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

AMESA REVIEW OF THE GRADE 9 ANA MATHEMATICS PAPER 2013

Dear Mr Mweli

Last year the Department (Mr Moloi) requested AMESA to give the Department "an independent opinion on the standard of the Grade 9 ANA Mathematics paper", which we did.

This year we have initiated the process ourselves. We find it a very fruitful professional development exercise for our participating members, and we believe that you will find our resulting review useful and constructive feedback into your evaluation of the annual assessment.

I therefore hereby submit our review to the Department in the spirit of promoting mathematics education and enhancing the quality of the teaching and learning of Mathematics in South Africa.

Sincerely

Alwyn Olivier
AMESA President

INTRODUCTION

All our AMESA regions (provinces) participated in a workshop activity to review the 2013 ANA Grade 9 Mathematics paper according to specific criteria and guidelines developed by our National Curriculum Committee. The provinces then submitted their reports to the AMESA National Curriculum Committee, and the Curriculum Committee then compiled this report as a summary of the findings and trends of the AMESA provincial reports.

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

A. Overall Review
   1. Technical aspects (typing, diagrams, etc.)
   2. Language used
   3. Content area coverage
   4.1 Standard of paper
   4.2 Comment on the time allocated
   4.3 What did learners say
   4.4. Compliance with ANA Framework
   4.4.1 Difficulty level
   4.4.2 Cognitive level
   4.4.3 Format of questions

B. 1. Question by question analysis
   2. Weighting of content area (learning outcomes) per question
   3. Difficulty levels per question
   4. Cognitive levels per question

C. Conclusion

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.

PART A: OVERALL REVIEW

1. Technical aspects (typing; diagrams; etc)

All technical aspects of the paper were in keeping with the high standards we expect from the Department of Basic Education. The typing of the paper was of an exceptionally high standard. All diagrams and graphs were large and clear, leaving no room for misinterpretation by learners. Learners were given ample space in which to write their responses/solutions on the question paper.

2. Language used

The language used in the paper would be within reach of most Grade 9 learners. There were no unfamiliar words or terms in the paper. The instructions or stimulus in each question was in straightforward and simple English and did not involve any perceived ambiguity. Teachers were also happy with the Afrikaans translation of the paper, stating that this was a great improvement when compared to the previous year.

3. Content area coverage (in 2013 on NCS) from Learning Outcomes − See part B(1)

Code	Learning Outcomes/ Content area	Suggested %	Actual
LO1	Numbers, Operations and Relationships	15%	13%
LO2	Patterns, Functions and Algebra	35%	35%
LO3	Space and Shape	30%	19%
LO4	Measurement	10%	14%
LO5	Data Handling	10%	19%
	Total	**100%**	**100%**

4.1 Standard of paper

The paper was of a substantially good standard which tested the knowledge and skills which a Grade 9 mathematics learner should have. The DBE is to be commended for setting a well-balanced paper. All the questions were in accordance with the ANA framework for Grade 9. Learners who were taught well and worked hard should have no problem with passing the paper.

4.2 Comment on the time allocated: Did learners finish on time?

The time allocated (150 minutes) compared to the marks for the paper (140) appeared to be reasonable. This was confirmed by teachers who claimed that a majority of their learners finished the paper in the stipulated time.

4.3 What did learners say about the paper?

In general, learners claimed that the paper was “easier than expected”. However, a number of them were concerned about their ability to work through the Geometry questions in question 8.

4.4 Compliance with ANA Framework for Grade 9 Mathematics

4.4.1 Difficulty level − see part B(3)

The difficulty levels and cognitive levels must conform to the percentages indicated in the tables.

