2015 AMESA Report on Grade 12 Mathematics & Mathematical Literacy

Introduction

The grade 12 Mathematics and Mathematical Literacy papers were written on Friday 30 October 2015 and Monday 2 November 2015. Mathematics teachers from our AMESA regions (provinces) participated in workshop activities to review the 2015 Grade 12 Mathematics & Mathematical Literacy examination papers according to specific criteria and guidelines developed by our National Curriculum Committee. The regions then submitted their reports to the AMESA National Curriculum Committee, and the Curriculum Committee compiled this report as a summary of the findings and key trends and features of the AMESA provincial reports. The report covers specific comments on the papers, focusing on the following:

A. Overall Review

1. Technical aspects (typing, diagrams, etc.)
2. Language used
3. Content area (syllabus) coverage

4.1 Standard of paper

4.2 Compliance with levels of thinking

5. Comparison with the 2015 paper
6. Overall verdict

B. Question-by-question analyses

In 2012, we had workshops for our regional representatives in the analysis of questions using the analysis tool. Although we do not claim any validity of the analysis, we are 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)

The question paper adhered in most respect to the technical requirements and standards expected at this level. All the graphs, sketches and formulae were clear. Text was clear and format of a high standard. In question 6.1 one of the graphs could have been drawn with a slightly thicker line, some candidates could've **mistakenly** seen a 3rd degree graph. Although the graphs in question 7 are just representations, there was a query regarding the use of straight lines rather than actual exponential functions..

2. Language used

Language usage was good. It was at a level where FAL candidates could clearly understand what was expected of/from them. The use of language was in the main unambiguous. The language used is appropriate and relevant for grade 12 candidates and acceptable. However, in question 3.1 the form $T_n = bn + c$ and not $T_k = bk + c$ should have been asked. There was some concern about the phrasing of Question 10.2.

3. Syllabus coverage

Code	Content/Topic	Suggested	Actual
1	Algebra and equations (inequalities)	25 ($\pm$ 3)	**26**
2	Patterns and sequences	25 ($\pm$ 3)	**22**
3	Finance, growth and decay	15 ($\pm$ 3)	**13**
4	Functions and graphs	35 ($\pm$ 3)	**37**
5	Differential calculus	35 ($\pm$ 3)	**35**
6	Probability	15 ($\pm$ 3)	**17**
	TOTAL	150	**150**

4.1 Standard of paper

The paper was of a very good standard catering for learners of different competency levels. There was a good balance between easy, medium and difficult questions. Some questions were phrased or posed differently, which added a good touch to the paper.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2015
1 – Knowledge	± 20%	**21.33%**
2 - Routine procedures	± 35%	**38,67%**
3 - Complex procedures	± 30%	**24.00%**
4 - Solving problems	± 15%	**16.00%**

5. Comparison with 2014 paper

To compare the 2015 paper with that of 2014 the table in 4.2 above is reproduced here with an additional column to show the AMESA's views of 2014 levels of thinking.

Levels of thinking	Suggested	November 2014	November 2015
1 – Knowledge	± 20%	25,3%	**21.33%**
2 - Routine procedures	± 35%	34%	**38,67%**
3 - Complex procedures	± 30%	29,3%	**24.00%**
4 - Solving problems	± 15%	11,4%	**16.00%**

The paper shows a shift from level 1 to level 2 and from level 3 to level. But these shifts are very much marginal if one has to combine level 1 & 2 and level 3 & 4 for both years. In this respect the papers are very similar.

6. Overall verdict

The Department of Basic Education and the examining panel are to be complimented on a well-set paper. There were enough level 1 and level 2 questions (about 60%) for the majority of learners to pass the paper and possibly obtain good marks. At the same time, the level 4 questions were both unique and thought provoking, and would have

challenged the top learners. In keeping with this comment, we welcome the fact that some questions were posed differently, thereby making the paper less predictable.

In conclusion, we believe that the paper was a “top-notch” paper set at the appropriate level and could be classified as a very “fair” paper which would be a true indicator of learner performance in the topics/content areas for Mathematics paper 1.

