Province of the EASTERN CAPE EDUCATION

CHIEF MARKER'S REPORT

SUBJECT:	MATHEMATICS P1

1. ANALYSIS OF QUESTION BY QUESTION PERFORMANCE

QUESTION 1

Almost all candidates answered this question.

1.1.1 This question tested the basic solution of a quadratic equation and was answered by most of the candidates.

1.1.2 The use of the quadratic formula is a predictable question and most candidates attempted this question. Learners should be given sufficient practice in substitution into the formula as well as calculator work. This should enable them to do well in this question.

1.1.3 Solving quadratic inequalities is a challenge to many candidates and this question was answered very poorly. Some candidates could determine the critical values but only a few could then determine the correct solution using basic understanding of inequalities.

1.2 This question tested the solving of simultaneous equations. Most candidates attempted this question but struggled with the substitution and simplification of the fractions. The following common error was made in making either x or y the subject.

ERROR: $3y = 2x$, $y = 2x - 3$ OR $3y = 2x$, $x = 3y - 2$

Candidates who made this mathematical error could only score a maximum of 3 marks. Basic manipulation of fractions must be practiced on a regular basis.

1.3 This question tested the application of exponential laws and only a few candidates could solve it. The instruction said "calculate the integer that is the closest approximation". Only a small number of candidates completed their answer and gave this closest integer value of 4. The use of calculators was not permitted as working had to be shown.

QUESTION 2

This question tested knowledge and skills to identify arithmetic and geometric sequence and series and was a routine question that required basic skills. Most candidates attempted the question.

2.1 This question tested the use of sigma notation. The substitution of $n=1$ resulted in 3^{-1} and candidates did not have the skills to write $a=\frac{1}{3}$.

Although this was a routine question, many candidates failed to get the correct solution due to a poor understanding of the $\sum$ notation and the incorrect use of the formula.

If answer only was given, three out of a possible four marks were awarded. Educators must take note of a new instruction that states that answers only will not necessarily be awarded full marks. This instruction could in future be implemented to award only one mark for answers only.

2.2 This question tested the candidates understanding of convergent geometric sequences and was answered very poorly. Some learners were able to give the value of r but lacked the knowledge of $-1<r<1$. Candidates once again lacked the skills to handle fractions.

2.3 This was a routine question testing the knowledge of arithmetic sequences. In 2.3.2 the even numbers are removed and the sum calculated. Candidates were unable to identify $T_1=23$ and $d=6$.

QUESTION 3

This question tested quadratic sequences and was answered very poorly. Candidates struggled to find the value of x in 3.1 but knew the method to do 3.2. If they did 3.1 correctly most got full marks for 3.2 as well.

It was possible to calculate the n^{th} term without the value of x.

$a+b+c=4$

$4a+2b+c=9$

$16a+4b+c=37$

$\therefore 3a+b=5$

$12a+2b=28$

$6a+b=14$

$3a=9$

$a=3$

$b=-4$

$c=5$

QUESTION 4

Question 4 was a standard question testing knowledge of the hyperbola and straight line. Most learners attempted the question. Educators need to revise the grade 10 and 11 content for functions.
Question 4.1, 4.2 and 4.4 required the candidates to write down an equation. No marks were awarded for answers that did not show an equation. Emphasis must be placed on giving answers as asked in the question paper.
Learners need to check whether their answers are realistic by referring to the given sketch. If a point of intersection was selected in 4.5 that did not have an x-value greater than 2, the mark was not awarded.
The manipulation of basic algebraic fractions was required for answering this question and needs to be practised from an early stage.

QUESTION 5

This question was fair and of a good standard. The question was generally well answered although basic algebraic errors were evident.
Many candidates were able to calculate the intercepts with the axes. Candidates should note that although the gridlines were given on the diagram sheet they need to draw the horizontal asymptote clearly as it could not be implied.
Question 5.5 was answered very poorly. The first challenge was the correct interpretation and use of the $f(x)$ notation and only a few candidates applied logs to solve the equation.
Teachers need to expose learners to as many different ways of asking questions. Rote learning will not develop mathematical and critical thinking.

QUESTION 6

This question tested knowledge and skills of inverse functions and was answered very poorly. Although it was not a higher order question it required a clear understanding of functions and their inverse and the correlation between inverse and reflection about $y = x$.

6.1 Candidates knew to substitute the point (-6;-8) but failed to manipulate the equation to solve for a. $-8 = a(-6)^2$ was written as $-8 = -12a$; evidence of a lack of basic mathematical skills

6.2 Many learners knew the concept of swopping the x and y in determining the inverse but failed to write the correct equation for the inverse. Manipulation of the fraction proved once again to be a challenge to many learners.

6.3 It was possible to answer question 6.3 – 6.5 without the use of 6.2. Not many candidates realised this and did either not answer these questions or gave incorrect answers. Examples can be given to practise the use of the graph of a function in determining the range or domain of the inverse as well as the sketch of the inverse. Many candidates considered the inverse to be a log function and introduced logs.

6.4 The sketch of the inverse from the graph was a standard question but answered poorly.

6.5 Learners found this question to be very difficult. Many candidates did not have the mathematical insight to realise that the inverse and reflection of f about $y = x$ gives the same function. The function from 6.2 could then have been reflected about the x axis and given without any calculations.

Educators should if possible make use of technology in their teaching of functions.

QUESTION 7

This question tested financial maths and was answered very poorly. This is a problem area for learners as well as teachers and the mathematical and theoretical knowledge could not be applied to real life problems. Learners used wrong formulae and poor calculator skills disadvantaged learners even more.
Only a few candidates remembered to use logs to determine the value of n in 7.2.2.Second language learners most probably struggled with the interpretation of this question. Candidates have not mastered the use of the present and future value formulae. Teachers should teach this section in relation to real life scenarios.

