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AMESA Review of Grade 12 Examination Papers: <u>Mathematics;</u> <u>Technical Mathematics and</u> <u>Mathematical Literacy</u>

November/December 2023

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# Introduction

Since 2009, AMESA has been involved in workshop activities which focused on the grade 12 Mathematics & Mathematical Literacy examination papers. These workshop activities take place in the various AMESA regions (provinces). The AMESA National Curriculum Committee then consolidates the input from the regions.

2023 marked the fifteenth year in which AMESA has been involved in these workshop activities. AMESA is aware of the many challenges facing Mathematics teaching and learning in South Africa and many of these challenges stem from the earlier grades. We believe that more should be done for teacher development in these grades and AMESA is ideally placed to assist the Department of Basic Education (DBE) in addressing some of these challenges.

Despite the ravages caused by COVID-19 in 2020 – 2022, AMESA has not shelved its responsibility of being the voice of Mathematics Education in South Africa. We also note that while 2023 has been free of education disruptions, compared to previous years (2020 – 2022), the core issues in mathematics still remain. We appreciate the efforts of the DBE and provinces in arranging "extra-classes" for the class of 2023. However, we still believe that such support should be extended to all grades, especially the earlier ones where such support can influence a learners' trajectory in a subject like Mathematics. AMESA has been gathering data on mathematics teaching and learning in South African schools. Most schools are back to normal. However, teachers, across the phases, require support in a number of content areas, including the use of ICTs and digital technologies in mathematics teaching and learning.

AMESA is currently involved with the South African Mathematical Society (SAMS) and other organisations in a National Strategy for Mathematical Sciences where the focus is getting more South African learners enrolled in Mathematical Sciences programmes at South African universities. Thus, while all mathematics related subjects are important, of special importance to those involved in this national strategy is performance in Mathematics. Universities have various entry level requirements for the Mathematical Sciences, with a level 6/7 in Grade 12 Mathematics being the main criteria.

. Mathematics, Technical Mathematics and Mathematical Literacy were written nationally on Friday 3 November 2023 (paper 1) and Monday 6 November 2023 (paper 2). After these papers were written, teachers, under the banner of AMESA, participated in workshops in various AMESA regions. The focus of these workshops was the analyses of these examination papers. The following key issues were discussed at these workshops and are shown in this report:

Technical aspects; Language used; Syllabus coverage; Standard of the paper; Compliance with levels of thinking (cognitive levels); Comparison to the 2022 paper; Learners views on the papers, Unfair questions, Innovative/creative questions (for some papers) and Overall verdict.

At the end of each paper review is a **question-by-question analysis** and a **summary of the cognitive levels** for each question (actual marks and percentages).

The purpose of this report is to provide constructive feedback, on the grade 12 papers, to the Department of Basic Education. We do this 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 and the question-by-question analyses will be useful to the examiners, moderators and markers in our attempt to promote a high standard of mathematics education in our country.

We firmly believe that the DBE, School teachers, Subject Advisors, University Academics; Subject Advisors and others will find the contents of this report thought-provoking, useful and constructive.

**AMESA National Executive** 

## A. Overall Review

# 1. Technical Aspects (typing; diagrams; etc)

There were no issues about the technical aspects of the paper. The typing, tables, diagrams were clear to candidates. The DBE is to be complimented about its high standards.

# 2. Language used

There were no major language issues. The language is in keeping with the language level of grade 12 learners. There were no unfamiliar words in the text. The information given in each question as well as the questions were clear in most cases.

There were some issues with the Afrikaans terminology used; these were direct translations rather than the use of original Afrikaans words; for example in 6.2.2 *"maandelikse paaiment"* instead of *"maandelikse deposito"*. In 8.4 it would have been better to use *"buigpunt"* 

# Other issues:

- In question 3.2, it should have included the word first, that is, the sum of the first
  22 terms ....
- Question 5.7 is a bit difficult to read and understand.
- In 10.3.2, it should be **exactly 5 learners**.

# 3. Syllabus coverage:

Code	Content/Topic	Suggested	Actual
1	Algebra and equations (inequalities)	25 (±3)	24
2	Patterns and sequences	25 (±3)	26
3	Finance, growth and decay	15 (±3)	16
4	Functions and graphs	35 (±3)	32
5	Differential calculus	35 (±3)	37
6	Probability	15 (±3)	15
	TOTAL	150	150

# 4.

# 4.1 Standard of paper

A well-balanced, fair question paper catering for all ability levels (see 4.2). Each question usually started off with knowledge or routine procedure type questions. This allowed candidates to gain confidence and better able to answer complex procedures and problem solving questions which usually came at the end of the question. There were a fair number of innovative, unpredictable questions; but all were accessible. Some questions were unseen and phrased differently to possibly cater for the top learners. But these were not unfair. However, candidates would have to be at their very best to achieve 90% and above.

Levels of thinking	Suggested	November 2023
1 – Knowledge	±20%	18,0%
2 – Routine procedures	± 35%	40,0%
3 – Complex procedures	± 30%	28,0%
4 – Solving problems	± 15%	14,0%

## 5. Comparison with 2022 paper

We add our levels for November 2022 in the above table:

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	±20%	14,7%	18,0%
2 – Routine procedures	± 35%	45,3%	40,0%
3 – Complex procedures	± 30%	24,7%	28,0%
4 – Solving problems	± 15%	15,3%	14,0%

The 2023 Mathematics Paper 1 compares well with the paper from 2022. Higher order questions (level 3 and level 4) are spread across the paper. The overall cognitive level distribution is quite similar to the 2022 paper.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

No unfair questions were noted. However, there were a number of unseen, unpredictable and differently phrased questions. But these questions were accessible.

## 7. Innovative/Creative questions

There were several innovative/creative questions in the paper. These were noted in:

- Question 1.2: Simultaneous equations with fractions
- Question 1.3: An innovative wat of testing exponents
- Question 2.2: Information on quadratic number patterns given in an unfamiliar way.
- Question 2.2.3: Showing that the pattern which represents a discreet graph is increasing.
- Question 3.2: An innovative way of examining the sum of an arithmetic series and the sum to infinity.
- Question 4: This function is drawn for a restricted domain.
- Question 5.6 and 5.7: Creative unseen questions based on graphs.
- Question 8.4: Candidates had to figure out where to start and bring everything together in a question on a tangent at the point of inflection quite a bit to do.
- Question 10.1.2: A creative way of asking P(A or B)
- Question 10.3.2 A creative question requiring "out of the box" thinking.

# 8. Learners' views of the paper

Learners interviewed after the paper indicated that there were enough "do-able" questions. Average learners appeared to have managed well. Some "top" learners felt there were many higher order questions (level 3 and level 4); but these questions were accessible

## 9. Overall verdict

The paper was of a good standard, catering for a wide range of ability levels. Our compliments must go to the exam panel for setting a fair paper and at the same time keeping high standards, with innovative and creative questions.

Our final verdict: A fair accessible paper to the grade 12 Mathematics learners of 2023!

