

**GUIDELINE DOCUMENT
NATIONAL EXAMINATION 2001
MATHEMATICS PAPER 1 & 2**

1. THE NATIONAL EXAMINATION PAPERS will be set on the national interim core syllabus of 1996 for Grades 11 and 12. The nature of mathematics is such that work done in the earlier grades is not excluded. An interpretation of the national interim core syllabus is included in this document.

2. NUMBER OF PAPERS

Two papers will be set:

Paper 1	Algebra $\pm 75\%$ Calculus $\pm 25\%$ (See topics weighting)
Paper 2	Analytical Geometry $25\% \pm 5\%$ Trigonometry $40\% \pm 5\%$ (Bookwork not more than 15% of Trig) Euclidean Geometry $30\% \pm 5\%$ (Bookwork not more than 30% of Geometry) General Question 5 – 10% (Optional question integrating the concepts of the Mathematics syllabus)

3. TIME ALLOCATION for each paper: 3 hours

[illegible]

5. LAYOUT OF PAPERS

- English on one page and Afrikaans on a separate page but opposite the same questions in English.
- Subsections of related questions and their diagrams, where applicable, must be on the same page.
- Use standard numbering:

1.1

1.1.1

1.1.2 etc.
- Avoid lengthy sentences.
- Units (e.g. mm, cm) should not be indicated on diagrams but must be reflected in the wording of the question.
- Subsections to questions have marks enclosed in (). Total for the question is given at the end in (. The marks must be aligned on right hand side of the page.

6. COGNITIVE LEVELS

Questions will be set according to the levels of Thinking Taxonomy (addenda on variations of Bloom's Taxonomy are included)

Questions will be graded cognitively as follows:

Cognitive Ability	Approximate Mark allocation	
	HG	SG
Knowledge and Skills	40%	50%
Understanding	40%	40%
Application and Creative Thought	20%	10%

7. GENERAL COMMENTS

- The national paper will not deviate radically from previous question papers set by provinces. Thus previous question papers will still be a reliable resource for revision.
- Words like "*Hence*"; "*Thus*"; "*Now*" suggest that previous results should be used in the solution of a follow-up question.
- Sketches provided in questions are not necessarily drawn to scale.
- No SECTION of multiple choice questions will be set.
- If necessary, answers should be rounded of to **TWO** decimal places, unless otherwise stated.
- An integrated question covering various sections of the interim core syllabus may be asked in Paper 2.
- Time should be allocated for reading the instructions on the front page of the paper before the commencement of the examination paper.

MATHEMATICS PAPER 1, NATIONAL 2001

1. APPROXIMATE MARK ALLOCATION

TOPICS – WEIGHTING	HG	SG	
Quadratic Theory, including simultaneous equations (HG includes absolute values and quadratic and absolute value inequalities)	35	25	± 5
Graphs (including semi circle, straight line, hyperbola)	30	25	± 5
Remainder and Factor Theorem	10	10	± 5
Exponents, logs, surds	30	25	± 5
Sequences and series (SG including Compound Increase/Decrease)	30	25	± 5
Differential Calculus	50	35	± 5
Linear Programming	15		± 5

NB. : The above does not mean that questions will appear in this order or compartmentalised as such. Questions may be integrated and may therefore test more than one concept.

2. GENERAL INSTRUCTIONS: (Mathematics Paper 1 HG/SG)

1. This paper consist of 1 questions.
2. Answer **ALL** questions.
3. Clearly show all working and calculations you have used in determining your answer.
4. An approved calculator (non-programmable and/or non-graphical) may be used, unless stated otherwise.
5. The attached graph paper must be used only in QUESTION 1. / Graph paper is not required.
6. Number your answers **exactly** as the questions are numbered.
7. It is in your own interest to write legibly and to present the work neatly.
8. An information sheet pertaining to formulae is provided.

3. COMMENTS

- Questions may require candidates to leave answer(s) in surd form.
- Marks for proofs, as prescribed by the interim core syllabus, may not exceed 10% of the total mark allocation.

MATHEMATICS PAPER 2, NATIONAL 2001

- 1. ORDER OF SECTIONS** – Give headings for the start of each section with some specific instructions related to the particular section (as indicated below)

Analytical Geometry

1. In this section only analytical methods may be used.
2. Accurate constructions and measurement is not to be used.

Trigonometry

(The number of decimal digits to which the answer should be rounded off is to be stated next to the particular question where it is required)

Euclidean Geometry

1. Diagrams need not be redrawn unless otherwise stated.
2. Diagrams are not necessarily drawn to scale.
3. Reasons for each statement are required.

