Report of the

Ministerial Panel established to review the

Grade 12 NSC Mathematics Examination Papers of November 2008

Introduction

The Minister of Education, Ms Naledi Pandor, announced at a meeting of the Committee of Education Ministers on 12 January 2009 that a panel of mathematics experts would be constituted to provide advice on the standard of the Senior Certificate Mathematics examination papers of November 2008.

This request arose after criticism of the standard of the mathematics examination papers by two different groups. The first was from a group called the Concerned Mathematics Educators (CME) who released a press statement on 5 January 2009 claiming that the November examination papers were "watered down" and that the "standard of the Mathematics exam for 2008 had dropped to an unacceptable level". Furthermore, the Concerned Mathematics Educators claimed that students with more than 50% on the mathematics papers were not necessarily prepared to cope with "Mathematics related courses such as Engineering, Architecture, and Business Science at tertiary institutions".

The second recorded criticism was from academics and commentators who expressed concern through the media (see: *e tv* interviews 30 December 2008; *The Star*, 3 January 2009; *Business Day*, 6 January 2009;). They suggested that since the numbers of learners (63 035) passing Mathematics with more than 50% represented a significant increase from the approximately 28 000 learners who had passed Higher Grade Mathematics at the 40% level in 2006 (28 156) and 2007 (28 263) it should be asked whether the 2008 results at this level were comparable to Higher Grade passes in previous years.

On 21 January 2009 the Minister of Education approved the following persons to serve on the Panel for Mathematics (abridged *curriculum vitae* for each panel member are included in Appendix A):

Mr A. Brombacher (Chair)	Private consultant
Ms A. Kitto	Private Consultant
Prof. M. Setati[*]	University of South Africa
Nominee	Association for Mathematics Education of South Africa (AMESA) AMESA nominated: • Mr Aarnout Brombacher; • Ms Alison Kitto; • Mr Khangelani Mdakane; • Mr Marcus Bizony[**]; and • Mr Lwazi Mosheqane
Nominee	South African Mathematical Society (SAMS) / The South African Mathematics Foundation (SAMF) SAMF nominated: • Dr Belinda Huntley

[*] Professor M Setati was not able to participate and nominated Dr G Moche in her place.

[**] Mr Marcus Bizony was not able to participate and Ms Jenny Campbell replaced him.

Brief

The brief, established by the Minister of Education, was that the Panel would assess the levels of complexity of the Mathematics examination question papers to determine the standard set for the subject in the 2008 National Senior Certificate examination and to compare this with the question papers set in previous Senior Certificate examinations.

In particular, the panel was asked to advise whether those students who scored at or above the 50% level on the NSC Mathematics Examination Papers of November 2008 would historically, and in the opinion of the panel, have passed Mathematics at the Higher Grade level.

Methodology

The Panel met on Monday 26 January 2009 in Pretoria and considered the following:

- Two independent item analyses of the NSC Mathematics Examination Papers of November 2008;
- A cohort analysis comparing the learners who wrote the NCS Mathematics Examination Papers in November 2008 with the learners who wrote Mathematics in previous years;
- A brief curriculum analysis; and
- The impact that a change in curriculum may have on performance in a subject.

Item analyses

The detailed Item analysis of the two examination papers (Paper 1 and Paper 2) conducted by two independent groups of experts were critiqued and compared.

The first analysis was conducted by the members of the AMESA (Western Cape) branch on 27 November 2008 as part of their annual examination review meeting. For this meeting a team of teachers developed an initial item analysis that was tabled at the meeting (attended by some 75 teachers) for debate and the establishment of consensus. The panel worked with the analysis agreed on by the meeting. The second analysis was developed by the Mathematics team members of the UMALUSI *Maintaining Standards Research* (UMALUSI, 2008 and ongoing) programme. Both analyses classified each item on the examination papers in terms of its cognitive demand, where the cognitive demand was, in turn, established according to the Mathematics Assessment Taxonomy described in the *Mathematics Subject Assessment Guideline* (SAG) (p. 13, DoE, 2008). But for the fact that such item analysis is not an exact science and there will, by the nature of the exercise, be some variation in the allocation of items by different people there was a reasonably high level of agreement between the findings of the two groups of experts (see Table 1). The actual analysis used by the Panel are provided as Appendix B and Appendix C of this report.