	Question 1												
0	Content		Lev	els		Marks	Topic Code	0					
Quest.		1	2	3	4			Comment					
1.1.1	Roots by inspection factorising	3				3		Knowledge					
1.1.2	Use the formula		4			4		Routine					
1.1.3	Surd equation which leads to quadratic		4			4		Square both sides					
1.1.4	Quadratic inequality		2	2		4	1	Rearrange and check regions					
1.2	Simultaneous equation		3	2		5		Unusual second equation; algebraic manipulation					
1.3	Exponential equation with 2 unknowns				4	4		Quite a bit to do					
	TOTAL	3	15	2	4	24							

	Question 2												
Quest	Content	Levels				Marks	Topic	Comment					
Quest.	est. Content	1	2	3	4	Mai KS	Code	Comment					
2.1.1	91 <sup>st</sup> term of AS	3				3		Use formula					
2.1.2	Sum of 91 terms of AS	2				2		Use sum formula					
2.1.3	Which term of AS is 517		3			3		Specific term					
2.2,1	Show 5 <sup>th</sup> term of quadratic series is 111		2			2	2	Quadratic number pattern					
2.2.2	General term of quadratic pattern		3			3		Work towards general term					
2,2.3	Show pattern is increasing			3		3		A bit to do					
	TOTAL	5	8	3	0	16							

	Question 3													
Quest	Content		Lev	/els	i	Marks	Topic Code	Comment						
Quesi.		1	2	3	4									
3.1.1	General term of GS	1				1		General term of GS						
3.1.2	Sigma notation: number of teams to make a sum of GS			4		4		A bit to do						
3.2	Given a GS and AS with common first term			3	2	5	2	A bit to do						
	TOTAL	1	0	7	2	10								

	Question 4											
Quest	Content		Lev	vels	5	Marks	Topic	Comment				
QUESI.	Content	1	2	3	4	Marks	Code	Comment				
4.1	Asymptote of exp equation	1				1		Easy				
4.2	Coordinates of B, point of intersection		2			2		When x = 0				
4.3	Equation of the line through A and B		3			3		Use 2 points				
4.4	Vertical distance between $k$ and $f$ when $x = 1$		3			3		Vertical distance				
4.5	Equation of g	1				1	4	Use given information				
4.6	Domain of g <sup>-1</sup>			2		2		x-values				
4.7	Equation of g <sup>-1</sup>	2				2		Easy				
	TOTAL	4	8	2	0	14						

	Question 5												
Quest	Content		Le	/els	5	Marks	Торіс	Comment					
Quoon	Contoint	1	2	3	4	marito	Code	Common					
5.1	Coordinates of TP of <i>f</i>	2				2		From equation					
5.2	Coordinates of C $(y - intercept)$	2				2		Substitute $x = 0$					
5.3	Value of d (in hyperbola)	1				1		Easy					
5.4	Range of G	1				1		Easy					
5.5	$f(x).g(x)\leq0$			3		3	4	A bit to do					
5.6	Value of k for which h and g do not intersect			3	2	5		A bit to do					
5.7	Intersection of parabola with g at point R				4	4		A bit to do					
	TOTAL	6	0	6	6	18							

	Question 6											
Quest	Content		Lev	els	-	Marke	Topic	Comment				
QUESI.	Coment	1	2	3	4	ivia KS	Code	Comment				
6.1.1	Calculate of interest rate		3			3		Routine				
6.1.2	Effective interest rate		2			2		Routine				
6.2.1	Value = R0; number of years		2			2	3	Routine				
6.2.2	Monthly deposit		4			4		Routine				

6.3	Number of withdrawals			3	2	5
	TOTAL	0	11	3	2	16

	Question 7												
Quest.	Content		Lev	vels	5	Marks	Topic	Comment					
	ooment	1	2	3	4	wiai KS	Code						
7.1	First principles	5				5		Easy					
7.2.1	Rules for differentiation		2			2		Routine					
7.2.2	Rules for differentiation		3			3	5	Routine					
7.3	Tangent to graph with positive gradient			3		3		A bit to do					
	TOTAL	5	5	3		13							

				Qı	les	tion 8		
Quest.	Content	1	Levels 1 2 3 4		Marks	Topic Code	Comment	
8.1	Turning points of cubic graph		4			4		Routine
8.2	Draw cubic graph		4			4		Routine
8.3	3 real and unequal roots for point of intersection			2		2		A bit to do
8.4	Equation of tangent <i>g</i>			3	3	6	5	Higher level
8.5	Acute angle between $g$ and $x - axis$ in first quadrant			2		2		A bit to do
	TOTAL		8	7	3	18		

	Question 9											
Quest.	Content	Levels				Marks	Topic	Commont				
		1	2	3	4	wiai KS	Code	oonment				
9.1	Area of page			3		3		A bit to do				
9.2	Total area is a minimum			3		3	5	A bit to do				
	TOTAL			6		6						

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	Question 10												
Quest	Contont	Levels				Marke	Topic	Commont					
QUESI.	Content	1	2	3	4	Marks	Code	Comment					
10.1.1	P(A and B)	2				2		Easy					
10.1.2	P(at least one event occurs)		2			2		A different way of asking					
10.2.1	Probability on a tree diagram			3		3		A bit to do					
10.2.2	Temp not to drop below 0°C		3			3		Routine					
10.3.1	10 learners in a line; no of ways	1				1	6	Easy					
10.3.2	5 learners between the two youngest in the line				4	4		A bit to do; higher level					
	TOTAL	3	5	3	4	15							

# Summary of levels per question Mathematics Paper 1

Question	L1	L2	L3	L4	Total	
1	3	15	15 2 4		24	
2	5	8	3	0	16	
3	1	0	7	2	10	
4	4	8	2	0	14	
5	6	0	6	6	18	
6	0	11	3	2	16	
7	5	5	3	0	13	
8	0	8	7	3	18	
9	0	0	6	0	6	
10	3	5	3	4	15	
Total	27	60	42	21	150	

Overall total		Levels									
Overall total	1	2	3	4	iviai ks						
All questions	27	60	42	21	150						
Percentage	18%	40%	28%	14%	100%						

# Mathematics Paper 2

#### A. Overall Review

#### 1. Technical Aspects (typing; diagrams; etc)

Overall, a fair paper with no mistakes. Most diagrams were drawn accurately, and the size of the diagrams were perfect. In question 4 the circle was pixelated and in question 10 there was too much information around point S. S could have been placed where the 6 was written

#### 2. Language used.

The questions were stated clearly and the language was not difficult. Simple and common mathematical terminology was used. However, the wording in question 2.4 was confusing to learners. There was just too much reading for "weak" learners to identify that the formula for the estimated mean should have been used.

#### 3. Syllabus coverage

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

#### 4.

#### 4.1. Standard of paper

The standard of the paper is in line with previous years. There are enough questions to help learners who have worked consistently to pass. The paper also provides some challenging questions for top performing learners.

#### 4.2. Compliance with levels of thinking

Levels of thinking	Suggested	November 2023
1 – Knowledge	± 20%	25,3%
2 – Routine procedures	$\pm 35\%$	28%
3 – Complex procedures	$\pm 30\%$	32%
4 – Solving problems	± 15%	14,7%

#### 5. Comparison with 2022 paper

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	$\pm 20\%$	22,67%	25,3%
2 – Routine procedures	$\pm 35\%$	32,67%	28%
3 – Complex procedures	$\pm 30\%$	30,67%	32%
4 – Solving problems	± 15%	14%	14,7%

The paper compares favourably with our 2022 analyses of Mathematics Paper 2, with similar percentages for combined level 1 and 2 questions as well as combined level 3 and level 4 questions for both years.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

- The wording in 2.4 was too long and very few learners will know that they have to add 0,5k to the first and third interval.
- Though question 3.7 was targeted at the high performing learners, the word equidistant has not been used before.

