



AMESA Office
P.O Box 54
WITS
2050
Tel: 011 484 8917
Fax: 086 553-5042
Cell: 083 292 4077
Email: president@amesa.org.za
Webpage: www.amesa.org.za
Facebook: www.facebook.com/amesa93

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Mr Matanzima Mveli
Acting Director General
Curriculum Implementation & Support
Department of Basic Education
222 Struben Street
PRETORIA

AMESA report on the 2013 Mathematics & Mathematical Literacy Examination Papers

Dear Mr Mveli

On behalf of the National Council of the Association for Mathematics Education of South Africa (AMESA), I would like to commend the Department of Basic Education for the wonderful support afforded the Grade 12 learners and their teachers in the 2013 academic year.

As we have done for the past several years, I would like to make a formal submission of the AMESA Report on the 2013 Mathematics and Mathematical Literacy Examination Papers 1 and 2 that were written by the Grade 12 learners.

The purpose of the report is to provide constructive feedback to the Department in the spirit of promoting mathematics education and enhancing the quality of the teaching and learning of Mathematics in South Africa.

It is our hope that the report, especially the question by question analyses, will be useful to the examiners, markers and moderators in our attempt to promote the high standard of mathematics education in our country.

Sincerely

A handwritten signature in blue ink, appearing to read 'Alwyn Olivier', is written in a cursive style.

Alwyn Olivier
AMESA President

INTRODUCTION

The Grade 12 papers for Mathematics and Mathematical Literacy were written on Friday 1 November 2013 (Paper 1) and Tuesday 5 November 2013 (Paper 2).

AMESA regions (provinces) throughout South Africa soon after embarked on a workshop activity to review these papers according to specific criteria and guidelines. The provinces submitted their reports to the AMESA National Curriculum Committee. This report was then compiled by the Curriculum Committee and represents a summary of the findings and trends of the AMESA provincial reports.

The report covers specific comments on each paper focusing on the following aspects:

- A. Overall Review
 - 1. Technical aspects (typing, diagrams, etc.)
 - 2. Language used and compliance with the cognitive levels of thinking
 - 3. Curriculum coverage
 - 4. Comparison with 2011 papers
 - 5. Overall observations

- B. Question by question analysis

Provincial leaders were “trained” in the analysis of questions using the analysis tool. Although we do not claim any validity of the analysis, we are nevertheless confident that it represents a fairly balanced and accurate perspective from a cross-section of teachers throughout the country.

MATHEMATICS PAPER 1

A. OVERALL REVIEW

1. Technical aspects (typing; diagrams; etc)

As has been the trend for the past few years the paper was clear with no typing errors. All the diagrams, with the exception of the one for question 5, were well constructed, neat and clear. The arrows in question 5 seem to indicate intersection with axes which is fundamentally wrong for this type of graph.

Otherwise, the Department of Basic Education is to be complimented for its high technical standard.

2. Language used

The language used in the paper was clear and unambiguous and would be within the reach of most Grade 12 mathematics learners. Short sentences are used and are to the point. There is no complex English terminology in the paper. Words like “solve”, “simplify”, “calculate”, “write down”, “determine” and “sketch” have been used effectively throughout the examination paper.

3. Syllabus coverage

All content was covered in the paper. However, a question on the inflection point was missing. But this is unlikely to have any impact on learner performance in the paper.

Code	Content/Topic	Suggested	November 2013
1	Patterns & Sequences (LO1)	30	36
2	Annuities & Finance (LO1)	15	12
3	Functions & Graphs (LO2)	35	32
4	Algebraic manipulation; equations (LO2)	20	22
5	Calculus (LO2)	35	34
6	Linear Programming (LO2)	15	14
	Total	150	150

4.1 Standard of paper

The paper could be classified as a very reasonable paper. If learners were taught well, then a level 4 (minimum 50%) would be within reach. The table below shows that more questions were pitched at a routine procedures level (level 2) Than a complex procedures level (level 3). In terms of balance, the combined level 1 and level 2 cognitive levels of the paper, is approximately 6% higher than the suggested 55%.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2013
1 – Knowledge	± 25%	19%
2 – Routine procedures	± 30%	42%
3 – Complex procedures	± 30%	27%
4 – Solving problems	± 15%	12%

4.3 Comparison with 2012 paper

Another column has been added to the above table to include our 2012 analyses of Paper 1.