Table 1 reports on the proportion of marks allocated to each of the levels of the assessment taxonomy in terms of the analysis by each expert group. These proportions are compared with the proportion recommended by the SAG. The right hand column for each expert group shows the proportion of marks allocated to the combined lower two levels of the taxonomy and the combines upper two levels of the taxonomy. What both analyses clearly reveal is that there were insufficient marks allocated to questions at both the *knowing* (15% and 9,5% respectively versus the 25% recommended in the SAG) and *solving problems* (8,5% and 4% respectively versus the 15% recommended in the SAG) levels of the taxonomy. The

table also clearly shows that although more than the recommended 55% of the marks were allocated to the lower two levels of the taxonomy, the majority these marks were allocated to the *routine procedures* level – hence making it harder than it should have been to pass the paper at the 30% level.

Assessment taxonomy level and recommended allocation of marks (DoE, 2008)	Results of the AMESA (WC) analysis				Results of the UMALUSI analysis			
	P1	P2	Total		P1	P2	Total	
Knowledge (25%)	23%	7%	15%	63,5%	6%	13%	9,5%	71,5%
Routine procedures (30%)	36%	61%	48,5%		66%	58%	62%	
Complex procedures (30%)	27%	29%	28%	36,5%	23%	26%	24,5%	28,5%
Solving problems (15%)	14%	3%	8,5%		5%	3%	4%	

Table 1: Summary of item analysis for the NSC Mathematics November 2008 examination papers

Cohort analysis

The Panel considered the following historical and other data:

- The number of learners who achieved a score of 40% or more on the Higher Grade in both 2006 and 2007 -- 28 156 and 28 263 respectively.
- The number of learners who achieved a score of 70% or more on the Standard Grade in both 2006 and 2007 – 13 439 and 14 946 respectively.
- The number of learners who achieved a score of 60% or more on the Standard Grade in both 2006 and 2007 – 26 029 and 28 890 respectively.
- Observations made in the study *From Laggard to World Class* (Centre for Development and Enterprise, 2004) including:
  - "… in 1998 41% more SC maths learners could have passed maths HG than did so" (p. 57)
  - "In terms of numbers, among learners who did not write mathematics 53 283 more learners could have passed in 1998, and 49 439 in 2000. However, among this group the potential for extra HG passes was relatively small: 3 644 in 1998 and 3 728 in 2000." (p. 58)

Curriculum analysis

The Panel noted that there were some changes in the curriculum from the NATED Mathematics to the NCS Mathematics and in particular that Euclidean Geometry was no longer being examined in the main papers (of course it is still examined in the optional Paper 3). This is significant in that historically many learners were not taught the Euclidean Geometry component effectively and by implication these students would have had a greater access to more of the examination paper in 2008.

The Panel also noted that the core curriculum contains several topics that were prescribed only for Higher Grade in the NATED curriculum, in particular: quadratic inequalities, linear programming and compound angles. Furthermore, the Panel noted that several new topics such as the mathematics of finance and the

new approach to functions are at a level of cognitive demand that is comparable with the demand of the NATED Higher Grade subject.

The impact of a change in the curriculum

The Panel noted that a change in curriculum brings with it a great deal of energy. While in some cases teachers are, understandably, frightened by the change, in general the change causes teaches to examine their teaching practices; their understanding of the topics they are teaching (in particular the new topics); and the efforts they make in preparing their students for an examination for which they have no precedent. In addition to the above the introduction of a change in curriculum brings with it a wide range of interventions both large and small from workshops for teachers on the new topics to support for learners in various forms.

Findings

In light of the item analysis and the other considerations described above, the Panel is of the opinion that:

- Those learners who scored 50% or more on the 2008 NSC Mathematics papers would historically have passed mathematics HG at the 40% or higher level.
- The examination did not adequately differentiate between learners in the 60 - 69%; 70 – 79%; and 80 – 100% bands. That is, the paper did not have enough questions (15%) at the "solving problems" level of the taxonomy (as per the SAG). This suggests that fewer candidates would probably have attained distinctions (>80%) had there been more questions at the "solving problems" level of the taxonomy.
- The examination did not provide enough questions (25%) at the "knowledge" level of the taxonomy (as per the SAG). The impact of this is that there were possibly too many learners who failed the subject unnecessarily. This is not to say that all who wrote the subject should have passed, indeed some should rather have taken Mathematical Literacy but there would have been many students who deserved to pass the subject (at the >30% level) who did not have adequate opportunity to achieve the required marks.

Furthermore the Panel also notes that:

- While the CME make the observation that learners with more than 50% on the mathematics papers were not necessarily prepared to cope with "Mathematics related courses such as Engineering, Architecture, and Business Science at tertiary institutions", it is wrong to assume that by comparison all learners who scored more than 50% on the HG papers were adequately prepared to cope with such courses – the Panel members working at institutions of higher education suggested that only A and B symbols on HG were historically good predictors of success in these courses – that is success without some form of initial bridging and/or support programmes.

