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EDUCATION

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NSC 2015 CHIEF MARKER'S REPORT

SUBJECT	MATHEMATICS

PAPER	2

DATE OF EXAMINATION:	2 NOVEMBER 2015	DURATION:	3 HOURS

This section of the instrument is aimed at providing valuable feedback to schools, subject advisors, teachers and learners about common errors committed by candidates in the answering of questions, to assist teachers and subject advisors to identify areas that need to be given special attention in the teaching and learning of the subject in 2016.

Your responses will be based on two parts:

Section 1: General overview of Learner performance in the question paper as a whole

Section 2: Comment on candidates' performance on individual questions (Detailed explanations must be provided **per question** as follows: (You may include sub questions where necessary)

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
(b) Why the question was poorly answered?
(c) Provide suggestion for improvement in relation to teaching and learning
(d) Describe any other specific observations relating to responses of learners
(e) Any other comments useful to teachers, subject advisors, teacher development

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

Many candidates attempted all questions in this question paper. There are, however, a number of candidates who did not attempt some questions. Questions that were not attempted by a few candidates were questions 10 and 11. Candidates generally did well in statistics in question 1. Question 2 was a challenge for many candidates as it was the first time that there was also frequency column in the given data. Candidates are also still struggling to deal with problems requiring interpretation in Statistics. This was evident in question 1 and 2 as many of them struggled to score marks in questions requiring interpretation.

Many learners dropped were unable to score a lot of marks in Co-ordinate Geometry especially in question 3 as they had to have a good background of Euclidean Geometry in order to answer most of the questions. They also struggled to link the angle of inclination with gradient. Many candidates are still struggling to deal with circles in Co-ordinate Geometry. This was evident in question 4 as many of them did not score enough marks in questions 4.4 and 4.5. Question 4.6 was one of the most poorly answered questions. Firstly, ΔPQS was not drawn and that confused many candidates as they had to visualise it or construct the triangle. This question also demanded the understanding of areas in triangles and some learners are struggling to use the area formula of a triangle. Most candidates were able to calculate the equation of a circle in 4.1, though some made a mistake when calculating the value of r^2.

Lack of basic trigonometric skills was evident in questions 5, 6 and 7. Some candidates were still not able to use sine rule and cosine rule in question 7. They seem to be confused about which rule to use. There is an improvement in the use of double angles as a reasonable number of candidates were able to score some marks in question 5.2 and 5.3. However, some candidates are still struggling to apply compound angle identities correctly. Most learners did well in solving general solution in 5.3. This is encouraging and teachers are commended for thoroughly teaching general solution. However, a few of them are still struggling to choose the correct cos double angle expansion to use. Many candidates struggled to solve problems requiring interpretation of graphs in question 6. The integration of transformations in trigonometric functions proved to be giving many candidates a problem.

Most candidates did well (more than expected) in question 8. This question was the first question in Euclidean geometry and it was the third best answered question in the whole question paper! Candidates, however, did very badly in questions 9 and 11. In question 10, a reasonable number of candidates did better than expected. However, many candidates are still struggling with the correct reasoning in Euclidean Geometry as a whole. Proportionality and Similarity challenged a number of candidates. Question 9 and 11 were the most poorly answered questions in this question paper.

SECTION 2: Comment on candidates' performance in individual questions

Comment on candidates' performance in individual questions
(It is expected that a comment will be provided for each question on a separate sheet).

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
(b) Why the question was poorly answered?

QUESTION 1 **This question tested the understanding of a scatter plot including drawing the least squares regression line, correlation co-efficient and its interpretation as well as outlier(s).**
Many candidates did well in this question though very few got full marks. Many of them managed to accurately draw the scatter plot but were not able to draw the regression line perfectly. This may be caused by the fact that in the old NCS, the line that was expected to be drawn was the line of best fit hence many of them drew the line of best fit instead of regression line. Many learners also dropped marks in 1.2.1. Some of them were not able to round to the nearest 100 and lost that mark. It was encouraging to note that most candidates scored marks in 1.3, 1.4 and 1.5. This means that teachers prepared them well in these questions especially the use of a calculator to find the standard deviation and interpretation thereof. The average percent for this question was 73 and was the best answered question in this question paper.
QUESTION 2 **This question tested the understanding of mean, median and standard deviation where there is frequency column.**
This question was poorly answered by many candidates. The frequency column was a challenge to many candidates. This was the first time that this question was asked in an examination (grade 12) and it is likely that teachers never put emphasis on it during teaching, assessment and revision. Many candidates used one column (especially 'the sum of the values of uppermost faces' column), ignoring the frequency column, thereby losing marks in this question. Most candidates, however, were able to use their wrong answers to find the number of times that the sum of the recorded values of dice is within standard deviation from the mean. This means that many candidates now can interpret mean and standard deviation. This also means that teachers have improved their teaching of Statistics, perhaps through sharing good practices, developing themselves and support from subject advisors and the department among others. The average percent for this question was 40 and it was the third poorly answered question.