# 7. Innovative/creative questions

The following questions were regarded as innovative or creative:

- Question 2.4 which required a bit of reading and understanding
- Question 4.6 which involved translation of the smaller circle along the x axis
- Question 10.3 which is an innovative way of showing RP is a tangent to the circle passing through P, S and A. In this case, proving  $\hat{P}_2 = \hat{A}_2$  would be sufficient

# 8. Learners' views of the paper

Top performing learners felt that the paper was easier than the trial examinations. They found the paper to be quite easy. Learners that normally achieve more than 50% said that only question 10 was a bit difficult, along with question 2.4, 3.7 and 4.6. The "weaker" learners found the paper extremely difficult and said that they hope their CASS mark will help them to pass mathematics. They finished the paper but only answered the questions that they understand.

Learners in general were happy and many of them said that they expected a more difficult paper. They were just grateful for the extra hours that the teachers have put in to complete the syllabus in time and to do revision thoroughly.

## 9. Overall verdict

The paper was fair and reasonable according to the cognitive level analysis.

Questions were stated clearly and the mark allocation for the difficult questions were kept to a minimum. The time allocation for each question was also correct. Learners had to answer the questions that they know well, first. All the learners that we spoke to had finished the paper. Question 10 was tough, but doable.

The impact of "load shedding" on learners' preparation cannot be underestimated. However, teachers believed that learners who worked consistently over the year would most likely do well in the paper.

Our compliments to the examining panel on a well-constructed Mathematics Paper 2 which catered for all ability levels.

Thus, our verdict is "A fair and accessible paper to grade 12 Mathematics learners"

	Question 1											
	Content		Le	vels		Marke	Topic Code	Comment				
Quest.		1	2	3	4	IVIAI KS						
1.1	Regression line	3				3	-	Equation				
1.2	Prediction of time	2				2		From regression line				
1.3	Correlation coefficient	1				1		Use calculator				
1.4	Interpretation of correlation coefficient	1				1		Interpretation				
1.5.1	Mean amount spent	2				2	1	Easy				
1.5.2	STD deviation	1				1		Use calculator				
1.5.3	Amount spent (less than one STD deviation below the mean)		2			2	-	Routine				
	TOTAL	10	2			12						

	Question 2										
Quest	Content		Le	evels		Marke	Topic Code	Comment			
QUESI.		1	2	3	4	IVIAI NO					
2.1	Cumulative frequency	2				2	-	Knowledge			
2.2	No of staff members interviewed	1				1		Knowledge			
2.3	Drinking fewer than 6 glasses	1				1		Easy			
2.4	Interpretation of data to determine number of absent teachers			4		4		A bit to do			
	TOTAL	4		4		8					

			Q	uest	ion 3	3		
Quest.	Content	Levels		Marks	Topic Code	Comment		
		1	2	3	4			
3.1	Length of SL	2				2		Distance formula
3.2	Gradient of SN	2				2		Gradient formula
3.3	Angle of inclination	2				2		Use of gradient
3.4	Size of LNS		3			3	1	Use of gradients
3.5	Equation of straight line		3			3		Gradients are equal
3.6	Area of ΔLSN		3			3	_	Area of triangle
3.7	Coordinates of P (linked to circle)				3	3	2	Circle around L; S and N
3.8	Size of LPS			2		2		Need point P first
	TOTAL	6	9	2	3	20		

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	Question 4								
	0		Lev	els			Topic	0	
Quest.	Content	1	2	3	4	Marks	Code	Comment	
4.1	Point on a circle	2				2		Substitute	
4.2	Coordinates of F					3		Use midpoint formula	
4.3	Equation of common tangent					4		Use given points	
4.4	The value of t					3		Centre of larger circle	
4.5	Equation of the larger circle					4	2	Use point G and radius	
4.6	Value of k; translate smaller circle to touch larger circle internally					4		A bit to do	
	TOTAL	5	2	9	4	20			

	Question 5								
•	Content		Lev	els		Marke	Topic Code	Commont	
Quest.	Content	1	2	3	4	IVIAI NO		Comment	
5.1.1	$\cos \beta$	3				3		In 2 <sup>nd</sup> quadrant	
5.1.2	$\sin 2\beta$		3			3		Use double angle identity	
5.1.3	$\cos(450^{\circ}-\beta)$		3			3		Complimentary ratio	
5.2.1	Prove trig identity			4		4		A bit to do	
5.2.2	Trig expression undefined			2		2		Denominator = 0	
5.2.3	Minimum value of trig expression			2		2	3	Use RHS of identity	
5.3.1	Deduce an identity			3		3		From the given identity	
5.3.2	General solution			5		5		Simplify LHS	
5.4	Simplify to single trig ratio				6	6		A bit to do	
	TOTAL	3	6	16	6	31			

	Question 6								
Quest	Contont		Lev	els		Marks	Topic	Commont	
Quesi.	Content	1	2	3	4	Mai K3	Code	Comment	
6.1	Period of trig graph <i>f</i>	1				1		Easy	
6.2	Range of $g$	2				2		Easy	
6.3.1	Graph product inequality			2		2		A bit to do	
6.3.2	Graph inequality			2		2	3	A bit to do	
6.4	New graph; value(s) of <i>k</i>				3	3		New graph	
6.5	Graph translation			2		2		Translation of 45 <sup>0</sup> to the left	
	TOTAL	3	0	6	3	12			

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	Question 7							
Quest	Content		Lev	els		Marke	Topic Code	Commont
QUESI.	Content	1	2	3	4	IVIAI NS		Comment
7.1	Length of SK		2			2		Use area rule
7.2	Trig expression based on diagram		2			2		Manipulation; sine rule
7.3	Calculate size of $lpha$		3			3	3	Substitution
	TOTAL		7			7		

	Question 8									
Quest	Contont		Lev	els		Marke	Topic Code	Commont		
QUESI.	Content	1	2	3	4	IVIAI KS		Comment		
8.1	Angle at centre theorem	5				5		Bookwork		
8.2	Value of x (angle)		5			5		Using theorem and angles around a point		
8.3.1	Size of OMD	2				2	4	Easy		
8.3.2	Length of OB		4			4		Use Pythagoras		
	TOTAL	7	9			16				

	Question 9								
Quest	Content		Lev	els		Marke	Topic	Comment	
QUESI.	Content	1	2	3	4	iviai no	Code	Comment	
9.1	Length of FB		2	1		3		From proportionality	
9.2	Similar ∆s		3			3		Routine	
9.3	Length of FC		2	1		3	4	Find DF first	
	TOTAL		7	2		9			

	Question 10								
Quest	Content		Le	vels		Marks	Topic Code	Comment	
QUESI.	Content	1	2	3	4	ivial KS		Comment	
10.1	Prove $\hat{S}_1 = \hat{S}_4$			5		5		A bit to do	
10.2	Prove SMRC is cyclic			4		4	4	A bit to do	
10.3	Prove RP is a tangent				6	6		Show $\hat{P}_2 = \hat{A}_2$	
	TOTAL			9	6	15			

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# Summary of levels per question Mathematics Paper 2

Question	L1	L2	L3	L4	Total
1	10	2	0	0	12
2	4	0	4	0	8
3	6	9	2	3	20
4	5	2	9	4	20
5	3	6	16	6	31
6	3	0	6	3	12
7	0	7	0	0	7
8	7	9	0	0	16
9	0	7	2	0	9
10	0	0	9	6	15
Total	38	42	48	22	150

<b>Overall total</b>		Marks			
	1	2	3	4	
All questions	38	42	48	22	150
Percentage	25,3%	28%	32%	14,7%	100%

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# **Technical Mathematics Paper 1**

#### A. Overall Review

#### 1. Technical Aspects (typing; diagrams; etc)

All technical aspects of the paper were in order; the diagrams were clear. The DBE is to be compliment with its high technical standards.

