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**REPORT 1: EVALUATION OF THE QUESTION PAPER AND MARKING GUIDELINE**

**INTERNAL MODERATOR’S MATHEMATICS P 2 NOVEMBER 2021**

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| **SUBJECT** | **MATHEMATICS** |
| **PAPER** | **2** |
| **DURATION OF PAPER:** | **3 HOURS** |

**SECTION 1: (General overview of Learner Performance in the question paper as a whole)**

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| **The top learners performed very well, with 1179 learners getting more than 70% , 460 learners getting level 7 and 4 learners getting 100% . 6445 of our average learners obtained marks between 40% and 69%. 5029 learners got a level 2. Unfortunately, our underperforming learners performed very poorly, with 36201 learners getting a level 1, i.e. a mark smaller than 30%. The total number of candidates who sat for the November 2021 Mathematics paper 2 exams is 48 854.**  **We are still optimistic though that there will be an improvement of marks from 2020, mainly because the paper of 2021 was fair. There were difficult questions, but they were reasonable, and all cognitive levels were catered for throughout the paper.**  **The paper catered, as it should, for all candidates that is weak, average and mathematically gifted. There is a misconception that the cognitive levels are related to how weak or how strong the candidates are. The cognitive levels are independent of a learner’s weaknesses or his strengths.**  **Candidates are also encouraged not to practice mathematics topics in isolation. They should know that there will be an integration of topics in both papers.**  **The national lockdown in 2020 and the continuation of the spread of the Covid – 19 virus in 2021 will have a negative impact on the results of 2021. All the learners of 2021 have faced many unprecedented challenges. I appeal to the department of basic education to bear this in mind when we ask for an upward adjustment of the raw marks.**  **The poor results is an indication that learners lack the basics and understanding of Mathematics as a whole.** |

**SECTION 2: Comment on candidates’ performance in individual questions**

**(It is expected that a comment will be provided for each question).**

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| **QUESTION 1 – 11** |
| 1. General comment on the performance of learners in the specific questions. Were the questions well answered or poorly answered? |
| Question 1: **Grade 11 statistics** Attempted by most learners and was answered fairly well.  Question 2: **Grade 12 statistics** Attempted by most learners and was also answered well.  Question 3: **Mainly grade 11 analytical geometry** Attempted by most learners, except for question 3.4 and was answered ok.  Question 4: **Grade 12 analytical geometry and transformations** Attempted by most learners except for question 4.3 and was poorly answered.  Question 5: **Grade 11 trigonometry** Attempted by most learners and was poorly answered.  Question 6: **Grade 12 trigonometry** Attempted by most learners but was very poorly answered.  Question 7: **Trigonometric graphs**  Attempted by most learners but was very poorly answered.  Question 8: **sin, cos and area rule**  Not many learners attempted question 8, very poorly answered.  Question 9: **Introduction to grade 11 euclidean geometry** Attempted by most learners and answered very well.  Question 10: **Grade 11 geometry and proportionality theorem including midpoint theorem** Attempted by many learners, except question 10.4 and was poorly answered.   Question 11: **Grade 12 geometry – similarity** Attempted by very few learners and very poorly answered. |

