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## **REPORT OF THE AMESA CURRICULUM COMMITTEE ON THE 2010 SENIOR CERTIFICATE MATHEMATICS AND MATHEMATICAL LITERACY PAPERS**

After the 2010 National Examinations for Mathematics and Mathematical Literacy were written on 29 October and 1 November 2010 and the Curriculum Committee of the Association for Mathematics Education of South Africa (AMESA) called on its nine regions and branches to review the papers and give constructive feedback. Responses were recorded and submitted to the AMESA National Council as a consolidated report. The detailed reports are provided as appendixes as follows:

- Appendix A: Mathematics Paper 1 Report
- Appendix B: Mathematics Paper 2 Report
- Appendix C: Mathematical Literacy Paper 1 Report
- Appendix D: Mathematical Literacy Paper 2 Report

In terms of AMESA's vision and goals, the purpose of this report is to provide effective feedback to the Department of Education on the following aspects regarding the Mathematics Grade 12 examinations:

- Technical aspects
- Language used
- Curriculum coverage
- Standard of the paper and compliance with the cognitive levels of thinking
- Comparison with the 2009 Paper
- Overall observations

It is our hope that the question by question analyses found in Appendixes, will be helpful to the Examiners, Markers and Moderators as well as to the Department of Basic Education in general.

It is also our wish as AMESA to continue working very closely with the Department of Basic Education in our attempt to promote Mathematics education and, in particular, to enhance the quality of the teaching and learning of Mathematics in South Africa.

Many thanks

**Elsbeth Mmatladi Khembo**  
**AMESA National President**  
**10 December 2010**

## APPENDIX A: Mathematics Paper1 Report

### Technical aspects

All technical aspects were in-keeping with general high standard which is expected from the Department of Basic Education.

### Language used

The language was mostly fair and within the scope of learners' reading ability as they would be familiar with the language used in the paper. Learners who use English as the language of learning and teaching would have had difficulty interpreting questions 8.3 and 11.5. Some learners did not know the meaning of "curved surface area" in the text box in question 10.

### Curriculum coverage

The curriculum was well covered; fair proportion of Grades 11 and 12 work; all questions were within the scope of the syllabus. The table below shows that the content in the paper was in-keeping with the requirements as set out in the Subject Assessment Guidelines for Mathematics.

Code	Content/Topic	Suggested	Actual
1	Patterns & Sequences (LO1)	30	24
2	Annuities & Finance (LO1)	15	14
3	Functions & Graphs (LO2)	35	37
4	Algebraic manipulation; equations (LO2)	20	21
5	Calculus (LO2)	35	38
6	Linear Programming (LO2)	15	16
	<b>TOTAL</b>	<b>150</b>	<b>150</b>

The mark allocation appeared to be fair; some questions required a higher level of cognitive ability and may have been beyond the scope of average learners.

### Standard of the paper and compliance with the cognitive levels of thinking

The paper had a good overall standard catering for all ability levels. There were some very insightful and challenging questions and these are highlighted below:

- Q2.3.2. Removal of the even numbers in the sequence and calculating the remaining sum
- Q8.3. Calculation of the unknown constants in a given function
- Q9.5. Explaining why there is a local maximum at  $x = -2$
- Q10. Calculating outer surface area function and its minimum value
- Q11.5. Interpretation of the demand for braai stands

Our analysis of the question paper in terms of cognitive levels of thinking is shown in the table below:

Levels of thinking	Suggested	November 2010
1. Knowledge	± 25%	± 5%
2. Routine procedures	± 30%	± 49%
3. Complex procedures	± 30%	± 39%
4. Solving problems	± 15%	± 7%

The analysis table above tends to reveal that almost 90% of the paper consisted of level 2 and level 3 questions. Although more level 1 questions could have been included, one may have to look at combining level 1 with level 2; and combining level 3 with level 4. This would be a fairer analysis. Level 1 and level 2 (combined) comprised 54% of the paper and level 3 and level 4 (combined) comprised 46% of the paper. This, clearly, is in-keeping with the suggested percentages.

