Study & *Master*

Study Guide 10

Mathematics

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How to use this study guide

Study & Master Mathematics Grade 10 Study Guide is your ladder to success. It builds on work from previous grades and prepares you for Grade 11 and Grade 12 Mathematics.

Mathematics requires practice, and new work builds on previous work – this is called scaffolding. It is important that there are no gaps in your scaffolding so that you do not experience difficulties later. To help make sure that you do not have gaps in your knowledge, you should use this guide as a constant friend throughout the year, and not simply when you have to prepare for exams or tests. You can use the sample tests and examination papers to practise for tests and exams and, for maximum benefit, tackle these questions in test-like conditions and work at a rate of about one mark per minute.

This book summarises the most important aspects of each topic in the syllabus and gives many examples for you to work through, and then gives you questions to answer so that you can check how well you understand the work. All the Grade 10 Mathematics learning outcomes (LOs) and assessment standards (ASs), as well as the optional assessment standards, have been covered in this book. The optional assessment standards will be examined in Paper 3 (for schools that have chosen to cover this work).

This guide has been divided into sections, one for each learning outcome and one for the optional assessment standards. At the beginning of each unit, the LO(s) and AS(s) that are the primary focus of that unit are given. All the LOs and ASs for Grade 10 Mathematics are given in the table that starts on page 451.

Features of this study guide include:

- There is a list of symbols and abbreviations on page viii.
- The opener page for each section lists the units and their contents. These pages serve as a mind map for each learning outcome.
- Sections are divided into units, which divide the work into manageable parts. Most units focus on one assessment standard.
- Links, indicated by the icon on the left, refer you to other sections in the book where a skill or technique has been addressed.
- Examples, which cover the possible problems you may face in exams, are given in each unit. These examples are relevant and up to date and are often set in a realistic South African context.
- Practice questions are given at the end of each topic in a unit. They provide a variety of question types and plenty of practice for the topic. Working through these questions will give you more than enough practice and help you tackle other problems with confidence.
- The solutions are given for each example, practice question, test and sample paper. These solutions provide more than just answers as they include all working out and often added explanations.

- How to boxes will give you hints and tips for answering questions efficiently. Often they explain short cuts for answering standard questions or show you how to set out the solution to a particular problem.

- Two sample tests are given at the end of each unit. The first test (A), which assesses your knowledge and skill at handling simple procedures, is relatively easy and includes standard questions and problems for a particular section. The second test (B), which tests your ability at working with complex procedures and problem-solving, is more complicated and questions usually require several steps. In addition, the second tests include questions that integrate material across LOs and ASs for Mathematics as well as for other subjects. You may be required to give well-reasoned arguments for answers.

- Three sample examination papers (Paper 1, Paper 2 and Paper 3) are included at the end of this guide. A memorandum, which includes full solutions, is given for each paper. These exams will prepare you for the examinations you can expect in term 2 and term 4 as part of the programme of assessment (see below). They will also begin to prepare you for the final examination in Grade 12.

Assessment

In Grade 10 all assessment is continuous. This means that it is an ongoing process that continues throughout the year. Assessment is divided into informal and formal assessment.

Informal assessment
This type of assessment will be carried out by your teacher on a regular basis, perhaps daily. Informal assessment is not used for promotional or certification purposes; it can be used, for example, as a tool to track your progress or to evaluate your prior knowledge and skills. The many different forms of informal assessment include short tests, worksheets, homework assignments, class work, and teacher observation.

Formal assessment
The formal year-long programme of assessment consists of a number of tasks you will carry out through the year (25% of the assessment for the year) and an end-of-year examination (75% of the assessment for the year). These marks will be included in reports to your parents and to the school management team. Your report will indicate a rating based on the seven-point rating scale shown below.