B. Question by question analysis

Question 1 Algebra and Equations								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
1.1.1	Simple quadratic equation	1	2			3	**1**	Factorisation
1.1.2	Simple quadratic equation		4			4		Routine; use formula
1.1.3	Exponential equation	2	2			4		Divide by 2 first, then raise to both sides to $-\frac{3}{5}$
1.1.4	Quadratic equation		2	2		4		Square both sides; solve and check solution
1.1.5	Quadratic inequality	1	1	1		3		Factorise; look for regions
1.2	Sum of two perfect squares equal to zero			2	2	4		Innovative; each perfect square must be equated to zero
1.3	Nature of roots		2	2		4		Use of the discriminant
Total		**4**	**13**	**7**	**2**	**26**		

Question 2 Pattern and Sequences								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
2.1	Fifth term of Geometric sequence	1	1			2	**2**	Know a and r; then find the fifth term
2.2	nth term of geometric sequence	1	1			2		Routine procedure
2.3	Reason for convergence	1	1			2		Prove that -1 < r < 1
2.4	Difference between S_∞ and S_n	1	1	2		4		Simplification to given form
Total		**4**	**4**	**2**	**0**	**10**		

Question 3 Pattern and Sequences								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
3.1	General term of arithmetic sequence	1	1			2	**2**	Follow normal procedures
3.2	Sigma notation		2			2		Routine
3.3	Sum to n terms of arithmetic sequence		2	1		3		Substitute a and d into sum formula of arithmetic series
3.4.1	New sequence	1	1			2		Add -6 to given series
3.4.2	Value of 129^{th} term of new sequence			2	1	3		Different/challenging
Total		**2**	**6**	**3**	**1**	**12**		

Question 4 Function and graphs								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
4.1	Asymptote of exponential function	1				1	**4**	Read off from function
4.2	Sketch exponential function	2	2			4		Routine procedure
4.3	Reflecting exponential function		1			1		Reflection in the y-axis
Total		**3**	**3**	**0**	**0**	**6**		

Question 5 Functions and Graphs								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
5.1	x-intercept of straight line	1	1			2	**4**	Straightforward
5.2	Domain of inverse	1	2			3		Domain of inverse = range of function
5.3	Sketch inverse function		2	1		3		Be careful of the domain
5.4	Equating function to its inverse	1	2			3		Read off from graphs drawn
5.5	Calculating distance			2	3	5		OP must be perpendicular to h
5.6.1	Functions and derivatives		1	1		2		The gradient is negative, then zero, then positive
5.6.2	Maximum gradient				1	1		Substitution
Total		**3**	**8**	**4**	**4**	**19**		

Question 6 Functions and Graphs								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
6.1.1	Coordinates of turning point/y-intercept	1				1	**4**	Find f(o)
6.1.2	x-intercept of parabola	1	2			3		Equate f(x) to zero
6.1.3	Calculating co-ordinates of other x-intercept		2			2		Using symmetry
6.1.4	Second derivative				2	2		Interpretation
6.2	Sketching a hyperbola		2	2		4		Different/challenging
Total		**2**	**6**	**2**	**2**	**12**		

Question 7 Finance, Growth and Decay								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
7.1	Cost of vehicle	1				1	**3**	Read off from graph
7.2	Reducing balance	2	1	1		4		Interpretation; use formula
7.3	Calculation of price of new vehicle	1	2			3		Use formula
7.4	Sinking fund		2	2	1	5		Interpretation; calculation on monthly payment
Total		**4**	**5**	**3**	**1**	**13**		

Question 8 Differential Calculus								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
8.1	First principles	2	3			5	**5**	Simple; routine
8.2.1	Simple derivative	1	1	1		3		Square expression first
8.2.2	Simple derivative	1	1	1		3		Divide first or use quotient rule
Total		**4**	**5**	**2**	**0**	**11**		

Question 9 Differential Calculus								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
9.1	Cubic function and straight line			2	3	5	**5**	Challenging
9.2	Average gradient	2	1	1		4		Substitution
9.3	Concavity		2	1		3		Second derivative
9.4	Explanation				1	1		Knowing about changes to concavity
9.5	Tangent and parallel lines			2	2	4		Combination of procedures
Total		**2**	**3**	**6**	**6**	**17**		