#### 2. Language used.

The language used in the paper should be within the comprehension of most grade 12 learners. There may be an issue with the wordy nature of question 5.3

#### 3. Syllabus coverage

Code	Content/Topic	Suggested	Actual
1	Number System	25 (±3)	48
2	Algebra	25 (±3)	26
3	Functions and graphs	35 (±3)	14
4	Finance, growth and decay	15 (±3)	62
5	Differential and Integral Calculus	50 (±3)	48
	TOTAL	150	150

## 4.1. Standard of paper

In 4.2 we note that our cognitive levels are in line with the suggested ones for the paper. Thus, this paper should be accessible to most grade 12 learners. However, while there appears to be more questions on Calculus and Integration and fewer on Functions and Graphs, this is balanced out in question 7 which carried 18 marks requires a both a calculus and graph background. Since the paper comprises a majority of level 1 and level 2 questions, learners should not find it difficult to pass the paper. The paper, is thus, of a good standard.

#### 4.2. Compliance with levels of thinking:

Levels of thinking	Suggested	November 2023
1 – Knowledge	± 25%	24%
2 – Routine procedures	±45%	43,3%
3 – Complex procedures	± 20%	22%
4 – Solving problems	± 10%	10,7%

# 5. Comparison to 2022 paper

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	± 25%	24,0%	24%
2 – Routine procedures	± 45%	46,7%	43,3%
3 – Complex procedures	± 20%	17,3%	22%
4 – Solving problems	± 10%	12,0%	10,7%

We add a column to the previous table

We note that based on our analyses of Technical Mathematics P1 in both 2022 and 2023, there is a very marginal difference in the standards of both papers. Learners who were taught well and worked consistently should have no trouble passing the paper.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

Question 5.3 is very wordy and may be beyond the understanding of most grade 12 learners.

# 7. Overall verdict

We compliment the exam panel for its efforts in setting a fair and accessible Technical Mathematics Paper 1. We are aware that Technical Mathematics learners struggle academically and choose the technical stream as they wish to work with their hands, rather than entry into one of the engineering fields. They appear to be more interested in being artisans and may find Technical Mathematics difficult. However, performance in the subject has been improving over the last 2 years and we believe this would be the case for 2023.

Notwithstanding our comments above, our verdict on the paper is

"A well-set paper which was in line with the content and cognitive prescripts for Technical Mathematics"

# B. Question by question analysis:

Question 1											
Quest	Content	Le	evels	;		Marks	Topic	Comment			
Quoon		1	2	3	4		Code				
1.1.1	Quadratic equation – factorised	2				2		Easy			
1.1.2	Quadratic equation – use of formula		4			4		Use formula			
1.1.3	Quadratic inequality		2	1		3		Two methods			
1.2	Simultaneous equations		6			6		Routine			
1.3.1	L the subject of the formula		2	1		3		A bit to do			
1.3.2	Value of L	2				2	1/2	Substitution			
1.4	Binary number	1				1		Easy			
1.5	Binary number division		2			2		Routine			
	TOTAL	5	16	2		23					

	Question 2											
Quest	Content		Lev	/els	5	Marks	Topic	Comment				
Quest.		1	2	3	4	wiai k5	Code	Comment				
2.1.1	Discriminant	2				2		Easy				
2.1.2	Nature of roots	1				1		From discriminant				
2.2	Non-real roots	3				3	2	From discriminant				
							-					
	TOTAL	6				6						

	Question 3											
	Contont		Lev	/els	5	Morko	Topic	Commont				
Quest.	Content	1	2	3	4	IVIAI KS	Code	Comment				
3.1.1	Log simplification	1				1		Easy				
3.1.2	Surd simplification			3		3		A bit to do				
3.1.3	Exponents		1	2		3		Routine with a bit to do				
3.2	Log equation		2	2		4		Change RHS; quadratic equation				
3.3.1	Complex number & quadrant	1				1		Easy				
3.3.2	Modulus of Z	2				2	1/2	Routine				
3.3.3	Polar form	1	2			3	1/2	Routine				
3.4	Value of unknown given 2 equivalent complex numbers	2				2		Identity				
	TOTAL	7	5	7		19						

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	Question 4												
Quest	Content		Lev	/els	5	Marks	Topic	Comment					
Quest.	ooment	1	2	3	4	Mai K3	Code	ooninicitt					
4.1.1	Coordinate of negative <i>x</i> –intercept	2				2		Easy					
4.1.2	Axis of symmetry		1			1		Routine					
4.1.3	Positive x –intercept	1				1		Easy					
4.1.4	Equation of graph		4			4		Routine					
4.1.5	Range of <i>f</i>			3		3		A bit to do					
4.1.6	Graph inequality			2		2	3	A bit to do					
4.2.1a	Radius of semi- circle	1				1		Straightforward					
4.2.1b	Equation of semi- circle	2				2		Straightforward					
4.2.2	Numerical value of a			3		3		A bit to do					
4.2.3	y intercept of exp graph		2			2		Routine					
4.2.4	Asymptote of f				2	2		New graph f					
4.3	Draw hyperbola				3	3		Draw specific hyperbola					
	ΤΟΤΑΙ	6	7	0	E	26							
	IUIAL	6	1	8	5	26							

	Question 5											
Quest	Quest Content		Levels			Marka	Topic	Commont				
Quesi.	Content	1	2	3	4	4 warks	Code	Comment				
5.1	Annual effective rate		3			3		Use formula				
5.2	Value of investment after 7 years		4			4		Use formula				
5.3.1	Approximate value of <i>r</i>				4	4		A bit to do				
5.3.2	Initial temperature				3	3	4	A bit to do				
	TOTAL	0	7	0	7	14						

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	Question 6											
Quest	Contont		Lev	/els	5	Marka	Topic	Commont				
Quest.	Content	1	2	3	4	Warks	Code	Comment				
6.1	First principles	5				5		Easy				
6.2.1	Rules for differentiation	2				2		Easy				
6.2.2	Rules for differentiation		4			4		Simplify first				
6.2.3	Rules for differentiation			3		3		A bit to do				
6.3.1	Value of h when $x = 1$	1				1		Substitution				
6.3.2	Average gradient		3			3	5	Routine				
6.4	Equation of tangent to curve		2	3		5		A bit to do				
	TOTAL	8	9	6		23						

