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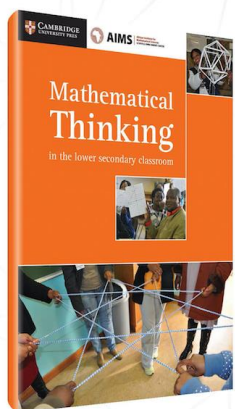
First Book in the AIMSSEC Series

# Mathematical Thinking in the Lower Secondary Classroom

## CURRICULUM MAPPING TO SOUTH AFRICAN CURRICULUM AND ASSESSMENT POLICY



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

978-1-316-50362-1

"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 NRIC website ([www.nrich.maths.org](http://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

This document provides a mapping between the South African Government CURRICULUM AND ASSESSMENT POLICY STATEMENT GRADES 7-9 MATHEMATICS (CAPS) and the sections in the AIMSSEC MATHEMATICAL THINKING BOOK that relate directly to each topic in the curriculum.

The learning activities can be used in Grade 7 or 8 to introduce a concept or in Grade 9 to check on, reinforce and extend knowledge and understanding of the concept.

The blue links in this document go to enquiry based learning activities on the AIMING HIGH TEACHER NETWORK WEBSITE and solutions, Notes for Teachers and suggestions for teaching the topics. In the AIMING HIGH online community teachers support each other and share ideas about teaching.

AIMING HIGH TEACHER NETWORK

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

Book sales at AIMSSEC Muizenberg offices or at MT courses or order online from <http://cup.co.za/products/mathematical-thinking-in-the-lower-secondary-classroom>



# Mathematical Thinking in the Lower Secondary Classroom

## CURRICULUM MAPPING TO SOUTH AFRICAN CURRICULUM AND ASSESSMENT POLICY

CAPS SP MATHEMATICS - TIME ALLOCATION PER TOPIC: GRADE 7							
TERM 1		TERM 2		TERM 3		TERM 4	
Topic	Time	Topic	Time	Topic	Time	Topic	Time
<b>Whole numbers</b> Counting forward and back C1p14 Multiples, factors, primes C1p16 Common factors & common multiples C1 <a href="#">Patterns of multiples seive</a>	9 hours	<b>Common fractions</b> Links between fractions, decimals, & pC3p29 Equivalent fractions C3p30 <a href="#">Fractions in a square</a> <a href="#">Egyptian fractions</a>	9 hours	<b>Numeric and geometric patterns</b> Patterns on a number grid C1p15 Multiples, polygons and stars C1 <a href="#">Strip patterns</a>	6 hours	<b>Integers</b> Adding and subtracting negative numbers. Number lines C4p37 <a href="#">Extremes</a>	9 hours
<b>Exponents</b> <a href="#">Powerful Thinking 1</a>	9 hours	<b>Decimal fractions</b> Place value & decimal fractions C2p21 <a href="#">Divide Divide</a>	9 hours	<b>Functions and relationships</b> Functions and inverse functions C8 <a href="#">Function Game</a>	3 hours	<b>Numeric and geometric patterns</b> Sequences & patterns C7p61 <a href="#">Calendar patterns</a>	3 hours
<b>Construction of Geometric figures</b> <a href="#">Viewing cubes</a>	10 hours	<b>Functions and relationships</b> Functions and inverse functions C8 <a href="#">Shifting times tables</a>	3 hours	<b>Algebraic expressions</b> From words to algebraic expressions. Brackets. C6p53 Variables C7p61 <a href="#">Odd squares</a>	3 hours	<b>Functions and relationships</b> Functions and inverse functions C8p69 <a href="#">Paper Weight</a>	3 hours
<b>Geometry of 2D shapes</b> Properties of 2D shapes C13p109 <a href="#">Triangles</a>	10 hours	<b>Area and perimeter of 2D shapes</b> Area and perimeter C15p125 <a href="#">Square fence</a>	7 hours	<b>Algebraic equations</b> Developing Algebraic skillsC9p77 Using algebra to solve problems C9 <a href="#">What's it worth?</a>	6 hours	<b>Algebraic expressions</b> Brackets, difference of squares C11p93 <a href="#">Think of Two Numbers</a>	3 hours
<b>Geometry of straight lines</b> Properties of parallels, angles in triangles & polygons C12p101 <a href="#">Ratty</a>	2 hours	<b>Surface area &amp; Volume of 3D objects</b> Surface area and volume C17p141 <a href="#">Painted Cube</a>	8 hours		<b>Algebraic equations</b> Word Problems, linear equations C10p85 <a href="#">Odd One Out</a>	4 hours	
<p style="color: red; font-size: small;">Learning activities in the AIMSSEC Mathematical Thinking Book relate directly to the topics in CAPS school mathematics curriculum.as indicated by Chapter (C) and Page (p) references.</p> <p style="color: red; font-size: small;">Use the chapters in Grades 7 or 8 in the early stages of work on these topics or in Grade 9 to review the topics and to consolidate earlier learning.</p> <p style="color: red; font-size: small;">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.</p> <p style="color: red; font-size: small;">The links take you to learning activities on the AIMING HIGH Teacher Network and solutions, Notes for Teachers and suggestions for teaching the topics, all related to the school curriculum.</p>				<b>Graphs</b> Teaching & Learning with Technology p173 <a href="#">Car Racing</a>	9 hours	<b>Collect, organize &amp; summarize data</b> Asking Questions C19p157 <a href="#">Our Names</a>	4 hours
				<b>Transformation geometry</b> Transformations & tessellations C14p117 <a href="#">Transformation Art</a>	9 hours	<b>Represent data</b> Representing Data Graphically C20p165 <a href="#">Histogram</a>	3 hours
				<b>Geometry of 3D objects</b> Polyhedra & other 3D objects C16p133 <a href="#">Cube Nets</a>	9 hours	<b>Interpret, analyse and report data</b> Averages, bar charts & pie charts C20p165 <a href="#">For Younger for Older</a>	3,5 hours
				<b>Probability</b> Provoking discussion of probability C18p149 <a href="#">Games of Chance</a>	4,5 hours		
revision/ assessment	5 hours	revision/ assessment	9 hours	revision/ assessment	6 hours	revision/ assessment	8 hours
<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>	



