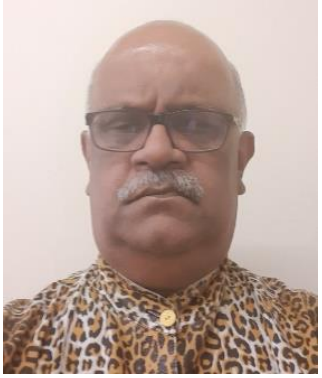
AMESA NEWS
The Association for Mathematics Education of South Africa
December 2020 Volume 61

Contents

From the President's desk

Greetings to all AMESA members. It is my honour to serve as your President in these very uncertain times for South Africa and the world. We were on track to have a very successful Congress in Gauteng in 2020. However, due to the COVID-19 pandemic and guidance from the Department of Health, we have decided to postpone the Congress to June/July 2021. Despite these uncertain times, AMESA continues to play a significant role in the development of mathematics education communities through various activities at the regional, branch and national level. We are grateful to our members and sponsors for supporting our various activities in 2020. I would like to wish all our members a **Happy Festive Season!** Please stay safe at all times by following the normal COVID-19 protocols!

Editor's comment



2020 has been a very eventful year for all of us. We started off the year with lots of hopes and dreams, only to be dashed by the world-wide COVID-19 pandemic. Despite this massive setback, AMESA is alive and well and still serving its members. In this edition we report on some of our activities for 2020 and pay tribute to our former President, Busi Goba, We report on an interview with former National council member, Peace Mojake from the Northern Cape.

Vasuthavan Govender

We congratulate our North West chair Onicah Thibodi on receiving her PhD in Mathematics education and our National Secretary, Kgomtso Pilane for her great achievement in the National Teacher awards for 2019. We feature two short pieces on Mathematics learning and Mathematics and Social Distancing. We also report on our grade 12 review and the SAMF awards. **Enjoy reading!**

A tribute to our former President Ms Busisiwe Goba by Vasuthavan Govender

In 2011 the then President of AMESA Ms Elspeth Khembo sent yours truly and AMESA National Secretary Isaiah Shabungu to the KwaZulu Natal Region of AMESA to assist with the AGM. The KZN region of AMESA had been one of the most promising regions of AMESA but had been beset with internal conflict.

At the first AGM, which was combined with a regional conference, in August 2011, the meeting resolved that it was inopportune for the AGM to proceed as there were outstanding issues that needed to be resolved. Thus, the AGM was rescheduled for November 2011. At this rescheduled AGM, Ms Busi Goba was elected at Chairperson of AMESA KZN. Busi carried out her duties responsibly and worked very hard to boost morale and confidence amongst AMESA members in KZN. For two or three years, AMESA membership in KZN was the highest among all 9 AMESA regions.

In 2014, Busi Goba was elected as Vice President of AMESA, a position which she held for two terms. In 2018, she was elected, by a large majority of voting delegates of AMESA, taking over from me (as my second and final term had come to an end). Under Busi's presidency, AMESA accomplished a lot. Two of these were:

- Our training of grade 4-7 teachers in the remaining 4 AMESA regions had taken place
- She worked with the AMESA KZN LOC , and oversaw one of the largest (in terms of participants) AMESA Congresses ever, with more than 1800 participants.

While her key contributions to the functioning of AMESA at both national and regional level will be missed, we know that Busi will always have the interests of AMESA at heart. AMESA takes this opportunity of wishing Busi Gobi all the best in her future endeavours

Regional Activities

2020 has been a very challenging year for South Africa and the world, with the COVID-19 pandemic creating havoc and uncertainty amongst the people. However, 2020 started very promisingly with some key regional activities in our northern regions.

Limpopo

Our Limpopo regional has always been a very active region and the beginning of 2020 was no exception. Unfortunately, the COVID-19 pandemic put paid to any organised activities from the end of March 2020, onwards.

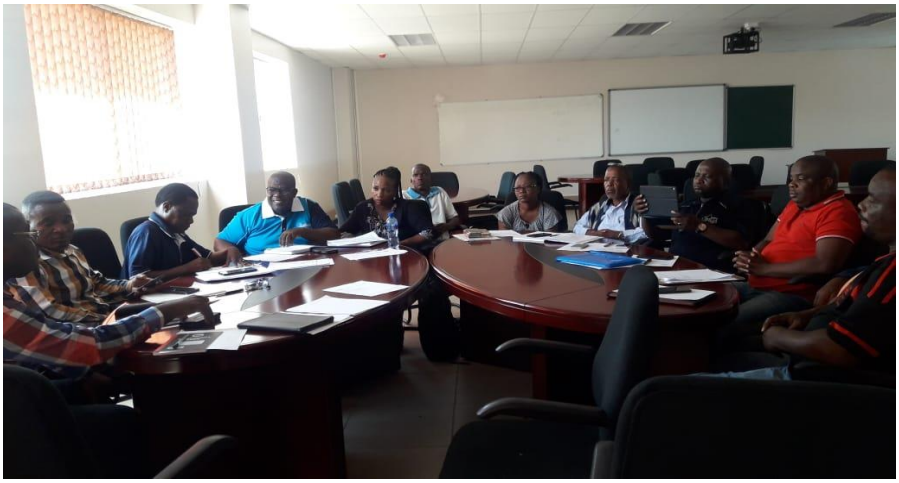
16 January 2020: Meeting with Limpopo Mathematics Olympiad coordinators at the University of Limpopo.

8 February 2020: Seminars for teachers from all phases at different venues at the University of Limpopo.

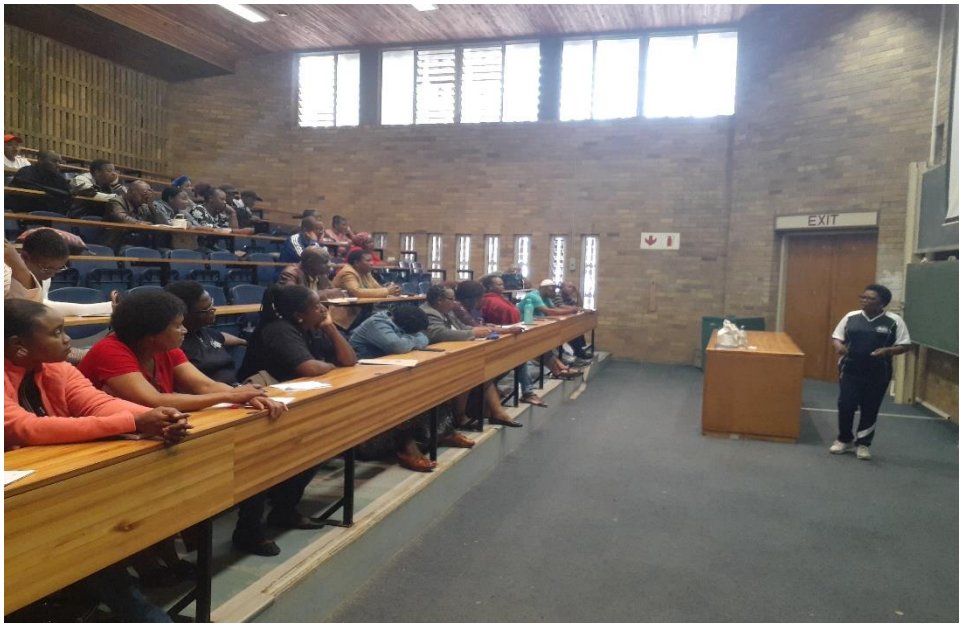
14 – 16 February 2020: Mathematics camp for 39 learners and 7 teachers at the Tivumbeni CPD

9 – 13 March 2020: 7165 learners from Capricorn, Greater Sekhukhune, Vhembe and Waterberg Districts of Limpopo participated in the first round of South African Mathematics Foundation Mathematics Challenge [SAMC]. 600 learners qualified for the second which was written in September 2020 (later than normal date due to the COVID-19 pandemic)

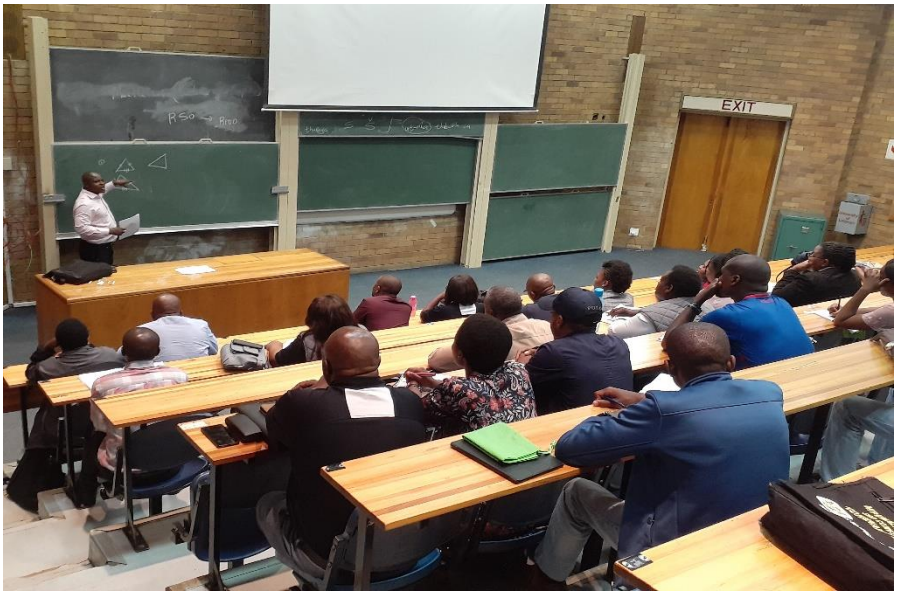
Pictures from activities in Limpopo



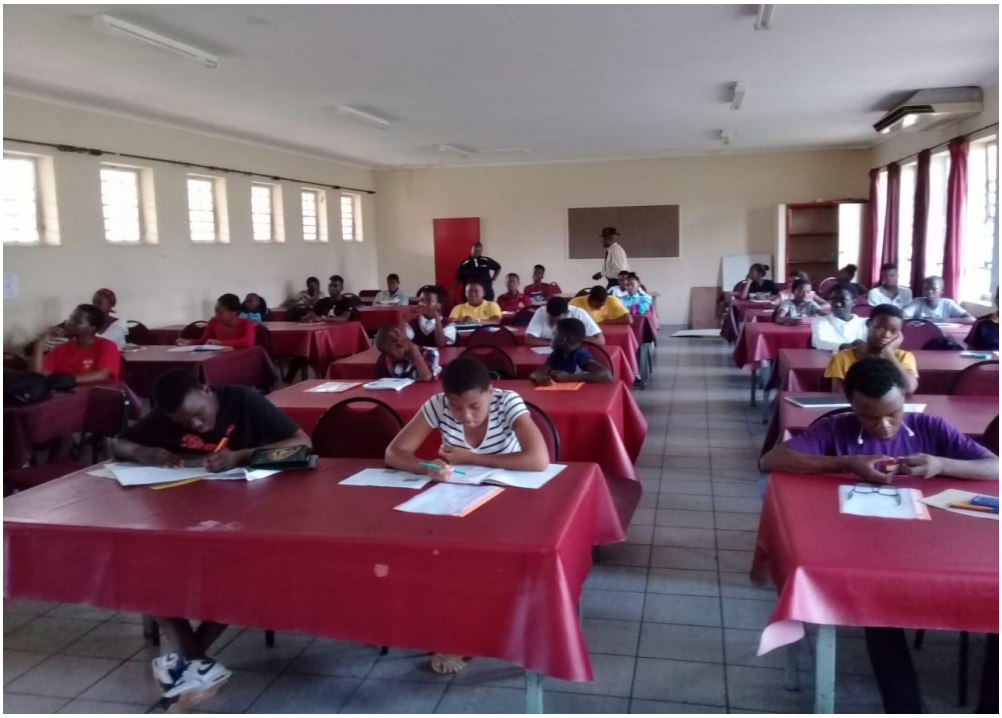
Meeting of Mathematics Olympiad coordinators in January 2020



Intermediate Phase teachers at February seminar



Senior Phase teachers at February seminar



Mathematics camp for 39 learners and 7 teachers at the Tivumbeni CPD

Mpumalanga

There was a hive of activity in the Mpumalanga region of AMESA in the early part of 2020..