Question 10 Differential Calculus								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
10.1	Working out r in terms of h			2		2	**5**	Apply in right angled triangle
10.2	Derivative and volume			2	3	5		Finding the derivative when h = 9 cm
Total		**0**	**0**	**4**	**3**	**7**		

Question 11 Probability (and counting principles)								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
11.1	Probability and independent events	1	2			3	**6**	Do appropriate calculations
11.2.1	Counting principles	1	1			2		Letters are repeated
11.2.2	Counting principles	1	1			2		Letters are not repeated
11.2.3	Counting principles	1	1		2	4		Conditions given and no repetition of letters
11.3	Probability			3	3	6		Challenging problem; systematic
Total		**4**	**5**	**3**	**5**	**17**		

Overall total	**Levels**				**Marks**
	1	**2**	**3**	**4**	
All questions	32	58	36	24	150

Mathematics Paper 2

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The paper was well laid out. Generally the diagrams and text were clear, and there were no "cramped" questions. However, we recommend the "**bolding**" of x-axis and y-axis (Questions. 3, 4, 6) for greater clarity in graphs.

Once again were have seen full stops at the end of mathematical expressions/equations (for example: questions 1.2, 1.2.2, 5.3, 6.1, 6.2, 6.3) which may be grammatically correct to place full stops at the end but it is not mathematically pleasing. Further, there is a danger that the full stop might be mistaken for a "multiply" symbol or give the impression that something is missing. In a mathematics paper, we feel that full stops should only be indicated at the end of text. (for example: questions 1.1, 1.3, 1.4, etc)

We are very pleased for the use of answer booklets in mathematics paper 2. However, it now behoves teachers to guide their learners on the best use of these booklets. While we are aware that answer books for Mathematics P2 have been in the offing since 2014 it would appear that some teachers were taken by surprise by the answer books. .

2. Language Used

The language seemed generally acceptable to most grade 12 Mathematics learners. There may have been a problem for those with English as a second or third language. For example, in question 1, the full word for kilojoules rather than the abbreviation (kJ) should have been used. In question 3, it should have been $a > 0$ and $b > 0$ rather than the "clumsy" a and $b > 0$

3. Syllabus Coverage

The coverage of the syllabus was within the CAPS guidelines.

Code	Content/Topic	Suggested	Actual
1	Statistics	20 ($\pm$ 3)	20
2	Analytical Geometry	40 ($\pm$ 3)	38
3	Trigonometry	40 ($\pm$ 3)	42
4	Euclidean Geometry and measurement	50 ($\pm$ 3)	50
	TOTAL	150	150

4.1 Standard of Paper

We believe that the paper was quite challenging for the high school mathematics learner. We are concerned that it not possible to answer question 3.4 without the extra information given in question 3.5. This error is unfortunate (and unacceptable) and can have a greater negative impact than one would think. We believe that there should be some consideration on a mark adjustment based on wasted time and brighter students "second guessing themselves" and wondering why they were "stuck" with something seemingly straightforward.

4.2 Compliance with Levels of Thinking

Levels of thinking	Suggested	November 2015
1 – Knowledge	± 20%	11,33%
2 - Routine procedures	± 35%	37,33%
3 - Complex procedures	± 30%	33,34%
4 - Solving problems	± 15%	18,00%

In terms of our analyses, we find the paper is more tilted towards level 3 and level 4 questions.

5. Comparison with 2014 Paper

To make a comparison with the 2014 paper, we attach another column to the table in 4.2

Levels of thinking	Suggested	November 2015	November 2015
1 – Knowledge	± 20%	20,7%	11,33%
2 - Routine procedures	± 35%	38,7%	37,33%
3 - Complex procedures	± 30%	31,3%	33,34%
4 - Solving problems	± 15%	9,3%	18,00%

We note that there is a significant shift towards level 3 and level 4 questions and a drop in level 1 and level 2 questions, making the paper more difficult than the 2014 paper.