### **Comparison with the 2009 Paper**

Although the paper appeared to be at a similar level (challenging) to the 2009 paper, there were plenty of opportunities for learners to do well, especially if they were well prepared.

### **Overall observations**

A very fair paper, set at the appropriate Grade 12 standard, notwithstanding the lack of level 1 questions and its impact on “weaker” learners.

## Mathematics Paper 1: November 2010: Question by question analysis

Question 1: Equations; Inequality; Exponents [21]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
1.1.1	Quad. Eq.		3			3	4	
1.1.2	Quad. Eq. (formula)		4			4		
1.1.3	Quad. Ineq.		2	2		4		
1.2	Sim. Eq.		7			7		
1.3	Exponents			3		3		

Question 2: Sequences and Series [17]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
2.1	$\sum$ GS		4			4	1	Must final answer be simplified? $x \neq 0$
2.2.1	Convergence			3		3		
2.2.2	$S_{\infty}$		2			2		
2.3.1	Calculation of n		2			2		
2.3.2	$S_{\infty}$ (odd numbers)			6		6		

Question 3: Quadratic sequence [7]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
3.1	Cal. $T_3$			3		3	1	3.1 can also be done by inspection; learners unable to find $x$ would not be able to proceed; positive marking
3.2	Cal. $T_k$		4			4		

Question 4: The hyperbola [14]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
4.1	Eqns. of asymptotes	2				2	3	Knowledge
4.2	Eqn. of hyperbola		3			3		Note: formula in SAG has: $y = \frac{a}{x+p} + q$
4.3	y-intercept	2				2		
4.4	Equation of AD		3			3		If 4.2 is wrong cannot attempt 4.3 – 4.5
4.5	Pt. of intersection			4		4		

Question 5: Exponential function [12]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
5.1	Intercepts on axes		4			4	3	Diagram sheet – hint for learners
5.2	Asymptote	1				1		Good grid – axis must be central
5.3	sketch		3			3		
5.4	$f$ translated	1				1		
5.5	Solve equation		3					

Question 6: Parabola; inverse function; reflections [11]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
6.1	Find “a”		2			2	3	Too many fractions but more relevant than in 2009
6.2	Equation of $f^{-1}$			3		3		Calculator with fraction function – advantage to some learners
6.3	Range of $f^{-1}$		1			1		
6.4	Sketch of $f^{-1}$		2			2		
6.4	Reflections of $f$			3		3		

Question 7: Financial Mathematics [14]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
7.1	Cal. $i$ - compd interest		5			5	2	Ambiguity – not clear if months include time when no payments are made
7.2.1	$F_V?$ – compd interest			2		2		Accept 25,78; 26 or 30 months
7.2.2	$n?$ – annuity formula			4		4		Loan allows him to start payment in August; does not imply that interest was charged initially
7.2.3	Balance of loan			3		3		Phrasing needs to improve; should have no ambiguity

Question 8: Calculus: Derivatives/function & derivative values [14]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
8.1	1 <sup>st</sup> principles		5			5	5	Learners should not be penalised if negative exponents are given in final answer as positive exponents not requested in instructions
8.2	derive by rules		3			3		
8.3	Find a and b			6		6		

Question 9: Calculus (graph of derivative) [12]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
9.1	y-intercept of $g'$	1				1	5	Wording not clear
9.2	Equation of $g'$		4			4		
9.3	x-coordinates of TP			2		2		
9.4	x-coordinate of inflection pt.			2		2		
9.5	Explain local maximum				3			

Question 10: Calculus applications [12]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
10.1	Show $h =$		3			3	5	Poor sketch
10.2	Show $S =$			3		3		Wording not clear
10.3	Cal. min value of S			6		6		Once again, more fractions

Question 11: Linear programming [16]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
11.1	Constraints			4		4	5	Poor wording; it could be interpreted as 3 hours for "welding" and 3 hours for "finishing"
11.2	Sketch		3			3		
11.3.1	Max. no of type A		1			1		
11.3.2	Max. no. of type B		1			1		
11.4	Max. total			2		2		
11.5	N& T				5	5		

Overall total	Levels				Marks
	1	2	3	4	
All questions	7	74	58	11	150

## APPENDIX B: Mathematics Paper 2 Report

### Technical aspects

The technical aspects of the paper were in keeping with the high standards as set out by the Department of Basic Education. However, some learners found the diagram in question 11 a bit confusing.