	Question 7											
Quest	Contont		Lev	els		Merko	Topic	Commont				
Quest.	Content	1	2	3	4	Marks	Code	Comment				
7.1	y – intercept of cubic function	1				1		Easy				
7.2	Value of g when $x = -2$		1			1		Substitution				
7.3	x – intercepts of g		2	2		4		Factorise cubic equation				
7.4	Turning points		5			5		Routine				
7.5	Draw graph		4			4	5	Routine				
7.6	Graph inequality		3			3		Interpretation – when graph is below x-axis				
	TOTAL	1	15	2		18						

	Question 8											
Quest	Ocarlant		Lev	/els	5	Morke	Topic					
Quest.	Content	1	1 2 3 4 Marks C		Code	Comment						
8.1	Height of cylinder	1				1		Easy				
8.2	Total surface area		2			2		Routine				
8.3	Dimension for minimum area		3	2		5	5	A combination				
	TOTAL	1	5	2		8						

	Question 9											
Quest	Contont		Le	/els	5	Morke	Topic	Commont				
Quesi.	Content	1	2	3	4	IVIA KS	Code	Comment				
9.1.1	Integral	2				2		Easy				
9.1.2	Integral		1	2		3		Simplify first				
9.1.3	Area of shaded region			4	4	8	5	A bit to do; work out area under the curve up to x-axis; then subtract area of triangle				
	TOTAL	2	1	6	4	13						

# Summary of levels per question Technical Mathematics Paper 1

Question	L1	L2	L3	L4	Total
1	5	16	2		23
2	6	0			6
3	7	5	7		19
4	6	7	8	5	26
5	0	7	0	7	14
6	8	9	6		23
7	1	15	2		18
8	1	5	2		8
9	2	1	6	4	13
Total	36	65	33	16	150

Overall		Marka			
total	1	2	3	4	IVIAI KS
All questions	36	65	33	16	150
Percentage	24%	43,3%	22%	10,7%	100%

# **Technical Mathematics Paper 2**

#### A. Overall Review

#### 1. Technical Aspects (typing; diagrams; etc)

All technical aspects of the paper were in line with the usual DBE standards. All I diagrams and illustrations were clear. Font type was clear and big enough; text was well spaced out.

#### 2. Language used

The language used in the paper would be accessible to most Grade 12 learners. The There was no ambiguity and all questions were clear.

#### 3. Syllabus coverage

Code	Content/Topic	Suggested	Actual
1	Euclidean Geometry	40 (±3)	39
2	Mensuration	15 (±3)	18
3	Circles, angles and angular movement	20 (±3)	20
4	Analytical Geometry	25 (±3)	24
5	Trigonometry	50 (±3)	49
	TOTAL	150	150

#### 4.1. Standard of paper

The paper was well set with no unfair questions. Learners might have struggled with some questions if their reading is a problem as they may not have fully comprehend what was being asked. The question paper was fully CAPS aligned.

#### 4.2. Compliance with levels of thinking:

Levels of thinking	Suggested	November 2023
1 – Knowledge	±25%	25,3%
2 - Routine procedures	±45%	49,3%
3 - Complex procedures	±20%	16,0%
4 - Solving problems	± 10%	9,7%

## 5. Comparison to 2022 paper

We add our analyses for the November 2022 paper to the above table.

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	$\pm 25\%$	27,3%	25,3%
2 - Routine procedures	± 45%	50,0%	49,3%
3 - Complex procedures	± 20%	14,7%	16,0%
4 - Solving problems	± 10%	8,0%	9,7%

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The November 2023 paper for Technical Mathematics Paper 2 is very similar to the November 2022. We compliment the exam panel for its ability to keep the cognitive levels within the suggested framework.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

There were no unfair questions.

# 7. Overall verdict

Overall, this was a very fair question paper. Learners should be able to respond positively to questions posed provided they were taught well and did the necessary preparation for the paper.

Our verdict on the paper is:

"A fair and accessible paper".

	Question 1												
Quest	Contont		Le	/els	;	Morko	Topic	Commont					
QUESI.	Content	1	2 3 4 Marks Co	Code	Comment								
1.1	Gradient of line	2				2		Use formula					
1.2	Size of angle		3			3		From gradient					
1.3	Point on a line			4		4		A bit to do					
1.4	Area of ∆DEF		4	1		5	4	Use EF and DE					
	TOTAL	2	7	5		14							

	Question 2													
Quest	Content		Le	/els	5	Morko	Topic	Comment						
QUESI.	Content	1	2	3	4	ivial K5	Code	Comment						
2.1.1	Equation of circle		2			2		Routine						
2.1.2	Product of gradients	1				1		Knowledge						
2.1.3	Equation of line JK		4			4		Use gradient and one point						
2.2.1	Simplification	1				1		Rearrange						
2.2.2	Graph of ellipse			2		2	4	Routine						
	TOTAL	2	6	2		10								

	Question 3													
Quest	Contont		Le	/els	5	Morko	Topic	Commont						
Quesi.	Content	1	2	3	4	IVIAI KS	Code	Comment						
3.1.1	Sine ratio	2				2		Use calculator						
3.1.2	Sec ratio		2			2		Use calculator						
3.2.1	Cosec ratio	1				1		No calculator						
3.2.2	Add tan and cos ratios		3	2		5	5	No calculator						
3.3	Trig equation		3	1		4		Use calculator						
	TOTAL	3	8	3		14								

	Question 4													
0	Content		Lev	vels		Marke	Topic	Comment						
Quest.	Content	1	2	3	4	Mains	Code	Comment						
4.1.1	Reciprocal of cosec	1				1		Easy						
4.1.2	Simplification	1				1	5	Easy						
4.1.3	Simplification	1				1		Easy						
4.2	Simplify trig expression		4	3		7		Quite a bit to do						

	TOTAL	6	6	3	15	
4.3.2	Prove identity	2	2		4	Easy to routine
4.3.1	Factorise trig expression	1			1	Straightforward

	Question 5													
Quest	Contont		Lev	/els		Marke	Topic	Commont						
QUESI.	Coment	1	2	3	4	IVIAI NS	Code	Comment						
5.1.1	Value of constant a	1				1		Easy						
5.1.2	Period of g	1				1	-	Easy						
5.1.3	Trig equation		2			2	5	Use graph						
5.1.4	Range of <i>g</i>	1				1	-	Easy						
5.1.5	Graph inequality	2				2	-	Use graph						
5.2	Distance between 2 graphs	2				2		Easy						
5.3	Decreasing function		2			2		Routine						
	TOTAL	7	4			11	-							

	Question 6													
Quest	Content		Lev	vels		Marke	Topic	Comment						
QUESI.	Coment	1	2	3	4	IVIAI NS	Code	Comment						
6.1	Length of PR		3	1		4		Use sine rule						
6.2	Size of <i>RPM</i>	1				1	5	Easy						
6.3	Sine ratio in $\triangle RPM$	1				1		Easy						
6.4	Length of MT		3			3		Subtract from RM						
	TOTAL	2	6	1		9								

	Question 7													
Quest	Quest Content		Le	/els	5	Marke	Topic	Comment						
Quest.	ooment	1	2	3	4		Code	oonnicht						
7.1	Size of $\hat{M}_{1}$	2				2		From theorem						
7.2	Why is $\hat{A}_1 = 90^\circ$	1				1	1	Rad $\perp$ tan						
7.3	Length of AP		2	1		3		Find AO first						
		-												
	TOTAL	3	2	1		6								

