C14p117 Mirror Mirror
Functions and relationships Functions and inverse functions C8p69 Mind Reader		Surface area & volume of 3D objects Surface area and volume C17p141 Cuboids	Geometry of 3D objects Polyhedra & other 3D objects C16p133 Tets and Octs Puzzles
Algebraic expressions Brackets, trinomials, difference of squares C11p93 Differences of Squares	Geometry of straight lines Properties of parallels, and angles C12p101 Lattice Points	Collect, organize and summarize data Asking Questions C19p157 Travel to School	Probability Provoking discussion of probability C18p149 At Least One
Algebraic equations Word Problems & linear equations C10p85 Matching Equations		Represent data Representing Data Graphically C20p165 Best Representation	
		Interpret, analyse and report data Different averages, bar & pie charts C20p169 M, M and M	



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LOWER SECONDARY SCHOOL MATHEMATICS CURRICULUM - AGE 13-14			
TERM 1	TERM 2	TERM 3	TERM 4
Topic	Topic	Topic	Topic
Whole numbers Multiples, factors & primes. Sieve of Eratosthenes C1 Ratio & Proportion C5p45 Factors and Multiples Game	Functions and relationships Functions and inverse functions C8p69 Building Functions	Functions and relationships Functions and inverse functions C8p69 Multiple representations of algebraic relationships Undoing	Transformation geometry Transformations & tessellations C14p117 Enlargement
Integers Number lines C4p37 Ratio problems C5p45 Mixing Paints	Exponents Powerful Thinking 3 Powerful Thinking 4 Exponents	Algebraic expressions Brackets, trinomials C11p93 Take Three from Five	Geometry of 3D objects Polyhedra & other 3D objects C16p133 Icosahedron Puzzle
Common fractions Fraction Jigsaw	Construction of Geometric figures Triangular Can You Explain Why?	Algebraic equations Word problems & linear equations C10p85 How Old Am I?	Collect, organize and summarize data Asking Questions C19p157 SA Demographics
Decimal fractions Links between fractions, decimals & % C3p29 Increasing and decreasing by a percentage Doughnut Percent	Geometry of 2D shapes Properties of 2D shapes C13p109 Simssets	Graphs Teaching & learning with Technology p 173 Intersections	Represent data Representing Data Graphically C20p165 Match the Matches
Numeric and geometric patterns Sequences & patterns C7p61 Triangle Number Picture	Geometry of straight lines Properties of parallels, angles in triangles & polygons C12p101 Tessellating Triangles	Surface area & volume of 3D objects Surface area and volume C17p141 Max Box	Interpret, analyse and report data Averages, bar & pie charts C20p169 For Richer For Poorer
Algebraic expressions Brackets, trinomials C11p93 Partitioning	Area and perimeter of 2D shapes Area and perimeter C15p125 Doesn't Add Up	Theorem of Pythagoras Pythagoras Jig-Saw	Probability Provoking discussion of probability C18p149 Mathsland Lottery
Algebraic equations Word problems & linear equations C10p85 Matchless			