We are very concerned that the Euclidean Geometry was largely of the pre-2008 style of presentation and there were quite a few tricky stumbling blocks along the way. We urge the examining panel to re-examine this approach as we believe that assessing Euclidean Geometry the "old" way is largely counterproductive and disadvantages learners. The 2014 approach to Euclidean Geometry was innovative and new and we recommend that the panel should go back to that approach. We also note that the Analytical Geometry of the paper required quite a bit of Euclidean Geometry knowledge, thus, disadvantaging learners even further.

6. Overall Verdict

In determining our overall verdict for the 2015 we would like to recall our recommendation to the Department of Basic Education in 2014 where we said:

> *"the Department of Basic Education should keep the paper at this level for the foreseeable future. Teachers reminded us of the debacle in 2009 when the standard of both Mathematics papers was raised so drastically and took all teachers by surprise"*

We note, however, that the Department of Basic Education did not take into account the views of AMESA on this matter, especially with regard to the Euclidean Geometry of paper 2. This does not auger well for the majority of the candidates writing Mathematics Paper 2. But we hope that we are proved wrong.

There is also some confusion about which calculators are permitted in the examinations. It was pointed out that candidates without appropriate calculators would have been disadvantaged as not all calculators have frequency options.

Notwithstanding our comments above, we believe, from a mathematical point of view, that the paper would have been an "entertaining paper" for the dedicated teacher and the "interested" candidate. Although there was a drop in the allocation of marks to level 1 and level 2 questions, it would appear there were sufficient marks for learners to pass the paper. But those wanting really high marks would certainly have to know their stuff!

B. Question by Question Analysis

Question 1 Statistics								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
1.1	Drawing scatter plot	3				3	**1**	Straightforward
1.2.1	Substitution in equation	2				2		Straightforward
1.2.2	Drawing regression line		2			2		Straightforward
1.3	Outlier	1				1		Straightforward
1.4	Correlation coefficient		2			2		Use calculator
1.5	Relationship between the two sets of data			1		1		Strength of relationship
	TOTAL	**6**	**4**	**1**		**11**		

Question 2 Statistics								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
2.1	Mean of grouped data		2			2	**1**	Straightforward
2.2	Median of grouped data		2			2		Straightforward
2.3	Standard deviation		2			2		Straightforward
2.4	Within one standard deviation of the mean		2	1		3		Need to be systematic
	TOTAL		**8**	**1**		**9**		

Question 3 Analytical Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
3.1	Gradient of straight line	2				2	**2**	Straightforward
3.2	Equation of straight line			4		4		Straightforward
3.3	Length of MN		2			2		Straightforward
3.4	Length of RS				1	1		Impossible to calculate without the information in 3.5
3.5	Coordinates of S			3		3		Requires a bit of working
3.6	Coordinates of P				6	6		Requires a bit of working
	TOTAL	**2**	**2**	**7**	**7**	**18**		

Question 4 Analytical Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
4.1	Equation of circle		3			3	**2**	Routine
4.2	Coordinates of S	1	2			3		Routine
4.3	Equation of tangent APB		2	2		4		y-intercept is known; can easily work out the gradient
4.4	Calculate size of α		2			2		Obtained from the equation of tangent APB
4.5	Calculate size of θ		2	2		4		Application of tan-chord theorem
4.6	Area of ΔPQS			4		4		Know PS (base) and the height = 5 units (from coordinates of Q)
	TOTAL	**1**	**11**	**8**		**20**		

Question 5 Trigonometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
5.1.1	Simplification	1	1			2	3	Knowledge of quadrants required
5.1.2	Writing $\cos 23^\circ$ in terms of k		2	1		3		Pythagorean identity needed
5.1.3	Using $\sin 23^\circ$ and $\cos 23^\circ$		1	1		2		Quotient identity
5.2	Simplification involving multiplication, division and addition		3	3		6		Combination: complementary ratio; compound angles and special angles
5.3	General solution			6		6		First write $\cos 2x$ in terms of $\cos x$
5.4	Numerical value of $\sin 3\theta$ if is given that $\sin\theta = \frac{1}{3}$				5	5		Start with $\sin 3\theta = \sin(2\theta + \theta)$ and then use compound angles
	TOTAL	**1**	**7**	**11**	**5**	**24**		