2. APPROXIMATE MARK ALLOCATION

TOPICS – WEIGHTING	HG	SG	
ANALYTICAL GEOMETRY	50	40	± 5
Basic Analytical Geometry	25	20	± 5
Circles, straight lines and loci	25	20	± 5
TRIGONOMETRY	84	60	± 5
Basic trigonometry and reduction formulae	22	20	± 5
Trigonometric graphs	18	15	± 5
Trigonometric identities, equations and compound angles	22	10	± 5
Trigonometric formulae(sin-, cos-, area-formula)	22	15	± 5
Solution of triangles, heights and distances in 2D and 3D			
EUCLIDEAN GEOMETRY	66	50	± 5
Circles and angles in circles	22	15	± 5
Circles, cyclic quadrilaterals and tangents	22	15	± 5
Proportionality and Similarity	22	20	± 5

NB. : The above does not mean that questions will appear in this order or compartmentalised as such. Questions may be integrated and may therefore test more than one concept.

3. GENERAL INSTRUCTIONS

1. This paper consist of 1 pages, a diagram sheet and a formula sheet. Please ensure that your paper is complete.
2. Answer **ALL** questions.
3. All the necessary working details must be shown with your answer.
4. Clearly number all your answers correctly.
5. The figures in this question paper are not drawn to scale.
6. A set of axes are supplied on the diagram sheet for drawing the graphs of the trigonometric functions of Question 1.
7. The figures of Questions 1, 1, 1, ... are supplied on a diagram sheet. You need not redraw these figures.
8. Detach the diagram sheet from your paper, fill in your examination number on it and insert it in the **FRONT** of your answer script.
9. Non-programmable calculators may be used unless the question states otherwise.
10. Round off your answers to **TWO** decimal digits correctly unless the question states otherwise.

4. GENERAL COMMENTS.

ANALYTICAL GEOMETRY

Apply the interim core syllabus, noting the following:

- In this topic the use of appropriate diagrams on the Cartesian plane may serve as a useful aid in solving problems. Learners are encouraged to attempt all problems in conjunction with diagrams.
- For SG the equation of a tangent may be asked provided that it contains questions which lead up to the equation.
- In questions related to loci, final equations can relate to figures not required by the syllabus, provided the candidate does not have to state what the shape of the figure is. Only the description for straight lines and circles are permitted. For SG the circle must have the centre at the origin.
- The final(standard) form of equations in answers need not be given, unless the form of the equation is stipulated in the question.
- No proofs are required for Analytical Geometry formulae.

TRIGONOMETRY

Apply the interim core syllabus, noting the following:

- Not more than 15% of the marks in the Trigonometry section may be based on bookwork.
- Avoid using x , y when naming angles in a Cartesian plane.
- Proofs of identities using fundamental identities can be asked on HG and SG.
- Only ONE deviation from the basic trigonometric function for graphing purposes will be examined in the same graph.
- If θ is used as the independent variable in trigonometric functions, the horizontal axis should be labeled θ .
- Axes for the trigonometric graphs may be supplied on the diagram sheet.
- Proofs of the sine, cosine and area rules for specific cases, e.g. acute angled or obtuse angled triangles, are examinable.

- Rounding off of an answer should only occur in the final step of a calculation.

GEOMETRY

- Not more than 30% of the marks of the geometry section of the paper will be based on theory or bookwork in Grade 11 and Grade 12.
- The sine rule cannot be used for the proof of similar triangles.
- Not more than one converse may be asked in one paper.
- Where theorems have more than one diagram the one required for the proof should be given in the paper and candidates should be instructed to use the given diagram.
- It is recommended that the application of theorems be given accurately and in conventional form e.g. if $\triangle ABC \parallel \triangle PQR$ then $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$
- Marks should be given for the statement AND significant reasons in geometry. At the end of a rider 1 mark can be awarded for the final reason.
- Abbreviations, that are clearly understandable, are acceptable for reasons.
- In Geometry use different letters for subsequent diagrams, eg. the theorem may use $\triangle ABC$ and the question following the theorem could have $\triangle PQR$.
- Labeling of angles in diagrams should show A_1, A_2, B_1, B_2, B_3 , etc.
- Diagrams are labeled according to the question number. When transferred to the diagram sheet, they carry the same numbering.