4 February 2020: Kwaggafontein branch had a very successful re-launch earlier this year in February 2020 at Sozilane Primary School. 66 delegates attended the activity.

15 February 2020: Miss Nombuso Thobela, an AMESA member from Likhweti Primary School in the Ehlanzeni district came first in the National Teacher Awards (NTA) in the Mpumalanga province (Excellence in Mathematics Teaching: GET category). She represented the province at the National Awards in Pretoria where she **was placed second overall**. She is a very hardworking teacher who also presents lessons on radio where she reaches a large audience (on Ligwalagwala FM and Ikwekwezi FM).

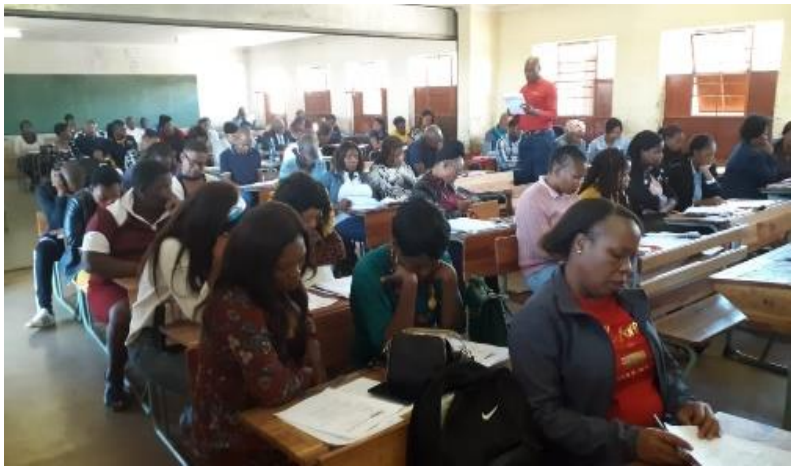
4 March 2020: The Middleburg branch had a successful branch meeting at Khulunolwazi Primary School. 68 teachers attended.

14 March 2020: All Nkangala branches at Mpumalanga converged at Mzimhlophe Secondary School to celebrate Pi day. The event hosted both learners and teachers from all phases. Presenters were invited to share their expertise with both learners and teachers. Some of the topics discussed were: ***What is Pi*** ?, ***4IR***, ***Problem Solving*** **and** ***Measurement*****.** There was also ***Career guidance for learners*****.** 80 learners, 120 teachers (from all phases) attended these successful Pi day activities.

14 March 2020: The the iNsikazi Branch hosted the two branches (Matsulu and Sikhulilemgwenya) from Ehlanzeni District in Mpumalanga at Buhle Primary School at KaBokweni. Learners and teachers from different schools attended. Subject advisors were invited to conduct workshops with teachers from the different phases. Foundation Phase, Intermediate, Senior and FET. There was a mathematics competition for learners. Prizes were given to the top performing learners; and certificates of participation were given to all learners. There were 168 attendes (52 teachers and 116 learners).

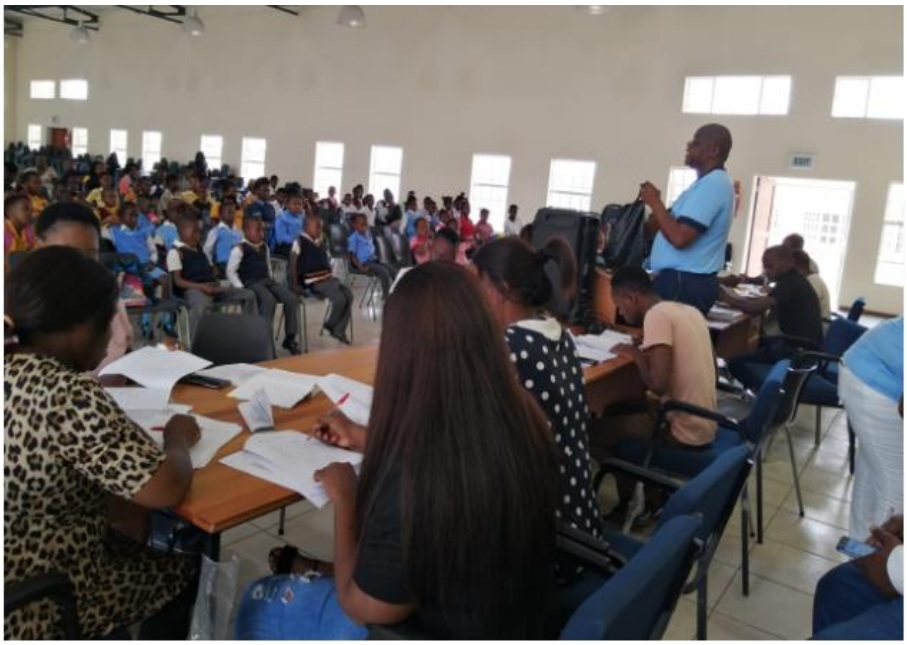
Pictures from activities in Mpumalanga

Miss Nombuso Thobela receiving her District award from her District Director



Teachers in action at the Middleburg branch

Pi day activities at Mzimhlophe Secondary School



Pi day activities at Buhle Primary School

North West

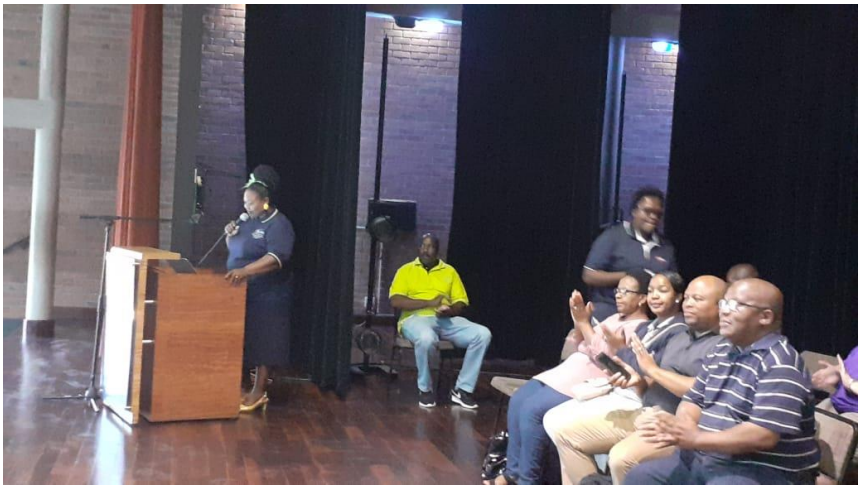
Activities in the North West were curtailed by the onset of COVID 19. However, before then there was plenty to celebrate:

15 February 2020: AMESA National Secretary Kgomotso Pliane, from our North-West Region was placed first in the category ***Excellence in Mathematics Teaching: GET*** at the National Teacher Awards in Pretoria for the 2019 school year . At the same awards function, Ms Masilo came second nationally in the category. ***Excellence in Primary School Leadership***

14 March 2020: 1: The Regional Conference tok place on Saturday 14 March 2020 at Lebone II. The theme was ***" Mathematics is everywhere"***. Mr Phillip Digkomo from the DBE was the Guest speaker. The conference was supported by a number of AMESA supporting publishers.

NB: See detailed insert later in publication on Ms Kgomotso Pilane

Pictures from activities in North-West



North-West Chair Ms Oniccah Thibodi addressing delegates at regional conference

A frontal view of the delegates at the regional conference

AMESA National Webinars

Due to the COVID-19 pandemic, AMESA arranged with our publishers and other supporters to have webinars for our members and mathematics teachers. These webinars were geared towards supporting grade 12 teachers with a last push effort to improve learner performance in the subject.

Date	Grade	Activity	Time	Presented by
15 September 2020	12	A focus on level 3 and 4 questions in Mathematics grade 12 (English)	16:00 – 17:00	Anne Eadie (Answer Series)
17 September 2020	12	A focus on level 3 and 4 questions in Mathematics grade 12 (Afrikaans)	16:00 – 17:00	Anne Eadie (Answer Series)
19 September 2020	12	Differential Calculus Part 1	10:00 – 11:15	Pearson
26 September 2020	12	Differential Calculus Part 2	10:00 – 11:15	Pearson
26 September 2020	11	Euclidean Geometry	14:00 – 15:00	Kevin Smith (Sharp)
30 September 2020	11/12	Financial Mathematics	16:00 – 17:00	Macmillan Education
3 October 2020	12	Probability	10:00 – 11:15	Pearson
7 October 2020	12	Trigonometry	16:00 – 17:00	Macmillan Education
10 October 2020	12	Financial Mathematics	10:00 – 11:15	Pearson
17 October 2020	12	Interpreting rates of change in applied contexts: Reflecting on student reasoning	10:00 – 11:00	Oxford University Press

We would like to express our sincere thanks and appreciation to the Answer Series, Pearson and Sharp for very interesting and thought -provoking webinars.

AMESA National Virtual Mini-Conference

AMESA' s National virtual mini-conference took place on Saturday 24 October 2020. It consisted of both plenary as well as breakaway sessions. The plenary sessions focussed on problem solving. The platform used for this conference was Google Meet. There were 102 attendees.

Plenary Sessions

Time	Topic	Presenter
09:00 – 09:05	Welcome by AMESA President	Rajendran Govender
09:05 – 09:20	Teacher Development: Problem solving & some reflections on teaching and learning of mathematics during the COVID-19 period	Phillip Dikgomo (DBE-Director: Teacher Development)
09:20 – 09:40	Problem Solving: The impact of enhancing the capabilities of teachers to facilitate meaningful problem solving in their mathematics classrooms.	Daniel Krupanandan (DCES: Mathematics & Physics in Umlazi District-KZN)
09:40 –10:20	Designing fit-for-purpose problems for the Mathematics Challenge	Alwyn Olivier (Chair: South African Mathematics Challenge)
10:40 – 11:20	Problem solving and the Maths Olympiad: The importance of learning problem solving and the art of teaching it	Robert Hagspihl
11:40–12:20	An introduction to Junior Problem Solving	Marc Ancillotti
12:40 –13:05	How to teach a pupil to work a problem to an easier one in order to engage with more complex problem solving	Leigh Pleass

AMESA Financial Statements

In pages 11 to 20 the audited financial statements of AMESA for 2019 are shown:

THE ASSOCIATION FOR MATHEMATICS EDUCATION OF SOUTH AFRICA

Annual financial statements
for the year ended 31 December 2019

DE BRUYN DALY
Chartered Accountant (S.A.)
Registered Auditor
Published 31 August 2020

Index

The reports and statements set out below comprise the annual financial statements presented to the members:

The following supplementary information does not form part of the annual financial statements and is unaudited:

Level of assurance

These annual financial statements have been audited in compliance with the applicable requirements of the Association's Constitution.