Question 6 Trigonometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
6.1	Calculate values of constants in cosine and sine function	2	2			4	**3**	Determine amplitude and period from drawn graphs
6.2	Values of *x* for which one graph is greater than another graph		1	1		2		Read off the x-values when the graph of f is above the graph of g
6.3	Transformation of graphs			2		2		A phase shift of 60° to the left and then a reflection in the x-axis
	TOTAL	**2**	**3**	**3**		**8**		

Question 7 Trigonometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
7.1	Writing one angle in terms of another	1				1	**3**	Angles of a triangle
7.2	Proving a ratio using available information and the identity for $\cos 2\theta$		2	2		4		First apply cosine rule to ΔACD
7.3	Calculation of height		3	2		5		Substitute to get the value of θ then use sine ratio in ΔACD
	TOTAL	**1**	**5**	**4**		**10**		

Question 8 Euclidean Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
8.1.1	Completion of theorem statement	1				1	**4**	Straightforward
8.1.2	Proof of theorem		3			3		Very easy as diagram is given with markings at O
8.2	Proving two lines parallel, using information from cyclic quads		3	2		5		Prove that $\hat{A}+\hat{E}=180^\circ$ using properties of cyclic quads
	TOTAL	**1**	**6**	**2**		**9**		

Question 9 Euclidean Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
9.1	Tan-chord theorem and parallel lines		2	2		4	**4**	$\hat{C} = x$ and $\hat{K}_3 = \hat{C}$
9.2	Cyclic quad (converse of angles in the same segment)		2			2		$\hat{K}_3 = x$
9.3	Proving that TK bisects $A\hat{K}B$			2	2	4		Show that $\hat{K}_3 = \hat{K}_2 = x$
9.4	Prove that TA is a tangent to circle AKH			1	1	2		$\hat{K}_2 = x$
9.5	Explain why A, S, K and T are con-cyclic				2	2		$A\hat{S}B = A\hat{K}B = 2x$ $A\hat{T}B = 180^\circ - 2x$
	TOTAL		**4**	**5**	**5**	**14**		

Question 10 Euclidean Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
10.1	Length of DC	2	1			3	**4**	Theorem of Pythagoras
10.2.1	Length of CF		3			3		Use given ratio
10.2.2	Proving two triangles similar			5		5		Common angle C and 90° angle
10.2.3	Length of AC			2	2	4		Use results of similarity
10.2.4	Radius of circle through A, B and C				2	2		AC will be the diameter of this circle
	TOTAL	**2**	**4**	**7**	**4**	**17**		

Question 11 Euclidean Geometry								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
11.1	Complete statement of theorem	1				1	**4**	Straightforward
11.2.1	Prove two triangles similar		2	1		3		Use corresponding sides
11.2.2	Length of NQ				6	6		$\hat{P} = 90^\circ$ and $\Delta KPM /// \Delta RNM /// \Delta RPQ$
	TOTAL	**1**	**2**	**1**	**6**	**10**		

Overall total	Levels				Marks
	1	2	3	4	
All questions	17	56	50	27	150
Percentage	11,33%	37,33%	33,34%	18%	100%

Mathematical Literacy Paper 1

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The paper was clearly typed. The diagrams and tables were clear, visible, well-constructed and thoroughly explained. The questions were well spaced out and easy to read. However, in some regions, Annexure A was behind question 5 which made it difficult to view together with the relevant question. We feel that annexures should be at the end so that learners are able to detach and view easily.

2. Language used

The language used in the paper would be within the scope of most grade 12 Mathematical Literacy learners. There were complaints from some teachers that there was "too much" reading to do and that it too time to figure out what was required in the questions.