Appendix A: Panel members

Name and qualification	Short biographical description of expertise with respect to the deliberations of the panel (100 words)
Aarnout Brombacher (Chair) BSc (Wits) HDE (UCT) MA (Georgia, USA)	Former Head of Mathematics at Westerford High School, former President of AMESA and current chair of the AMESA Curriculum Committee. Consultant in the field of Mathematics education with special interest in teacher training, materials development and research related to curriculum implementation. Has developed materials to support the introduction of the NCS Mathematics and Mathematical Literacy curricula and has trained subject advisors and teachers across the country to implements the same.
Alison Kitto BA Hons (Mathematics Education) (Wits.); BEd (Educational Management) (UNISA)	Member of the Ministerial Committee responsible for the design of the new curriculum. Taught mathematics at various schools in Gauteng for more than 30 years. Lecturer in the Department of Mathematics at the University of the Witwatersrand for 6 years. Chairman of the Organising Committee of the first AMESA National Conference in 1994. Headmistress of Pretoria High School for Girls for 8,5 years. Examiner of both Mathematics and Additional Mathematics for the old Transvaal Education Department and for the Gauteng Education Department. Taught students in Mamelodi and Thembisa. The most recent of these experiences was a 50 hour intervention programme ahead of the 2008 examinations.
Belinda Huntley PhD	Belinda Huntley is a lecturer in the School of Mathematics, Wits University, and a member of SAMS/SAMF and AMESA. She is the coordinator of the first year Mathematics Major course at Wits. She has a doctorate in Science and Mathematics Education, with her research interest in assessment. In obtaining her doctorate, she has been extensively trained in the Rasch model of statistical analysis. Dr. Huntley has been a member of the National Benchmark Project since its conception, developing test items and involved in test item analysis. She was on the SAMS panel to review the NSC exemplar papers .She also coordinated the screening process for the new NSC mathematics textbooks In 2008,she was involved in developing and teaching curriculum material for the NSC Maths Paper 3 .
Jenny Campbell BSc; HDE (Stellenbosch) MSc (Education) (Baylor University, Waco, Texas)	Head of Mathematics at Bergvliet High School from 2000 - 2008. Currently teaching Mathematics at Diosesan College in Cape Town. Involved in AMESA Western Cape Mathematics Examination Reviews for many years. Tasked with the responsibility of preparing the item by item analysis for both HG and SG papers on several occasions. Invited to attend and address a group of teachers and lecturers at a meeting held at UCT in 2007 to allow for interaction between the different role players in education of learners in both the FET and Universities. Attended NBT workshop in Cape Town and invited to attend AARP workshop. Has taught Additional Mathematics and more recently Advanced Programme Mathematics. Has experience in teaching learners of very different levels of ability.
Lwazi Mosheqane	
Gugu Moche	
Khangelani Mdakane Secondary Education Diploma (Specialising in Grade 11 and 12 Mathematics), and Bachelor of	Has taught Matric Mathematics for about 25 years producing three distinctions in 2007 and two distinctions in 2008 respectively. A member of the “User Groups” in the establishment of the Independent Examination Board. Actively involved in mathematics teacher development in various structures including Gauteng Department of Education Districts and in AMESA branches and at Regional level. Has successfully represented AMESA Gauteng by presenting workshops in algebra, trigonometry, and curriculum matters, etc at National Annual Congresses. As AMESA Gauteng Regional Branch Organiser, he has established six AMESA branches in Gauteng.

Arts (Specialising in Statistics) (Vista University) Bachelor of Education (Specialising in Mathematics Curriculum) (University of Johannesburg)	

Appendix B: Item analysis developed by the AMESA Western Cape Branch on 27 November 2008

2008 NSC Mathematics Paper 1

Summary	Taxonomy level	I	II	III	IV	Total
	Recommended proportion of marks (SAG)	25%	30%	30%	15%	100%
	Actual marks	34	54	41	21	150
	Actual marks as a percentage	22,67%	36,00%	27,33%	14,00%	100%

Question 1	Algebraic manipulations - Equations					26
1.1.1	solving - factorising	3				
1.1.2	solving - formula	5				
1.1.3	Inequality		5			
1,2	simultaneous equn		8			
1,3	determine value of, x given			3		
1,4	roots				2	

Question 2	Patterns and sequences					21
2.1.1	recognise pattern	2				
2.1.2	sum of arith and geo			7		
2.2.1	quadratic pattern recognition		2			
2.2.2	nth term quadratic pattern		6			
2.2.3	Which term is 330			4		