Published

31 August 2020

Members' Responsibilities and Approval

The members are responsible for the maintenance of adequate accounting records and the preparation and integrity of the annual financial statements and related information. The independent auditor is responsible to determine that the annual financial statements are in agreement with the accounting records, summarized in the manner required by section 58(2)(d) of the Act.

The members are also responsible for the corporation's system of internal financial control. These are designed to provide reasonable, but not absolute, assurance as to the reliability of the annual financial statements, and to adequately safeguard, verify and maintain accountability of assets, and to prevent and detect misstatement and loss. Nothing has come to the attention of the members to indicate that any material breakdown in the functioning of these controls, procedures and systems has occurred during the year under review.

The annual financial statements have been prepared on the going concern basis, since the members have every reason to believe that the corporation has adequate resources in place to continue in operation for the foreseeable future.

The annual financial statements set out on pages 4 to 9, were approved by all members on 31 August 2020 and were signed by them or on their behalf by:

Member

To the members of THE ASSOCIATION FOR MATHEMATICS EDUCATION OF SOUTH AFRICA

I have audited the Income and Expenditure statements of THE ASSOCIATION FOR MATHEMATICS EDUCATION OF SOUTH AFRICA as set out on page 5. These statements are the responsibility of the Association. My responsibility is to report on the income and expenditure statements.

Members' Responsibility for the Annual Financial Statements

The Association's members are responsible for the preparation and of the annual financial statements in accordance with the basis of accounting as set out in Note 1 to the financial statements and for such internal control as the members determine is necessary to enable the preparation of annual financial statements that are free from material misstatements, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on these annual financial statements based on my audit. I conducted my audit in accordance with International Standards on Assurance Engagements. Those standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance whether the annual financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the annual financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the annual financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the annual financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the annual financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my qualified audit opinion.

Basis for Qualified Opinion

In common with similar organisations, it is not possible for the Association to institute accounting controls over collections from subscriptions, donations, fundraising, hire of facilities and sundry income prior to the initial entry of the collections in the accounting records. Accordingly it was impracticable for me to extend my examination beyond the receipts actually recorded.

Qualified Opinion

In my opinion, except for the possible effects of the matter described in the Basis for Qualified Opinion paragraph, the annual financial statements of THE ASSOCIATION FOR MATHEMATICS EDUCATION OF AFRICA for the year ended 31 December 2019, in all material respects, in accordance with basis of accounting described in note 1 to the annual financial statements.

Alan Daly
Partner
Registered Auditor

31 August 2020
WYNBERG

Alan Daly, B.Com, B.Compt (Hons), CA(SA), PGDip(Tax)
Ingo Talke, B.Acc, B. Compt (Hons), CA(SA).

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Statement of Financial Position as at 31 December 2019

Figures in Rand	Note(s)	2019	2018
Assets			
Current Assets			
Reserve fund	3	313 721	295 608
Trade receivables	2	826 576	-
Cash and cash equivalents	4	879 816	1 012 432
		2 020 113	**1 308 040**
Total Assets		**2 020 113**	**1 308 040**
Equity and Liabilities			
Members' interest and reserves			
Retained income		789 767	743 920
Liabilities			
Current Liabilities			
Trade and other payables	5	1 230 346	564 120
Total Equity and Liabilities		**2 020 113**	**1 308 040**

Statement of Comprehensive Income

Figures in Rand	Note(s)	2019	2018
Revenue		1 756 917	817 645
Other income		236 993	605 506
Operating expenses		(2 016 633)	(1 435 828)
Operating loss		**(22 723)**	**(12 677)**
Investment revenue		68 570	60 662
Profit for the year		**45 847**	**47 985**

Accounting Policies

1. Presentation of Annual Financial Statements

The annual financial statements have been prepared in accordance with the accounting policies as set out below. The annual financial statements have been prepared on the historical cost basis. They are presented in South African Rands.

The financial statements are prepared on the Cash Basis, except for expenses relating to National Congress and Subsidy refunds due to regions which is accounted for on accrual basis.

These accounting policies are consistent with the previous period.

Notes to the Annual Financial Statements

Figures in Rand	2019	2018
2. Trade receivables		
Profit sharing due to National		
National Congress 2019 - KZN	826 576	-
3. Reserve fund		
Term - Account 20-6641-6798	18 196	17 487
Term - Account 20-6519-7783	117 705	109 847
Term - Account 20-6245-3984	59 581	56 128
Term - Account 20-6108-0279	50 012	46 696
32 day notice - Account 91-8606-5955	68 227	65 450
	313 721	**295 608**
4. Cash and cash equivalents		
Cash and cash equivalents consist of:		
Bank balances	19 677	202 750
Depositor Plus account	728 277	683 188
Education fund	131 862	126 494
	879 816	**1 012 432**
5. Trade and other payables		
Amounts due to Regions for National Congress profits	969 784	468 734
Subsidy refunds due to regions	260 562	95 386
	1 230 346	**564 120**
Subsidy refunds due to regions		
Eastern Cape 2016	6 736	6 736
Eastern Cape 2017	6 232	6 232
Eastern Cape 2018	4 760	4 760
Eastern Cape 2019	5 488	-
Free State 2018	27 354	27 354
Free State 2019	41 168	-
Gauteng 2019	11 924	-
Kwazulu-Natal 2019	14 168	-
Limpopo 2019	41 324	-
Mpumalanga 2019	24 972	-
North West 2016	17 768	17 768
North West 2019	11 924	-
Northern Cape 2017	1 248	1 248
Northern Cape 2018	3 104	3 104
Northern Cape 2019	4 584	-
Western Cape 2016	11 116	11 116
Western Cape 2017	9 074	9 074
Western Cape 2018	7 994	7 994
Western Cape 2019	9 624	-
	260 562	**95 386**

Notes to the Annual Financial Statements

Figures in Rand	2019	2018

5. Trade and other payables (continued)

Profits due to regions for National Congress		
National Congress 2014 - Northern Cape	114 090	164 090
National Congress 2017 - Eastern Cape	150 000	150 000
National Congress 2018 - Free State	154 643	154 643
National Congress 2019 - KZN	551 051	-
	969 784	**468 733**

6. Taxation

No provision has been made for 2019 tax as the entity is exempt from Income Tax.

7. Auditor's remuneration

Fees	19 565	18 285
Congress audits prior years	7 875	7 360
	27 440	**25 645**

Detailed Income Statement

Figures in Rand	Note(s)	2019	2018
Revenue			
Congress		1 401 231	401 562
Member fees		355 686	416 083
		1 756 917	**817 645**
Other income			
DBE Training/workshops		129 664	-
Interest received		68 570	60 662
Other income		107 329	605 506
		305 563	**666 168**
Operating expenses			
Accounting fees		8 468	13 211
Auditor's remuneration	7	27 440	25 645
Bank charges		37 065	34 520
Congress 2019 Booklet		-	30 528
Council expenses		20 143	66 941
Employee costs		207 701	165 424
IT expenses and web hosting		15 588	11 988
Maths training		59 994	285 790
National Congress expenses		445 563	73 973
National Council Meeting expenses		64 580	30 568
Postage		92 492	113 452
Printing LTM		76 079	108 654
Printing, stationery and photocopies		17 052	32 235
Profit share due to regions relating to National Congress		551 051	146 603
Publishing Pythagoras		142 820	42 323
Subscriptions		1 983	1 560
Subsidies refunded to regions		165 176	144 228
Sundry		18 936	10 902
Telephone and fax		8 989	8 057
Travel reimbursements, flights and accommodation		55 513	89 226
		2 016 633	**1 435 828**
Profit for the year		**45 847**	**47 985**

The 2020 SAMF Awards (Information provided by SAMF)

2020 will long be remembered as a very difficult year with death, destruction and mayhem the order of the day as a result of the COVID-19 pandemic. Despite disruptions to the school academic year and other issues, the South African Mathematics Foundation (SAMF) which arranges the South African Mathematics Challenge (SAMC) for primary schools and the South African Mathematics Olympiad (SAMO) for high schools managed to complete its programmes, albeit under very trying circumstances

On Saturday 21 November 2020, SAMF and Old Mutual hosted the 2020 Annual Awards Function as a live broadcast on the SAMF YouTube channel. The event honoured learners, schools, and teachers that achieved in the various development programmes run by the organisation every year. Andi Qu (Grade 12) from St. John's College walked away with the title of Best Young Mathematician in the Senior division, while Minkyum Kim (Grade 9) from Reddam House Durbanville was awarded the Best Young Mathematician in the Junior division of the Old Mutual South African Mathematics Olympiad, that is co-sponsored by the South African Institute for Chartered Accountants (SAICA).

In his keynote address Prof Jonathan Jansen, former Rector and Vice-Chancellor of the University of the Free State, said that *"so much of our system of education is built on mediocrity, built on just getting by."* He continued by saying that *"there is something in the way we teach mathematics that doesn't encourage people to think laterally, to be more efficient, to get to an answer in their own way because we are so traditional and rule-bound."* Jansen highlighted that, *"apart from its intellectual values, mathematics also has social values. It teaches you how to solve problems together*."

"*What South Africa needs in this 21st century is high-level skills, and high-level skills are often based on competence in mathematics. The South African Mathematics Foundation for me, represents an example of what can be if we take education very seriously. Thank you for being the lodestar for education and thank you to all of those who are the teachers in the Olympiads. Thank you for refusing to be part of this mediocrity and thank you for the work that you do, because without you a bad situation would be much more dire for our young people and our country."*

Prof Kerstin Jordaan, the executive director at the SAMF is of the view that South Africa needs a larger quantity and better quality of mathematically skilled people, *"Because mathematics underpins all innovation in finance, engineering, and business*"; "*For this*

reason, one of the main goals of the SAMF is to make a positive impact on the standard of mathematics teaching and learning in South Africa. The learners, schools, and volunteers who received recognition today are proof that we are well on our way to making an impact. Congratulations to everyone who received rewards and thank you to all the teachers and parents who make these achievements possible."

Teachers play a vital role in the development of mathematics in the country. Without passionate mathematics teachers, there will be no Olympiads. That is why the SAMF awards schools for participation in the NESTLÉ NESPRAY South African Mathematics Challenge (SAMC) and the Old Mutual South African Mathematics Olympiad (SAMO).

"Congratulations to all the 2020 NESTLÉ NESPRAY South African Mathematics Challenge winners. We are so proud of all learners and schools that took part in the Challenge and still managed to perform to the best of their abilities. Our role as NESTLÉ NESPRAY is to emphasize the importance of nutrition for the cognitive and physical growth development of school-going children" said Yovini Moodley, Business Executive Officer at Nestlé South Africa.