3. Syllabus coverage

Code	Content areas (contexts)	Suggested	Actual
1	Finance	53 ± 7	58
2	Measurement	30 ± 7	31
3	Maps, plans and other representations	23 ± 7	21
4	Data Handling	38 ± 7	32
5	Probability	Minimum 7	8
	TOTAL	**150**	**150**

We note that the syllabus coverage was within the scope as indicated in CAPS document

4.1 Standard of paper

The content coverage in the paper was in line with the CAPS document. The paper was set at the appropriate level for what comprises Mathematical Literacy Paper 1. Some teachers indicated that the paper was of a higher standard when compared to the trial examinations.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2015
1 – Knowledge	60% (± 5)	53,33%
2 - Routine procedures	35%(± 5)	40,67%
3 – Multi-step procedures	5% (minimum)	6,00%
4 – Reasoning and reflecting	0%	-
TOTAL	100%	100%

We note that the paper tended to shift toward level 2 and 3 questions. But this is marginal as there were still enough questions for learners to achieve a pass in the paper.

5. Comparison with 2014 paper

In comparing the paper with that of the 2014 paper, we include an extra column to the table in 4.2

Levels of thinking	Suggested	November 2014	November 2015
1 – Knowledge	60% ($\pm$ 5)	62,7%	53,33%
2 - Routine procedures	35%($\pm$ 5)	30%	40,67%
3 – Multi-step procedures	5% (minimum)	7,3%	6,00%
4 – Reasoning and reflecting	0%	0%	0%
TOTAL	100%	**100%**	100%

We see that there was a reduction in questions at the knowledge level (level) and more at the routine procedures level. This made the paper marginally “more difficult”.

6. Overall verdict

Our request for some time has been for the examining panel for Mathematical Literacy Paper 1 to make the paper cognitively more difficult. We are pleased that for the second year running, that the panel has acceded to our request. In some areas of the country teachers stated that they “missed” the “old” question 1 of the Mathematical Literacy paper 1. While they may have a point, we believe that the new style of setting Mathematical Literacy Paper 1 is the right way and should not be changed. In fact, there were more than enough questions in the paper for the learners to pass. We are, thus, able to conclude that the paper was reasonable and “fair”.

B. Question by question analysis

Question 1								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
1.1.1	Basic calculations – number of guests	2				2	**1; 5**	Straightforward
1.1.2	Cost of catering	2				2		Straightforward
1.1.3	Cost as percentage	2				2		Straightforward
1.1.4	Cost of flowers and decorations	2				2		Straightforward
1.1.5	Exchange rates	2	2			4		Routine procedure
1.1.6	VAT calculation	2	3			5		Add VAT then convert to cedi
1.1.7	Identification of another expense	2				2		Straightforward
1.2.1	Financial document: IRP5 form	2				2		Difference between employer and employee
1.2.2	Abbreviation UIF	2				2		Straightforward
1.2.3	Taxable amount	2				2		Tax calculation
1.2.4	Non-taxable reimbursive travel allowance	1	1			2		Reasoning not relevant
1.2.5	Medical scheme fees credit	1	1			2		Routine procedure
1.2.6	Calculate missing amount	2				2		Simple addition
1.2.7	Calculation of gross non-retirement funding	2				2		Identify from document
1.2.8	Pension contributions		5			5		Routine procedure
	TOTAL	**26**	**12**			**38**		

Question 2								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
2.1.1	Calculating area of left over fabric		4	2		6	**2; 5**	Multi-step procedure
2.1.2	Calculating area of triangular shape		4			4		Routine procedure
2.1.3	Time calculations		4			4		Routine procedure
2.2	Calculating area and division		2	3		5		Formulae should be given
2.3.1	Calculating area of external surface area		4			4		Circular area
2.3.2	Calculating height		2	4		6		Multistep procedure
2.3.3	Conversions (and fraction)	1	1			2		Straightforward
	TOTAL	**1**	**21**	**9**		**31**		

Question 3								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
3.1.1	Direction from plan	2				2	**2; 3**	Straightforward
3.1.2	Reading from plan	2				2		Straightforward
3.1.3	Plans and direction	2				2		Straightforward
3.1.4	Maximum number of people (from plan)	4				4		Straightforward
3.1.5	Name of seats (reasoning)	2				2		Straightforward
3.1.6	Probability	1	2			3		Routine procedure
3.2.1	Read from route map	1	1			2		Straightforward
3.2.2	Read from route map	1	1			2		Straightforward
3.2.3	Name residential area from route map	2				2		Straightforward
3.2.4	Name water points; distance	3				3		Straightforward
	TOTAL	**20**	**4**			**24**		