Difficulty levels *	Easy E	Moderate M	Difficult D
Suggested %	25	60	15
Actual %	27	58	15

4.4.2 Cognitive level − see part B(4)

Cognitive levels **	Knowledge of basic concepts K	Application of concepts A	Non-routine problem solving N
Suggested %	25	60	15
Actual %	26	59	15

4.4.3 Format of questions

Format of question	Multiple choice M	Written response showing calculation C	Graph sketching G
Suggested %	10	80	10
Actual %	7	84	9

PART B: QUESTION BY QUESTION REVIEW

1. QUESTION BY QUESTION ANALYSIS

SECTION	QUESTION	TOPIC/CONTENT	LO	W/SCHEDULE (TERM)	DIFFICULTY LEVEL (E, M, or D)	COGNITIVE LEVEL (1, 2, 3 or 4)	COMMENT	MARK	TOTAL MARK
A	**QUEST 1**								
	1.1	Number system	1	1	E	1	Types of numbers	1	
	1.2	Patterns	2	1	E	2	Observe denominators	1	
	1.3	Functions	2	1	E	2	Make y =0	1	
	1.4	Algebra	2	1	E	1	Make sense of an expression	1	
	1.5	Exponents	2	1	E	2	Simplification	1	
	1.6	Scientific notation	1	1	E	1	Moving the decimal	1	
	1.7	Exponents	1	1	M	2	Division	1	
	1.8	Geometry	3	2	M	2	Choosing pairs of triangles with right description	1	
	1.9	Geometry	3	3	M	2	Calculation in terms of x	1	
	1.10	Probability	3	4	E	1	Probability of an event	1	**10**
B	**QUEST 2**								
	2.1	Algebraic fractions	2	1	M	2	Simplification	3	
	2.2	Simplifying brackets	2	2	M	2	Simplification	4	
	2.3	Square and cube roots	1	2	E	1	Simplification	5	
	2.4	Fractions	2	2	M	3	Simplification	4	**16**
	QUEST 3								
	3.1	Factorizing	2	1	E	1	Common factor	2	
	3.2	Factorizing	2	1	M	2	Difference of two squares	2	**4**
	QUEST 4								
	4.1	Simple linear equation	2	2	E	1		2	
	4.2	Linear equation with brackets	2	2	M	2	Simplify both sides	4	
	4.3	Fractional linear equations	2	2	E	1	Multiply by LCM	4	
	4.4	Simpleexponential equation	1	1	M	1	Find cube root on both sides	2	**12**

	QUEST 5								
	5.1	Number patterns	2	1	E	1	Next two terms of sequence	2	
	5.2	Number patterns	2	1	M	1	General term (in terms of n)	2	
	5.3	Number patterns	2	1	M	1	Substitute in general term	2	**6**
	QUEST 6								
	6.1	Distance, speed, time	1	2	M	1	Calculation of time	2	
	6.2	Simple interest	1	3	M	2	Simple interest after 3 years	5	
	6.3	Compound interest	1	3	M	2	Amount owing	4	**11**
	QUEST 7								
	7.1.1	Coordinates on graph	2	2	E	1	Writing coordinates in a table	3	
	7.1.2	Finding the equation of graph	2	2	M	2	Using the table or any other method	2	
	7.2.1	Drawing graph	2	2	M	3	Use of ruler and pencil/pen	5	
	7.2.2	Reading off from graph	2	2	E	1	Knowing that “cut one another” means intersect	2	**12**
	QUEST 8								
	8.1.1	Basic geometry	3	2	M	2	Base angles of Isosceles triangle	1	
	8.1.2	Basic geometry	3	2	M	2	Exterior angle of triangle	1	
	8.1.3	Basic geometry	3	2	M	2	Base angle of isosceles triangle	3	
	8.2.1	Congruency	3	3	M	2	Application of congruency	1	
	8.2.2	Congruency	3	3	E	1	Identifying a triangle	1	
	8.3	Congruency	3	3	D	3	Giving reasons for congruency	4	
	8.4.1	Similarity	3	3	M	2	Scaffolding question on similar triangles	4	
	8.4.2	Similarity	3	3	M	2	Application of similarity	3	**18**