Question 3	Patterns and sequences					7
3,1	nth term geo		1			
3,2	value of x - convergence		3			
3,3	sum to infinity		3			

Question 4	Functions (hyperbola)					7
4,1	equation of hyperbola	4				
4,2	equn of line to obtain y = f(x)				3	

Question 5	Functions (expo and parabola)					15
5,1	sketch of expo and parabola		8			
5,2	sketch of log graph	2				
5,3	parabola shift			2		
5,4	show h(x + 0.5) = 2h(x)				3	

Question 6	Trigonometric functions					6
6,1	equns of asymptotes	2				
6,2	transformation of tan(x - 45) to tan (45 - x)				2	
6,3	new equn of sine wave			2		

Question 7	Annuities and finance					17
7,1	compound interest	4				
7.2.1	value of tractor in 5 years		3			
7.2.2	monthly deposit			6		
7.2.3	new deposit after withdrawals				4	

Question 8	Calculus					8
8,1	basic principles	5				
8,2	rules of differentiation		3			

Question 9	Calculus					18
9,1	using roots for length	2				
9,2	x-coord of turning point			4		
9,3	equn of tangent			5		
9,4	value(s) of k - three roots				3	
9,5	x-coord for point of inflection				4	

Question 10	Calculus					9
10,1	height i.t.o radius	2				
10,2	expression for SA		2			
10,3	minimum SA			5		

Question 11	Linear Programming					16
11,1	constraints	3				
11,2	represent constraints		5			
11,3	feasible region		1			
11,4	objective function		1			
11,5	max profit with search line		3			
11,6	alternate optimal function			3		

2008 NSC Mathematics Paper 2		Taxonomy level			
	QUESTION 1	I	II	III	IV
1.1	$M\left(-\frac{1}{2};-\frac{1}{2}\right)$	2			
1.2	$\text{Midpoint}_{BD}=\left(-\frac{1}{2};-\frac{1}{2}\right)$ AC and BD bisect each other at $M\left(-\frac{1}{2};-\frac{1}{2}\right)$		3		
1.3	$m_{AD}=\frac{2}{3}$ and $m_{DC}=-\frac{3}{2}$ $\Rightarrow AD\perp DC$ $\therefore A\hat{D}C=90^\circ$		4		
1.4	$AD=\sqrt{13};\quad DC=\sqrt{13};\quad BC=\sqrt{13};\quad AB=\sqrt{13}$ and $A\hat{D}C=90^\circ$ ABCD is a square (rhombus with a right angle) **or** ABCD is a paralellegram (AC and BD bisect each other at $M\left(-\frac{1}{2};-\frac{1}{2}\right)$ ABCE is a rectangle ($A\hat{D}C=90^\circ$) $AD=\sqrt{13}$ and $DC=\sqrt{13}$ ABCD is a square (rectangle with equal sides)		3	3	
1.5	$\tan\theta=-\frac{3}{2}$ $\theta=180^\circ-56,3^\circ$ $=123,7^\circ$		3		
1.6	$OC=\sqrt{5}>2$, so C lies outside the circle.			2	
	QUESTION 1	2	13	5	0

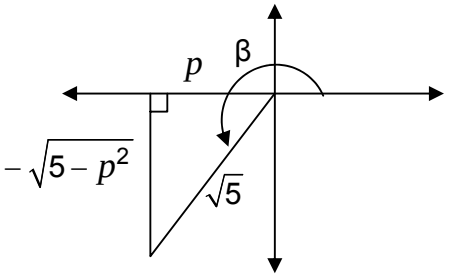
	QUESTION 2	I	II	III	IV
2.1	$x^2 + y^2 = 169$ Too many marks?		3		
2.2	$y = \frac{5}{12}x$		2		
2.3	P(–12;– 5)		2		
2.4	$m_{PQ} \times m_{QR} = -1 \quad (\text{rad} \perp \text{tangent})$ $m_{PQ} = \frac{5}{12}$ $\Rightarrow m_{QR} = -\frac{12}{5}$		2		
2.5	$y - 5 = -\frac{12}{5}(x - 12)$ $y = -\frac{12}{5}x + \frac{169}{5}$		3		
2.6	Substitute $(t;-1)$ into $y = -\frac{12}{5}x + \frac{169}{5}$ $\Rightarrow -1 = -\frac{12}{5}t + \frac{169}{5}$ $-5 = -12t + 169$ $t = \frac{174}{12} = \frac{29}{2}$ **OR** $m_{QR} = \frac{-6}{t - 12} = -\frac{12}{5}$ $\Rightarrow -12t + 144 = -30$ $t = \frac{174}{12} = \frac{29}{2}$			2	
2.7	$(x - 12)^2 + (y - 5)^2 = 169$		3		
	QUESTION 2	0	15	2	0