# Mathematical Thinking in the Lower Secondary Classroom

## CURRICULUM MAPPING TO SOUTH AFRICAN CURRICULUM AND ASSESSMENT POLICY

### CAPS SP MATHEMATICS -TIME ALLOCATION PER TERM: GRADE 8

TERM 1		TERM 2		TERM 3		TERM 4	
Topic	Time	Topic	Time	Topic	Time	Topic	Time
<b>Whole numbers</b> Ratio & proportion. Solving problems C5p45 <a href="#">One of Thirty Six</a>	6 hours	<b>Algebraic expressions</b> <a href="#">Temperature</a>	9 hours	<b>Common fractions</b> <a href="#">The Greedy Algorithm</a>	7 hours	<b>Functions and relationships</b> <a href="#">Steps</a>	6 hours
<b>Integers</b> Adding and subtracting negative numbers. Number lines C4p37 <a href="#">Target Game</a>	9 hours	<b>Algebraic equations</b> <a href="#">Symmetry</a>	3 hours	<b>Decimal fractions</b> Links between fractions, decimals, % C3p29 <a href="#">Repetitiously</a>	6 hours	<b>Algebraic equations</b> <a href="#">Letter Land</a>	3 hours
<b>Exponents</b> <a href="#">Powerful Thinking 2</a> <a href="#">Power Matching</a>	9 hours	<b>Construction of Geometric figures</b> <a href="#">Constructing Geometrical Patterns</a>	8 hours	<b>Theorem of Pythagoras</b> <a href="#">Riding on Pythagoras 1</a>	5 hours	<b>Graphs</b> Teaching & learning with Technology p 173 <a href="#">Graphical Triangle</a>	9 hours
<b>Numeric and geometric patterns</b> Sequences & patterns C7p61 Sierpinski Number and Shape Patterns	4,5 hours	<b>Geometry of 2D shapes</b> Properties of 2D shapes C13p109 Properties of quadrilaterals <a href="#">Tri-fold</a>	8 hours	<b>Area and perimeter of 2D shapes</b> Area and perimeter C15p125 <a href="#">Not So Square Fence</a>	5 hours	<b>Transformation geometry</b> Transformations & tessellations C14p117 <a href="#">Mirror Mirror</a>	6 hours
<b>Functions and relationships</b> Functions and inverse functions C8p69 <a href="#">Mind Reader</a>	3 hours			<b>Surface area &amp; volume of 3D objects</b> Surface area and volume C17p141 <a href="#">Cuboids</a>	5 hours	<b>Geometry of 3D objects</b> Polyhedra & other 3D objects C16p133 <a href="#">Tets and Octs Puzzles</a>	7 hours
<b>Algebraic expressions</b> Brackets, trinomials, difference of squares C11p93 <a href="#">Differences of Squares</a>	4,5 hours	<b>Geometry of straight lines</b> Properties of parallels, and angles C12p101 <a href="#">Lattice Points</a>	9 hours	<b>Collect, organize and summarize data</b> Asking Questions C19p157 <a href="#">Travel to School</a>	4 hours	<b>Probability</b> Provoking discussion of probability C18p149 <a href="#">At Least One</a>	4,5 hours
<b>Algebraic equations</b> Word Problems & linear equations C10p85 <a href="#">Matching Equations</a>	3 hours			<b>Represent data</b> Representing Data Graphically C20p165 <a href="#">Best Representation</a>	3 hours		
				<b>Interpret, analyse and report data</b> Different averages, bar & pie charts C20p169 <a href="#">M, M and M</a>	3,5 hours		
<b>revision/ assessment</b>	6 hours	<b>revision/ assessment</b>	8 hours	<b>revision/ assessment</b>	6,5 hours	<b>revision/ assessment</b>	9,5 hours
<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>	



