

2010 CHIEF MARKER PUBLICATION REPORT ON MARKING

INSTRUCTIONS FOR COMPLETION

1. The report on marking is a comprehensive report that will serve the following three objectives:
 - a) Provide an evaluation of the question paper and marking guideline.
 - b) Provide an in-depth analysis of the nature of learner responses, which will facilitate feedback to teaching and learning.
2. This report must be completed by the **CHIEF MARKER in conjunction with the senior markers.**
3. The report must be completed in detail and single word responses will not be accepted.
4. Where additional space may be required, use a separate page which must be appended to this report.
5. The final report must be approved and signed by the Head of Examinations in the province.
6. The report must be submitted to the responsible WCED official at the marking centre.

SUBJECT	MATHEMATICS	
PAPER	1	
GRADE	12	DURATION OF PAPER :3 HOURS
PROVINCE	WESTERN CAPE	
CHIEF MARKER	NAME: JOSEPH BOUMAN	

QUESTION 1
1. General comment on the performance of candidates. Was the question well answered or poorly answered?
<p>The question was a good start for the paper. It compared well with question of previous years. Overall, candidates did best in this question.</p> <p>1.1.1 Well answered. Although candidates could expand the expression and solve the resulting linear equations, some of them lacked the skill to factorize the quadratic expression.</p> <p>1.1.2 Well answered. Some candidates still copied the formula incorrectly from the formula sheet.</p> <p>1.1.3 Well answered. However, some candidates could not display a thorough understanding of the quadratic inequality. The cognitive demands include changing the inequality, determining the critical values and interpreting the solution.</p> <p>1.2 Candidates experienced difficulty in making x or y the subject of the formula. Substituting the fractional linear equation into the quadratic was problematic.</p> <p>1.3 Was an appropriate higher order question. It tested real understanding of exponents and not "learnt" methodology. Difficulty applying exponential laws and taking out a common factor was common amongst many candidates. On the other hand, many candidates who could simplify the expression lost the final mark for not approximating the answer to the nearest integer.</p>
2. Why question was poorly answered: Also provide specific examples:.
<p>Inability to factorise a quadratic equation</p> <p>Copying of formula wrongly from the formula sheet</p> <p>Incorrect use of the calculator</p> <p>Inability to solve simultaneous equations with fractions</p> <p>Lack of skills to solve quadratic inequalities</p>
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
<p>Discuss with candidates the general mistakes (see 2 above) and ways to improve it.</p> <p>Enough revision exercise on this section. This is always the first question and the expectation is that candidates would do well in this question so as to ease into the rest of the paper.</p>
(ii) Support
<p>Have extra tutoring sessions to revise work done in Grade 11.</p>
(iii) Setting of questions
<p>The question follows the same format as the previous papers.</p>

4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were positive. It was the best-answered question.

QUESTION 2
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
2.1.1 Was well done by candidates who could interpret Σ -notation. Candidates should be encouraged to use the sum formula and refrain from calculating all the terms.
2.2.1 It is disappointing to note that most candidates did not readily understand the concept of convergence. The question was set in previous final and exemplar papers.
2.2.2 It was fairly well answered. Most candidates could determine the first term, but lost the final mark owing to an incorrect value for r .
2.3 Candidates struggled with this question.
2.3.1 In determining the number of terms, candidates' confused n and T_n .
2.3.2 Many candidates could not separate the even from the given sequence.
2. Why question was poorly answered: Also provide specific examples:.
Inability to establish the sequence from the Σ -notation Trying to obtain the sum of the sequence by writing out all the terms Not knowing the restriction on the ratio for convergent series Inability to separate the even from uneven numbers
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
After formal teaching of number patterns, concentrate on preparing candidates for exams.
(ii) Support
Use the questions on number patterns from previous NCS question papers for exam preparation.
(iii) Setting of questions
The question follows the same format as the previous papers.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were reasonably satisfactory.

