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NATIONAL DIAGNOSTIC REPORT ON LEARNER PERFORMANCE

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NATIONAL DIAGNOSTIC REPORT ON LEARNER PERFORMANCE 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

DBE	Department of Basic Education
FET	Further Education and Training
NCS	National Curriculum Statement
NSC	National Senior Certificate
PEDs	Provincial Education Departments
MCQs	Multiple Choice Questions
LOLT	Language of Learning and Teaching
LTSM	Learning and Teaching Support Material
Q	Question
SAGs	Subject Assessment Guidelines

FOREWORD



It is my pleasure to release this diagnostic report on the performance of learners in selected subjects in the 2012 NSC examinations. Last year, a national diagnostic report on the 2011 NSC examinations was also published. The 2011 diagnostic report served as a catalyst for all provinces to engage in their own diagnostic analysis of learner performance in the 2011 NSC. This reflexive practice was manifest in the conceptualization and delivery of the respective provincial intervention strategies that focused on improved curriculum delivery through enhanced teaching and learning in all schools offering Grade 12 in 2012.

The National Senior Certificate (NSC) examination has been administered since 2008, giving us a five year history as of 2012, which is a reasonable period to reflect on the achievements and challenges of the last five years.

There have been consistent improvements in the performance of learners in the NSC over the last 5 years, and a reasonable improvement in the performance of candidates in a number of the key subjects was recorded in the 2012 NSC examinations. However, the quality of passes in key subjects like Mathematics, Physical Sciences, Accounting, Life Sciences, Economics, Geography and History, remains a matter of concern to the department. A number of these subjects are still registering pass rates below 50% at the 40% achievement level. Quality must be the focus in 2013 as we plan our interventions.

The 2012 diagnostic report presents a detailed per-question analysis of the responses of candidates in each of the following high enrolment subjects, namely: Accounting, Agricultural Science, Business Studies, Economics, English First Additional Language, Geography, History, Life Sciences, Mathematics, Mathematical Literacy and Physical Sciences. Based on the analysis, some areas of the curriculum have been identified as problematic and the frequently occurring errors and misconceptions have also been indicated. These areas are highlighted in the report and suggestions for improvement are provided.

Once again the target audience for this publication remains education officials, curriculum specialists, subject advisors, curriculum planners and teachers who could use this valuable feedback from the marking process to plan their intervention programmes to improve the teaching and learning and to ensure learner readiness for the 2013 NSC examinations. The Provincial Education Departments will be expected to report on how teaching and learning in the 2013 Grade 12 classrooms reflects the contents of these reports. The Department of Basic Education will continue to undertake similar analyses of performances in subsequent NSC examinations and it is hoped that the areas of concern will decrease considerably in the subsequent years.

I wish to take this opportunity to acknowledge and appreciate the support and motivation of parents, guardians, teachers and education officials in this fifth year of the NSC's implementation. Without you, the ambitious goals and objectives we have set for ourselves for 2014 as a nation cannot be realised. As a nation, we owe it to future generations to ensure the realisation of these goals and objectives. I encourage the Grade 12, 2013 cohort to apply themselves with a greater sense of commitment and zeal so as to ensure an improvement on the 2012 NSC results.

MRS AM MOTSHEKGA, MP

MINISTER OF BASIC EDUCATION

4 JANUARY 2013

CHAPTER 1**1. INTRODUCTION, SCOPE AND GENERAL FINDINGS****1.1 Introduction**

Public examinations are a valuable tool not only in measuring learner achievements but also in providing relevant diagnostic information which serves as feedback to teaching, learning and the assessment processes.

This *Subject Report on Learner Performance* is the first step in providing teachers, as well as subject advisors and other support officials, with information that could assist in planning the teaching and learning practices for 2013.

The individual subject reports have been compiled from the data collected by the chief markers, internal moderators and subject specialists during the marking of the 2012 NSC examination. The reports highlight areas that have been identified as problematic in each of the eleven subjects, based on the responses of candidates, as well as aspects of the curriculum that need urgent attention in form of classroom interventions. Suggestions have been made for improvement in teaching and learning, and these include: teaching methodology, support to be provided for teachers and the use of learning and teaching support materials (LTSM).