Levels of thinking	Suggested	November 2013	November 2012	Difference
1 – Knowledge	± 25%	19%	22,7%	-3,7%
2 – Routine procedures	± 30%	42%	36%	6%
3 – Complex procedures	± 30%	27%	26%	1%
4 – Solving problems	± 15%	12%	15,3%	-3.3%

The paper, in terms of standard, was very similar to the 2012 paper, with marginal differences in the cognitive levels. These differences are not likely to impact significantly on learner performance.

5. Overall verdict

It was a fair, balanced paper. There was ample opportunity for learners to score well in this paper. However, learner performance would depend on a number of factors which are beyond the scope of this report.

B. QUESTION BY QUESTION ANALYSIS

Quest.	Content	Levels				Marks	Topic	Comment	
		1	2	3	4				
Question 1: Algebraic manipulation; equations									
1.1.1	Quadratic equation	2	1			3	4	Solving by factorisation	
1.1.2(a)	Quadratic formula	2	2			4		Use quadratic formula	
1.1.2(b)	Quadratic formula and common factor		2			2		Extension of 1.1.2a	
1.1.3	Quadratic inequality	2	2			4		The impact of -3 on the inequality	
1.2	Simultaneous equations	2	4			6		Express y in terms of x; then routine	
1.3	Simplification involving exponents			2	1	3	Express in terms of base 3; factorise numerator, then divide ("cancel") common factor		
Total		8	11	2	1	22			
Question 2: Patterns & Sequences									
2.1	Geometric sequence	1	2			3	1	Application; two values of x	
2.2.1	Tenth term of a geometric sequence	1	2			3		Get a and r; then substitute in formula	
2.2.2	Sum to 9 terms of geometric sequence		1	1		2		Substitute in formula	
2.3.1	Specific term of a combination sequence			1		1		The odd terms are all zero	
2.3.2	Sum of first 500 terms of combination sequence		3	1		4		Consider only the non-zero terms (only take 250 terms; the other 250 terms are zero)	
2.4.1	First term of a series given in sigma notation	1	1			2		Substitute in sigma notation formula	
2.4.2	Existence of the sum to infinity			2	1	3		We note that $-1 < r < 1$	
Total		3	9	5	1	18			
Question 3: Patterns & Sequences									
3.1.1	nth term of arithmetic sequence	1	1			2	1	Substitute in formula	
3.1.2	Specific terms of sequence	2				2		Add common difference	
3.1.3	Finding the remainders when dividing by 3		2			2		Division	
3.1.4	Sum of terms which are divisible by 3		3	2		5		Selecting certain terms of sequence	
3.2.1	Number of dots in fifth figure	2				2		Following a pattern	
3.2.2	Number of dots in fiftieth figure			3	2	5		Substitute in formula (which must be derived)	
Total		5	6	5	2	18			
Question 4: Functions & Graphs									
4.1	y-intercept of quadratic function	1				1	3	Simple; let $x = 0$	
4.2	x-intercepts of quadratic function	1	2			3		Let $y = 0$, solve by factorisation	
4.3	Turning point		3			3		Could use the formula	
4.4	Sketching quadratic function (parabola)	1	2			3		Simple sketch	
Total		3	7			10			

Question 5: Functions & Graphs; Logs								
5.1.1	Determining the base in an exponential function			2		2	3	Substitute in graph equation; graphs not clear – show intersection with axes
5.1.2	Inverse of exponential function			2		2		The inverse of an exp function is a log function
5.1.3	Log inequality			1	1	2		Consider the intervals; cannot find log of negative number
5.1.4	Domain of a transformed log function				1	1		Consider values of x for which $x - 3 > 0$
5.2.1	Sketching the inverse of $y = 1$			2		2		The inverse is $x = 1$
5.2.2	Motivating whether the inverse is a function		2			2		Not a function
Total			2	7	2	11		
Question 6: Functions & Graphs								
6.1.1	Determining values of constants in hyperbola			2		2	3	Manipulation of given equation then substitution or reading off from graph
6.1.2	Rewriting equation in another form	1	1			2		Linked to 6.1.1
6.1.3	Coordinates of the intersection of the asymptotes	2				2		Read off from graph or equation in 6.1.2
6.1.4	Reflection in the line $y = x + 2$			2		2		y –value of image: substitute $x = 2$ in $y = x + 2$; x- value of image: substitute $y = 0$ in $x = y - 2$
6.2	Calculation of constants in an exponential function				3	3		Interpretation of function; substitution
Total		3	1	4	3	11		
Question 7: Annuities & Finance								
7.1.1	Effective annual interest rate		2			2	2	Use formula or do a simple calculation
7.1.2	Calculation of number of years k		3	2		5		Changing subject of formula
7.2.1	Calculation of amount to spend each month	1				1		Simple calculation
7.2.2	Present value		2	2		4		Substitute in present value formula
Total		1	7	4		12		
Question 8: Calculus								
8.1.1	Derivative from first principles	5				5	5	Simple substitution
8.1.2	Average gradient		3	2		5		Interpretation; substitution
8.2	Using the rules of differentiation		2	1		3		Divide by \sqrt{x} first
8.3	Gradient of tangent		2	2		4		Substitute in derivative
Total		5	7	5		17		
Question 9: Calculus								
9.1	Calculation of constants in cubic function			2	4	6	5	Obtained from two equations; $f(x)$ and $f'(x)$
9.2	Coordinates of other turning point		3			3		Use values for a and b from 9.1; simple substitution in $f'(x)$
9.3	Turning point of transformed function				2	2		A vertical stretch and a shift 4 units downward
Total			3	2	4	11		