	QUESTION 4	I	II	III	IV
4.	$P(x;y) \rightarrow P'(x\cos\theta - y\sin\theta;\quad y\cos\theta + x\sin\theta)$ $\Rightarrow P'\left(2\cos\left(-45^\circ\right) - 3\sin\left(-45^\circ\right);\quad 3\cos\left(-45^\circ\right) + 2\sin\left(-45^\circ\right)\right)$ $= P'\left(\frac{5\sqrt{2}}{2};\frac{\sqrt{2}}{2}\right)$ $= P'(3{,}54\,;0{,}71)$			7	
	QUESTION 4			7	

	QUESTION 5	I	II	III	IV
5.1.1	$\text{L.H.S.} = \frac{\left(-\tan 60^\circ\right)\left(-\sin 60^\circ\right)\left(\cos 14^\circ\right)\left(-\sin 45^\circ\right)}{\left(\cos 14^\circ\right)\left(-\cos 45^\circ\right)}$ $= \frac{\left(-\frac{\sqrt{3}}{1}\right)\left(-\frac{\sqrt{3}}{2}\right)\left(-\frac{1}{\sqrt{2}}\right)}{\left(-\frac{1}{\sqrt{2}}\right)}$ $= \frac{3}{2}$ $= \text{R.H.S.}$		6		
5.1.2	$\text{L.H.S.} = \cos\left(45^\circ + 30^\circ\right)$ $= \cos 45^\circ \cos 30^\circ - \sin 45^\circ \sin 30^\circ$ $= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$ $= \frac{\sqrt{3}-1}{\sqrt{2}\times 2} \times \frac{\sqrt{2}}{\sqrt{2}}$ $= \frac{\sqrt{2}\left(\sqrt{3}-1\right)}{4}$ $= \text{R.H.S.}$		4		

5.3	$\text{L.H.S.} = \sin 2x.\tan x + \sin^2 x$ $= 2\sin x\cos x \times \frac{\sin x}{\cos x} + \sin^2 x$ $= 2\sin^2 x + \sin^2 x$ $= 3\sin^2 x$ $= \text{R.H.S.}$			6	
	QUESTION 5		10	6	

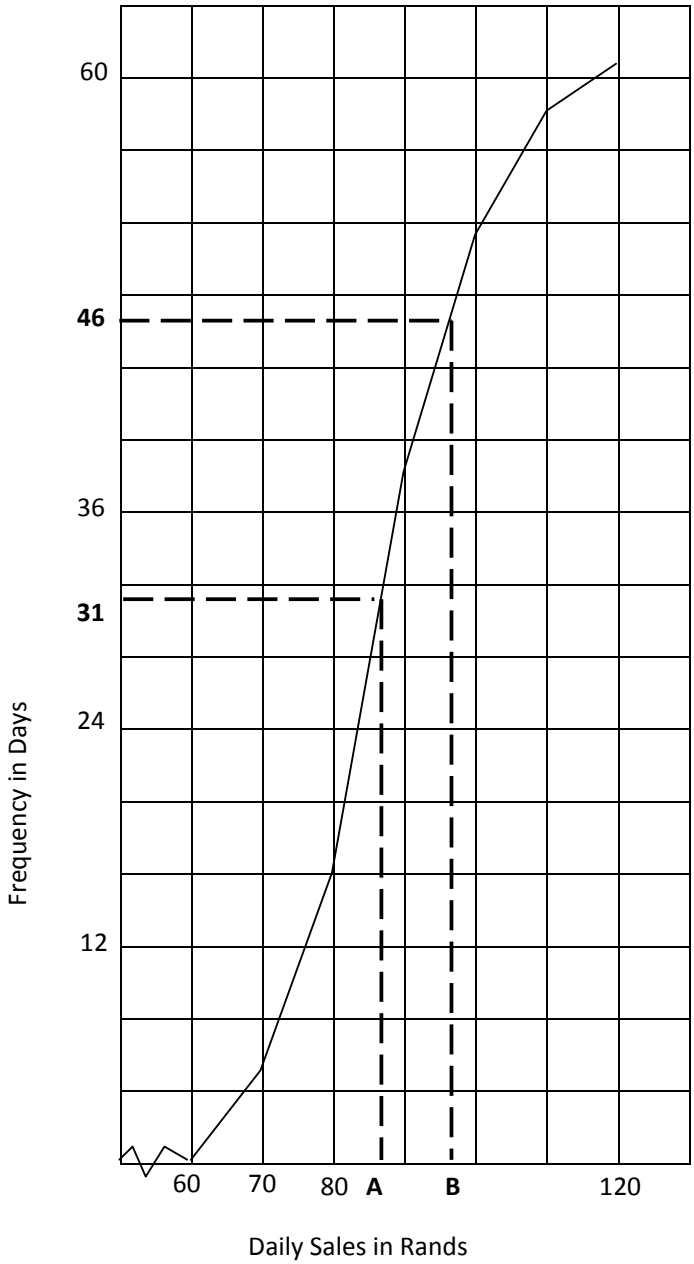
	QUESTION 6	I	II	III	IV
6.1.1	$\text{L.H.S.} = \left(\frac{\sin x - \cos x}{\cos x}\right)\left(2\sin x\cos x - 2\cos^2 x\right)$ $= \left(\frac{\sin x - \cos x}{\cos x}\right)\left(2\cos x\left(\sin x - \cos x\right)\right)$ $= 2\left(\sin^2 x - 2\sin x\cos x + \cos^2 x\right)$ $= 2\left(1 - 2\sin x\cos x\right)$ $= \text{R.H.S.}$			5	
6.1.2	$\frac{\tan x - 1}{2} = -3$ $\tan x = -5$ $\text{Ref} \angle = 78,7^\circ$ $x = 101,3^\circ + 180^\circ n, \quad n \in Z$		5		