	QUEST 9								
	9.1	Reflection	3	3	M	2	Reflecting a triangle	2	
	9.2	Image of a point	3	3	E	1	From the reflection	1	
	9.3	Rotation through 180° about the origin	3	3	M	2	Drawing of triangle	2	
	9.4	Length of segment AA'	3	3	M	1	Properties of reflection	1	**6**
	QUEST 10								
	10.1.1	Area (of circle)	4	1	D	4	Using area of two circles	2	
	10.1.2	Substitution in formula	4	1	D	3	Area of a ring	2	
	10.2.1	Calculation in triangular prism	4	1	E	2	Use of theorem of Pythagoras	2	
	10.2.2	Use of theorem of Pythagoras to calculate PT	4	1	M	2	Acknowledge that PQR is a triangle with height PT	4	
	10.2.3	Area of triangle	4	1	M	2	Use of area formula	3	
	10.2.4	Volume of prism	4	1	M	2	Use of volume formula	2	
	10.2.5	Surface area of prism	4	1	D	3	Use of surface area formula	5	**20**
	Quest 11								
	11.1	Completing frequency table	5	3	D	4	Use histogram	4	
	11.2	Reading off from histogram or table	5	3	E	1	Interpretation of histogram or table	1	
	11.3	Calculating mean from table	5	3	M	2	Summing of all products and dividing by the number of learners	3	
	11.4	Reading off from table or histogram and calculating %	5	3	M	2	Interpretation of table or histogram	2	**10**

	Quest 12								
	12.1	Stem and leaf display	5	3	M	2	Writing the leaves in descending order	5	
	12.2.1	Range	5	3	M	2	Highest – lowest	1	
	12.2.2	Mode	5	3	E	1	The number which occurs the most	1	
	12.2.3	Median	5	3	M	2	The number in the middle	1	
	12.2.4	Calculation from data or stem-and-leaf display	5	3	E	1	Interpretation of stem and leaf display	1	**9**
	Quest 13								
	13.1	Probability	5	4	E	1	Simple calculation	1	
	13.2	Probability	5	4	E	1	Simple calculation	1	
	13.3	Probability	5	4	E	1	Simple calculation	1	**3**
	Quest 14								
		Problem solving	5	4	D	4	Using Venn diagrams or linear equation	3	**3**
Total									**140**

2. WEIGHTING OF CONTENT AREA (LEARNING OUTCOMES) PER QUESTION

Key:

1 – Numbers, operations and relationships
2 – Patterns functions and algebra
3 – Space and shape
4 – Measurement
5 – Data handling

QUESTION/CONTENT	1	2	3	4	5	TOTAL
1	3	4	2		1	10
2	5	11				16
3		4				4
4		12				12
5		6				6
6	11					11
7		12				12
8			18			18
9			6			6
10				20		20
11					10	10
12					9	9
13					3	3
14					3	3
Total	**19**	**49**	**26**	**20**	**26**	**140**
%	**13%**	**35%**	**19%**	**14%**	**19%**	**100%**
Requirement	**15%**	**35%**	**30%**	**10%**	**10%**	**100%**

3. DIFFICULTY LEVELS PER QUESTION

Key: E – Easy; M – Moderate; D - Difficult

QUESTION/DIFFICULTY LEVEL	E	M	D	TOTAL
1	5	5		10
2	3	13		16
3	2	2		4
4	4	8		12
5	2	4		6
6		11		11
7	5	7		12
8		14	4	18
9	2	4		6
10		16	4	20
11		6	4	10
12	4	5		9
13	3			3
14	3 (Non-routine)			3
Total	**33**	**95**	**12**	**140**
%	**23%**	**68%**	**09%**	**100%**
Requirement	**25%**	**60%**	**15%**	**100%**