Question 4								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
4.1.1	Categorical data	2				2	**4**	Data in categories
4.1.2	Mode	2	1			3		Use correct data set
4.1.3	Mean	1	2			3		Use correct data set
4.1.4	Total percentage of internet usage in America	2				2		Straightforward
4.1.5	Percentage of world population living in Asia	3				3		Straightforward
4.1.6(a)	Read percentage of African world population	2				2		Straightforward – read from graphs
4.1.6(b)	Draw broken line graph	2	4			6		Routine procedure
4.1.7	Interpreting data from table	2				2		Straightforward
4.2.1	Interpreting data from table	3				3		Straightforward
4.2.2	Calculating percentage	2				2		Straightforward
4.2.3	Write in number format	2				2		Straightforward
	TOTAL	**23**	**7**			**30**		

Question 5								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
5.1.1	Calculate missing value from report	2					**4; 5**	Straightforward
5.1.2	Calculate missing value from report	4						Straightforward
5.1.3	Range of data		2					Routine procedure
5.1.4	Ratio	2						Straightforward
5.1.5	Largest increase in remuneration		5					Routine procedure
5.1.6	Interpretation - annual report	2						Identify from table – simple
5.2.1	Stating probability		2					Routine procedure
5.2.2	Representing probability		3					Routine procedure
5.3	Total number of visitors		5					Routine procedure
	TOTAL	**10**	**17**					

Overall total	**Levels**				**Marks**
	1	**2**	**3**	**4**	
All questions	80	61	9	-	150

Mathematical Literacy Paper 2

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The layout of the question paper was done very professionally. Diagrams, maps, tables, etc. were very clear and easy to read. However, some of the annexures could have been placed with the respective questions as the paging front to back and back to front could have been very time consuming for the learners.

2. Language used

For those with English as a second or third language this question paper would have been a challenge in terms of how some of the questions were structured. Before learners could start to answer any question, they first had to comprehend and make sense of the copious amount of information that was given.

Some of the questions were ambiguous and could have been phrased in another way to make it simpler and easy for learners to understand. For example, question 1.1.2 could have been rephrased as “Calculate how much was paid in total to the UIF”

3. Syllabus coverage

The syllabus coverage was in keeping with the prescripts of the CAPS document as seen in the table below.

Code	Content areas	Suggested	Actual
1	Finance	53 (± 7)	49
2	Measurement	30 (± 7)	30
3	Maps, plans and other representations	23 (± 7)	25
4	Data Handling	37(± 7)	37
5	Probability (minimum)	7	9
	TOTAL	**150**	**150**

4.1 Standard of paper

Generally, the paper was of a high standard which required learners to have a certain level of reading, comprehending, interpreting and reasoning skills. There was integration

of two or three content areas in each question. Teachers claimed that below average learners would be at a disadvantage.

Two questions (questions 3.3.2; 3.4) carried 11 and 12 marks respectively. This required a structured approach which not many learners would have managed..

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2015
1 – Knowledge	0%	-
2 - Routine procedures	± 25%	24,00%
3 – Multi-step procedures	± 35%	37,33%
4 – Reasoning and reflecting	± 40%	38,67%

According to our calculations, the cognitive levels for Mathematical Literacy paper 2 were in line with the prescripts of the CAPS document.

5. Comparison with 2014 paper

To make a comparison with the 2014 paper, an additional column is included in the table for 4.2.

Levels of thinking	Suggested	November 2014	November 2015
1 – Knowledge	0%	-	-
2 - Routine procedures	± 25%	27,3%	24,00%
3 – Multi-step procedures	± 35%	38,7%	37,33%
4 – Reasoning and reflecting	± 40%	34,0%	38,67%

We note that there was an increase in level 4 (reasoning and reflecting) type of questions, making the 2015 marginally more difficult than the 2014 paper. However, with a large number of learners who were “progressed” to grade 12 (despite failing grade 11 in 2014), there are indications that overall learner performance in Mathematical Literacy P2 (and possibly Mathematical Literacy as a whole) would drop in 2015.