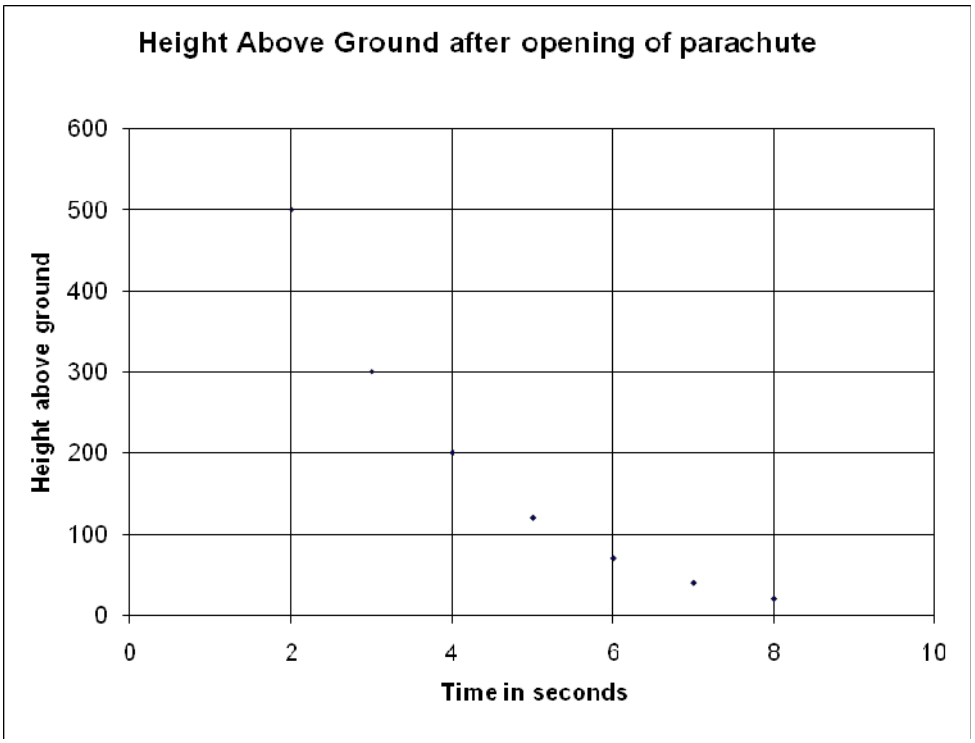
6.2.1	$\tan\beta = \dfrac{p}{-\sqrt{5-p^2}}$				4	
6.2.2	$2\cos^2\beta - 1$ $= 2\left(\dfrac{p}{\sqrt{5}}\right)^2$ $= 2\left(\dfrac{p^2}{5}\right)$ $= \dfrac{2p^2}{5}$				3	
		QUESTION 6		5	12	