	Question 8													
Quest	Contont		Le	/els		Marke	Topic	Commont						
QUESI.	Content	1	2	3	4	IVIAI NO	Code	Comment						
8.1.1	Size of angle	2				2		Base angles of isos $\Delta$						
8.1.2	Size of angle	2				2		Rem angle of $\Delta$						
8.1.3	Size of angle	2	2			4	1	Use reflex < and angle at centre						
8.2.1	4 angles equal to 37 <sup>0</sup>		6			6		Use given information						
8.2.2	Similar ∆s		2			2		Routine						
8.2.3	Product from similarity			2		2		A bit to do						
8.3.1a	Bisected angles	1				1		Easy						
8.3.1b	Angles in same segment	2				2		Easy						
8.3.2	Show 2 angles equal			5		5		A bit to do						
	TOTAL	9	10	7		26								

	Question 9												
Quest	Content	Levels				Marke	Topic	Commont					
QUESI.		1	2	3	4	iviai K5	Code	Comment					
9.1	Reason for statement	1				1		Easy					
9.2	Length of PT		2			2	1	From proportionality					
9.3	Complete statement with reason			2		2		A bit to do					
9.4	Length of ST		2			2		From proportionality					
	TOTAL	1	4	2		7							

	Question 10													
Quest	Content		Lev	/els	5	Marks	Topic	Comment						
Quest.	ooment	1	2	3	4	Marks	Code	•••						
10.1.1	Reflex angle		1			1		Routine						
10.1.2	Covert degrees to radians	1				1		Easy						
10.1.3	Major arc length of CF		3			3	2/3	Routine						
10.1.4a	Circumferential velocity		3			3		Routine						
10.1.4b	Rotational frequency				4	4		Problem solving						
10.1.5	Area of minor sector		3			3		Routine						
10.2.1	Value of height h	1				1		Easy						
10.2.2	Length of diameter		4			4		Routine						
	TOTAL	2	14		4	20								

	Question 11												
Quest	Contont	Levels				Marks	Topic	Comment					
QUESI.	Content	1	2	3	4	iviai K5	Code	Comment					
11.1.1	Width of equal parts	1				1		Easy					
11.1.2	Value of h		2			2		Routine					
11.1.3	Area of irregular figure		3			3	2	Use rule					
11.2	Volume and radius of spheres				5	5		A bit to do; problem solving					
11.3.1	Surface area of cone		2			2		Routine					
11.3.2	Comparison of new surface area to old surface area				5	5		A bit to do; problem solving					
	TOTAL	1	7		10	18							

# Summary of levels per question Technical Mathematics Paper 2

Question	L1	L2	L3	L4	Total
1	2	7	5		14
2	2	6	2		10
3	3	8	3		14
4	6	6	3		15
5	7	4			11
6	2	6	1		9
7	3	2	1		6
8	9	10	7		26
9	1	4	2		7
10	2	14		4	20
11	1	7		10	18
Total	38	74	24	14	150

Overall total		Leve	els		Marks
Overall total	1	2	3	4	
All questions	38	74	24	14	150
Percentage	25,3%	49,3%	16%	9,7%	100

#### A. Overall Review

#### 1. Technical Aspects (typing; diagrams; etc)

The font is clear, and the numbering is neatly aligned. However, in question 1.2 E is outside of the diagram and only an arrow to indicate the value; this may cause confusion for our learners. The diagram for question 3.2 should have been enlarged as learners with visual challenges may be disadvantaged.

#### 2. Language used

Language accessible for the most part. However, in question 2.1.4 the question should have been rephrased as "Using the service fee value excluding VAT for 30/11/2017, now calculate......". Question 2.3.5 may cause some confusion in learners due to the use of the word surplus; learners may add rather than subtract when doing the calculations

## 3. Syllabus coverage

Code	Content areas (contexts)	Suggested	Actual
1	Finance	$90\pm8$	81
2	Data Handling	$53\pm8$	60
3	Probability	Min 7	9
	TOTAL	150	150

#### 4.1. Standard of paper

The paper appears to be in line with the cognitive levels for Mathematical Literacy Paper 1 and covers the content areas (contexts) as suggested. The paper is of a good standard and is accessible to all grade 12 Mathematical Literacy learners.

## 4.2. Compliance with levels of thinking

Levels of thinking	Suggested	November 2023
1 – Knowledge	$30\%\pm5$	32,0 %
2 - Routine procedures	$30\%\pm5$	33,4%
3 – Multi-step procedures	$20\%\pm5$	17,3%
4 – Reasoning and analysis	$20\% \pm 5$	17,3%

# 5. Comparison with 2022 paper

We add a column to the table above:

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	$30\%\pm5$	42,0%	32,0 %
2 - Routine procedures	$30\%\pm5$	26,0%	33,4%
3 – Multi-step procedures	$20\% \pm 5$	18,7%	17,3%
4 – Reasoning and analysis	$20\%\pm5$	13,3%	17,3%

The 2023 paper appears to be more balanced compared to the 2022 paper with 65,4% comprising level 1 and level 2 questions and 34,6% to level 3 and level 4 questions.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

There were no unfair questions in the paper. However, the use of the term Mandatory Palestine in question 5.2 may be regarded as "insensitive" in the light of the current situation in the Middle East.

#### 7. Innovative/creative questions

There were no innovative or creative questions.

## 8. Learners view of paper:

Most learners were able to complete the paper in the allocated time. Some learners complained about certain questions such question 3.2 and 2.3.5. Only a few of the learners were not able to finish the paper.

## 9. Overall verdict

While some of the questions may be regarded as challenging, there is no doubt the that paper would be within the scope of grade 12 Mathematical Literacy learners and learner performance would be similar to that in the past 2 or 3 years.

Our verdict for the paper:

"A well-constructed, fair and accessible paper".

			Qı	Jes	tion	1		
Quest	Contont		Leve	els		Marko	Topic	Commont
Quest.	Content	1	2	3	4	warks	Code	Comment
1.1.1	Discrete or continuous data	2				2		Easy
1.1.2	Number in words	2				2		Easy
1.1.3	Identification of session	2				2		Easy
1.1.4	Number of songs steamed		2			2		Easy
1.1.5	Paid users to number of free users (as a ratio)		3			3	-	Routine
1.2.1	Acronym for value added tax	2				2		Straightforward
1.2.2	One music CD	3				3		Straightforward
1.2.3	Amount received (royalties)		3			3	1	Routine
1.2.4	Amount earned by music artists		2			2	_	Straightforward
1.2.5	Receipt of R16,50	2				2		Straightforward
1.3.1	Gross monthly income	2				2	-	Straightforward
1.3.2	Price of vehicle	2				2		Straightforward
1.3.3	Rounding off	2				2		Straightforward
	TOTAL	19	10			29		

	Question 2											
Quest.	Content		Levels			Marks	Торіс	Comment				
		1	2	3	4		Code					
2.1.1	Type of account	2				2		Knowledge				
2.1.2	Service fees	3				3	-	Knowledge				
2.1.3	Verification of statement via calculations			2	5	7	-	A bit to do				
2.1.4	Service fee including VAT		3	2		5		Routine/Multistep				
2.2.1	Tax bracket	3				3		Knowledge				
2.2.2	Verification of claim via calculations			2	4	6		A bit to do				
2.3.1	Overbudgeted item	2				2		Knowledge				
2.3.2	Adjusted budget		3			3		Routine				
2.3.3	Reason for amount in brackets	2				2		Knowledge				
2.3.4	Net surplus/deficit		3			3		Routine				
2.3.5	Actual amount (Z)		2	2		4		Routine/ Multistep				
	TOTAL	12	11	8	9	40						