Competing in the Olympiad requires dedication. To reach the top 10 learners out of more than 86,000 participants who took part in the first round of the SAMO is quite an achievement. Olympiad mathematics is so much more than the problem solving found in the standard school curriculum.

"We are proud to be working with the South African Mathematics Foundation to improve education, particularly scarce skills like mathematics," said Celiwe Ross, mining engineer turned Human Capital Director at Old Mutual. "*The world has become heavily reliant on technology and this will most likely influence how companies select prospective employees – students with higher mathematical aptitude are more likely to stand a better chance stepping into the job market. At Old Mutual, we really believe in creating a mathematically enabling environment, which provides opportunities for all learners to develop to their fullest potential, which is what the South African Mathematics Olympiad strives to do. This year is particularly special – with so many disruptions to the academic year, the students still managed to do exceptionally well. A heartfelt congratulations and well done to all the participants and winners."*

The awards also featured recognition of special achievements and honorary awards. **Mr Alwyn Olivier**, a former lecturer from the University of Stellenbosch received a long

service award for serving on the SAMC Problem Committee and an honorary award for substantial contribution to SAMF Olympiad programmes. Other recipients of long service awards were Mr Leon Roode from the Western Cape Department of Education, Mr Mark Rushby of Sweet Valley Primary School, Mr Steven Muthige from the Limpopo Department of Education, and Dr Vasuthavan Govender from the Eastern Cape Department of Education. Mr Michael Vamvadelis from Bishops Diocesan College also received a 10-year service award for serving on the SAMO committee

The South African Institute of Chartered Accountants (SAICA), co-sponsor of the SAMO adds: "*As a scarce-skills profession, the chartered accountancy profession is in dire need of talented learners who have expressed an aptitude and love for mathematics. SAICA is delighted to see how many young South Africans have excelled in this year's SAMO and worked so hard to develop the much-needed problem solving skills our country needs. We congratulate all the winners as well as all learners who took part this year,"* says Chantyl Mulder, Executive Director of Nation Building at SAICA.

The 2020 Annual Awards can be watched on the SAMF YouTube channel. Go to www.youtube.com/SAMathematicsFoundation

Full list of winners

NESTLÉ NESPRAY South African Mathematics Challenge

- School with most entries – Beaumont Primary School (Western Cape)
- Top overall performing school – Sweet Valley Primary School (Western Cape)
- Top performing new school – Abana Primary School (North-West)
- Top performing Quintile 1 school – Mokgwathi Primary School (Limpopo)
- Top performing Quintile 2 school – Nyanda Primary School (KZN)
- Top performing Quintile 3 school – Imbaliyethu Primary School (KZN)
- Top performing Quintile 4 school – Laerskool Die Poort (Gauteng)
- Top performing Quintile 5 school – Sweet Valley Primary School (Western Cape)

Old Mutual South African Mathematics Olympiad

<u>Top 10 Junior and Senior Participants</u>

Top 10 Junior SAMO (Grades 8-9, in alphabetical order)

- Brock van der Westhuizen, Grade 9, The J&S Homeschool Academy (Western Cape)
- Cari Bellingan, Grade 9, Hoërskool Menlopark (Gauteng)
- Jana Rossouw, Grade 8, Hoërskool Jim Fouche (Free State)
- Jeongeun Park, Grade 9, St. Dunstan's College (Gauteng)
- Lenita Jacobs, Grade 9, Lenita's Home School (Gauteng)
- Maia Birch, Grade 8, Rustenburg Girls' High School (Western Cape)
- Minkyum Kim, Grade 9, Reddam House Durbanville (Western Cape)
- Simon Oosthuizen, Grade 8, Westerford High School (Western Cape)
- Tengjun Liu, Grade 8, American International School of Cape Town (Western Cape)
- Uwakmfon Unwana Jacob, Grade 8, Graceland International School (Nigeria)

Top 10 Senior SAMO (Grades 10-12, in alphabetical order)

- Akinfoluhan Akinleye, Grade 11, The Ambassadors College (Nigeria)
- Andi Qu, Grade 12, St. John's College (Gauteng)
- Danielle Kleyn, Grade 12, Hoërskool Parel Vallei (Western Cape)
- Emmanuel Rassou, Grade 10, South African College High School (Western Cape)
- Jaedon Naidu, Grade 11, Eden College Durban (kwaZulu Natal)
- Juliette Roux, Grade 10, Herschel Girls' High School (Western Cape)
- Kerry Porrill, Grade 11, Cannon's Creek High School (Western Cape)
- Kgaugelo Bopape, Grade 12, Horizon International High School (Gauteng)
- Wisdom Eden Omodiagbe, Grade 12, The Ambassadors College (Nigeria)
- Yi Lou, Grade 11, St. Peters College (Gauteng)

<u>Top individual awards</u>

- Best performing black learner (junior) – Atlegang Letloenyane, Brebner High School (Free State)

- Best performing black learner (senior) – Kgaugelo Bopape, Horizon International School (Gauteng)
- Best junior learner in a MST school – Kevin Naylor, Worcester Gimnasium (Western Cape)
- Best junior learner in a Quintile 1 school – Z. A Thomo, Highveld Secondary School (Mpumalanga)
- Best junior learner in a Quintile 2 school – Ntuthuko Buthelezi, Mfinyeli High School (KZN)
- Best junior learner in a Quintile 3 school – Joshua Malgas, Panorama Primary School (Western Cape)
- Best junior learner in a Quintile 4 school - Rolan Kruger, Hoërskool Eldoraigne (Gauteng)
- Best junior learner in a Quintile 5 school – Jana Rossouw, Hoërskool Jim Fouche (Free State)
- Best senior learner in a MST school - Bhekisizwe Thomo, Highveld Secondary School (Mpumalanga)
- Best senior learners in a Quintile 1 school – Gladwin Ngobeni, Sevengwana High School (Limpopo), and Bhekisizwe Thomo, Highveld Secondary School (Mpumalanga)
- Best senior learner in a Quintile 2 school – Blessing Maseko, Moreko Secondary School (Limpopo)
- Best senior learner in a Quintile 3 school – Kamohelo Phajane, Sefoloko Secondary school (Lim)
- Best senior learner in a Quintile 4 school – Dian Raubenheimer, Hoërskool Wesvalia (North West)
- Best senior learner in a Quintile 5 school – Danielle Kleyn, Hoërskool Parel Vallei (Western Cape)

<u>Schools with the best participation</u>

- Jeppe High School for Girls (Gauteng)
- Curro Waterfall (Gauteng)
- PEPPS Polokwane School (Limpopo)
- Grantleigh College (Kwazulu-Natal)
- Umtata High School (Eastern Cape)
- Harvest Christian School (Eastern Cape)

- Bishops Diocesan College (Western Cape)
- Wynberg Boys' High School (Western Cape)
- The Cape Academy of Maths, Science & Technology (Western Cape)
- Claremont High School (Western Cape)
- Curro Hermanus (Western Cape)

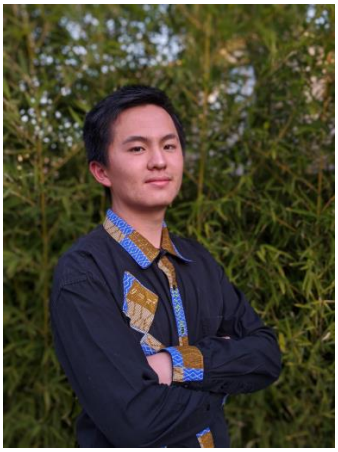
Other School Awards

- New school with the best participation – Sidingimfundo Secondary School (KZN)
- Top performing Mathematics, Science and Technology (MST) school - Worcester Gimnasium (Western Cape)
- Top performing Quintile 1 school – Highveld Secondary School (Mpumalanga)
- Top performing Quintile 2 school – Sterkspruit Junior Secondary School (Eastern Cape)
- Top performing Quintile 3 school – Giyani High School (Limpopo)
- Top performing Quintile 4 school – Hoërskool Eldoraigne (Gauteng)
- Top performing Quintile 5 school – Westerford High School (Western Cape)
- Top performing school

  1st place: Bishops Diocesan College (Western Cape)

  2nd place: St. John's College (Gauteng)

  3rd place: Westerford High School (Western Cape)



Andi Qu (Senior winner)

Minkyum Kim (Junior winner)

The ASSA South African Mathematics Team Competition (SAMTC):
Sponsored by the Actuarial Society of South Africa

Background

The South African Mathematics team competition (previously known as the South African Inter Provincial Mathematics Olympiad or SAIPMO) has been a regular event since 1990. A province, district or region does not coincide with any official nine provinces of the country and neighbouring countries are also welcome to participate. Team must include members from different schools. Each region team enters two teams of ten: Junior (grades 8 and 9) and Senior (grades 10, 11 and 12) (could B, C, …teams)

Format of the competition

The first part of the Competition kicks off at time to be decided and is a one-hour individual problem paper, consisting of 15 problems in multiple-choice format: 10 questions (6 marks each); 5 questions (8 marks each); wrong solution (0 marks); no solution (1 mark).

After a break for refreshments and a discussion of team strategy, the second part of the Competition takes place. The second paper consists of ten difficult problems; the teams now work together and must submit just one set of answers. (100 marks each)

Results of the 2020 competition

The 2020 competition took place on Saturday 17 October 2020 at centres all over South Africa as well as some African countries. There were 77 teams in the junior section and 81 teams in the senior section.

The junior competition was won by **the Western Cape Junior team 1** with 1185 points (out of 2000 points). The senior competition was won by the **Western Province Senior team** 1 with 1553 points (out of 2000 points).

Editor's note:

AMESA and the mathematics community at large is very grateful to SAMF and its hardworking staff for ensuring that the bulk of its activities took place in 2020, despite challenging circumstances.

Interview with Kagiso Peace Mojake (former regional representative of Northern Cape on the AMESA National Council)

Kagiso Peace Mojake served as Northern Cape representative on the AMESA National Council until 2019. AMESA News editor, Vasuthavan Govender spoke to him:

1. **How long have you been a member of AMESA?**

   I have been an AMESA member in good standing for a solid 15 years. I joined AMESA in 2005 and became a Life member in 2007

2. **What did you learn (if any) from being a member of AMESA?**

   I have learned so much as a member of AMESA. I learnt different teaching strategies for especially the FET grades. I learnt a lot from attending both regional and national conferences. I was able to share the knowledge gained with AMESA members in my region. I was also offered the opportunity of attending the AMESA problem solving training workshops. My problem-solving skills improved greatly. As a result, I became an AMESA Problem solving facilitator.

3. **How long did you serve on the National Council?**

   In 2013 AMESA Northern Cape elected me to represent the province at the national level, a position which was vacated by Jeffery Thomas. I served for 6 years that is from 2013 until the end of 2019.

4. **What did you learn from exchanges during National Council meetings?**

   I served under 3 presidents namely Alwyn Oliver, Vasuthavan Govender and Busi Goba. I learned so much from these presidents and other council members. One thing I took for granted was to organise a national congress, I thought it doesn't require much but 2014 came and I realised that organising a national congress demands commitment and dedication and that the national council has so much to do before the next congress. The experience I gained from serving as council member helped me in dealing with difficult issues at work place and at community level especial on how to make people feel part of any activity or decisions.