4. COGNITIVE LEVELS PER QUESTION

Key: K – Knowledge; A – Application; N – Non-routine problem solving

QUESTION/LEVEL	K	A	N	TOTAL
1	03	04	03	10
2	03	13	0	16
3	04	0	0	04
4	0	12	0	12
5	06	0	0	06
6	0	11	0	11
7	05	07	0	12
8	0	13	05	18
9	02	04	0	06
10	0	16	04	20
11	01	09	0	10
12	04	05	0	09
13	03	0	0	03
14	0	0	03	03
Total	**31**	**94**	**15**	**140**
%	**22%**	**67%**	**11%**	**100%**
Requirement	**25%**	**65%**	**15%**	**100%**

PART C: CONCLUSION

1. Highlights

- It was a well- balanced paper, catering for a wide range of ability levels
- The paper was generally in keeping with the Grade 9 ANA framework in terms of cognitive and difficulty levels; the questions were well constructed and thought provoking.
- Exemplar papers arrived earlier than usual to schools and so teachers were able to conduct revision sessions with learners; thus learners were better prepared when compared to 2012.
- The time allocation appeared to be "spot-on" with most learners finishing within the stipulated 150 minutes.

2. Challenges

- It remains a challenge to complete a whole years' work to answer the paper in the third term. The timing for the writing of ANA put teachers under severe pressure, firstly to complete the work and secondly to mark the work within a specified period. They also had to do a question-by-question analysis for the DBE. Regions felt that it would be better if the paper would be written in the fourth term. A similar view was given in 2012. The DBE assured teachers that the 4^{th} term part of the paper had come from Grade 7 & 8. While this is true, many schools tend not to do justice to the 4^{th} term part of the syllabus in Grades 7 & 8 and depend on the Grade 9 teacher to "put things right". Thus learners tend to be disadvantaged as they do not have the necessary background to handle these 4^{th} term part of the ANA paper and consequently perform poorly in these sections.
- Although there were some murmurs of the dissatisfaction that the ANA did not count, advocacy by the DBE and schools appeared to have had the desired results of the ANA being taken more seriously by teachers and learners in 2012
- Parents do not understand why there was a difference in marks obtained by their children in the ANA and the final exam paper. They need to be informed about the similarities and differences between the ANA mark and the final mark. In this regard, the ANA is an "exam" only; the final examination consisted of an exam mark plus a school based assessment (SBA) mark. The current ratio of 75:25 in favour of SBA tends to inflate the final mark.
- Teachers felt that the mark allocation for question 8 should ensure that learners get credit for both statements and reasons as learners spend quite some time when writing reasons for their geometry statements.
- Teachers are under enormous pressure to mark and analyse the papers within a short period; and submit their analyses to the districts.

3. Comparison with 2012

- Although the paper was similar in standard to the 2012 paper, it would appear that learners responded better this year when compared to 2012. This was probably due to better support and better preparation.
- Learners tended to perform better in certain sections such as number patterns and graphs, when compared to 2012. However, challenges still remain in some of the algebra topics and geometry
- Afrikaans medium schools were very complimentary of the Afrikaans translation of the paper which was far better when compared to 2012.

4. Overall verdict

It was a very well-balanced, fair paper with very substantial coverage of the Grade 9 curriculum.

5. Concluding remarks

- The marking memorandum for Grade 9 ANA should be more detailed and alternative responses should be included. This will help teachers in their development and expose their learners to different methods of working through various questions.
- Learners should be given practice on working with papers of two hour (+) duration prior to the ANA as it will prepare them to sit for two hours; also this practice of sitting for more than 2 hours for an exam paper will hold them in good stead for the FET where papers are usually 2 or more hours.
- The DBE should ensure that there is substantial teacher development for senior phase mathematics teachers. It would appear that some teachers are not very confident about teaching some of the algebra topics and geometry. Support for teachers in the senior phase is likely to result in better learner performance and possibly increase the pool of learners for mathematics in the FET.