It is therefore expected that all teachers of these subjects, together with the subject advisors, will read through these reports, identify critical challenges to be addressed in 2013, and prioritise them accordingly. It should be noted that some challenges identified in the previous examinations may still persist, and these must be given special attention. This suggests that continued reference to the previous reports is also essential. Should there be a need from teachers to be supported with regard to the teaching and learning of the identified areas, they should not hesitate to contact the subject specialists in their district offices, who will be eager to assist.

1.2 Scope and purpose

The eleven high enrolment subjects addressed in this report include: Accounting, Agricultural Science, Business Studies, Economics, English First Additional Language, Geography, History, Life Sciences, Mathematics, Mathematical Literacy and Physical Sciences. Each subject report presents learner performance trends in the last four years (2009 to 2012), a general overview of learner performance in the subject in the 2012 NSC examination as well as a diagnostic per question analysis.

Based on a detailed per-question analysis of the responses of candidates in each of the eleven subjects, some areas of the curriculum have been identified as problematic. These areas are highlighted in the report and suggestions for improvement are provided. The list of the suggestions made for improvement is not exhaustive. Teachers and subject advisors are encouraged to be creative and explore other appropriate remedial measures.

During the monitoring of schools, the Department of Basic Education (DBE), working together with the provinces, will assess and evaluate the utilisation of these reports in schools. The expectation is that the problems experienced in the 2012 examinations will be considerably reduced in the 2013 examinations.

Teachers and subject advisors are requested to provide input on the usefulness of these reports and how they could be improved in future years. An opportunity to make these inputs will be created for teachers and subject advisors during the monitoring of curriculum implementation and support.

1.3 Methodology

During the marking process, markers, senior markers and chief markers were requested to note the nature and type of learner responses to specific questions that posed a challenge to candidates. In addition, 100 scripts per paper per subject were randomly selected at each of the 118 marking centres across the country, for more intensive analysis and scrutiny. The scripts were randomly selected from a number of districts to cover low, medium and high scores.

In the case of these 100 scripts, the individual marks obtained by learners per question were recorded and analysed to identify questions that were poorly answered and those that were well answered. The individual scripts were scrutinised to provide an in depth understanding of the different responses, and areas of concern were noted paying particular attention to common errors and misconceptions that occurred in the learners' responses.

From the analysis, a report was compiled per subject covering the following three main parts:

Section 1: Performance Trends (2009 – 2012)

In this section on performance trends, the performance of learners at a national level is compared over the last four years in terms of the numbers who wrote, the number and percentage who achieved at 30% and above, and the number and percentage who achieved at 40% and above. This information is depicted in tabular and graphical format.

In addition, a performance distribution curve is provided, which graphically represents the distribution of learner scores in the last two examinations. Any improvement or decline in the performance of the cohort of learners can be observed in the shift of the graph either to the right or left. A shift to the right is a positive shift, confirming improvement in performance, while a shift to the left is an indication of decline in performance.

Section 2: Overview of Learner Performance

This section summarises the performance of learners in the paper as a whole, by referring to generic areas of good performance or weakness and the possible reasons for these observations.

Section 3: Diagnostic Question Analysis

This section covers the following:

- An analysis of the performance of learners in the specific question, stating whether the question was well answered or poorly answered;
- Why the question was poorly answered, highlighting common errors and misconceptions that were identified in candidates' answers; and

- Suggestions for improvement in relation to teaching and learning, content and methodology, subject advisory support and provision and utilization of LTSM.

The reports from all nine provinces for each paper per subject were consolidated and the information summarised in this report.

It is important that this report is read in conjunction with the November 2012 question paper, since specific reference is made to specific questions in the question paper.