5. **What impact has AMESA had on Mathematics teaching and learning in the Northern Cape?**

Most teachers started to show interest in AMESA in 2018 as individuals and after attending 2018 national congress in numbers they started to respond to any call made by AMESA Northern Cape to participate in the activities of AMESA. Some teachers gave positive feed on how AMESA National Congress activities l helped them in their personal development and how they used the knowledge they gained to do their own research and to improve their classroom practice, especially when teaching certain "difficult" mathematical concepts to make it easier for learners to understand.

6. **How did you keep your Mathematics activities going during the COVID-19 pandemic**?

   From an AMESA point of view it has being difficult to physically engage members on regional activities. However, we have tried to continuously engage members through our WhatsApp and Facebook groups. I have done my best in trying to keep my learners actively involved in doing Mathematics activities during the lockdown using WhatsApp. But it had its own advantage and disadvantages. I could only do so much when learners were attending school which also had its challenges as my learners were coming to school only twice a week which made it impossible for smooth learning and teaching.

7. **Any other comments**

   I am currently actively involved at the regional level and try by all means to keep members informed of any activities of AMESA through our newly elected regional representative. My aim as one of the life members of AMESA is to help the regional structure to ensure that we increase our numbers of individual members and that we have branches launched. We also intend to start now in planning for our Northern Cape National Congress in 2024 by attending all congresses prior to it to take note of good practices.

Interview with Oniccah Dikeledi Thibodi (AMESA North West Chair and recent PhD graduate in Mathematics Education)

Onicah Thibodi, currently the North West Chair, graduated earlier this year with a PhD in Mathematics Education. Her topic was: "*Metaphors in mathematics: Perspectives from learners and teachers in the Bojanala District, North West Province".*

AMESA News Editor, Vasuthavan Govender spoke to her about her studies

1. **What prompted you to do this study?**

   I was encouraged to study further when I was doing my Advanced Certificate: Technology at the University of North-West (Potchefstroom Campus). I had been teaching for a while and one of my lecturers motivated us about further studies. I did the various qualifications BA; ACE; B.Ed (Honours) and my Masters. I found studying to be very enriching and rewarding.. It gave me a new vision for teaching my classes at my school. In this regard, I believe that teachers are life-long learners. I was raised by a single parent and was determined to become a PhD graduate.

2. **What did you learn from doing your study?**

   I have learnt a lot of things, formally and informally. Firstly, I came to understand that by using Google Scholar, "you are climbing on the shoulders of the giants". I gained lots of skills related to research writing, the writing of articles, and also analysing data. Referencing and acknowledging authors is also an integral part of studies. I learnt how to write formally and the need to acknowledge other researchers and writers. Socially I met with other academics and we supported each other throughout our journey. I realised that in order to be successful in my studies, I have had to limit my social activities and make new friends in the "academic" field. The study itself have changed my character. I am now honoured and gratefully acknowledged by senior officials and other dignitaries. It is not about wealth to be popular in the world of academics, but it is about knowledge and ability to assist and motivate others to follow suite.

   I spent a number of years doing this study. It has taught me to be patient and disciplined. Further, despite being busy, at no time did I ignore my learners at school. I had many sleepless nights working through lots of research documents, but I would still report for duty at school the next morning.

3. **How do you think this can change the face of Mathematics teaching in primary schools?**

   It is important that primary school teachers ensure that their learners have a solid mathematics foundation. Teachers should change the way they teach their learners. They should focus less on the traditional way of doing things and come up with interesting, meaningful lesson for their learners who are becoming increasingly technologically advanced.

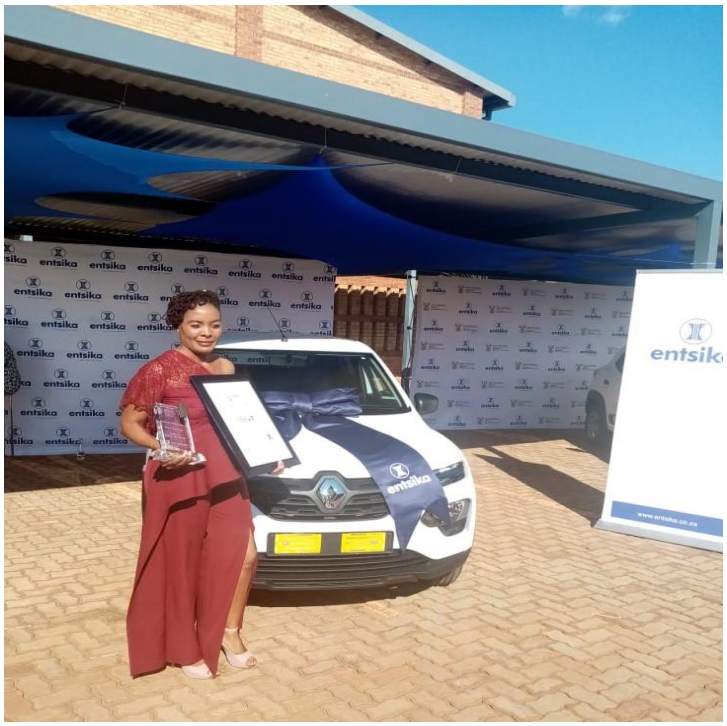
   The study itself has changed the way I teach mathematics to my Grade 7 classes. If teachers are able to understand why learners cannot perform in mathematics and yet actively participate in other subjects, then we will be well on the road to solving issues of performance in mathematics. We use metaphors in mathematics teaching, and these must well understood by teachers, first and foremost, and then the learners. Metaphors used in mathematics teaching are similar to metaphors used in English. The central idea behind the use of metaphors is to understand and experience one kind of a thing in relation to another kind This is very important in a subject like mathematics and is considered as a cornerstone for meaningful mathematics learning.

Editor's comment:

On behalf of the National Council of AMESA and all AMESA members, we take this opportunity of congratulating Onicah Thibodi on her wonderful achievement of a PhD in Mathematics Education. May she inspire all teachers in her school, local community, her province and nationally that self-empowerment is the key to enriching one's educational and teaching experiences in order to change the lives of our children.

The National Teacher Awards (NTA) of 2019

In February 2020, the National Teacher Awards took place in Pretoria. AMESA National Secretary Kgomotso Pilane was placed first in the category: ***Excellence in Mathematics Teaching: GET.***



Kgomotso Pilane with her new car and other prizes

AMESA News editor Vasuthavan Govender asked Kgomotso a few questions::

1. **What made you take part in the NTA in 2019?**

   I have three reasons for doing so:

   - *I am passionate about the teaching profession*
   - *I wanted the Department of Education to recognise my potential as a teacher*
   - *I was motivated by former NTA participants and my circuit manager.*

2. **Describe the steps involved that resulted in you representing the North West province in the National Awards in Pretoria:**

   Firstly, I was nominated by my school to enter for the NTA. I represented my school quite well in the initial stages of the competition which enabled me to participate in the Rustenburg sub-district. I did well in the sub-district and ten participated in the Bojanala district where I was placed first. My performance was very strong at district level. As a result – I went straight through to National where I did exceptionally well. (coming first in my category)

3. **What did you learn from being involved in these awards?**

   I have learnt that the Department of Education does recognise and appreciate what teachers do; it was an honour for me to receive such recognition and appreciation. I also learnt a lot from fellow participants from other provinces. This also exposed me to a variety of teaching land learning issues and solutions.

4. **Do you think that being an active AMESA member assisted you? Explain**

   Being an active member of AMESA assisted me tremendously. The conferences, congresses and workshops I participated in and attended , developed my insight in Mathematics. It made me learn new approaches, techniques, strategies, and methods to use in my class. It improved my teaching ability and made me grow as a teacher. I am a confident Maths teacher because of the AMESA professional development.

5. **What were your prizes?**

   Kgomotso received a number of prizes from her sub-district/district; province and from the Department of Basic Education. These are shown in the table below:

Prizes received	**Awarded for:**	**Sponsor**
2 tablets	For **1st prize** in sub-district and district	Rustenburg sub-district; Bojanala district
Printer and laptop	For **1st prize** in province	Northwest Province
Renault KWID	For **1st prize** Nationally	Department of Basic Education
R4000,00 cash	For **1st prize** Nationally	Entsika
R500,00 voucher	For **1st prize** Nationally	Ackermans
Laptop with laptop bag plus smartphone with airtime	For **1st prize** Nationally	Vodacom Foundation
Camping hamper of R6500	For **1st prize** Nationally	Campmaster
R6500,00 cash prize	For **1st prize** Nationally	AVBOB
Two hour online digital education training and access to teaching for 4IR worth R5625,00	For **1st prize** Nationally	Via Afrika
R2000,00 cash prize	For **1st prize** Nationally	Via Afrika

6. **What advice would you give other teachers who are interested in participating in the NTA?**

   - *Firstly, you need to be passionate about your profession.*
   - *You need to capacitate yourself by attending professional development courses/workshops.*
   - *Keep a portfolio of evidence of all activities you are engaged in.*
   - *Strive for excellence at all times.*
   - *Go an extra mile by going above and beyond the regular duties of a teacher to truly make an impact in your school, community, district and further afield.*

7. **Any other comments?**

   My vision is to see excellence in Mathematics and for South African children to pursue mathematics-related careers.

   "I am a CANDLE THAT CONSUMES ITSELF TO LIGHT A WAY TO LEARNERS, TEACHERS AND THE COMMUNITY"

Editor's comment:

On behalf of the National Council of AMESA and all AMESA members, we take this opportunity of congratulating Kgomotso Pilane on her great achievement of winning the NTA award for *Excellence in Mathematics Teaching: GET* for 2019. You are indeed an inspiration to all AMESA members and mathematics teachers throughout South Africa.

We would like to encourage our members to make themselves available for NTA awards in the various categories when the NTA resumes in 2021/2022.

MEMBERSHIP

Will members please note that should their postal address change, to **PLEASE** let the Membership Secretary know as soon as possible of the change so that the member can continue getting all the publications that they are entitled to as a paid up member.

Nombulelo may be contacted at:

Tel : 011 484-8917

Fax : 086 553-5042

Email : membership@amesa.org.za

AMESA Review of grade 12 papers in 2020

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.

2020 marks the twelfth year in which AMESA has been involved in these workshop activities. Despite the COVID-19 pandemic, there has been keen teacher participation in these activities (both face-to-face and virtual and the feedback from the AMESA regions, has generally been positive. We appreciate the fact that there has been stability in the standard of the papers.

AMESA is aware of the many challenges facing Mathematics teaching and learning in South Africa and much 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. We also note that 2020 has been a very disruptive and difficult year for education and we appreciate the efforts by the DBE to salvage the 2020 school year for grade 12 learners.
However, we are concerned about the reports of the leakage of Mathematics Paper 2. We know that the DBE is investigating this very serious breach of national security and trust that the culprits will be brought to book. We also appreciate the call by the DBE for learners not to panic and that learners will not be severely disadvantaged by these leaks.

Mathematics, Technical Mathematics and Mathematical Literacy were written nationally on Thursday 12 November 2020 (paper 1) and Monday 16 November 2020 (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 2019 paper; Learners views on the papers, Unfair questions and Overall verdict.

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 and useful.

NB: A report together with a full question-by-question analysis appears on our website.