### Language used

The language was mostly fair, clear and unambiguous and within the scope of learners' reading ability.

### Curriculum coverage

The syllabus was well covered; a fair proportion of Grades 11 and 12 work and all the questions were within the scope of the syllabus. The table below shows that the content in the paper was in-keeping with the requirements as set out in the Subject Assessment Guidelines for Mathematics.

Code	Content/Topic	Suggested	Actual
1	Coordinate Geometry (LO3)	40	37
2	Transformation Geometry (LO3)	25	26
3	Trigonometry (LO3)	60	57
4	Data Handling (LO4)	25	30
	<b>TOTAL</b>	<b>150</b>	<b>150</b>

The mark allocation appeared to be fair; some questions required a higher level of cognitive ability and may have been beyond the scope of average learners.

### Standard of the paper and compliance with cognitive levels of thinking

Although it would appear that the paper was fair, there were very few questions set at the Level 1 category. This may have disadvantaged "weaker" learners. However, there were questions, which although appearing to be easy, had a higher level of cognitive demand. These are highlighted below:

- Q 5: Interpretation of straight lines and coordinates (Analytical Geometry)
- Q 6: Analytical Geometry (Circles and parallel lines)
- Q 8: Trigonometry (rotation through a given angle)
- Q 11: Trigonometry (3- D problem)
- Q 12.2: Using graphs to solve trigonometric equations
- Q 12.3: Using graphs to solve trigonometric inequality

Some teachers felt that the order of the paper needs to be re-considered as the learners only get to the trigonometry part when they are already tired. Other teachers suggested that Data Handling should maybe come first.

Some concern was expressed about the **Trigonometry part of the paper**. Q8.1 became an exercise in simplifying surds and the same problem arose in Q10.2 where the answer (without using a calculator) required some fancy (algebraic) footwork to manipulate it into the given form, thereby wasting the candidates' time. It would

appear that the answer  $\frac{\sqrt{3}-1}{\sqrt{2}}$  would have been the more obvious without-using-a-

calculator answer rather than the one given in the paper which was straight from the calculator! On further inspection, the proof is not valid for any angle A, since values of 45°;135°; etc. would invalidate this proof.

Q11, the heights and distance problem, could be solved entirely with right-angled triangles – so the **area, sine and cosine rules did not feature** in this paper.

In Q12 the graphs were badly chosen – for the interval, (-90°; -45°) it requires some careful (time consuming) work to decide which graph lies above the other. And then the trigonometric equation in Q12.2 (which has already been examined in Q10.3) is at an entirely different level of difficulty.

Our analysis of the question paper in terms of cognitive levels of thinking is shown in the table below:

Levels of thinking	Suggested	November 2010
1. Knowledge	± 25%	± 9%
2. Routine procedures	± 30%	± 49%
3. Complex procedures	± 30%	± 24%
4. Solving problems	± 15%	± 18%

The questions at level 3 and level 4 were in keeping with the requirements but those at level 1 and 2 tended to be in favour of level 2. Too many questions depended on the answers/results of previous questions. This would have a major impact on learner's results if CA (continued accuracy) is not applied fairly in the paper.

### Comparison with the 2009 Paper

The paper compares well with the previous two years; it would appear that learners (if they had worked hard) would score well in the paper as it catered for all the types of questions and there was nothing challenging or untoward in the paper.

### Overall observations

A paper set at the appropriate Grade 12 standard, notwithstanding the effect on "weaker" learners with too few level 1 questions and our criticism of the trigonometry part of the paper.