	QUESTION 7	I	II	III	IV
7.1	$\tan 40^\circ = \dfrac{3}{LB}$ $LB = \dfrac{3}{\tan 40^\circ} = 3,58m$		2		
7.2	$AB^2 = 5,2^2 + 3,58^2 - 2(5,2)(3,58)\cos 113^\circ$ $= 54,404...$ $\Rightarrow AB = 7,38m$		4		
7.3	$\text{Area}\,\Delta ABL = \dfrac{1}{2}(5,2)(3,58)\sin 113^\circ$ $= 8,57m^2$		4		
	QUESTION 7		10		

	QUESTION 8	I	II	III	IV
8.1	$\cos 3x = \sin x$ $\cos 3x = \cos\left(90^\circ - x\right)$ Quad 1 $3x = 90^\circ - x + 360^\circ \text{n}, \quad \text{n} \in Z$ $4x = 90^\circ + 360^\circ \text{n}$ $x = 22{,}5^\circ + 90^\circ \text{n}$ Quad 4 $3x = 360^\circ - \left(90^\circ - x\right) + 360^\circ \text{n}, \quad \text{n} \in Z$ $3x = 270^\circ + x + 360^\circ \text{n}$ $2x = 270^\circ + 360^\circ \text{n}$ $x = 135^\circ + 180^\circ \text{n}$ $\Rightarrow x \in \left\{-67{,}5^\circ; \quad -45^\circ; \quad 22{,}5^\circ; \quad 112{,}5^\circ; \quad 135^\circ\right\}$			8	
8.2			6		
8.3	$x \in \left[-67{,}5^\circ; -45^\circ\right]$			3	
	QUESTION 8		6	11	

	QUESTION 9	I	II	III	IV
9.1	$\overline{x} = 22$	2			
9.2	$\sigma = 3,9496$		4		
9.3	6			2	
	QUESTION 9	2	4	2	0

	QUESTION 10						I	II	III	IV
10.1	5	16	38	51	58	61			3	
10.2									3	
10.3	Show where you obtained your answer?							1		
10.4	96 –120									2
						QUESTION 10	0	1	6	2

	QUESTION 11	I	II	III	IV
11.1				2	
11.2	Exponential graph of decay (decreasing exponential graph)				1
11.3	85m				1
	QUESTION 11	0	0	2	2

	QUESTION 12				
12.1	They have the same median They have very similar interquartile ranges			2	
12.2	18		2		
12.3	No 25% of Class A score marks below the lowest mark in Class B. The range for Class A is 66, but for Class B it is only 30. Class B has a normal distribution, Class A has a very negatively skewed set of results.			3	
	QUESTION 12	0	2	5	0

	SAG Taxonomy levels			
Paper 2 Summary	I	II	III	IV
QUESTION 1	2	13	5	
QUESTION 2		15	2	
QUESTION 3	4	10	4	
QUESTION 4		7		
QUESTION 5		10	6	
QUESTION 6		5	12	
QUESTION 7		10		
QUESTION 8		6	11	
QUESTION 9	2	4	2	
QUESTION 10		1	6	2
QUESTION 11			2	2
QUESTION 12	2	5		
TOTAL	10	92	44	4
	7%	61%	29%	3%

Appendix C: Item analysis developed by the UMALUSI expert panel

2008 NSC Mathematics Paper 1		Panel member 1	Panel member 2	Panel member 3	Panel member 4
Item	**Max marks**	**Taxonomy level**	**Taxonomy level**	**Taxonomy level**	**Taxonomy level**
1.1.1	**3**	**R**	**r**	**r**	**r**
1.1.2	**5**	**r**	**r**	**r**	**r**
1,13	**5**	**r**	**r**	**r**	**r**
1,2	**8**	**r**	**r**	**r**	**c**
1,3	**3**	**c**	**r**	**p**	**r**
1,4	**2**	**c**	**c**	**p**	**c**
2.1.1	**2**	**r**	**k**	**r**	**k**
2.1.2	**7**	**c**	**c**	**c**	**r**
2.2.1	**2**	**r**	**c**	**r**	**k**
2.2.2	**6**	**r**	**c**	**r**	**r**
2.2.3	**4**	**r**	**r**	**r**	**r**
3,1	**1**	**r**	**c**	**r**	**k**
3,2	**3**	**r**	**r**	**r**	**r**
3,3	**3**	**r**	**r**	**r**	**r**
4,1	**4**	**c**	**r**	**r**	**k**
4,2	**3**	**p**	**r**	**c**	**c**
5,1	**8**	**r**	**r**	**c**	**r**
5,2	**2**	**r**	**r**	**r**	**c**
5,3	**2**	**r**	**r**	**k**	**k**
5,4	**3**	**c**	**c**	**p**	**r**
6,1	**2**	**k**	**r**	**r**	**k**
6,2	**2**	**c**	**p**	**r**	**r**
6,3	**2**	**r**	**r**	**r**	**r**
7,1	**4**	**r**	**r**	**r**	**r**
7.2.1	**3**	**r**	**r**	**r**	**r**
7.2.2	**6**	**c**	**c**	**r**	**r**
7.2.3	**4**	**p**	**p**	**c**	**c**
8,1	**5**	**r**	**k**	**r**	**r**
8,2	**3**	**r**	**r**	**r**	**c**
9,1	**2**	**r**	**k**	**k**	**k**
9,2	**4**	**r**	**r**	**c**	**r**
9,3	**5**	**r**	**r**	**r**	**r**
9,4	**3**	**c**	**c**	**r**	**c**
9,5	**4**	**r**	**r**	**r**	**c**
10,1	**2**	**r**	**r**	**r**	**r**
10,2	**2**	**c**	**r**	**r**	**r**