QUESTION 3

This question tested the understanding of circle in Co-ordinate Geometry – using the properties of a parallelogram and the Midpoint Theorem.

This question was poorly answered considering the fact that it is Analytical Geometry and candidates used to do well in it in the past. This time, Euclidean Geometry was integrated in this question especially Midpoint Theorem. This meant a candidate who is struggling was not properly exposed to Euclidean Geometry and as a result battled to answer this question. Some candidates even struggled to relate the angle of inclination and the gradient in 3.1 and as a result they were not able to get the equation of MN in 3.2. Some of them assumed the gradient to find the equation but were penalised since they are not allowed to assume values to solve problems. Most candidates struggled to find the length of MN as they were not able to apply the Midpoint Theorem which was supposed to be learnt in grade 10. Question 3.4 was unfair and was removed from the memorandum as candidates had to assume that PQRS is a parallelogram and that is not acceptable. Many candidates struggled to solve 3.5 and 3.6 proving that many of them do not understand properties of quadrilaterals which they are supposed to learn them in grade 10. The average percentage for this question was 56.

QUESTION 4

This question tested the understanding of circle in Co-ordinate Geometry – Equation of a circle, tangent, angles and area of a triangle.

Many candidates attempted this question and collected marks in 4.1 and 4.2. Many of them did not collect maximum marks in 4.3 where they were asked to determine the equation of a tangent. This proves that many candidates are struggling to solve problems involving applications of Euclidean Geometry. They also struggled to solve questions 4.4 and 4.5 where they were asked to find angles especially in 4.5 as they were expected to apply Euclidean Geometry theorem(s). Many candidates are still struggling to find the area of a triangle using either the area formula or the area rule. They seem not to know the relationship between the height and the base. This was evident in 4.6 as they lost marks here. The average percentage for this question was 71 and was the second best answered question in this question paper.

QUESTION 5

This question tested Basic Trigonometry – Definitions, Reduction and General Solutions applying Compound and Double angle Identities.

This question was fairly answered by many candidates. In question 5.1, some candidates failed to reduce correctly and lost a few marks which they could have easily scored. The challenge that some learners have in as far as applying reduction formula was evident in 5.2 as many of them did not gain maximum marks in this question. Another factor in 5.2 was the application of compound angle identities in the denominator. Candidates were expected to reduce the compound angle identity but many chose to expand which backfired as they were not able to correctly simplify, thereby losing a lot of marks. Many learners, however, scored a lot of marks in 5.3. They were asked to determine the general solution. However, a few of them struggled to use the double angle for cosine correctly and

factorise correctly. The average percentage for this question was 60.

QUESTION 6

This question tested the understanding of Trigonometric functions with its interpretation.

This question was poorly answered considering the fact that it was testing trigonometric functions. The fact that the graphs were drawn and candidate had to interpret them challenged them. Many candidates struggle to apply transformations in basic functions and most questions integrate transformations in functions. This was evident in 6.3 as a very large number of candidates were unable to score marks. The average percentage for this question was 52.

QUESTION 7

This question tested the applications of sine and cosine rules especially in three dimensional figures.

This question was fairly answered considering the fact that many candidates used to struggle before dealing with it. However, a lot has to improve in candidates when they answer this question. Many of them are usually not sure whether to use Sine or Cosine rules or just the trigonometric ratios when solving these problems. This was evident in 7.2. A number of them did not get $B\hat{A}C$ correct, proving once again that they struggle with basic Euclidean Geometry which is supposed to be taught in lower grades. Many candidates struggled to calculate the height of the piece of wood because they could not relate the angles in different triangles. The average percentage for this question was 52.

QUESTION 8

This question tested Euclidean Geometry – Theorems which involve centre, circumference including cyclic quadrilaterals (Circle Geometry).