QUESTION 8

8.1 Calculating the derivative from first principles was answered by almost all candidates. The correct use of the formula needs to be practised. Learners must take care in the simplification steps. A maximum of 2 marks were awarded if candidates corrected the expansion to enable them to factorize the h as a common factor.

8.2 Teachers need to ensure that learners are familiar with the different notations used for determining the derivative as candidates were penalised for using incorrect notation. Learners were able to determine the derivative of $4\sqrt{x}$ but not that of $\frac{x^6}{2}$. This is once again due to a lack of basic fraction skills in realising that $\frac{x^6}{2} = \frac{1}{2}x^6$.

8.3 Very difficult question for most learners. The interpretation of the given information was very poor and many learners simply substituted $x = 4$ into the function. To achieve good marks the learners had to demonstrate a very good understanding of calculus. Calculating the derivative was a challenge as it contained a fraction and it was evident that candidates lacked the basic skills to work with fractions.

QUESTION 9

This question was not a straight forward question and varied from the format in which cubic functions were tested in the past. Learners are not used to answering questions about the derivative function. The relationship between g' and g required a clear understanding and interpretation of this content. Not many candidates managed to answer this question.

9.1 This was a basic question that tested the understanding of the y-intercept of a straight line.
9.2 Educators should take note of the alternative responses in the marking guideline. The use of fractions was once again required; emphasizing the necessity for mastering the manipulation of fractions.
9.3 Very few candidates realized that the answers could be written without any calculations. Many candidates know that the turning points can be calculated were the derivative equals zero but few managed to see the relation to the graph given in the question.
9.4 A number of alternatives are given in the marking guideline. Interpretation of this answer from the graph was very poor and most learners who attempted this question made use of the second derivative.
9.5 Very few candidates could explain why the local maximum is at $x = -2$. This can be contributed to a poor understanding of the concept as well as a lack of the correct use of mathematical language. To achieve marks the candidates had to make reference to the graph of g'. Only referring to a being a positive value or simply drawing the correct shape of g was not sufficient to score marks. Mention must be made to the fact that the graph of g' changes from positive to negative at $x = -2$

QUESTION 10

This question tested skills and understanding of volume and total surface area. Many candidates did not attempt this question at all. Language barriers and inability to interpret the 2-dimensional sketch was a problem for many learners. Not all learners are exposed to the concept of satellites.
The manipulation of fractions was once again required.
Some learners did attempt 10.3 even if 10.1 and 10.2 was not attempted. These learners showed some knowledge of determining the derivative and equating to zero to calculate the minimum value.
Educators should regularly revise these topics as they are covered in grade 10 and 11.

QUESTION 11

This question was attempted by most candidates.

11.1 Learners were able to write down the constraints but got confused with $\leq$ and $\geq$. This can possibly be attributed to language barriers and candidates not being able to interpret the information correctly.

11.2 Candidates were able to represent the constraints on the graph, given realistic constraints were given in 11.1.

11.3 Not many candidates understood what was required of them. Many candidates gave the point of intersection of the two constraints as the answer. Educators need to focus on questions similar to this. This question should be included in all questions based on linear programming done in grade 11 and 12.

11.4 Candidates were expecting to write down an objective function and struggled to interpret this question correctly. Educators need to emphasise the use of correct notation in writing down their answers. Responses $4x$ and $12y$ did not receive full marks. Many candidates referred to x and y instead of Type A and B as the different types of braai stands.

11.5 This question was of a higher order and only a few candidates were able to score good marks. Not reading the question carefully caused candidates to get only 3 out of 5 marks. The questions stated “calculate the largest number of braai stands” and they were required to add the number of type A and type B to give a total of 12 braai stands. Candidates focused on giving the machine-time required as the answer and did not realise that the question required two “answers”.

7. ANY ADVICE THAT YOU COULD GIVE TO EDUCATORS TO HELP LEARNERS TO REACH THE EXPECTED LEVELS

1. Educators must treat grade 10, 11 and 12 as one unit and not only focus on grade 12 content in the final year of learners. Regular worksheets on work covered in grade 10 and 11 should be given. Certain topics are completed in grade 11 and not revised in grade 12.

2. Focus should also be placed on the training and development of grade 8 and 9 educators. Understanding of basic concepts is promoted in these grades.

3. Follow the NCS, SAG and other official documents for Mathematics. All sections must be covered.

4. Educators need to emphasise the importance of reading the questions very carefully and following the given instructions. Careful reading is important in giving answers in the correct notation and completing what is asked, e.g. 1.3, 2.3.2 or 11.5.

5 Educators need to constantly upgrade their own knowledge and skills to meet all the challenges. Communicate with educators from different centres and create support groups.

6 If available, use technology in the teaching of certain topics. Technology enables the educator to demonstrate more situations and helps in securing a better understanding of Mathematics. Practise the use of calculators.

7 Be an enthusiastic Mathematics teacher.

8 Thomas Edison said: "If there is a way to do it better… find it."

8. ANY OTHER COMMENTS

1. Take note of the new instructions stating that answers only will not necessarily be awarded full marks.

2. To ensure accurate marking, candidates should not divide the pages in half and give their answers as two columns. Learners must take note of the instructions on the back of the script.

3. There are too many candidates taking Mathematics without mastering basis mathematical skills. It can be to their advantage if these learners are motivated to rather take Mathematical Literacy. This subject offers maths as a real-life subject and learners can benefit more from the skills and attributes they can gain from the subject.