QUESTION 3
1. General comment on the performance of candidates. Was the question well answered or poorly answered?
A good question – testing understanding rather than a learnt method of finding quadratic patterns.
3.1 Candidates struggled to determine x owing to the nature of the question. Candidates were taught formulae without understanding the relevance of the first and second differences. Trial and error was often used.
3.2 Poorly answered. Candidate who could not determine x struggled to answer this question.
2. Why question was poorly answered: Also provide specific examples:.
Poor understanding of sequence with common second difference
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Teach candidates to have a sound understanding of a sequence with a constant second difference. Don't concentrate on finding the formula for the n^{th} term only. Let candidates understand the significance of the first and second differences.

(ii) Support
Use the questions on number patterns from previous NCS question papers for exam preparation.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general the candidates' responses to the question were poor.

QUESTION 4
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
<p>4.1 Although this was regarded as an easy question, many candidates could not express the answer in equation form.</p> <p>4.2 Fairly well answered.</p> <p>4.3 Candidates who could answer 4.2 did well in 4.3. Some candidates failed to recognize D as the y-intercept.</p> <p>4.4 Well answered. Many candidates could find the gradient of AD, but failed to use the y-intercept from D.</p> <p>4.5 Presented a challenge to most candidates. Although candidates could answer it by using translations, most of them preferred to use simultaneous equations, which was problematic for the weaker candidates.</p>
2. Why question was poorly answered: Also provide specific examples:.
<p>In general a poor understanding of the features of the graphs was displayed. Some of the answers given for the equations of the asymptotes and the y-intercept showed candidates' poor grasp of the concept.</p> <p>Other obstacles included the following:</p> <ul style="list-style-type: none"> - Inability to determine the equations of the hyperbola and the straight line - Inability to determine the co-ordinates of a point using translations. - Inability to solve simultaneous equations with fractions
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Teach candidates to have a comprehensive understanding of the different features of functions.
(ii) Support
Use previous question papers and any available software for graphs.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

QUESTION 5
1. General comment on the performance of candidates. Was the question well answered or poorly answered?
<p>5.1 Basic concept of making $x = 0$ and $y = 0$ for the intercepts was lacking. Many candidates could not solve the exponential equation to obtain the x-intercept. Many candidates wrote 4^{-x} as x.</p> <p>5.2 Well answered. Again candidates lacked the required knowledge of the asymptote. Some candidates associated it with the hyperbola and wrote down the perceived equations for the horizontal and vertical asymptotes.</p> <p>5.3 It was evident that some candidates could not identify the shape of the exponential function. The horizontal asymptote was omitted in many cases.</p> <p>5.4 Was poorly done. The vertical transformation was not recognised by many candidates.</p> <p>5.5 It was evident that many candidates have a problem with the interpretation of functional notation and did not understand what $f(x) = 3$ meant.</p>

2. Why question was poorly answered: Also provide specific examples:.
Unable to determine the intercept with the axes Candidates did not show any knowledge of the asymptote of an exponential function Inability to identify the shape of the graph from the given function. Some candidates used a table method to draw the graph and restricted the resulting graph to a set interval.
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Teach candidates to acquire a comprehensive understanding of the different features of functions. Refrain from using a table to draw the graphs. The table method is a good way to introduce the graph of a function. For all other applications, concentrate on the features of the graph.
(ii) Support
Use previous question papers and any available software for graphs.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