			Q	uest	tior	13		
Quest.	Content	Levels				Marks	Topic	Comment
		1	2	3	4		Code	
3.1.1	Age group descriptor	2				2		From graph
3.1.2	Percentage difference	3				3		Subtraction
3.1.2	Urban and rural comparison		3			3		Routine
3.1.4	Learners not obese or overweight			3		3	-	Multistep
3.1.5	Probability			3		3		/Multistep
3.2.1	Measurement in inches	2				2		From graph
3.2.2	Below 50 <sup>th</sup> percentile				2	2	2/3	A bit to do
3.2.3	Comparison of boys			2		2		Multistep
3.3.1	Malnourished children	2				2		Straightforward
3.3.2	Below median head circumference			3		3		Multistep
3.3.3	Selection of children sampled				2	2		Reflection
	TOTAL	9	3	11	4	27		

	Question 4											
Quest.	Content		Le	/els	;	Marks	Topic	Comment				
		1	2	3	4		Code					
4.1.1	Modal instore price at P & P store	2				2	-	From table				
4.1.2	Comparison of instore and online prices		2			2		From table				
4.1.3	Savings for Mrs. Swartz				4	4		Reflection				
4.1.4	Median price at W & W store	2	2			4	-	From table				
4.1.5	Probability		3			3		From table				
4.2.1	Name of store (3 <sup>rd</sup> lowest price)		2			2	1/2/3	From table				
4.2.2	Showing calculations (annexure C)				6	6	17270	A bit to do				
4.2.3	Agreement/ disagreement with reason				3	3	-	Reflection				
4.2.4	Increase in selling price			3		3		Multistep				
4.2.5	Percentage profit		4			4		Routine				
	TOTAL	4	13	3	13	33						

Quest.	Content	Le	evels	5		Marks	Topic	Comment
		1	2	3	4		Code	
5.1.1	Increase in daily flights	2				2		Straightforward
5.1.2	Calculation of A, missing value		2	2		4	2/3	Percentage calculation
5.1.3	Range of % change	1	2			3		Subtraction
5.1.4	Missing value B		2	2		4		Percentage calculation
5.1.5	Probability	1	2			3		From table
5.2.1	Strength of currency		2			2		Use calculator
5.2.2	Currency conversion		3			3		Use calculator
	TOTAL	4	13	4		21		

# Summary of cognitive levels for Mathematical Literacy Paper 1

Question	Level 1	Level 2	Level 3	Level 4	Total
1	19	10			29
2	12	11	8	9	40
3	9	3	11	4	27
4	4	13	3	13	33
5	4	13	4		21
Total	48	50	26	26	100

Overall total		Levels									
	1	2	3	4	iviai ko						
All questions	48	50	26	26	150						
Percentage	32%	33,4%	17,3%	17,3%	100%						

# Mathematical Literacy Paper 2

#### A. Overall Review

#### 1. Technical Aspects (typing; diagrams; etc)

Font size sufficient and diagrams clear and neat. The annexures show a range of crucial information which is used in questions 2, 4 and 5.

#### 2. Language used

The language used was perfect, well instructed, and easy to understand. While there were a few concerns with the translation to Afrikaans, teachers reported that there were no major challenges in this regard.

#### 3. Syllabus coverage

Code	Content areas	Suggested	Actual
1	Measurement	35%	43,3%
2	Maps, plans and other representations	60%	51,3%
3	Probability (minimum: integrated in sections 1 and 2)	5%	5,3%
4	Finance (integrated in sections 1 & 2)		
	TOTAL	150	150

#### 4.1. Standard of paper

The paper is pitched at the correct standard and most grade 12 learners should find the paper accessible. The exam panel is to be compliment for such a comprehensive and interesting paper.

## 4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2023
1 – Knowledge	$\pm 30\%$	30,7%
2 – Routine procedures	± 30%	28,0%
3 – Multi-step procedures	± 20%	24,0%
4 – Reasoning and reflecting	± 20%	17,3%

#### 5. Comparison with 2022 paper

We add our analyses for the November 2022 paper

Levels of thinking	Suggested	November 2022	November 2023
1 – Knowledge	$\pm 30\%$	32,0%	30,7%
2 – Routine procedures	± 30%	28,7%	28,0%
3 – Multi-step procedures	± 20%	20%	24,0%
4 – Reasoning and reflecting	± 20%	19,3%	17,3%

We note that the papers for both November 2022 and November 2023 are very similar with almost identical mark allocation to level 1 & level 2 questions and level 3 & level 4 questions for both these years.

# 6. Unfair question(s): State question(s) and indicate why the question(s) are regarded as unfair:

While there appears to be no unfair questions, concern was expressed over the following questions, which may cause confusion in learners:

- Question 2.2: Packed water bottles might be confusing, as some will calculate the number of packs, where others will calculate the number of bottles.
- Question 3.1.1: Translation of the word 'numerals' to Afrikaans, 'telwoorde' may cause learners to write the number in words
- Question 3.3.2 Learners might not refer back to the previous page to calculate area of 12 posts, but may do it according to the diagram in 3.3.
- Question 4.2: Some confusion about size; there should be some clarification as to whether it refers to the body size, dress size or actual weight.
- Question 5.2: 'two tons': learners might not pick this up; whereas if it was mentioned as 2 tons, they will recognise it as weight (mass)

## 7. Innovative/creative questions

Quesion 5.3 is a creative way of assessing conversions

## 8. Learners' views of the paper

Most learners were very comfortable with the paper, saying it was very accessible to them. However, some learners thought that question 3 was on the challenging side

## 9. Overall verdict

There were no major problems in the paper. Teachers agreed that learners who read with understanding, will definitely do well while those with language barriers may struggle with some of the questions,

Our overall verdict for the paper is:

"A very comprehensive paper which assesses a range of mathematical literacy content in very interesting contexts, with questions in line with the prescribed cognitive levels for the paper".

# B. Question by question analysis:

			Qı	lest	tion	1		
Quest	Content		Leve	els		Marks	Topic	Comment
Quest.	Content	1	2	3	4	Mai K3	Code	Comment
1.1.1	Bar scale	2				2		Easy
1.1.2	Surface area	2				2		Easy
1.1.3	Road map	2				2		Easy
1.1.4	Speed	2				2		Easy
1.2.1	No of streets	2				2		Counting
1.2.2	Street over Klip river	2				2		Identification
1.2.3	Distance		3			3	2	Calculate distance
1.3.1	Different types of screws	2				2		Straightforward
1.3.2a	Chair base	2				2		Straightforward
1.3.2b	No of screws in step 4	2				2		Straightforward
1.3.3	Name of tool	2				2		Straightforward
1.3.4	Component of chair (as a pair)	2				2		Straightforward
	TOTAL	22	2			05		
	IOTAL	22	3			25		