## Mathematics Paper 2: November 2010: Question by question analysis

Data Handling (Q1 – 4): [30]								
Question 1: 5-number summary/box and whisker (9)								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
1.1	5-number summary		4			4	4	Routine procedure
1.2	Box and whisker	2				2		Drawing from data in 1.1
1.3	Opinion and reasons			3		3		Involves reasoning

Question 2: Cumulative Frequency Table/Ogive [8]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
2.1	Cum. Freq. table	2				2	4	Table given
2.2	ogive		5			5		Routine procedure
2.3	Estimate from ogive	1				1		Done in earlier grades

Question 3: : Mean/Standard Deviation [7]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
3.1	mean	2				2	4	Use of formula
3.2	Std. deviation		3			3		Routine procedure using calculator
3.3	Applying std. deviation			2		2		Level of reasoning and some calculator

Question 4: Scatter plot [6]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
4.1	Question on scatter plot	1				1	4	Identifying from data. Axes should be the other way round
4.2	Motivating – T/F?			1		1		Concept of ratio here
4.3	Justify opinion					2		Level of reasoning (not obvious)
4.4	Choice/reason					2		Quite a bit of reasoning needed here; not necessarily mathematical

COORDINATE GEOMETRY: (Q5 - 6) [37]								
Question 5: Formulae, Lines & Angles [20]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
5.1.1	Gradient	2				2	1	Formula use
5.1.2	Gradient	1				1		Formula use
5.2	size of angle			3		3		No direct route to solution
5.3	equation of straight line		2			2		Use of formula (given two points) it is "the" equation ; not "an" equation
5.4	Co-ordinates of midpoint		2			2		Formula use
5.5	collinear points			4		4		Non routine problem (2 methods) –find equation of AM or collinear concept. Serious knock on effect, from 5.4 and to 5.6
5.6	find values of b			6		6	Higher level calculation.	

Question 6: : Lines & Circles [17]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
6.1	equation of diameter		3			3	1	Routine procedure – perpendicular lines. This whole question had a serious knock on effect right from 6.1 to 6.6
6.2	coordinates of contact point		2			2		Routine procedure – pt. of intersection. It would have been better to say "show that the coordinates of L are..."
6.3	equation of circle		3			3		Some manipulation using distance formula to get RHS
6.4	coordinates of end point		3			3		Formula use
6.5	equation of line		3			3		Routine procedure using parallel lines
6.6	Translation and enlargement; new equation				3	3		Higher level skills (horizontal shift and doubling the diameter) Will they just double radius? Challenging but excellent question

TRANSFORMATIONS: (Q7 – 8) [26]								
Question 7: Reflection, translation, enlargement & area [14]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
7.1	multi-transformation		6			6	4	Simple applications with many steps There may be only one sketch and if the final sketch is correct, they should get full marks. They might have calculated the final answer.
7.2	rule for transformation		4			4		Will they keep continuity of transformation?
7.3	area of triangle				4	4		First have to establish that $AB \perp AC$

Question 8: : Rotation [12]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
8.1	x-co-ordinate of rotated point.			6		6	4	Use of compound angle makes it more complicated –higher order calculation skills. Over kill on surds. Messy, it would have been better as a problem using a calculator.
8.2	find angle of rotation				6	6		If they used special angles (30, 60 triangle) then fairly simple But if used simultaneous – quite complicated

TRIGONOMETRY: (Q 9 – 12) [57]								
Question 9: Sketch – ratios & identities [8]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
9.1	trig ratio from sketch	3				3	3	Good warm up question.
9.2	trig expression		2			2		Familiar problem
9.3	trig expression		3			3		

Question 10: Identities, Special angles/Compound angles/Trig equation [17]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
10.1	identity./special angles		5			5	3	Routine procedure but strange answer!
10.2	compound angles				6	6		Higher level skills.



## APPENDIX C: Mathematical Literacy Paper 1 Report

### Technical aspects

All technical aspects were in-keeping with general high standard which is expected from the Department of Basic Education.

### Language used

The language was mostly fair and within the scope of learners' reading ability as they would be familiar with the language used in the paper. However, in Q2.1 learners may have had a problem with "lateral" surface area. For this word they could have explained what lateral means as was done with the word "calibrated" in Q1.3.