QUESTION 6
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
It was good to see the understanding of inverse graphs being tested outside logs and exponential graphs. Generally speaking, it showed up a definite lack of teaching of this concept. 6.1 Well answered. 6.2 Many candidates were aware that they had to "swop" the x- and y values. However, making "y" the subject of the resultant formula as well as making the correct choice for "y" based on the initial restriction, was either poorly executed or totally neglected. This could be ascribed to the fact that candidates had to take the square root and then had to choose the negative square root. The mathematics of this question was of a higher order, but not unfair. 6.3 This answer depended on the candidates' knowledge of inverse graphs. Most of them could not indicate that the range of the inverse equals the domain of the original function. 6.4 Poorly answered. Many candidates drew the graph in the incorrect "quadrant". Sketching the inverse of a given graph requires knowledge of the reflection in the line $y = x$. 6.5 Poorly answered. Many candidates did not see the link between Question 6.2 and Question 6.5 Candidates ignored the order in which the transformations were given.
2. Why question was poorly answered: Also provide specific examples:.
The poor performance of the candidate can be attributed to the fact that this section stems from the old Higher Grade syllabus. Again the interpretation of the transformations was problematic.
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Teach candidates to have a comprehensive understanding of the different features of functions. Before teaching the inverses of specific functions, first make sure that candidates have a good understanding of inverses.
(ii) Support
Use previous question papers and any available software for graphs.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

QUESTION 7
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
Q7 was generally very poorly handled. A lack of understanding of the formulae was evident in all parts of the question, but particularly in Q7.2.3
7.1 Not well answered. Candidates missed the fact that the interest rate was compounded quarterly and subsequently could not solve "i" or the rate.
7.2 A realistic question very relevant to the real-life "buy now and pay later" scenario. Candidates struggled to identify which of the present value or future value formulae to use. Again students missed the fact that the interest rate was compounded monthly.
7.2.2 Poorly answered. Many candidates incorrectly used the compound appreciation formula for this question. In solving for "n", candidates had a problem in applying log laws.
7.2.3 Many students did not attempt this question. A clear understanding of the repayment when using future value or present value formula seems to be lacking. Candidates did not check the validity of their answer against the borrowed amount.
2. Why question was poorly answered: Also provide specific examples:
Poor understanding of financial mathematics and application of formulae.
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Teach candidates to comprehend financial mathematics. For a revision exercise, let candidates identify only the formula needed for a specific scenario. Practise the used of the calculator and rounding off answers.
(ii) Support
Use previous question papers.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general the candidates' responses to the question were poor.

QUESTION 8
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
8.1 Was generally not well answered. Many candidates did not realise that they needed to adapt the first principle's formula from $f(x)$ to $g(x)$. Substitution into the first principle formula still posed a problem. Candidates knew what the answer should be, therefore many of them manipulated their solution to get $f'(x) = 2x$. Notational errors frequently occurred.
8.2 Again notation for the derivative was a problem with $\frac{dy}{dx}$ not written in the appropriate place. Recognition of $\frac{1}{2}$ as the coefficient of x^6 and converting \sqrt{x} to exponential form were a problem. Many candidates did not know how to apply the basic rules of differentiation.
8.3 Most of the candidates struggled to set up the simultaneous equations arising from the substitution of the point (4;96) into the correct equation and then using their knowledge of the derivative associated with the minimum value of a function. Many candidates did not recognise that they had to set up simultaneous equations in order to solve for a and b.
2. Why question was poorly answered: Also provide specific examples:
Incorrect copying of formula of the definition from formulae sheet and inability to adjust formula to other functions. Inability to apply the basic rules of differentiation Inability to interpret higher order questions where you have to set up two simultaneous equations

3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Concentrate on writing down the formula correctly and do exercises where the formula needs to be adjusted to different function notations. Concentrate on the features of the derivative (gradient) of the function when applying it to the local minimum or maximum
(ii) Support
Use previous question papers.
4. Describe any observations relating to responses of candidates: e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