This question was well answered by many candidates, especially question 8.1. A few candidates, however, struggled to realise a revolution (360^{o}) in the angles at centre and could not properly prove the theorem. 8.2 challenged a lot of learners as they had to use the converse theorem hence they were not able to give correct reasons. The average percentage for this question was 62 and this was surprisingly the third best answered question in this question paper, above one question is Statistics and one in Analytical Geometry.

QUESTION 9

This question tested Euclidean Geometry – converses of theorems involving cyclic quadrilaterals and tangents.

This was one of the most poorly answered questions in this question paper. Four out of five sub-questions required an in depth understanding of the theorems examined as candidates had to use converses of theorems to answer the questions. This was the first time that many converses of theorems were asked in one question paper. This means that teachers have to teach and assess these converses during the year so that candidates get used to them. The language used in 9.5 was unfamiliar for most of the candidates. The word 'concyclic' may not have been understood by many learners, thereby not knowing what to do to answer the question. The average percentage for this question was 32 and was the most poorly answered question together with question 11.

QUESTION 10

This question tested Euclidean Geometry – Circle Geometry, Proportionality and Similarity including their Applications

This question was poorly answered. Many candidates answered question 10.1 well but failed to give a reason why ΔBDC was a right angled triangle, thereby losing a mark. Many candidates took the given ratio as the lengths of the sides and used it to solve 10.2.1 and 10.2.3 and that led them to getting wrong answers. Many candidates were not able to correctly prove two similar triangles in 10.2.2. They wanted to work backwards with angles and that backfired as there were some steps missing and they lost the marks. One again, the expectation of using the converse of a theorem proved to be a challenge to a lot of candidates as they could not give the reason for AC to be a diameter before finding the radius. The average percentage for this question was 43 and was the third poorly answered question.

QUESTION 11

This question tested Euclidean Geometry – Circle Geometry and Similarity including its Applications

This question was poorly answered. Many candidates were not able to use proportionality to prove similar triangles as they are used to using angles. Applications of similarity and proportionality is generally still a challenge for many candidates. The average percentage for this question was 32 and was the most poorly answered question together with question 9.

(c) Provide suggestion for improvement in relation to teaching and learning

- Basic Mathematics skills from earlier grades (grade 8 and 9) must be thoroughly taught because they will be needed in the FET.
- Topics learnt in earlier grades (grade 8 to 11) must be thoroughly revised before candidates write examinations.

- Teachers must teach everything in the curriculum and not depend on the previous years' question papers only.
- All teachers must get the examinations guidelines as early in the year as possible so that they can familiarize themselves with what is needed including acceptable reasons in Euclidean Geometry.
- Assessment plays a vital role in teaching and learning. Assessment (formal and/or informal) should take place in everyday teaching.
- Assessment tasks should cater for all cognitive levels (1, 2, 3 and 4) so that candidates are not coming across challenging questions for the first time when writing examinations.

(d) Describe any other specific observations relating to responses of learners

- Language is still a challenge for most candidates. They struggle to understand what is asked and end up not correctly answering the questions).
- Giving the correct reasons the acceptable way in Euclidean Geometry is still a huge challenge for many candidates.
- Most candidates were not able to answer questions that demanded interpretation; they expected easier questions before they could interpret.
- Many candidates did not expect frequency column in question two when they were asked to find the mean, median and standard deviation.

(e) Any other comments useful to teachers, subject advisors, teacher development

- It is not enough for teachers to teach learners to solve easy problems (find, determine, draw, etc.) only, they must also teach learners to solve more challenging problems (Why …?, What if …?, and any problems that demand understanding and interpretation).
- Higher order questions (Level 3 and 4) must be included when setting tasks throughout the year.
- Teachers must teach everything in the curriculum and not depend on the previous years' question papers only.
- Grade 8 – 12 teachers (not only grade 12!) must be developed so that they are confident in teaching all Mathematics topics thereby becoming better teachers.
- More workshops on certain topics (Statistics, Trigonometry and Euclidean Geometry) must be organized for teachers (especially the new teachers).
- Grade 12 question paper includes questions from earlier grades (e.g. grade 10 and 11). These must be revised thoroughly before subjecting learners to examinations.
- Subject Advisors must assist teachers on how to set quality assessment tasks so that they expose learners to all types of questions.
- Teachers must teach the whole syllabus and then revise previous years question papers thoroughly before candidates write the examinations.
- Available technology must be used where necessary and/or available as it enhances teaching and learning.
- Euclidean Geometry in grade 12 must be shifted to the first term so that it can be thoroughly taught and can be revised in term 3 and 4.

NAME OF THE CHIEF MARKER: **SIGNATURE** **DATE**