MATHEMATICS PAPER 1

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The DBE is to be complimented for producing papers which are technically of a very high standard. Mathematics Paper 1 was neatly typed and all the information was presented in a clear, unambiguous manner. The use of bullets in some of the questions made reading easier. Although the sketch in 4.2 was not consistent with other sketches in the paper, as far as line thickness is concerned, all information was accessible to the candidates.

2. Language used

The language in the paper would be within the grasp of most grade 12 mathematics learners. The language usage was good, unambiguous and unbiased throughout the question paper. The use of bullets in certain questions appeared to help learners with making sense of the questions.

Only question 11 posed a bit of a language problem, especially 11.1 and 11.3

3. Syllabus coverage

Code	Content/Topic	Suggested	Actual
1	Algebra and equations (inequalities)	25 ($\pm$ 3)	22
2	Patterns and sequences	25 ($\pm$ 3)	25
3	Finance, growth and decay	15 ($\pm$ 3)	16
4	Functions and graphs	35 ($\pm$ 3)	35
5	Differential calculus	35 ($\pm$ 3)	37
6	Probability	15 ($\pm$ 3)	15
	TOTAL	150	150

Mathematics Paper examines 6 of the 10 content areas. In terms of content coverage, all these content areas/topics were covered within the prescripts of the CAPS document.

4.1 Standard of paper

Candidates had a good "welcome to the paper" in question 1 which probably gave them confidence for the rest of the paper. Questions 1; 4.1, 7 and part of question 2 presented learners with a sizeable proportion of level 1 and level 2 questions, which were mostly accessible.

The questions were "well structured" with "easy" questions to start off with and then a gradual increase in the level of difficulty per question. However, questions 1.3 (3), 2.2.4 (4), 3.2 (5), 4.2.6 (4), 5.4 (3), 5.5 (3), 6.3.2 (4), 8.4 (4), 8.5 (5), Q9 (10) and 11.3 (3) required candidates to have mathematical insight, analytical thinking and conceptual understanding.

4.2 Compliance with levels of thinking:

‘Levels of thinking	Suggested	November 2020
1 – Knowledge	± 20%	15,3%
2 - Routine procedures	± 35%	40,7%
3 - Complex procedures	± 30%	28,0%
4 - Solving problems	± 15%	16,0%

Mathematics Paper 1 appears to be cognitively balanced with 56% of the paper, according to our analyses, comprising level 1 (knowledge) and level 2 (routine procedures) questions and 44% comprising level 3 (complex procedures) and level 4 (problem solving) questions. This is in line with the CAPS document.

5. Comparison with 2019 paper

An extra column is added to the table in 4.2 to show our allocation of levels of thinking for the 2019 paper.

Levels of thinking	Suggested	November 2020	November 2019
1 – Knowledge	± 20%	15,3%	15%
2 - Routine procedures	± 35%	40,7%	33%
3 - Complex procedures	± 30%	28,0%	33%
4 - Solving problems	± 15%	16,0%	19%

We note that the 2020 Mathematics Paper 1 was definitely less challenging than the 2019 paper. In 2019 the paper was loaded with many hurdles along the way, almost in every question. Candidates never got a chance to feel comfortable. In some cases, the challenging questions were right at the start of a particular question.

The 2020 Mathematics Paper 1 was definitely more candidate friendly with the questions well-structured from easy to medium to difficult/challenging.

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

There were **no unfair** questions identified in the paper that would disadvantage any candidate in any way. However, there were a number of unseen, challenging questions throughout the paper (usually the last one in the question.

7. Learners views of the paper

Learners, surveyed, felt it was better and more accessible than the recent Trial paper They indicated that the paper was fair and the time allocation was good. .
Although many learners felt that there were no unfair questions, many mentioned questions 5, 9, 10 and 11 as quite challenging (not unfair). They also identified some other sub-questions as challenging, eg. 1.3, 3.2 , 4.2.4 and 8.5.

8. Overall verdict

The paper was of a good standard catering for all different levels of candidates. Although the questions were much more accessible to candidates, it had its fair share of challenging questions for, especially, the top candidates.

We are able to classify the paper as follows:

"A well-balanced, fair paper allowing candidates to showcase their mathematical knowledge and abilities"

MATHEMATICS PAPER 2

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

Mathematics Paper 2 was neatly typed, with all information clearly legible. However, there were some technical inconsistencies which, although not impacting on the essence of the paper, need to be corrected for future papers:

For example, the diagram in question 3 had the x of the x-axis above the x-axis; in question 4 it was below the x-axis; in question 5 it was on the side.

There were also issues in the diagrams in 8.1 (L and N on the circumference); 9.2 (M on the circumference) and the depiction of the parallel lines in the diagram for question 3 in the answer book.

2. Language used

The language used in the paper would be accessible to most grade 12 learners. However, question 2 appeared to be very verbose, with lots of writing. Thus, a fair bit of comprehension and understanding would be required for this question. This could have been avoided with the use of shorter sentences; this would have made it easier for learners to understand and grasp the questions. The use of bullets (as used in Mathematics Paper 1) would have definitely helped.

In question 4.5, the wording in the English version of the paper, "centred at M" may lead to the assumption that the circles "touch" at M; candidates may also be confused as to whether a large circle may touch and intersect another circle.

3. Syllabus coverage:

Code	Content/Topic	Suggested	Actual
1	Statistics	20 ($\pm$ 3)	19
2	Analytical Geometry	40 ($\pm$ 3)	40
3	Trigonometry	40 ($\pm$ 3)	42
4	Euclidean Geometry and measurement	50 ($\pm$ 3)	49
	TOTAL	150	150

Mathematics Paper 2 assesses 4 of the 10 content areas/topics in the subject. A quick glance at the above table shows that coverage of these content areas/topics were clearly in line with prescripts of the CAPS document.

4.1 Standard of paper

There was a good start to the paper Statistics assessed in the first two questions. Most candidates should do well in these two questions. However, candidates with a "language problem" may have found question 2 to be verbose and time consuming.

Although the questions in the paper should have been accessible to most learners, the use of fractional and decimal calculations, especially in Analytical Geometry, may cause some learners to

"second guess" some answers and, thus, waste, time. The content examined were fine but the overuse of fractions may result in a "breakdown" in candidates' responses.

The Trigonometry part of the part required deep, analytical thinking in a number of its questions. The Euclidean Geometry was extremely fair. However, the fact that Euclidean Geometry questions were the last 3 in the paper, those learners who managed to get to these questions, assuming they followed the order in the paper, may not have been in a "good head space" to answer these questions.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2020
1- Knowledge	± 20%	17,3%
2- Routine procedures	± 35%	37,4%
3- Complex procedures	± 30%	28,0%
4- Solving problems	± 15%	17,3%

54,7% of Mathematics Paper comprised level 1 (Knowledge) and level 2 (Routine procedures) questions with 45,3% comprising level 3 (Complex procedures) and level 4 (Solving problems) questions. This is in keeping with the prescripts of the CAPS document.

5. Comparison with 2019 paper

We add a column to the table in 4.2 to reflect our levels of thinking for the 2019 paper.

Levels of thinking	Suggested	November 2020	November 2019
1- Knowledge	± 20%	17,3%	14,7%
2- Routine procedures	± 35%	37,4%	32,6%
3- Complex procedures	± 30%	28,0%	32,6%
4- Solving problems	± 15%	17,3%	18,7%

We note that based on our calculations for both 2019 and 2020, the Mathematics Paper 2 in 2020 appeared to be "marginally easier" than the 2019 paper, with a slight shift to level 1 and 2 questions (in percentage terms).

6. Unfair question(s):

According to teachers surveyed, there were **no unfair** questions in the paper.

7. Learners' views of the paper

Learners surveyed after the paper indicated that the paper was better than the one written in the trial examination (in one province). Some of the "stronger" learners indicated that the Analytical Geometry was "tricky", possibly due to the emphasis on fractional and decimal calculations. However, one the whole learners stated the paper was "reasonable" and most could finish on time.

8. Overall verdict

Mathematics Paper 2 appeared to be a fair paper with good coverage of the work as well as cognitive levels which were in keeping with the prescripts of the CAPS document. Learners who worked well consistently this year, especially after lockdown level 5, should have no problem in passing. The stronger learners, should have little difficulty in getting a minimum of 60% in this paper.

Notwithstanding, our comments on technical issues and the preponderance of fractional and decimal calculations, in especially, Analytical Geometry, our overall verdict for Mathematics Paper 2 is:

"A fair paper which should be accessible to most learners, with enough questions for both average and above average learners. However, those who aspire for very high marks in the paper must be able to negotiate some really high-level questions.

TECHNICAL MATHEMATICS PAPER 1

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The DBE is to be complimented on its high technical standards in Technical mathematics Paper 1. The diagrams were clear and not complicated. Questions were neatly laid out with appropriate spacing.

2. Language used

In general, the language used, in both the Afrikaans and English versions of the paper were to the point and unambiguous.

However, at times there was unnecessary use of language in questions 1; 4.3; 5.2; and 5.3. This can be to the disadvantage of candidates who struggle with reading and interpretation, especially second language learners.

3. Syllabus coverage:

Code	Content/Topic	Suggested	Actual
1	Number System	25 (± 3)	19
2	Algebra	25 (± 3)	34
3	Functions and graphs	35 (± 3)	27
4	Finance, growth and decay	15 (± 3)	16
5	Differential and Integral Calculus	50 (± 3)	54
	TOTAL	150	150

NB: Differential Calculus includes Cubic graphs which carried 16 marks

The coverage of the content areas/topics for Technical Mathematics appears to be in line with the prescripts of the CAPS document.

4.1 Standard of paper

The paper was of a fairly high standard. It started off with an unusual question compared to previous papers and learners may have found this unnerving, especially as questions 1.1 and 1.2 were more difficult than ones which appeared in 2018/2019.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2020
1 – Knowledge	± 25%	20,7%
2 - Routine procedures	± 45%	44,0%
3 - Complex procedures	± 20%	20,7%
4 - Solving problems	± 10%	14,6%

Technical Mathematics Paper 1 in 2020 appears to be more on the difficult side with 64,7% of the paper comprising level 1 (knowledge) and level 2 (routine procedures) questions (compared to the

suggested 70%). This means that 35,3% of the paper (rather than 30%) comprised level 3 (complex procedures) and level 4 (solving problems) questions.

5. Comparison to 2019 paper

We add a column to the table in 4.2 to reflect our levels of thinking for the 2019 paper.

Levels of thinking	Suggested	November 2020	November 2019
1 – Knowledge	± 25%	20,7%	20%
2 - Routine procedures	± 45%	44,0%	59%
3 - Complex procedures	± 20%	20,7%	14%
4 - Solving problems	± 10%	14,6%	7%

When one looks at the above table, we note that, according to our calculations, the 2020 paper appears to be more difficult than the 2019 paper. Although more unusual questions are asked in the 2020 paper and these are not too difficult, technical mathematics learners usually have challenges with questions that require insight and analytical thinking,

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

A list of unfair questions (for Technical Mathematics learners) is shown below:

Q1.1 Although not so difficult, it is very different from past year papers. Learners' lack of familiarity with the context would impact negatively on the way they responded. Some learners stated that they did not attempt the question.