			G	lues	tion	2		
Quest	Contont		Le	vels		Marka	Topic	Commont
Quest.	Content	1	2	3	4	warks	Code	Comment
2.1.1	Layout plan	2				2		Definition
2.1.2	Number of chairs	2				2		Easy
2.1.3	Statement about layout	2				2		Easy
2.1.4	Not placing plants on the north side				2	2		Reflection
2.1.5a	Outside length of conference room	2				2		Straightforward
2.1.5b	Scale used in plan		3			3		Routine
2.2	Max number of bottle water			8		8	1/2/3	Multistep
2.3.1	General direction	2				2		Straightforward
2.3.2	Explanation of phrase	2				2		Easy
2.3.3	Completion of statement	2				2		Easy
2.3.4	Probability	2				2		Easy
2.3.5	Numbering of streets				2	2		Reasoning
2.3.6	Verification of time taken to work				4	4		Reflection
	TOTAL	16	3	8	8	35		

			(	Ques	stion	3		
Quest	Content		Le	evels	5	Morke	Topic	Commont
Quesi.		1	2	3	4	IVIAI KS	Code	Comment
3.1.1	2,7 million in numerals	2				2		Easy
3.1.2	Carp caught in kg		3			3		Routine
3.2.1	Volumes of holes dug up			5		5		Multistep
3.2.2	Left over concrete				2	2		Reflection
3.2.3	Mass of sand for 1 m <sup>3</sup> of concrete			6		6		Multistep
3.3.1	Total area pf all post sides in cm <sup>3</sup>			4		4		Multistep
3.3.2	Verifying showing calculations				8	8	1	Reasoning and reflection
3.3.3	Paint needed to paint given area		3			3		Routine
	ΤΟΤΑΙ	2	6	15	10	33		

Content			-				
Content		Le	vels	5	Marks	Topic Code	Commont
	1	2	3	4			Comment
Ratio in simplified form		3			3		Straightforward
Conversion of units		3			3		Conversion
Reason for given scenario of placing seats				2	2		Reasoning
Reason for gap between 2 runways				2	2		Reasoning
Area of top of round table		3			3		Routine
Max length allocated to each person			4		4		Multistep
Body size for given measurement	2				2	1/2/3	From annexure
Mass of girl	2				2		From annexure
Body Mass Index		3			3		Use calculator
Probability	2				2		As a percentage
Validity of statement with calculations				4	4		Reflection
ΤΟΤΑΙ	6	12	4	8	30		
IF F O F S S F L A N S E E N E F N S C	Ratio in simplified orm Conversion of units Reason for given scenario of placing seats Reason for gap between 2 runways Area of top of ound table Max length allocated to each berson Body size for given measurement Mass of girl Body Mass Index Probability /alidity of statement with calculations	1Ratio in simplified ormConversion of unitsReason for given scenario of placing seatsReason for gap between 2 runwaysArea of top of ound tableMax length allocated to each bersonBody size for given neasurementAreas of girl2Mass of girl2Body Mass IndexProbability2Validity of estatement with calculationsTOTAL6	12Ratio in simplified orm3Conversion of units3Conversion of units3Reason for given scenario of placing seats3Reason for gap between 2 runways3Area of top of ound table3Max length allocated to each berson2Reasurement2Areas of girl2Body size for given neasurement3Probability2Validity of estatement with calculations4TOTAL612	123Ratio in simplified orm33Conversion of units33Reason for given scenario of placing seats33Reason for gap between 2 runways4Area of top of ound table34Max length allocated to each berson24Body size for given neasurement24Body Mass Index34Probability24TOTAL6124	1234Ratio in simplified orm33	1234Ratio in simplified orm333Conversion of units333Reason for given scenario of placing seats22Reason for gap between 2 runways22Area of top of ound table33Max length allocated to each 	1234CodeRatio in simplified orm333Conversion of units333Reason for given scenario of placing between 2 runways22Reason for gap between 2 runways22Area of top of ound table33Max length allocated to each berson44Allocated to each berson22Reason figirl22Reason figirl22Reason figirl22Reason figirl22Reason figirl22Reason figirl22Reason figirl33Reason figirl44Reason figirl22Reason figirl22Reason figirl22Reason figirl22Reason figirl44Reason figirl44Reason figirl22Reason figirl22Reason figirl44Reason fig

Question 5										
Quest	Contont		Le	vels	5	Marka	Topic	Commont		
Quesi.	Content	1	2	3	4	IVIAI KS	Code	Comment		
5.1	Surface area of a cube		3			3		Use formula		
5.2.1	Total mass of blocks		4			4	-	Routine		
5.2.2	Volume of ice carved out			3		3		Multistep		
5.3.1	Difference in distances		3			3		Routine		
5.3.2	Conversion of units to metres		4			4	1/2	Routine		
5.3.3a	Average speed of ship		4			4		Routine		
5.3.3b	Arrival date and time in Tokyo			6		6		Multistep		
	TOTAL		40	•		07				

# Summary of cognitive levels for Mathematical Literacy Paper 2

2

Question	Level 1	Level 2	Level 3	Level 4	Total
1	22	3			25
2	16	3	8	8	35
3	2	6	15	10	33
4	6	12	4	8	30
5		18	9		27
Total	46	42	36	26	150

Overall total	Levels				Marks
	1	2	3	4	
All questions	46	42	36	26	150
Percentage	30,7%	28%	24%	17,3%	100%

# Conclusion

AMESA is proud to be associated with the review of grade 12 Mathematics/Technical Mathematics/Mathematical Literacy. These are key subjects, and it is important for teachers to be knowledgeable about the assessment processes in these subjects. In this regard, the discussions and deliberations about the grade 12 examination papers in the various AMESA regions of South Africa has given teachers the opportunity of being involved in this key teacher development activity where they were able to analyse and interrogate these important end-of-year assessments. We would like to compliment the various DBE examiners and moderators as well as UMALUSI for providing South African learners with assessments which were set in accordance with the curriculum and subject assessment guidelines. In this regard we would like to mention the following:

- The change in mark allocation for Trigonometry in paper 2 (from 40 marks to 50 marks) and Euclidean Geometry (from 50 marks to 40 marks) since 2021 has not had any major impact on the results.
- The reconfiguration of the two Mathematical Literacy papers into two "equal papers" with the same cognitive level allocation, but different content for each paper is probably advantageous for learners as it means they can revise only specific topics/sections per paper, rather than all the content for the subject.
- The inclusion of a PAT (Practical Assessment Task) for Technical Mathematics since 2021 has played a major role in the improved performance in the subject. However, there should be attempts to make the PATs more relevant to the technical field taken by learners, rather than just being another project or assignment.

AMESA believes that learners who were taught well should have no problem in passing these various Mathematics related papers. We note that there were lots of efforts in the various provinces to ensure that learners, especially from schools in "disadvantaged" areas, pass these and other subjects at a more acceptable level, rather than the minimum 30%.

However, learning does not begin in grade 12. Rather, grade 12 is the culmination of all the efforts which have been put in over the years. Thus, it is important to keep track of learner performance from the earlier grades so that the necessary interventions can be made very early in a learner's schooling career and not in grade 12.

AMESA is a key role player in Mathematics Education and is able to interact with its members on an informed basis, for the betterment of Mathematics Education in South Africa. The review of the grade 12 Mathematics related examination papers by mathematics teachers in a workshop situation is one such activity which has contributed to improved teaching and learning in South African schools.

Dr Batseba Mofolo-Mbokane (AMESA Acting President and Vice-President)

Dr VG Govender (AMESA National Executive Member)