Rating code	Rating	Mark (%)
7	Outstanding achievement	80–100
6	Meritorious achievement	70–79
5	Substantial achievement	60–69
4	Adequate achievement	50–59
3	Moderate achievement	40–49
2	Elementary achievement	30–39
1	Not achieved	0–29

You will need to complete eight formal assessment tasks during the course of the year – two in each term. Two of these tasks will be examinations (in the second and fourth term) and two must be tests that are written under controlled conditions. The other four assessment tasks should be varied and chosen from forms such as debates, presentations, projects, simulations, written reports, practical tasks, performances, exhibitions and research projects. Below is a sample of a plan for a Grade 10 Mathematics programme of assessment.

Term	Task		Weighting	
1	1	Test	10	
	2	Investigation	10	
2	3	Investigation	10	
	4	Examination	30	converted
3	5	Project	20	to 25%
	6	Test	10	
4	7	Assignment	10	
	8	Examination		75%
Total			**100%**	

Examinations

The LOs and ASs of the curriculum for Mathematics have are divided into core ASs and optional ASs. The core ASs will be examined in Paper 1 (LO1 and LO2) and Paper 2 (LO3 and LO4), and the optional ASs in Paper 3. (Not all schools will choose to cover the optional material.) The table contains the format for the examination papers.

Term	Paper	Time	Marks
Term 2	Paper 1	2 hours	100
Term 4	Paper 1	2 hours	100
	Paper 2	2 hours	100
	Paper 3 (Optional)	1 hour (at least)	50 (at least)

The suggested distribution of marks across the various sections is given below.

Paper 1		Paper 2		Paper 3	
Bookwork: 4 marks (maximum)		No bookwork		Bookwork: 10 marks (maximum)	
LO1 Patterns and sequences	±20	LO3 Coordinate geometry	±26	LO3 Geometry	±25
LO1 Finance	±10	LO3 Transformations	±17	LO4 Descriptive statistics and interpretation	±12,5
LO2 Functions and graphs*	±23	LO3 Trigonometry*	±20	LO4 Probability	±12,5
LO2 Algebra and equations	±14	LO4 Data handling	±17		
LO2 Calculus	±23				
Total	**100**		**100**		**50**

* Trigonometric graphs can be examined in the first two papers. In Paper 1, they are incorporated into functions and graphs and in Paper 2, they are examined in the trigonometry section.

In addition to the different mark allocations for each topic, marks are allocated according to taxonomical categories (basically on how difficult the questions are). The proportions are given in the table below.

Taxonomical category	Approximate proportion of the paper (%)
Knowledge	±25
Performing routine procedures	±30
Performing complex procedures	±30
Problem solving	±15

Examples of examinations for Grade 10 can be found at http://www.thutong.org.za. If possible work through these papers as they reflect the style and content of the examinations you can expect in your final examination in Grade 12.

Symbols and abbreviations

=	equal to		s	second
≡	congruent to		min	minute
|||	similar to		h	hour
≠	not equal to		m/s	metres per second
≈	approximately equal to		km/h	kilometres per hour
<	less than		3-D	3-dimensional
≤	less than or equal to		r	radius
>	greater than		h	perpendicular height
≥	greater than or equal to		l	length
$\sqrt{n}$	the square root of n		b	breadth
LCM	lowest common multiple		A	area
HCF	highest common factor		V	volume
ˆ	angle		I	interest
△	triangle		P	principal
||	parallel to		r	annual rate of interest
⊥	perpendicular to		p.a.	per annum
t	time		tan	tangent
π	pi (approximately 3,14)		sin	sine
2 : 3	the ratio of 2 to 3		cos	cosine
%	per cent (per hundred)		θ	theta (angle)
mm	millimetre		a	gradient of line $y = ax + q$
cm	centimetre		q	y-intercept of line $y = ax + q$
m	metre		$\mathbb{Z}$	the set of integers
km	kilometre		$\mathbb{Q}$	the set of rational numbers
ha	hectare		$\mathbb{R}$	the set of real numbers
g	gram		$\mathbb{N}$	the set of natural numbers
kg	kilogram		∩	union
t	tonne		∪	intersection
ml	millilitre		P(A)	probability of event A
ℓ	litre		A'	complement of set A
kl	kilolitre		ξ	universal set