Question 10: Calculus								
10.1	Rate of change; maximum rate		2	1		3	5	Solve $r'=0$
10.2	Rate of change – stop flowing		2		1	3		Solve $r = 0$
Total			4	1	1	6		
Question 11: Linear Programming								
11.1	Constraints			4		4	6	From descriptions
11.2	Sketching of constraints (inequalities)		5			5		Drawing of inequalities from 11.1
11.3.1	Profit equation	1				1		Simple equation
11.3.2	Coordinates which will give maximum profit		1	1		2		Use search line or substitution
11.4	Objective function $P = ax + by$				2	2		Calculation of $\frac{a}{b}$ if P is maximised when $100 < y < 160$
Total		1	6	5	2	14		

Summary of marks and levels per question					
Question	Levels				Marks
	1	2	3	4	
1	8	11	2	1	22
2	3	9	5	1	18
3	5	6	5	2	18
4	3	7			10
5		2	7	2	11
6	3	1	4	3	11
7	1	7	4		12
8	5	7	5		17
9		3	2	4	11
10		4	1	1	6
11	1	6	5	2	14
Total	29	63	40	18	150
Percentage	19%	42%	27%	12%	100%

MATHEMATICS PAPER 2

A. OVERALL REVIEW

1. Technical aspects (typing; diagrams; etc)

As far as the technical criteria of compliance are concerned, the typing was clear and error free, while the diagrams were clear and understandable. However, in some provinces the angle of rotation was not shown in the diagram for Question 9. Also, the square base for question did not show at least one right angle.

Despite these issues, the Department of Basic Education is to be complimented for its high technical standards for Mathematics paper 2.

2. Language used

As for paper 1, the language usage was clear and precise. However, the Transformation Geometry seemed unusually 'wordy' in comparison to the previous years. In addition, Question 8.4 seemed overly confusing as to what was required and how the answer should be presented. This question should have been better phrased.

3. Syllabus coverage

Code	Content/Topic	Suggested	November 2013
1	Coordinate Geometry (LO3)	40	39
2	Transformation Geometry (LO3)	25	26
3	Trigonometry (LO3)	60	60
4	Data Handling (LO4)	25	25
	Total	150	150

4.1 Standard of paper

Our analyses (in the table below) show that the combined level 1 and level 2 questions (knowledge and routine procedures) was 54% which was 1% lower than the suggested 55% for this two levels. This means that the level 3 and level 4 questions (complex procedures and solving problems) were 1% higher at 46%. A further interrogation of these levels shows the paper learning towards the problem solving level of thinking.

A number of innovative questions are included in the paper and these may have "distracted" learners. However, the brighter learners would have been able to easily work through these distractions. Thus, we commend the Department of Basic Education for the high standards set.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2013
1 – Knowledge	± 25%	23%
2 – Routine procedures	± 30%	31%
3 – Complex procedures	± 30%	27%
4 – Solving problems	± 15%	19%

4.3 Comparison with 2012 paper

To compare the paper to the 2012 paper, a column was added to the above table to include our analyses of the 2012.

Levels of thinking	Suggested	November 2013	November 2012	Difference
1 – Knowledge	$\pm 25\%$	23%	22%	1%
2 – Routine procedures	$\pm 30\%$	31%	33,3%	-2,3%
3 – Complex procedures	$\pm 30\%$	27%	30%	-3%
4 – Solving problems	$\pm 15\%$	19%	14,7%	5,7%

From our analyses of both the 2012 and 2013, we may conclude that the November 2013 was marginally more difficult than the 2012 paper, especially when considering the level 4 (solving problems) part of the paper.