6. Overall verdict

As expected, a high cognitive demand was expected for Mathematical Literacy Paper 2. We are, indeed, happy with this stance taken by the Department of Basic Education as Mathematical Literacy has been in the news for all the "wrong" reasons. The questions were very interesting, but learners had to "plan, re-organise and sort" before they started to answer. Some learners indicted to their teachers that they could not finish as the paging took up a lot of time

We believe that teachers should become more aware of the importance of Mathematical Literacy as a school subject and that more should be done to raise the level of teaching of this subject. In this regard, the reading and interpretative skills of learners should be improved. Further, the high cognitive demands of Mathematical Literacy paper 2 should filter down to Grade 11 and Grade 10.

Despite some of the issues discussed in this review, we were very pleased with Mathematical Literacy paper 2. As in 2014, we classify the paper as being "of an exceptionally high standard" which we believe should continue for the foreseeable future.

B. Question by question analysis:

Question 1								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
1.1.1	Salary		2			2	**1; 5**	Straightforward calculation
1.1.2	UIF contributions			10		10		Question could have been rephrased to avoid being ambiguous.
1.1.3	Percentage and mean				6	6		Verification of calculations
1.2.1	Probability		4			4		Add all employees; calculate fraction of female cleaners
1.2.2	Probability			2		2		Low number of male supervisors
1.3.1	Missing values on UIF table		5			5		A is a percentage; B is an amount in Rand
1.3.2	Line Graph		5			5		Relationship between monthly salary and IRR
	TOTAL		**16**	**12**	**6**	34		

Question 2								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
2.1.1	Probability (weight loss)		1	2		3	**2; 4; 5**	Interpret table and box-and-whisker
2.1.2	Median weight loss				7	7		Verification of calculations
2.1.3	Inter-quartile range		2	1	2	5		Comparison
2.2.1	Mass in grams			4		4		Straightforward
2.2.2	Difference in calories			5		5		Use table and change in drinks intake
2.2.3	Measurement (Sugar consumption)				6	6		Verification of calculations
	TOTAL		**3**	**12**	15	**30**		

Question 3								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
3.1	Understanding a floor plan				2	2	**1; 2; 3**	Give reason for no doors
3.2	Understanding a floor plan		1		2	3		Making a judgment with reason
3.3.1	Interior dimensions of living room		3			3		Straightforward
3.3.2	Total surface area of interior walls			11		11		Read off dimensions from plan
3.4	Costing of wood panels				12	12		Verification of budget for panels and labour
	TOTAL		**4**	**11**	**16**	**31**		

Question 4								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
4.1.1	Course fees				2	2	**1; 2; 4**	Reason for scale of fees
4.1.2	Comparing costs				2	2		Reason for cost of double room being less than a single room
4.1.3	Cost of tuition and accommodation		3			3		Straightforward
4.1.4	Minimum amount Fees			5		5		Multistep calculations
4.2	Interpreting tables			6		6		Calculating her APS and link to bursary (multi-step_
4.3.1	Driving time		3	2		5		Use speed and distance
4.3.2	Interpretation of distance from map				2	2		Read strip chart
4.3.3	Exchange rates				6	6		Verification of calculations
	TOTAL		**6**	**13**	**12**	**31**		

Question 5								
Quest.	**Content**	**Levels**				**Marks**	**Topic Code**	**Comment**
		1	**2**	**3**	**4**			
5.1.1	Net migration rate				2	2	**1; 3; 4**	Interpret table
5.1.2	Difference in population sizes			5		5		Multistep calculations
5.2.1	Reading from bar graph		2			2		Routine steps
5.2.2	Difference in production		2		1	3		Routine; includes reasoning and reflecting
5.2.3	Reason for high consumption of crude oil				2	2		Linked to number of vehicles/population size
5.3.1	Approximate distance on a map			3		3		Read from map
5.3.2	Total amount of crude oil		3					Straightforward calculation
5.3.3	Interpretation of a situation				4	4		Reasoning and reflecting
	TOTAL		**7**	**8**	**9**	**24**		

Overall total	**Levels**				**Marks**
	1	**2**	**3**	**4**	
All questions		36	56	58	150