# Mathematical Thinking in the Lower Secondary Classroom

## CURRICULUM MAPPING TO SOUTH AFRICAN CURRICULUM AND ASSESSMENT POLICY

### CAPS SP MATHEMATICS - TIME ALLOCATION PER TERM: GRADE 9

TERM 1		TERM 2		TERM 3		TERM 4	
Topic	Time	Topic	Time	Topic	Time	Topic	Time
<b>Whole numbers</b> Multiples, factors & primes. Sieve of Eratosthenes C1 Ratio & Proportion C5p45 <a href="#">Factors and Multiples Game</a>	4,5 hours	<b>Construction of Geometric figures</b> <a href="#">Triangular</a> <a href="#">Can You Explain Why?</a>	9 hours	<b>Functions and relationships</b> Functions and inverse functions C8p69 <a href="#">Multiple representations of algebraic relationships</a> <a href="#">Undoing</a>	5 hours	<b>Transformation geometry</b> Transformations & tessellations C14p117 <a href="#">Enlargement</a>	9 hours
<b>Integers</b> Number lines C4p37 Ratio problems C5p45 <a href="#">Mixing Paints</a>	4,5 hours	<b>Geometry of 2D shapes</b> Properties of 2D shapes C13p109 <a href="#">Simsets</a>	9 hours	<b>Algebraic expressions</b> Brackets, trinomials C11p93 <a href="#">Take Three from Five</a>	9 hours	<b>Geometry of 3D objects</b> Polyhedra & other 3D objects C16p133 <a href="#">Icosahedron Puzzle</a>	9 hours
<b>Common fractions</b> <a href="#">Fraction Jigsaw</a>	4,5 hours	<b>Geometry of straight lines</b> Properties of parallels, angles in triangles & polygons C12p101 <a href="#">Tessellating Triangles</a>	9 hours	<b>Algebraic equations</b> Word Problems & linear equations C10p85 <a href="#">How Old Am I?</a>	9 hours	<b>Collect, organize and summarize data</b> Asking Questions C19p157 <a href="#">SA Demographics</a>	4 hours
<b>Decimal fractions</b> Links between fractions, decimals & % C3p29 <a href="#">Doughnut Percent</a>	4,5 hours						
<b>Exponents</b> <a href="#">Powerful Thinking 3</a> <a href="#">Powerful Thinking 4</a> <a href="#">Exponents</a>	5 hours	<b>Theorem of Pythagoras</b> <a href="#">Pythagoras Jig-Saw</a>	5 hours	<b>Graphs</b> Teaching & learning with Technology p 173 <a href="#">Intersections</a>	12 hours	<b>Represent data</b> Representing Data Graphically C20p165 <a href="#">Match the Matches</a>	3 hours
<b>Numeric and geometric patterns</b> Sequences & patterns C7p61 <a href="#">Triangle Number Picture</a>	4,5 hours						
<b>Functions and relationships</b> Functions and inverse functions C8p69 <a href="#">Building Functions</a>	4 hours	<b>Area and perimeter of 2D shapes</b> Area and perimeter C15p125 <a href="#">Doesn't Add Up</a>	5 hours	<b>Surface area &amp; volume of 3D objects</b> Surface area and volume C17p141 <a href="#">Max Box</a>	5 hours	<b>Interpret, analyse and report data</b> Averages, bar & pie charts C20p169 <a href="#">For Richer For Poorer</a>	3,5 hours
<b>Algebraic expressions</b> Brackets, trinomials C11p93 <a href="#">Partitioning</a>	4,5 hours						
<b>Algebraic equations</b> Word Problems & linear equations C10p85 <a href="#">Matchless</a>	4 hours					<b>Probability</b> Provoking discussion of probability C18p149 <a href="#">Mathsland Lottery</a>	4,5 hours
<b>revision/ assessment</b>	5 h	<b>revision/ assessment</b>	8 h	<b>revision/ assessment</b>	5 h	<b>revision/ assessment</b>	12 h
<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>		<b>total: 45 hours</b>	