10,3	**5**	**r**	**c**	**c**	**p**
11,1	**3**	**r**	**r**	**r**	**k**
11,2	**5**	**c**	**r**	**r**	**r**
11,3	**1**	**c**	**k**	**k**	**k**
11,4	**1**	**r**	**r**	**k**	**r**
11,5	**3**	**r**	**c**	**r**	**r**
11,6	**3**	**r**	**p**	**r**	**c**

2008 NSC Mathematics Paper 2		**Panel member 1**	**Panel member 2**	**Panel member 3**	**Panel member 4**
Item	**Max marks**	**Taxonomy level**	**Taxonomy level**	**Taxonomy level**	**Taxonomy level**
1,1	**2**	**r**	**r**	**k**	**k**
1,2	**3**	**r**	**c**	**r**	**r**
1,3	**4**	**r**	**r**	**r**	**r**
1,4	**6**	**r**	**c**	**c**	**c**
1,5	**3**	**r**	**r**	**r**	**r**
1,6	**2**	**c**	**c**	**p**	**r**
2,1	**3**	**r**	**k**	**r**	**r**
2,2	**2**	**r**	**r**	**r**	**r**
2,3	**2**	**r**	**r**	**k**	**k**
2,4	**2**	**r**	**r**	**r**	**r**
2,5	**3**	**r**	**r**	**r**	**r**
2,6	**2**	**r**	**r**	**r**	**c**
2,7	**3**	**k**	**r**	**r**	**r**
3.1.1	**2**	**k**	**r**	**r**	**k**
3.1.2	**2**	**k**	**k**	**r**	**k**
3.2.1	**1**	**k**	**r**	**k**	**r**
3.2.2	**5**	**r**	**k**	**r**	**r**
3.2.3	**2**	**k**	**r**	**k**	**r**
3.2.4	**4**	**c**	**c**	**c**	**c**
3.2.5	**2**	**k**	**k**	**r**	**r**
4	**7**	**r**	**r**	**c**	**c**
5.1.1	**6**	**r**	**r**	**r**	**r**
5.1.2	**4**	**c**	**r**	**c**	**r**
5,2	**6**	**c**	**r**	**c**	**c**
6.1.1	**5**	**c**	**r**	**c**	**c**
6.1.2	**5**	**r**	**c**	**r**	**r**
6.2.1	**4**	**c**	**r**	**r**	**r**

6.2.2	**3**	**c**	**r**	**r**	**r**
7,1	**2**	**r**	**r**	**r**	**r**
7,2	**4**	**r**	**c**	**r**	**r**
7,3	**4**	**r**	**c**	**r**	**r**
8,1	**8**	**c**	**c**	**c**	**c**
8,2	**6**	**r**	**r**	**r**	**r**
8,3	**3**	**k**	**p**	**k**	**k**
9,1	**2**	**r**	**k**	**r**	**r**
9,2	**4**	**r**	**r**	**r**	**r**
9,3	**2**	**r**	**p**	**r**	**c**
10,1	**3**	**r**	**r**	**r**	**r**
10,2	**3**	**r**	**r**	**r**	**r**
10,3	**1**	**r**	**r**	**k**	**k**
10,4	**2**	**r**	**c**	**r**	**k**
11,1	**2**	**r**	**k**	**k**	**r**
11,2	**1**	**k**	**r**	**k**	**k**
11,3	**1**	**k**	**p**	**k**	**k**
12,1	**2**	**k**	**k**	**r**	**k**
12,2	**2**	**k**	**k**	**r**	**k**
12,3	**3**	**r**	**p**	**p**	**p**