### Curriculum coverage

Although the paper was comprehensive enough, there was some repetition of questions which could have been replaced with other questions. For example in Q 1.2.2 the mode and median were asked, but also in Q 6.1.3 (b) and (c). One of these questions could have been replaced by quartiles and percentiles.

The question paper also lacks personal finances such as simple interest, taxes, budgets, etc. Teachers spend a lot of time on these sections of the curriculum.

**Approximate** coverage of the **learning outcomes** are shown in the table below:

Code	Learning Outcomes	Suggested	Actual
LO1	Numbers and operations in context	37	32
LO2	Functional relationships	38	40
LO3	Space, Shape and measurement	38	39
LO4	Data Handling	37	39
	<b>TOTAL</b>	<b>150</b>	<b>150</b>

A quick scrutiny of the table shows compliance with the stipulations as set out in the Subject Assessment Guidelines for Mathematics.

### Standard of the paper and compliance with levels of thinking

The quality of the question paper is of a good and acceptable standard. The questions are set in such a way that it is easy to distinguish between the sub-sections. Mark allocations are also indicated alongside each question.

The questions in the question paper range from very easy to more advanced, but not too difficult. This is in keeping with the departmental requirement that only level 1 and level 2 questions form part of Mathematical Literacy P1. In all cases where applicable formulae are given and only substitution into these were needed.

In Question 2.3 too much data was given with different information which could lead to confusion by the learners. For learners to make more sense of the data, it could have been represented in different tables.

Question 5.2 (an easy question) was too late in the paper and as it was part of a LO3 question (which learners don't like) this could lead to the fact that learners will also

not attempt to do this question. The context of carrots in this question was not realistic as carrots are sold in “bunches” or in “packets” and not loosely.

Question 6 (also a reasonable question) should have been earlier in the paper, because coming to the end of a paper learners get tired and normally make silly mistakes

It was observed that most of the learners left the examination rooms just before the end time, therefore the time were adequate for learners to complete the question paper.

Our analysis of the question paper in terms of cognitive levels of thinking is shown in the table below:

<b>Levels of thinking</b>	<b>Suggested</b>	<b>November 2010</b>
1. Knowledge	± 60%	± 60%
2. Routine procedures	± 40%	± 40%

The cognitive levels for the paper were within the range as prescribed by the Subject Assessment Guidelines.

### **Comparison with the 2009 Paper**

Although this was seen as an easier and straight forward question paper, there was much intensive reading which could have lead to misinterpretation of questions. The paper was similar to the 2009 paper and set at the appropriate level. There were plenty of questions where learners could score “high” marks.

### **Overall observations**

A very fair paper, set at the appropriate Grade 12 standard. Learners (and teachers) cannot complain about this paper.

## Mathematical Literacy Paper 1: October/November 2010

### Question by question analysis

Question 1: Simple mixed questions [33]								
Quest.	Content/skill	Levels				Marks	Topic Code	Comment
		1	2	3	4			
1.1.1	Basic operations	4					LO 1-4	
1.1.2	Fraction	2						
1.1.3	Currency conversion	2						
1.1.4	Length Conversion	2						
1.1.5	Percentage	2						
1.1.6	% profit	2						
1.2.1	Read off	1						
1.2.2	Mode; median	2	2					
1.3.1	volume	2						
1.3.2	height	2						
1.4.1	Earnings, multiply	2						
1.4.2	Hours; division	2						
1.5.1	Read off from graph	2						
1.5.2	Read off from graph	2						
1.5.3	Estimate from graph		2					Answer is approximate
		29	4					

Question 2: Surface area; graphs and tables [33]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
2.1.1(a)	Lateral surface area	2					LO 1; 2; 3	The meaning of "lateral"
2.1.1(b)	Lateral surface area	3						
2.2.1	Time from home	1						
2.2.2	Time to reach post office		2					
2.2.3	Time at post office		2					
2.2.4	Distance from home		2					
2.2.5	Journey back		2					
2.2.6	Time		2					
2.2.7	Average speed		3					
2.3.1	% difference	2						
2.3.2(a)	Missing values	3						More level 3 than level 2 as distance must be calculated first