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| 1. **Why were some questions poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.** |
| **Question 4**: Many learners got the answer to **question 4.1** incorrectly and that discouraged them to answer the question further. Though consistent accuracy was applied throughout the marking processes the learners still fared badly in this question.  Learners have not studied the properties of quadrilaterals and could not calculate the area of parallelogram BCDE to calculate the area of triangle BCD. Transformations and in particular, translation, was over examined in this question. Most learners could not calculate the coordinates of M in **question 4.3** and hence could not get the length of MN and the midpoint of AF in **question 4.3.2**  **Question 5**: **Question 5.1** was answered poorly because it tested a lot of grade 11 trigonometry. Learners had to know reduction formulae, co ratios and negative angles. The identity in **question 5.2** was also poorly answered because many learners could not identify the square identity for or the double angle for cos 2x. Though **question 5.3.2** was attempted by many learners, very few learners received full marks since it involved either reduction formulas with a double angle or just double angle. There were so many different solutions to this question.  **Question 6**: Though **question 6.1.1** was bookwork, very few learners got full marks. It was either not covered by teachers or learners did not study it. In question 6.1.2, the candidates first had to break 10x up into ( 4x + 6x ) and then use compound angle formula for cos ( A + B ). Many candidates did not do that so ended getting 0 marks. **Question 6.2** was the general solution where many candidates got at least 2 out of 7. The first mark was for changing tan x to sin x / cos x and the 2nd mark was for the double angle of sin 2x. Many learners divided by sin x and got a maximum of 4 out of 7.  **Question 7.1** was answered well but many candidates could not answer the period of f(3x).  Many learners could not visualize where f(x) – g(x) = 1 for the given interval and many learners could not give the range of k(x) = 0.5g(x) + 1.  **Question 8** was answered poorly because learners have not revised the sin, cos and area rule.  If the sin, cos or area rule were used incorrectly, 0 marks were awarded.  **Question 9** was the best introduction to geometry we have ever seen. Most learners and teachers were very happy with this question.  **Question 10.3** was answered very poorly since it involved proving that a line is a tangent to a circle. **Question 10.4** was answered very poorly since the learners were not taught the midpoint theorem. There was another method using just Pythagoras, to calculate the length of AE. **Question 11.2.2** was not a really a difficult question, but the triangles in the diagram were not easy to identify and that made it very difficult to prove similarity between the two triangles. In **question 11.2.4**, most candidates failed to recognised that the proportionality theorem must be used. |

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| 1. **Provide suggestions for improvement in relation to Teaching and Learning** |
| Suggestions for improvement in relation to teaching and learning will only benefit teachers if they are making maximum use of the teaching time given to them. i.e., by being punctual for classes, by being well prepared for all lessons and assessments, by being in school every day and they have a passion and love for teaching mathematics. Lastly, if they are enthusiastic and willing to learn new ideas in making mathematics fun. Learners should be given a checklist of all topics they need to know for their grade 12 final examination. This list should have 3 columns, one to tick for June examination, one to tick for trial examination and a final column for their end of year examination.  Learners should also be given a page with all the acceptable reasons [ examination guidelines] in geometry and teachers must be encouraged to use those acceptable reasons only, and not use any shortened version in class or in a test/exam.  Learners should get a summary of the cognitive levels, what it measures and the percentage that each level represents in a test or in an examination.  These 3 pages must be pasted in their maths P 1 book and in their maths P 2 book.  That means that all learners should be given two 3 quire hard cover books. One for P 1 and another for P 2. The first two pages in each book must be used as a content page and all pages should be numbered. Eg. If a learner is looking for proving grade 12 trigonometric identities, the learners must be able to find the topic in their maths P 2 book in less than 7 seconds. Learners should only use these two books, that should include all the theory and proofs, to prepare them for their final examination. Learners can even divide each page in two to ensure they make use of maximum space in their notebooks. They should use different colour pens and increase the font size of very important theory notes and put a border around it. This is what top performing learners are doing!!! Learners should have two more 3 quire books, one for their P 1 exam papers and the 2nd one for their P 2 exam papers. These two books should also have a contents page.  It is very important to do planning for teaching and assessment in advance – 1 term in advance. This planning will benefit both the teacher and the learners.  The chief markers report gets send to all schools every year. Teachers should insist on getting a copy and keep it their maths files together with the marking guidelines.  Attending of workshops by underperforming schools is pathetic and unacceptable. Subject advisors must report teachers that are not attending workshops to their principals and if necessary to the principals EDO’s as soon as possible. If these underperforming school’s teachers are not attending the workshops offered by subject advisors, then all the help that is offered is in vain.  The responsibility of teachers attending workshops is another responsibility of principals. |
| It should be compulsory for under performing schools to attend all the workshops the subject advisors are offering. If the principal does not ensure that the teachers are attending the  workshops, then the principal must be reported to his EDO to act.  Subject advisors must be allowed back into schools to monitor teachers at underperforming schools. If schools can monitor the actions and report to subject advisors, then subject advisors do not have to do that. Attendance is a very important element of performance.  Teachers that are regularly absent, without a valid reason, have poor work ethics cannot possibly be a role model to his/her learner and cannot possibly encourage or motivate his learners to rise above their circumstances. Nobody’s circumstances should determine their destination. If a learner is determined to succeed, he/she will work hard each day, no matter what his/her circumstances.  I just read in an article of a student from a historically disadvantage community, who achieved 7 distinctions in her final year of medicine examination, how proud are those teachers who planted the seed of dedication and sacrifices to that learner? That is what the department of education expects from all educators    All workshops offered by subject advisors must be done in 3 categories  Category number 1: Learners who obtain more than 70%. Category number 2: Learners who get marks between 40% and 70%. Category number 3: Learners who get marks less than 40%.  Compulsory lessons for learners every Friday for 1,5 hours.  Subject advisors must continue to keep workshops for teachers that have not done geometry at school or that is not confident in teaching geometry. |