Mathematics Formula Sheet (HG and SG)

Wiskunde Formuleblad (HG en SG)

Algebra

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$T_n = a + (n - 1)d$$

$$T_n = a \cdot r^{n-1}$$

$$S_\infty = \frac{a}{1 - r}$$

$$A = P \left(1 \pm \frac{r}{100} \right)^n$$

$$S_n = \frac{n}{2} (a + l)$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

Trigonometry / Trigonometrie

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

Analytical Geometry / Analitiese Meetkunde

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$x^2 + y^2 = r^2$$

$$(x - p)^2 + (y - q)^2 = r^2$$

CLASSIFICATION OF QUESTIONS ACCORDING TO COGNITIVE LEVELS

CATEGORY	DESCRIPTION
KNOWLEDGE	The recall of content which was encountered first of all in the teaching situations, e.g. facts, notation, conventions, laws, concepts, definitions.
SKILLS	This refers to well defined procedures/methods which the learners has learnt/practised to carry out with ease and the necessary accuracy. The question set in the paper requires no decision-making and the choice of method for its solution is obvious, e.g. • Simplification of expressions • Solutions of standard equations • Simple calculations e.g. that requires substitution into a formula • Drawing of simple/standard graphs from a given function • Use of mathematical instruments such as calculators etc.
UNDERSTANDING	This refers to combining of different actions (operations, methods, concepts, information) to solve a problem. The necessary actions are easily recognisable when the question is read with understanding so that the learner knows WHAT to do, and WHY he/she is doing it. It also includes the ability to TRANSLATE from one symbolic form (representation) to another, to INTERPRET the essential meaning of wording or description of the question. Furthermore the learner has to recognise a tendency, pattern or idea and to generalise by means of a process of extrapolation
APPLICATION	The ability that is required here is very similar to that which applies to UNDERSTANDING, but the required actions are more difficult to recognise because the problem is of a different type to those which have been seen before in the teaching situation and is thus relatively unknown. Although the knowledge, principles and methods that are to be used are known, the method of solution is not implicit in the situation
CREATIVE THOUGHT	This refers to the ability to think originally and to handle material in a way that is new to the learner. This requires an analysis of the material into its constituent parts and then a synthesis of these parts to form a new whole.

MATHEMATICS												
PAPER: FIRST PAPER				HG			Name:					
Mark Analysis							Designation					
Topic & Concepts		Weighting	1	2	3	4	5	6	7	8	9	Total
Quadratic Theory	Solving Equations											
	Sim. Eqns											
	Nature of roots											
	Abs. Values											
	Inequalities											
	Word problems											
Graphs	St. line											
	Semi circle											
	Hyperbola											
	Parabola											
	Abs. Value											
	Exponential											
	logarithmic											
Remainder and Factor theorem												
Exponents,												
Logs												
Surds												
Sequences and series												
Arithmetic	T_n											
	S_n											
Geometric	T_n											
	S_n											
	Convergence and S_∞											
Calculus	First principles											
	Rules											
	Rate of change (average)											
	Rate of change (instant)											
	Tangents											
	Graphs											
	Optimisation (max/min values)											
Linear Programming												
TOTAL		200										
COMMENTS												

MATHEMATICS

PAPER: SECOND PAPER

HG

Name:

Mark Analysis

Designation

Topic & Concepts	Weighting	1	2	3	4	5	6	7	8	9	Total
ANALYTICAL GEOMETRY											
Distance formula											
Midpoint formula											
Gradient formula & inclination											
Collinear points											
Parallel & perpendicular lines											
Equations of s straght line											
Equation of circles											
Tangents											
Secants & points of intersections											
Loci											
Trigonometry											
Basics											
Calculators											
Relationships and identities											
Solving equations											
Graphs											
Compound angles											
Trig formulae											
Proofs											
Solution of triangles											
Heights and distances											
Geometry (Gr 11)											
Perp bisector of chords											
Angles at centre											
Angles in same segment											
Angle in semi circle											
Cyclic quads											
Tangents											
BOOKWORK											
Geometry (Gr.12)											
BOOKWORK											
Proportion											
Similarity											
TOTAL	200										

COMMENTS

[illegible]