2.3.2(b)	Missing values	3						Round off to nearest 100
2.3.2(c)	Missing values	3						Round off to 1 decimal place
2.3.3	ratio	3						Round off to 1 decimal place
	Total	20	13					

**Question 3: Tables; bar graph, conversions; rate [19]**

Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
3.1.1	Total income	2					LO 1-4	
3.1.2	Ascending order	2						
3.1.3	Bar graph		5					
3.2.1	Conversion	2						
3.2.2	Hectares		3					
3.2.3	Kilograms		3					
3.2.4	Average amount as %		2					Not clear
	Total	6	13					

**Question 4: Graphs & formulae [19]**

Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
4.1.1	Observation	2					LO 2-4	
4.1.2	Read off	2						
4.1.3	Read off	2						
4.1.4	Read off; round off	3	3					Round of to nearest whole number
4.1.5	Range		3					
4.2.1	Entrance fee	2						
4.2.2	Perimeter	2						
4.2.3	Volume		2					
	Total	13	8					

**Question 5: Area; perimeter; volume & tables [22]**

Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
5.1.1	Direction	1					LO 1-4	
5.1.2	Perimeter	3						
5.1.3	Volume	3						
5.1.4	Area		3					
5.1.5	Total area		4					
5.2.1	Average mass		2					
5.2.2	Missing values	4						
5.2.3	Number of carrots	2						
	Total	13	11					



Question 6: Tables; measures of central tendency; graphs [14]								
Quest.	Content	Levels				Marks	Topic Code	Comment
		1	2	3	4			
6.1.1	mean		3				LO 2;4	Common fraction in simplest form
6.1.2	probability	3						
6.1.3(a)	range	2						
6.1.3(b)	Mode	2						
6.1.3(c)	median		2					
6.2.1	Income		2					
6.2.2(a)	graph		8					
6.2.2(b)	Read off from table or graph	2						
	TOTAL	9	15					

Overall Total	Levels				Marks
	1	2	3	4	
All questions	82	68			150

## APPENDIX D: Mathematical Literacy P2

### Technical aspects

Technical aspects such as spacing and font-size, were in-keeping with general high standard which is expected from the Department of Basic Education. All diagrams, graphs and tables were clear.

### Language used

This paper required a great deal of reading and interpretation. Although the language was mostly fair and within the scope of learners' reading ability, learners with a poor grasp of English would have struggled with the paper.

### Syllabus coverage

Although the syllabus coverage in the paper appeared to be good, measures of central tendency was not in the paper. Learners tend to rely on this section for their marks. Learning Outcome 4 was also not adequately covered in the paper.

**Approximate** coverage of the learning outcomes are shown in the table below:

Code	Learning Outcomes	Suggested	Actual
LO1	Numbers and operations in context	38	46
LO2	Functional relationships	38	33
LO3	Space, Shape and measurement	37	49
LO4	Data Handling	37	22
	<b>TOTAL</b>	<b>150</b>	<b>150</b>

A quick scrutiny of the table shows there seems to be less coverage of LO4; with LO1 and LO3 having a great deal more than what was set out in the Subject Assessment Guidelines for Mathematics.

### Standard of the paper and compliance with cognitive levels of thinking

The paper was of a good standard as expected for Mathematical Literacy Paper 2. Once again learners had to do a lot of reading and may have had a problem with the terminology used in the paper. 2<sup>nd</sup> language learners (with a poor grasp of English) would have struggled with the paper. Some questions such as Q1.2.3 (a) **Definition of the concept, break-even point**; and Q2.1.3 (b) **Using a ruler to calculate the distance on a map** may have been unclear

There were some areas which could have "helped" learners:

- The formula for percentage change should have been given in 3.1.3b
- Question 4.2 and 4.3.1 each carried 11 marks, which was too high. Learners could easily lose these marks if they did not know how to start with these questions. These questions could have been broken up into sub-sections.

It was observed that the brighter learners finished the paper on time; the average and weaker learners struggled to finish because they had to do a lot of reading before attempting to answer the questions.