QUESTION 9
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
9.1 Was generally not well answered. Some of the candidates did not read the opening paragraph and therefore did not realise that the equation of the straight line was given. 9.2 Was poorly answered. Candidates did not expect to be tested on the derivative of the cubic graph as the given function. Thus they struggled to identify the application of the parabola in its given context. They also struggled to determine the equation of the parabola using the x-intercepts and neglected the importance of a in the formula $y = a(x - x_1)(x - x_2)$. 9.3 Candidates that wrote $(-2;0)$ and $(6;0)$ did not show the deeper understanding of the question. 9.4 Many candidates did not know that the answer required the use of the second derivative. Candidates who used the fact that the point of inflection is halfway between the two turning points were credited. 9.5 Candidates could not display an understanding of the relationship between the derivative graph and the original cubic function.
2. Why question was poorly answered: Also provide specific examples:
Poor understanding and knowledge of the derivative graph of a function Poor understanding of the derivative (gradient) when applying it to the shape and turning points of the cubic function Candidates did not know how to get the x-coordinate of the point from the given x-intercepts of the derivative graph.
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Practise the graph of the derivative regularly. Show candidates how to draw the derivative graph from a given graph of cubic function, and vice versa. Concentrate on the features of the derivative (gradient) of the function when applying it to the shape of the cubic graph and local minimum or maximum.
(ii) Support
Use previous question papers.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
Fairly satisfactory responses.

QUESTION 10
1. General comment on the performance of candidates . Was the question well answered or poorly answered?
10.1 & 10.2 These questions were well within the reach of candidates who knew how to manipulate the given formulae. 10.3 The application of calculus to real-life problems, in this case the minimum surface area, was, for the most part, badly interpreted.

2. Why question was poorly answered: Also provide specific examples:
Inability to build formulae Inability to apply calculus to real-life problems
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
The building of formulae should be enforced in Grade 10 It is evident that this section is neglected. Stress the method used to determine the minima and maxima.
(ii) Support
Use previous question papers.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

QUESTION 11
1. General comment on the performance of candidates. Was the question well answered or poorly answered?
11.1 & 11.2 Candidates struggled to set up the constraints and hence failed to do the graphical representation. 11.3 – 11.4 Candidates failed to apply the feasible region. Thus they could not arrive at the correct answers. 11.5 Poorly answered. Many candidates could not identify the third constraint given in this question.
2. Why question was poorly answered: Also provide specific examples:
Inability to write the constraints from the given text. Inappropriate used of the inequality signs Identifying the feasible region and determining the optimum position are problematic Poor understanding of the essence of the feasible region
3. Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
Linear programming is taught in Grades 11 and 12. Thus, there should be ample time to focus on establishing the constraints, teaching the importance of the feasible region and determining the optimum position.
(ii) Support
Use previous question papers.
4. Describe any observations relating to responses of candidates : e.g. positive, negative, outstanding etc.
In general, the candidates' responses to the question were poor.

GENERAL COMMENTS AND SUGGESTIONS TO IMPROVE TEACHING OF/ RESULTS IN MATHEMATICS

Provide suggestion for improvement in relation to the following :
(i) Learning and teaching
More resources in poorer schools. Mathematical dictionaries for teachers with language problems. Smaller classes Teachers must ensure that candidates understand the context in which formulae are used and their correct usage. Many teachers follow a specific textbook and do not use other resources e.g. question-and-answer books. Candidates, therefore, find many of the questions strange as they have not been exposed to such questions. Sections, such as linear programming, functional transformations in terms of reflections and inverses, were HG sections and many teachers are not familiar with this content and lack

experience in teaching them. Schools do not have the necessary resources in terms of technology to simplify certain concepts e.g. graphing programs for functions.

(ii) Support

Teachers need to be taught, literally, the specific sections, such as the old Higher Grade topics. Subject specialists or experienced teachers could be used for this. It would boost the teachers' knowledge of their subject and, in turn, improve the teaching at the school.

More workshops

Sharing of resources among all schools

Global database of question papers of various schools

More structured training for teachers in their school clusters. Teachers find that this is the only opportunity they have for self-development. Subject advisers should identify under-performing schools (from the results) and intervene with the necessary support early on. Handing out question-and-answer books to these schools is not sufficient.