5. Overall verdict

It would appear from learners' views after the paper that they found the questions quite challenging, possibly because of the higher level 4 proportion of the paper. At the same time if learners were taught properly and all the work was covered in class, then there were sufficient questions in the paper for learners to pass. In this regard, we would say that the paper was "not unfair". The inclusion of some innovative and possibly challenging questions ensured that the paper was not predictable. This is likely to favour those who worked consistently well over the last few years.

Our overall verdict for this paper would be "a challenging but acceptable paper".

B. QUESTION BY QUESTION ANALYSIS

C.

Quest.	Content	Levels				Marks	Topic	Comment
		1	2	3	4			
Question 1: Data Handling								
1.1	Interquartile range	2				2	4	IQR = $Q_3 - Q_1$
1.2	Interpretation of box and whisker-percentage	2				2		Simple percentage
1.3	Interpretation of box and whisker - quartiles			2		2		Calculation & interpretation
Total		4		2		6		
Question 2: Data Handling								
2.1	Scatterplot	1	2			3	4	Simple plotting of points
2.2	Line/curve of best fit	1				1		Simple drawing
2.3	Data trends		1			1		Description
2.4	Probability		2			2		Estimating from table
	TOTAL	2	5			7		
Question 3: Data Handling								
3.1	Estimation from Ogive	1	1			2	4	Read off from curve
3.2	Estimation from Ogive	1	1			2		Read off from curve
3.3	Modal class from Ogive	1				1		Check difference
Total		3	2			5		
Question 4: Data Handling								
4.1	Interpretation of table and Bell curve			2		2	4	Noting mean and spread
4.2	Interpretation of Bell curve		1			2		Difference
4.3	Adjustment of marks				2			What should be added/subtracted
4.4	Effect on mean and standard deviation				2			Effect on new mean and standard deviation
Total			1	2	4	7		
Question 5: Coordinate Geometry								
5.1.1	Gradient from angle	2				2	1	$\tan 63,43^\circ$
5.1.2	Equation of line	1	1			2		Using x-intercept and gradient
5.1.3	Distance	1	1	1		3		Find S first then use distance formula
5.1.4	Coordinates of point T		2			2		From midpoints
5.2	x-intercept of line TR, written in coordinate form			2		2		Use ratio 2:3
5.3	Area of triangle	1	2	1		4		Use area rule
Total		5	6	4		15		
Question 6: Coordinate Geometry								
6.1	Centre of circle	1	2	1		4	1	Write equation in terms of centre and radius
6.2	Equation of MR	1	2			3		Simple straight line
6.3	Relationship between p and q		2	2		4		Using equations
6.4	Calculate values of p and q			2	3	5		Using simultaneous equations
6.5	Equation of circle		2			2		Equation of circle centre O and radius ON, centre is (0;0)
6.6	Area of circle centre M	2				2		Use radius MR
6.7	Calculation of ratio				4	4		Work out NP and MP first
Total		4	8	5	7	24		

Question 7: Transformation Geometry								
7.1	Rotation through 90° about the origin; then reflection	2			2	2	Rotation and reflection	
7.2	Reflection and then rotation	2			2		Reflection then rotation	
7.3	Checking whether order affects final position of transformation			2	2		Does the order matter?	
Total		4			2		6	
Question 8: Transformation Geometry								
8.1	Description of transformation	1	1		2	1	Move 4 units up then 4 units to the left; use of the word rigid is unique	
8.2	Image of reflection	1	1		2		Reflection about $y = x$	
8.3.1	Scale factor of enlargement		1		1		Reduce to one dimension; $\sqrt{16} = 4$	
8.3.2	Calculation of length of A'C'		1		1		Size of new size	
8.4	Rigid transformation; equation in terms of s and t			4	4		New relationship	
Total		2	4		4	10		
Question 9: Transformation Geometry								
9.1	Rotation – calculation of angle			5	5	1	Using formula; x and y not indicated on axes	
9.2	Speed of wheel in revolutions per minute			5	5		Calculation of arc distance and then speed as the time is given; very unique/unusual question	
Total				5	5	10		
Question 10: Trigonometry								
10.1	Trig ratio from diagram	2	1		3	3	Calculate r first	
10.2	Trig ratio from diagram; reduction formula		2		2		Simplification then use values from diagram	
10.3	Trig ratio from diagram; compound angle			3	3		Expand then substitute	
Total		2	3	3	8			
Question 11: Trigonometry								
11.1	Proving an identity	2	2	2	6	3	Work with LHS first; routine reductions with complex procedures	
11.2	General solution of trig equation	2	3	2	7		Factorise with common factor then equate both factors to 0	
11.3.1	Simplification of trig expression			1	2		3	Use identities; double angle not clearly evident
11.3.2	Maximum value of trig expression				1		1	Follow up of 11.3.1
11.4.1a	Trig ratio in terms of p and q		2	1	3		Expansion and manipulation	
11.4.1b	Trig ratio in terms of p and q			2	2		4	Unique problem; manipulation
11.4.2	Simplification of an algebraic fraction (in terms of trig ratio)	2	2	2	6		Simplify expression; then substitute; then simplify again	
Total		6	9	10	5		30	