Our analysis of the question paper in terms of cognitive levels of thinking is shown in the table below:

<b>Levels of thinking</b>	<b>Suggested</b>	<b>November 2010</b>
2. Routine procedures	± 20%	± 23%
3. Multi-step procedures	± 40%	± 43%
4. Reasoning and reflecting	± 40%	± 34%

The cognitive levels for the paper were within the range as prescribed by the Subject Assessment Guidelines.

### **Comparison with the 2009 Paper**

It would appear to be more cognitively demanding than the 2009 paper. There were a number of questions which required a great deal of reading and sifting through of information. These questions may have disadvantaged 2<sup>nd</sup> language learners.

### **Overall observations**

A very comprehensive paper set at the appropriate Grade 12 standard. However, the coverage of the content from the four learning outcomes was not balanced.

## Mathematical Literacy Paper 2: November 2010

### Question by question analysis

Question 1: Mixed questions (Circumference; cell phone package; graphs) [26]								
Quest.	Content/skill	Levels				Marks	Topic Code	Comment
		1	2	3	4			
1.1.1(a)	Circumference			4			LO 1-2	
1.1.1(b)	Division			2				
1.2.1(a)	Formula			2				
1.2.1(b)	Cost of calls			4				
1.2.2	Graph		5					
1.2.3(a)	Definition		2					Explanation
1.2.3(b)	Read off from graph		2					
1.2.4	Choosing from two options; motivation & calculations				5			Motivating a choice through calculations
	TOTAL		9	12	5			

Question 2: Directions; routes; average speed, tree diagram; probability [28]								
Quest.	Content/skill	Levels				Marks	Topic Code	Comment
		1	2	3	4			
2.1.1	Grid reference		2				LO 2-4	
2.1.2	General direction		2					
2.1.3(a)	Shortest possible route			4				
2.1.3(b)	Approximate distance; actual				4			Depends on 2.1.3b; difficult to work out with accuracy
2.1.4	Verifying using relevant calculations				6			Too much of reading; learners can get "lost"
2.2.1	Tree diagram			7				
2.2.1	Probability			3				
	TOTAL		4	14	10			

<b>Question 3: Salary calculations; government spending</b> [38]									
<b>Quest.</b>	<b>Content/skill</b>	<b>Levels</b>				<b>Marks</b>	<b>Topic Code</b>	<b>Comment</b>	
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>				
3.1.1	Monthly costs		5				LO 1;4	All key concepts explained	
3.1.2(a)	Deductions from salary			5					
3.1.2(b)	Net annual salary			3					
3.1.3(a)	Validating a statement through calculations				10				Too many marks for one question
3.1.3(b)	Percentage change			3					
3.2.1	Multi-step calculations				8				
3.2.2	Reflection and reasoning				4				
	TOTAL		5	11	22				

<b>Question 4: Space and shape; cost</b> [28]									
<b>Quest.</b>	<b>Content/skill</b>	<b>Levels</b>				<b>Marks</b>	<b>Topic Code</b>	<b>Comment</b>	
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>				
4.1	Height of bottle		3				LO 1;3		
4.2	Multi-step procedures to validate a guideline				11				Too many marks for one question – should be broken up into sub-questions
4.3.1	Multi-step procedures to calculate mass			11					Too many marks for one question- should be broken up into sub-questions
4.3.2	Cost of cough syrup			3					
	TOTAL		3	14	11				

Question 5: CPI; inflation (30)								
Quest.	Content/skill	Levels				Marks	Topic Code	Comment
		1	2	3	4			
5.1.1(a)	Read from graph		2				LO 1; 2; 4	Questions clear and easy to understand
5.1.1(b)	Read from graph		2					
5.1.1(c)	Read from graph		2					
5.1.2(a)	Read from graph		3					
5.1.2(b)	Multi-step calculation			3				
5.2.1	Multi-step calculation (reverse)			3				
5.2.2	Cost of bread		4					
5.3.1	Draw graph			7				On the same grid as "old" fruit basket
5.3.2	Trends in the graph				2			
5.3.2	Possible reasons				2			
	TOTAL		13	13	4			

Overall total	Levels				Marks
	1	2	3	4	
All questions		34	64	52	150