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| **(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.** |
| In question 1.1.1 many learners wrote: mean = = 22 and not just the answer. The first mark was for the 396 and the 2nd mark was for the answer. This is the method we are encouraging teachers to follow. Many learners have input the numbers twice in their calculators to ensure they get the same answer for the mean and for the standard deviation. Most learners do have a very good understanding of the box and whisker diagram and teachers are encouraged to always give the scale to learners to draw the box and whisker diagram.  In question 2.1, most learners got full marks while a handful of learners plotted 20 points instead of 10. In question 2.2, learners are encouraged to calculate the values of a, b and r twice to ensure they get the same answer. In question 2.4, most learners commented on the correlation between the price of milk in rands per 5 L container and the number of 5 L containers of milk sold instead of the accuracy of their answer in 2.3.  In question 3.1.1, many learners wrongly assumed that C was the midpoint of BE, so they were not awarded the marks for 3.1.1.  In question 7.1, learners were asked to sketch g(x) = cos( x - 60). Learners are encouraged to use the table method on their casio calculator. Teachers are also encouraged to teach the definition of the period of a graph. That should have helped the learners to find the period of f(3x).   If they understand the concept of the range for g(x), then they should understand how to get the range of k(x) = 0.5g(x) + 1 In question 9.1, a few learners did not say” two tangents drawn from the same point”  In question 9.2.1, many learners did not use the correct reason, i.e. angles opposite equal sides.  In question 10.1, teachers are encouraged to tell learners to write out the full reason, i.e. line from centre that bisects the chord is perpendicular to the chord. Many learners did not get this mark. In question 10.3, many learners did not get the mark for the reason. They were supposed to say” converse of tan chord theorem or converse of radius ⊥ tangent”.  Many teachers seem to have not covered the midpoint theorem and the converse of the  midpoint theorem. Teachers are encouraged to cover the CAPS syllabus or latest ATP to prepare learners for final examinations.  It’s a danger working through past papers, and you have not completed your syllabus.  Very few candidates have answered question 11.1 correctly, yet it is bookwork!!!  Teachers are encouraged to prepare thoroughly for sections on the proportionality theorem and similarity. If they are not comfortable, they should contact their subject advisor immediately and attend all workshops on geometry.  We must sensitize our learners about the additional space for mathematics P 2. Many learners have made use of it but a big majority of learners still do not know what the purpose of the additional space is.  Euclidean geometry content gap workshops should be arranged in term 1. Proportionality and similarity is usually done in term 1.  Encourage the integration of topics in mathematics. E.g. We can ask learners to draw graphs of f(x) = sin 2x and g(x) = cos( x – 45 ) and ask learners for which value of x is f(x) g′(x) < 0. We can also try to integrate trigonometry with analytical geometry. Some markers have asked for subject advisors to hold workshops on trigonometry but to divide it into 3 categories:  Category number 1: Learners who obtain more than 70%, level 3 and level 4 questions Category number 2: Learners who get marks between 40% and 70%, Level 2 and level 3 questions. Category number 3: Learners who get marks less than 40%, only level 1 and level 2 questions. |
| Common tests should be set for under performing schools. These tests should include an answer book, similar to the ones used for trials and the end of year examinations.  It is the responsibility of teachers to motivate and encourage their learners. This they can do in many ways. E.g. Be punctual, be well prepared, to give meaningful lessons, to encourage learners to make wise and good choices every day, to be goal orientated, to make sacrifices daily and to choose good friends that will add value to their lives. Simply put, to do well at the end of the year, learners need to stay focused and work diligently every single day.  Teachers should be eager to develop themselves by interacting with fellow teachers.  Subject advisors and teacher development should put together an organized team of teachers who can bring about new and innovative ideas in teaching of mathematics and invite teachers to district workshops. It should be compulsory for all teachers to be fully equipped with GeoGebra and the graph program. Teachers can submit tests, where they have used either GeoGebra or graph, to a subject advisor or an appointed cluster leader for guidance/moderation. |