Question 12: Trigonometry								
12.1	Trig graphs	2	4			6	3	Simple graphs; routine
12.2	Period of g	1				1		The period is 180°
12.3	Description of transformation			2		2		Shifting to the left then a reflection in the x-axis
12.3	Trig inequality; graph interpretation			2	2	4		Noting that $f'(x) > 0$ when $f(x)$ is increasing
Total		3	4	4	2	13		
Question 13: Trigonometry								
13.1	Calculation of apex angle		2	1		3	3	Using cosine rule
13.2	Angle between face and base		2	4		6		Many steps; first get EF and GF
Total			4	5		9		

Summary of marks and levels per question					
Question	Levels				Marks
	1	2	3	4	
1	4		2		6
2	2	5			7
3	3	2			5
4		1	2	4	7
5	5	6	4		15
6	4	8	5	7	24
7	4			2	6
8	2	4		4	10
9			5	5	10
10	2	3	3		8
11	6	9	10	5	30
12	3	4	4	2	13
13		4	5		9
TOTAL	35	46	40	29	150
Percentage	23%	31%	27%	19%	100%

MATHEMATICAL LITERACY PAPER 1

A. OVERALL REVIEW

1. Technical aspects (typing; diagrams; etc)

While all the technical aspects were in keeping with the usual high standards of the Department of Basic Education, the following issues were raised by AMESA regions:

- There was a printing error in question 4.2, where the keys shown were not correct since they all started at one.
- The scale marking for 125 km is not indicated in question 4.2. Since learners had to measure in question 4.2.6, they may not have been able to accurately obtain the scale for the map.
- In question 5.2, the key included the microscope. However, there was no question about the microscope. This may have been an unnecessary distraction to learners.

2. Language used

The use of language in the paper appeared to be within the reach of most Grade 12 Mathematical Literacy learners. However, the AMESA regions raised the following issues with respect to language:

- In question 2.2.3, the word modus was used. Most learners are not exposed to this word. Here mode would have been the better word.
- In question 4.1 the wording used (very safe, fairly safe, a bit unsafe and very unsafe), appeared to be confusing to learners.
- In question 5.2.2, the term “visually impaired” may have confused learners. “Visually impaired” could mean “blind” or “partially sighted”.

3. Syllabus coverage

Code	Learning Outcomes	Suggested	November 2013
LO1	Numbers and operations in context	37	40
LO2	Functional relationships	38	37
LO3	Space, Shape and measurement	38	36
LO4	Data Handling	37	37
	TOTAL	150	150

4.1 Standard of paper

The question paper was of a good and acceptable standard for Mathematical Literacy paper 1. The questions were set in such a way that it is easy to distinguish between the sub-sections. The questions ranged from very easy to slightly difficult. This is in keeping with the departmental requirement that only “knowledge” and “routine procedures” questions form part of Mathematical Literacy P1.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2013
1 – Knowledge	± 60%	63%
2 - Routine procedures	± 40%	37%
3 – Non-routine procedures	0%	-
4 – Reasoning and analysis	0%	-

4.3 Comparison with 2012 paper

Another column was added to the table above to include our 2012 analyses of the November 2012 paper.

Levels of thinking	Suggested	November 2013	November 2012	Difference
1 – Knowledge	$\pm 60\%$	63%	56%	7%
2 - Routine procedures	$\pm 40\%$	37%	44%	-7%
3 – Non-routine procedures	0%	-	-	-
4 – Reasoning and analysis	0%	-	-	-

It would appear that the 2013 paper was easier than the 2012 paper, with a greater proportion of level 1 (knowledge) questions. However, this is not significant as the percentage allocation is within the suggested range.