Q1.2 Both the questions were different than normal. These questions should be easy and straight forward to settle the learners. Learners from Mathematics are also likely to find these question unnerving and difficult.

Q4.2 Although not difficult, the learners struggle to apply the information given.

Q6.3 5 Marks for just substituting the point (-1; -1) in $g(x) = ax^2 - x$?

$$-1 = a(-1)^2 - (-1)$$
$$a = -2$$

Learners wanted to know why so many marks for such an easy calculation. However, it is possible that the examiner(s) wanted g'(x) first. In this case, g'(x) = 2ax -1. Now x = -1 means m = g'(-1) = -2a- 1. Now m = 3 so -2a-1 = 3 so a = -2

Q1.4.1 & Q5.1.1 should be allocated 2 marks each (not 1 mark each) as learners should be awarded marks, fairly, for the work they do.

7. Learners views of the paper

Learners surveyed indicated their displeasure with some of the questions (for example, 1.1; 1.2; 4.2 and 9) where a lack of familiarity of the context or not knowing what to do impacted on the way they responded to these questions.

8. Overall verdict

In coming up with our verdict for the paper, it is important to consider the mathematical background and ability of Technical Mathematics learners. These learners tend to 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 are more interested in being artisans and so find the Technical Mathematics very difficult. Learners have previously indicated to their teachers that they do not spend much time on Technical Mathematics, preferring to put their efforts into passing Technical Science.

It is unfortunate that the preponderance of unusual, but not difficult, questions as well as those requiring complex procedures and problem solving is just too high for Technical Mathematics learners. Some teachers responded with "What are they trying to do?" (they being the examiners)

It should be noted, and could easily be verified, that learners taking Technical Mathematics do well in all their subjects but fail Technical Mathematics dismally. Teachers report that the standard appears to be much higher than other technically oriented subjects.

We are now in a position to come up with our verdict of the paper:

"A fair paper according to content coverage and levels of thinking but possibly "unreachable" paper for a large portion of Technical Mathematics learners"

TECHNICAL MATHEMATICS PAPER 2

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The DBE is to be complimented on its high technical standard in the paper. The diagrams were clear, with all information visible and the font was consistent throughout the paper.

There are some minor issues:

- In question 1, the angle in the picture looks 90° but, in the diagram, it is obtuse; this may be misleading to learners.
- The use of bullets in question 2.2 enabled learners to focus on the key parts of the question. However, this was not done for other questions.
- Chord KE in Question 10.2 could have been clearer.

2. Language used

The language used in the paper should be within the grasp of all learners, especially those who are second language learners. The questions are clear and unambiguous; and the instructions easy to follow. However, candidates have to do a lot of reading.

3. Syllabus coverage

Code	Content/Topic	Suggested	Actual
1	Euclidean Geometry	40 ($\pm$ 3)	37
2	Mensuration	15 ($\pm$ 3)	21
3	Circles, angles and angular movement	20 ($\pm$ 3)	16
4	Analytical Geometry	25 ($\pm$ 3)	26
5	Trigonometry	50 ($\pm$ 3)	50
	TOTAL	150	150

Technical Mathematics Paper 2 assesses 5 of the content areas/topics for the subject. The allocation for each of the content area/topics appears to be in line with the prescripts of the CAPS document.

4.1 Standard of paper

The paper is of a good standard with good content coverage and suitable for Technical Mathematics learners. The paper is cognitively balanced.

4.2 Compliance with levels of thinking:

Levels of thinking	Suggested	November 2020
1 – Knowledge	± 25%	16,6%
2 - Routine procedures	± 45%	50,7%
3 - Complex procedures	± 20%	24,00%
4 - Solving problems	± 10%	8,7%

We note that according to our calculations, 67,7% of the paper consists level 1 (Knowledge) and level 2 (Routine procedures) questions, with 32,7% comprising level 3 (Complex procedures) and level 4 (solving problems) questions. Thus, in terms of levels of thinking, we may say that the paper is cognitively balanced.

5. Comparison to 2019 paper

We add a column to our table in 4.2 to reflect our levels of thinking for the 2019 paper.

Levels of thinking	Suggested	November 2020	November 2019
1 – Knowledge	± 25%	16,6%	21%
2 - Routine procedures	± 45%	50,7%	47%
3 - Complex procedures	± 20%	24,00%	24%
4 - Solving problems	± 10%	8,7%	8%

In terms of our calculations, the 2020 compares very well with the 2019 paper. Only the ellipse question (question 2.2) was not as easy as in previous years – but this carried only 3 marks. The similarity question in Euclidean Geometry (3 marks) was easier than in the previous two years. Although the Mensuration questions were not easy, candidates were assisted with the relevant mensuration formulas (and descriptions) shown in the information sheet at the back of the question paper.

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

Q7.1: According to the Acceptable Reasons: Euclidean Geometry in the Examination Guidelines:
In English: "Angles subtended by a chord of the circle, <u>on the same side of the chord</u>, are equal"
In Afrikaans: "Hoeke in dieselfde sirkelsegment is gelyk."
The question asked to complete the statement:
"Hoeke onderspan deur 'n koord van 'n sirkel, ….., is gelyk aan mekaar."

Teachers are encouraged to teach the reasons according to the Examination Guidelines. However, the Afrikaans learner will not recognize the statement, because of the difference in the wording on the examination guidelines.

Q9: This was a very difficult question for learners. They did not recognize the proportionality in the complicated sketch.

Q10.2: In this question learners drew extra lines and brought in a x to work through this question. They thought that there was not enough information given.

7. Learners' views of the paper

A survey of some learners after writing the paper showed that most had difficulty with the questions, which involved lots of reading. It would be fair to say that most were disappointed and are not likely to achieve high marks in the paper.

8. Overall verdict

The paper, while cognitively balanced, appeared to be quite difficult for most learners. Once again, it needs to be stated that learners who take Technical Mathematics as a subject are ones who usually do not have a good mathematical background and tend to struggle with Technical Mathematics from grade 10. For the past two years, these struggles have resulted in poor grade 12 learner performance in the subject. This is unlikely to change in 2020.

Despite our misgivings above and the possible poor performance in the subject , our verdict on the paper is:

"A fair paper, carefully set paper in terms of content and levels of thinking but likely to be beyond the reach of most Technical Mathematics learners"

MATHEMATICAL LITERACY PAPER 1

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The paper was technically good with clear diagrams, well spaced-out text and key information (stimulus) given in text-boxes.

It was suggested that 1.3 could have also been included in the Addendum (as one of the annexures)

2. Language used

There were no language challenges in the paper. The language used should be within the grasp of most grade 12 Mathematical Literacy learners.

Question 5.1.1 had some ambiguity: Is it the team's combined score for the vault event or the individual with the highest score for the event.

3. Syllabus coverage

Code	Content areas (contexts)	Suggested	Actual
1	Finance	53 ± 8	54
2	Measurement	30 ± 8	24
3	Maps, plans and other representations	22 ± 8	25
4	Data Handling	38 ± 8	37
5	Probability	Min 7	10
	TOTAL	**150**	**150**

The coverage of the 5 content areas (contexts) for the paper was adequate, although Measurement appears on the "low side"; but still within the range.

4.1 Standard of paper

The paper is a typical Mathematical Literacy Paper 1, with adequate coverage of the content area and contexts. The paper should be within the grasp of most learners and is, thus, of an acceptable standard.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2020
1 – Knowledge	60% (± 5)	53%
2 - Routine procedures	35%(± 5)	37%
3 – Multi-step procedures	5% (minimum)	9%
4 – Reasoning and analysis	0%	-

According to our calculations, the allocations the levels of thinking for this paper appear to be within the range expected. Our calculations for knowledge questions seems to be slightly lower than expected but this should not detract from what is a "top quality paper".

5. Comparison with 2019 paper

We add a column to our table in 4.2 to show our levels of thinking for 2019.

Levels of thinking	Suggested	November 2020	November 2019
1 – Knowledge	60% (± 5)	53%	56%
2 - Routine procedures	35%(± 5)	37%	39%
3 – Multi-step procedures	5% (minimum)	9%	5%
4 – Reasoning and analysis	0%	-	

From the levels of thinking shown in the above table, the 2020 paper compares very favourably to the 2019 paper. However, according to our calculations, it would appear that level 3 (multi-step procedures) questions were slightly higher, making the 2020 slightly more difficult.

Teachers also noted the following:

- Questions appeared to be less ambiguous requiring interpretations to be confined (and not open to any view by candidates)
- The questions were more learner friendly; most learners should do well
- The paper was an ideal Mathematical Literacy paper 1

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

Although there were no questions which could be regarded as unfair, teachers noted the following:

Calculating the monthly tax payable before rebates are deducted in question 2.2.3 is a change from how this question has been set in previous paper. Usually learners write down everything including rebates when responding to questions of this nature. Thus, they have to read carefully and understand the requirements of the question.

7. Learners view of paper:

Most learners surveyed after the writing of the paper stated that the paper was “fair” and a good paper in which to score high marks in the subject.

8. Overall verdict

We note that the paper was a typical Mathematical Literacy Paper 1, with no issues.

Our verdict is, thus:

“A fair, well-set, learner friendly and manageable paper with no “twists” or “turns”..

MATHEMATICAL LITERACY PAPER 2

A. Overall Review

1. Technical Aspects (typing; diagrams; etc)

The paper was technically good with clear diagrams, well spaced-out text and key information (stimulus) given in text-boxes. Font sizes were big enough to make reading comfortable.

2. Language used

The language used in the paper should be within the grasp of most Mathematical Literacy learners. Although there was a lot of reading to do, the wording was clearly unambiguous and easy to understand.

3. Syllabus coverage

Code	Content areas (contexts)	Suggested	Actual
1	Finance	53 ± 7	50
2	Measurement	30 ± 7	32
3	Maps, plans and other representations	23 ± 7	18
4	Data Handling	37 ± 7	41
5	Probability	Min 7	9
	TOTAL	**150**	**150**

The coverage of the 5 content areas (contexts) for the paper was adequate and , although Maps, plans and other representations appears on the "low side", it still within the range.

4.1 Standard of paper

It was a typical Mathematical Literacy Paper 2, consisting of several unfamiliar scenarios which is evident of the current Paper 2 requirements. The paper was well set, fair and a very good standard.

4.2 Compliance with levels of thinking

Levels of thinking	Suggested	November 2020
1 – Knowledge	0%	0%
2 - Routine procedures	$\pm$ 25%	28%
3 – Multi-step procedures	$\pm$ 35%	35%
4 – Reasoning and analysis	$\pm$ 40%	37%

5. Comparison with 2019 paper

We add a column to the table in 4.2 to show our levels of thinking for the 2019 paper.

Levels of thinking	Suggested	November 2020	November 2019
1 – Knowledge	0%	0%	0%
2 - Routine procedures	± 25%	28%	26%
3 – Multi-step procedures	± 35%	35 %	37 %
4 – Reasoning and analysis	± 40%	37%	37%

According to our calculations, the levels of thinking expected in the 2020 paper was very similar to the 2019.

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

There were no questions in the paper which could be regarded as "unfair". It was a typical Mathematical Literacy Paper 2 where the emphasis was on higher level thinking.