5 Overall verdict

Before deciding on the overall verdict, we would like to make note of the following issues which were raised by regions:

- The understanding is that in Mathematical Literacy examination papers, learners should be given formulas. All they need to do is to substitute into the given formulas. This was not the case in questions 1.3.2 and 6.3.1. Further, in question 2.3.4 learners are asked to derive a formula; teachers feel that this should not be expected of Mathematical Literacy learners in Paper 1.
- There was a possibility that question 2.3.2 may have confused learners. The fact that SEVEN is written in capital letters tended to mislead learners since they might divide by seven instead of eight, thus leaving out the owner of the car.
- Learners may have found the formula given in question 3.1.1 to be “a bit difficult” since it is not one of the usual “Mathematical Literacy” formulas.

These issues are valid one and should be considered for future references. However, these issues are likely to have minimal impact on learner performance.

With this in mind, we would like to proclaim that the paper was fair and within reach of most, if not all, Mathematical Literacy learners.

B. QUESTION BY QUESTION ANALYSIS

Quest.	Content	Levels				Marks	Topic	Comment
		1	2	3	4			
Question 1								
1.1.1	Operations involving square root, percentages and decimals	2				2	LO1	Simple calculation using the calculator
1.1.2	Subtraction involving large numbers	1				1		Simple calculation
1.1.3	Calculations involving conversion of units		2			2		Ratio and proportion
1.1.4	Calculation of time given the distance and speed	2				2		Simple substitution
1.1.5a	Packing apples – calculation of time		3			3		Simple time calculation
1.1.5b	Average rate of working	2				2		Number of apples packed per minute
1.1.6	Probability		2			2		Simple probability
1.1.7	Ratio		2			2		Dividing the animals in given ratio; # sheep = $\frac{35}{36} \times 288$
1.2.1	Cost per CD	2				2		Division
1.2.2	Minimum number of CDs	3				3		Division
1.2.3	Writeable area of CD	3				3		Substitution in formula
1.3.1	Calculation of number of days	2				2		Division
1.3.2	Percentage discount	3				3		Percentage discount = $\frac{35}{304,99} \times 100\%$
1.3.3	Price excluding VAT		2			2		Price excluding VAT = $\frac{100}{114} \times R12,49$
1.3.4	Cost of goods	2				2		Multiplication and addition
Total		22	11			33		
Question 2								
2.1.1	Maximum length		2			2	LO1/3/4	Determining various distances
2.1.2	Total area of semicircular sections		4			4		Simple calculation
2.1.3	Perimeter of garden	2				2		Simple substitution
2.1.4	Number of thyme plants	2				2		Substitution in formula
2.2.1	Ages in ascending order	2				2		From lowest to highest
2.2.2	Range		2			2		Highest – lowest
2.2.3	Mode	2				2		The one that appears the most
2.2.4	Mean	1	2			3		Add all up and divide by 15
2.2.5	Ages greater than upper quartile		2			2		Those who are older than 25
2.2.6	Depreciated value of toys	3				3		Substitution in given formula
2.3.1	Type of proportion	1				1		Inverse proportion
2.3.2	Monthly cost given the number of colleagues	2				2		Read off from graph
2.3.3	Sharing - given the cost	2				2		Read off from graph
2.3.4	Determining a formula		2			2		Division
Total		17	14			31		

Question 3									
3.1.1	Area to be repainted	3				3	LO1/3	Substitution in formula; answer in correct units	
3.1.2	Height of water	2				2		Substitution in formula; answer in correct units	
3.2	Converting temperature from Celsius to Fahrenheit	2	1			3		Substitution; units in °F	
3.3.1	Determining number of children	2				2		Subtraction	
3.3.2	Total income		4			4		Substitution in given formula	
3.4	Number of branded bags given the profit	3				3		Profit per bag was R22,00; divide R594 by 22	
3.5	Discounted price for pool pump	1	2			3		Discounted price = $\frac{88}{100} \times R4999$	
3.6	Exchange rate	2				2		Division	
Total		15	7			22			
Question 4									
4.1.1	Calculate missing value from graph	1				1	LO1/2/3	Subtraction	
4.1.2	Percentage	2				2		Reading off from table	
4.1.3	Comparison between graphs	2				2		Reading off from table; comparison	
4.1.4	Interpretation from graph	2				2		Addition	
4.1.5	Difference	2				2		Reading off appropriate values from table and subtracting	
4.1.6	Ratio	2				2		Division; rounding off to nearest whole number	
4.2.1	Identifying from map	2				2		Simple identification	
4.2.2	Identifying from map	1				1		Simple identification	
4.2.3	Identifying from map - percentage		2			2		Simple identification	
4.2.4	Identifying from map - percentage	2				2		Simple identification	
4.2.5	Identifying from map - direction	2				2		Simple identification	
4.2.6	Scale		3			3		Scale calculation	
Total		18	5			23			
Question 5									
5.1.1	Calculating using table values	2				2		LO2/3	Doubling after every two hours: K = 3200
5.1.2	Time taken to multiply	2				2			Read off from table
5.1.3	Drawing of curve		5			5	Simple drawing		
5.1.4	Average growth rate	2	1			3	Substitution		
5.2.1	Location on plan/map		1			1	Identifying from map		
5.2.2	Direction	3				3	Giving accurate directions		
5.2.3	Calculation of width	3				3	Substitution		
5.2.4	Actual length from scale of plan	2				2	Scale calculations		
Total		14	7			21			

Question 6							
6.1.1	Interpretation of pie graph	2				2	LO2/4 Simple calculation Addition Read off from table Addition Identification from table A - Division; B - Multiplication Plotting of given points Read off from graphs
6.1.2	Interpretation of pie graph		3			3	
6.2.1	Interpretation of table	1				1	
6.2.2	Interpretation of table	2				2	
6.2.3	Interpretation of table		2			2	
6.3.1	Calculation of missing values from table	4				4	
6.3.2	Drawing of line graph		4			4	
6.3.3	Break-even point from graph		2			2	
Total		9	11			20	

Summary of marks and levels per question					
Question	Levels				Marks
	1	2	3	4	
1	22	11			33
2	17	14			31
3	15	7			22
4	18	5			23
5	14	7			21
6	9	11			20
Total	95	55			150
Percentage	63%	37%			100%

MATHEMATICAL LITERACY PAPER 2

A. OVERALL REVIEW

1. Technical aspects (typing; diagrams; etc)

Overall the technical aspects of the paper were in keeping with the high standards that we have come to expect from the Department of Basic Education over the years.

The only concern raised in this regard was Annexure B (to be used for question 3.4) which appeared to be “not very clear”. However, this was not likely to impact negatively on learners’ performance.

2. Language used

Although the language usage in the paper appeared to be fair, learners had to do much reading in this paper. This has always been the case for Mathematical Literacy Paper 2 and teachers and learners have come to accept it. However, it is very likely that some questions would have posed a problem to English second language learners, especially the way some questions were formulated (questions 1.3; 1.4; 2.2; 3.1.1; 3.1.2; 4.3.1; 5.2).

Despite these concerns, the language used in the paper has been much simpler than in previous years.

3. Syllabus coverage

Code	Learning Outcomes	Suggested	November 2013
LO1	Numbers and operations in context	37	30
LO2	Functional relationships	38	44
LO3	Space, Shape and measurement	38	46
LO4	Data Handling	37	30
	TOTAL	150	150

4.1 Standard of paper

The paper was of a good standard as expected for Mathematical Literacy Paper 2. A scrutiny of the cognitive levels table below shows a very close alignment with the suggested levels of thinking for the paper. Learners had to do a lot of reading as some of the questions were very wordy.

Some questions (1.3; 1.4; 2.2.2; 2.4; 3.1.1; 3.2.1; 4.1.2; 4.1.3; 4.2.2; 4.2.3; 5.2.6;) carry 5 marks or more. These questions usually involve multi-step calculations and learners should be given credit for constructive attempts. In this regard we ask that these and other similar questions be marked carefully, applying CA (consistent accuracy) where appropriate. In this way learners would not be unfairly penalized.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2013
1 – Knowledge	0%	-
2 – Routine procedures	± 20%	24%
3 – Multi-step procedures	± 40%	39%
4 – Reasoning and reflecting	± 40%	37%

We note that according to our analyses, the paper was set in line with prescribed guidelines for Mathematical Literacy Paper 2. The deviations are within the specified range.