7. Learners views of the paper

On the whole, learners expected the paper to be more difficult than paper 1 and thus prepared accordingly. While most learners were able to negotiate the copious amount of reading and interpretation required in the paper, a number of learners reported that question 2 was "quite challenging". .

8. Overall verdict

Mathematical Literacy is a relatively new subject in South Africa, have been introduced in our schools as recently as 2006 (grade 10). Most teachers who teach this subject have been doing so from those early days. They know exactly what to teach in this subject, and how to teach the "what". Their grade 12 learners have had 3 years experience in the subject and would be very familiar with the requirements of Mathematical Literacy paper 2 . These learners should have no problem passing this paper, provided they put in the necessary effort in the subject, especially since 2020 has been a very disruptive year for learners and teachers alike.

Our verdict of the paper is, thus:

A well-planned and interesting paper with some new scenarios to challenge the learners' thinking in an acceptable and meaningful way.

Five ways to make mathematics learning meaningful (adapted from a blog by Candace Walkington)

The full blog is available at https://www.insidesources.com/author/candacewalkington/)

1. **Connect mathematics to learners' interests.**

   Most people do not use formal mathematics concepts like algebraic equations in their everyday life when they are pursuing interests they are passionate about like sports, music or video games. However, the activities in many interest areas have underlying relationships between quantities that can be modelled with mathematics.
   For example, in a video game, quantities like health, experience points and loot are all measured and change over time and with different decisions the player makes. Connecting math instruction to students' out-of-school interests in this way can be beneficial to their interest in mathematics.

2. **Connect mathematics to learners' career aspirations**

   Many careers, particularly those in STEM (Science, Technology, Engineering, and Mathematics) and STEM-related fields use a lot of mathematics. The mathematics that is used often appears in very different formats than "school mathematics," but the day-to-day work that is done in these careers can still give meaning to many of the mathematics concepts children learn in the high school sequence.
   Research suggests that having learners focus on the usefulness of mathematics to their lives and goals is beneficial but, perhaps, only if they have a legitimate role in making the connection. Career connections may also feature in career exhibitions which usually focus on high school learners..

3. **Connect to mathematics learners' surroundings and community.**

   It may be a cliche that "mathematics is everywhere," but having learners view the world through a mathematical lens may help develop interest in and literacy for mathematics. The walkSTEM initiative (https://talkstem.org/walkstem/) is an excellent example of how this can be accomplished. WalkSTEM is a non-profit that supports the creation of mathematics walks in schools and neighbourhoods. During these walks, learners can see and explore how mathematics appears in the art, architecture and natural surroundings in their community. These mathematics walks can be designed and led by anyone; from elementary school learners, to teachers, to mathematics education lecturers in informal learning environments. The purpose is to help people appreciate the mathematical nature of the world around them, and to
   engage in conversations with each other about mathematics that normalizes its role in everyday life.

4. **Connect mathematics to physical movements**.

   Mathematics is sometimes thought of as an abstract, highly structured, and objective set of rules and procedures that reveal universal truths. But recent thinking in the field of mathematics education has argued that mathematics was created by humans to suit human needs, and is, thus connected to our bodies, our actions, to what we are able to perceive in

the world, and to how we perceive it. What this means is that we can learn things — even abstract things like algebra equations or geometry theorems — through perception and physical action. Activities that involve using hand gestures to represent mathematical ideas, or using your body to understand concepts (https://www.youtube.com/watch?v=gE8E0I-wNAk) like angle relationships or proportions, or manipulating concrete or virtual objects to reason about relationships, can be designed to take advantage of this embodied perspective on learning.

5. **Engage learners in mathematics problem creation.**

   Learning is most personalised when children are in the driver's seat; when they can use their knowledge and creativity to write and share their own mathematics problems and scenarios. They might be particularly well-qualified to write mathematical scenarios that capture something they are deeply interested in; like how scoring works in Ultimate Frisbee, or how many frames per second are needed to make a Lego stop-motion movie. (https://www.sciencedirect.com/science/article/pii/S0732312315000486

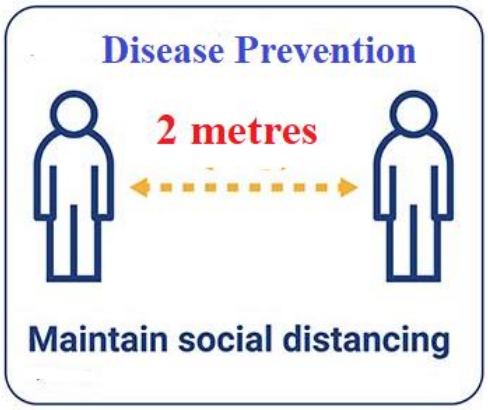
The mathematics behind social distancing: How does it help?

Adapted from: https://bigthink.com/politics-current-affairs/social-distancing-math?rebelltitem=2#rebelltitem2

Since March 2020, the COVID-19 pandemic has created havoc in the way we operate daily. A new buzzword has come to the fore: **Social Distancing**. Social Distancing, if carried out properly, can be a preventative measure against COVID-19 and can save lives.

Proper social distancing involves the following:

- Keeping at least 2 m away from others at all times
- Avoiding non-essential gatherings and crowds
- Limiting contact with high-risk groups (the elderly, new-born babies, etc)
- Working from home if possible
- Greeting neighbours or colleagues with a wave instead of handshakes
- Avoiding going out except for when it's absolutely needed (grocery shopping, to pick up medications, etc)



With many places around the world in various stages of "lock-down", gatherings such as sporting events and concerts have been cancelled or postponed. When sporting events resumed, these were initially held behind closed doors, with no spectators. The participants operated in what is called a "**bio-bubble".**

A **"bio-bubble"** may be described as "*an environment sealed off from the outside world and accessed by a limited number of people only*". It is only recently that some spectators were allowed into stadiums. These spectators have to adhere to strict social distancing protocols and wear masks.

How does social distancing help flatten the curve?

Mathematics plays an important role in understanding social distancing and efforts to "flatten the curve". Scientists measure the **intensity** of an infectious disease by its "reproduction number," which is the average number of people a sick person could infect.

The following things should be kept in mind when understanding social distancing:

- There is a direct correlation between social exposure and the reproduction number, which the researchers call R_0.
- The incubation period of COVID-19 is approximately 5 days - after this period, the person will either experience symptoms and self-quarantine or be "in the clear".

For COVID-19, the average reproduction number (R_0) has been estimated at 2.5. This means that during the incubation period, each infected person can infect 2.5 more people.

Here is how the mathematics works for various levels of social distancing, from no measures taken, to 50 and 75 percent social distancing:

No Social Distancing Measures

- Continuing your daily life as though nothing is happening
- Not practicing social distancing at all

Day 1: Person A contracts the virus

Day 5: Person A infects up to 2,5 people

Day 30: 406 people have been infected

Reducing Social Exposure: 50%

- By leaving your house for work and to get groceries
- Practicing social distancing at work
- Not physically touching others

Day 1: Person A contracts the virus

Day 5: Person A infects up to 1.5 people

Day 30: 15 people have been infected

Reducing Social Exposure: 75%

- Self-isolation
- Only leave your home once or twice a week for the essential needs such as groceries or medical supplies
- Not having any visitors

Day 1: Person A contracts the virus

Day 5: Person A infects up to 0.625 people

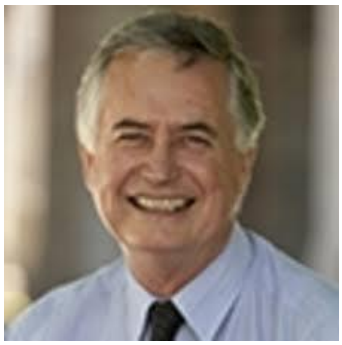
Day 30: 2.5 people have been infected

Scientists and health care professionals agree on this one fundamental truth in these difficult times:

NB: Social distancing can be thought of as the first line of defence against COVID-19.

Obituary: David Clarke (University of Melbourne, Australia)

The mathematics education community is saddened by the passing of Professor David Clarke of the Melbourne Graduate School of Education at University of Melbourne in January 2020.



We publish a message from his Dean, Professor Jim Watterston:

MESSAGE from Professor Jim Watterston, Dean, Melbourne Graduate School of Education, University of Melbourne

I am deeply saddened to announce that our dear friend and colleague, Professor David Clarke, passed away on January 25 surrounded by his family. David's courage in the face of his final illness, and his determination to make the most of moments with family and colleagues, has been an inspiration to those of us fortunate to have spent time with him.

Professor David Clarke leaves behind an incredible academic legacy and I detail below a short summary of significant moments in his career.

Professor David Clarke was welcomed to the University of Melbourne in 1994 and promoted to full Professor of Education in 2004. He established the International Centre for Classroom Research (ICCR) in 2003; a facility unique in its support of the generation, storage and collaborative analysis of complex classroom data. The ICCR's flagship project - The Learner's Perspective Study - examined the practices of eight grade mathematics classrooms in 16 countries in a more integrated and comprehensive fashion than had been attempted previously.

Professor David Clarke has been well known internationally for his establishment and leadership of a substantial, internationally-extensive, innovative research programme in video-based classroom research. Over the last twenty years, the research activity of Professor Clarke centred on capturing the complexity of classroom practice through a programme of international video-based classroom research in more than 20 countries. The combination of theoretical, methodological, and technological advances and the creation of the vibrant and active international research community moved the field towards greater critical self-reflection, and increasingly sophisticated research designs and research tools for understanding complex teaching and learning practices in different parts of the world.

Professor David Clarke attracted funds from a range of national and international funding agencies during his career. This included continuous Australian Research Council (ARC) funding since 1996 (18 ARC Research Grants; 14 as lead CI). In 2014, when David was co-awarded the ARC Special Research Initiatives grant which funded the establishment of the Science of Learning

Research Classroom, this research platform greatly enhanced the capacity of the ICCR to engage in controlled experimental classroom research and significantly expand its data management capacities. More recently, in 2017, David was awarded $1.2M in ARC funds for two Discovery Projects out of six awarded to mathematics education nationally.

Professor David Clarke has published 12 books (including one edition in Spanish translation and another in preparation), over 50 book chapters, more than 70 refereed journal articles and 90 refereed conference proceedings.

Besides promoting theoretical, methodological, and technological advances, the research programme led by Professor David Clarke has also created an active and vibrant international research community; an achievement he was most proud of. The list of active collaborators associated with David's research programme is very large, numbering more than 55 research academics plus associated research students and research assistants in Chile, China, the Czech Republic, Denmark, Finland, France, Germany, Hong Kong, Israel, Italy, Japan, Korea, New Zealand, Norway, the Philippines, Portugal, Singapore, South Africa, Sweden, the UK and the USA. David has supervised more than 20 doctoral students to successful completion. One of the most admirable qualities was David's willingness to engage in 'coffee conversations' with anyone who had a good idea to discuss.

Professor David Clarke has received three MGSE awards: in 2014 a Supervision Excellence Award; in 2017 a Research Leadership Excellence Award; and, in 2019 a Distinguished Career Research Award.

In December 2019, Professor David Clarke received two additional awards: Universitas 21 awarded David with an honorary U21 Award for Internationalisation; the University of Connecticut special award honoured David's leadership and support of student and faculty and collaborations between the two universities.

Please keep David's wife Sharon and his loving children, grandchildren and those most dear to him, in your thoughts.

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