4.3 Comparison with 2012 paper

To compare the paper to the 2012 paper, a column has been added to the above table:

Levels of thinking	Suggested	November 2013	November 2012	Difference
1 – Knowledge	0%	-	-	-
2 - Routine procedures	$\pm 20\%$	24%	20%	4%
3 – Multi-step procedures	$\pm 40\%$	39%	42%	-3%
4 – Reasoning and reflecting	$\pm 40\%$	37%	38%	-1%

We note that the 2013 paper, in terms of our analyses, was marginally easier than the 2012. However, this is not likely to have an impact on the results.

5. Overall verdict

We note that learners may not be familiar with shapes such as the Sphere and Pentagon. Also in Question 3 large numbers are used and learners may be prone to making errors when doing their calculations.

Despite these and other issues such as language, we would like to compliment the Department of Basic Education on a well-balanced and challenging Mathematical Literacy Paper 2.

B. QUESTION BY QUESTION ANALYSIS

Quest.	Content	Levels				Marks	Topic	Comment	
		1	2	3	4				
Question 1									
1.1	Ratio and proportion		3			3	LO3	Multiplication and division	
1.2.1	Surface area		3			3		Substitution	
1.2.2	Volume		2			2		Substitution	
1.3	Verification of calculation			7		7		Multi- step calculations	
1.4	Calculations - options				9	9		Multi- step calculations – choosing option 1 or 2	
Total			8	7	9	24			
Question 2									
2.1.1	Formula to calculate claim		2			2	LO 1/2	Choosing appropriate data and inserting in formula	
2.1.2	Verifying claim calculation			3		3		Division	
2.2.1	Calculation of monthly cost			3		3		Addition	
2.2.2	Calculation of difference in claims			9		9		Multi- step calculations	
2.3	Calculation of fixed monthly deposit		4			4		Substitution in formula	
2.4	Interpretation of tax tables			5		5		Calculation of tax payable	
Total			6	20		26			
Question 3									
3.1.1	Explanation of data in table form				5	5	LO 2/3/4	Making sense of numeric data	
3.1.2	Calculations from table		4			4		Multi-step calculation	
3.1.3	Probability		3			3		Division	
3.2.1	Line graphs			6		6		Simple plotting of data	
3.2.2	Description of trends from graphs				4	4		Making sense of drawn line graphs	
3.3.1	Explanation of totals \neq 100%				2	2		Rounding off	
3.3.2	Median		2			2		The province in the middle	
3.3.3	Identifying province - less than the lower quartile				2	2		Provinces below 22,55%	
3.3.4a	Suitability of pie chart				2	2		Providing suitable reasons	
3.3.4a	Suitability of line graph				2	2		Providing suitable reasons	
3.4.1	Boundary changes				2	2		Reading from map	
3.4.2	Scale measure			4		4		Scale calculations	
Total			9	10	19	38			

Question 4							
4.1.1	Perimeter of pentagon		2			2	LO 2/3 Multiply 270 mm by 5 Addition of area then subtracting letter and newspaper opening Conversion; multiple step calculations Take into account the mass of the parcel Observing patterns in the table Simple plotting of points Following directions carefully Multi-step calculations
4.1.2	Surface area			5		5	
4.1.3	Area of circle			5		5	
4.2.1	Formula – delivery cost		3			3	
4.2.2	Missing values from table		6			6	
4.2.3	Line graph			6		6	
4.3.1	Direction				3	3	
4.3.2	Verification of claim using calculations				4	4	
Total			11	16	7	34	
Question 5							
5.1.1	Possible explanation for most passing in December				2	2	LO 2/4 Learners are on holiday in December? Highest – Lowest Months not in order The cost is the same P is not part of the graph Explanation of the graph for option B The cost is the same Reading off from graph Reading off from graph Reading off from graph for 6 hours Calculations for 30 hours of lessons
5.1.2	Range		2			2	
5.1.3	Justification why a claim is incorrect				3	3	
5.2.1	Interpretation of horizontal section of graph				2	2	
5.2.2a	Explanation of a point				2	2	
5.2.2b	Cost of driving lesson – option B				3	3	
5.2.3	Interpretation of point of intersection				2	2	
5.2.4a	Discussion of options				2	2	
5.2.4b	Discussion of options				2	2	
5.2.5	Identification of option; explanation				3	3	
5.2.6	Difference in cost for option A and option B			5		5	
Total			2	5	21	28	

Summary of marks and levels per question					
Question	Levels				Marks
	1	2	3	4	
1		8	7	9	24
2		6	20		26
3		9	10	19	38
4		11	16	7	34
5		2	5	21	37
Total		36	58	56	150
Percentage		24%	39%	37%	100%