1.4 Limitations

The diagnostic analysis of learner performance is limited to only eleven subjects with high enrolment, and covers only the 2012 Grade 12 examination. The statistical data is drawn from a sample of 100 scripts per province, making it a total of 900 scripts per paper, irrespective of the number of candidates who wrote each of these subjects. Therefore, the sample size is not proportional to the candidate population.

In addition, the data collected and used in these reports is in the main, qualitative, based specifically on the responses of candidates to the questions. Quantitative information is only provided in terms of performance trends. It is acknowledged that in order to conduct a comprehensive post test analysis, statistical analysis for each item could have been done focussing on item difficulty, item discrimination or item reliability. It was the intention of this exercise to provide a qualitative analysis of learner responses to questions that were poorly answered, since the main focus of this report is to provide feedback to teaching and learning and not for purpose of test development.

1.5 General Findings

Details of the findings are presented per subject from Chapter 2 to Chapter 12 of this report. Much improvement has been observed in the quality of responses of candidates in most subjects. Pockets of excellence were identified in the quality of answers that learners provided, which reflects a significant improvement through the years in the subjects addressed in this report. There was also a gradual consistent improvement in the pass rate in each of the subjects analysed both at the 30% and 40% achievement levels.

However, there are still areas of concern, some of which are highlighted below:

- A lack of linguistic skills required to express themselves in simple and proper paragraphs were evident in the responses of candidates across all subjects. Candidates displayed inadequacies regarding the skills of reading, comprehension, and analysing, evaluating and applying information to either make decisions or solve problems.
- Basic number operations, namely: addition, subtraction, multiplication and division, which include but are not limited to working with fractions, equations, ratios, working with tables and graphs, analysis and synthesis of lots of information (texts and numerals) are lacking in Mathematics and in all other subjects where such numerical skills were required.
- There were inadequacies observed with regards to foundational knowledge and skills, and basic concepts

and principles. For example, candidates could not define terminology and concepts, were unable to display adequate understanding of the concepts and were, therefore, unable to answer questions assessing higher order thinking skills such as application, problem solving, critical thinking, analysis and evaluation.

- Inadequate preparedness in terms of mastery of the content was evident in the poor quality of answers provided by some candidates as well as the nature of the errors observed in the responses.

A general observation in Accounting and Physical Sciences was that questions which required mathematical skills were generally better answered in the 2012 NSC examination than in 2011. It can be assumed that the increase in the number of candidates taking the combination of Mathematics and Accounting, and Mathematics and Physical Sciences (as opposed to Mathematical Literacy) has provided learners with the mathematical background knowledge required for these subjects.

1.6 Key Recommendations

- (a) Districts and schools should continue to guide learners in making the right subject choices and combinations. It is important to note that certain subject combinations work to strengthen learners' performances as a whole, for example, acquired competencies in Mathematics can strengthen learners' thinking skills, understanding and improve performance in Physical Sciences and other subjects like Agricultural Sciences, Accounting and Economics.
- (b) It is recommended that subject advisors convene special workshops with teachers, where these reports will be thoroughly discussed and mediated, and problem areas addressed with teachers. It is expected that these reports will culminate in district, circuit, and school level intervention plans among teachers of each of these subjects.
- (c) It is also recommended that content coverage should be closely monitored
- (d) There should be focused interventions targeting areas of weakness highlighted in the report, combined with general systemic interventions.

CHAPTER 2

ACCOUNTING

The following report should be read in conjunction with the Accounting question paper of the November 2012 Examination.

2.1 Performance trends (2009 – 2012)

In 2012, there was an improvement in the proportion of candidates that passed the subject. At the 30% and above level, there was a 4% improvement, while at the 40% and above level there was an encouraging 6.9% improvement. These statistics reflect the improved general quality of responses in the examination by candidates across all provinces.

Table 2.1: Overall achievement rates in Accounting

Year	No. Wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	174 347	107 156	61.5%	62 743	36.0%
2010	160 991	101 093	62.8%	56 752	35.3%
2011	137 903	84 972	61.6%	49 368	35.8%
2012	134 729	88 366	65.6%	57 522	42.7%

Figure 2.1: Overall achievement rates in Accounting

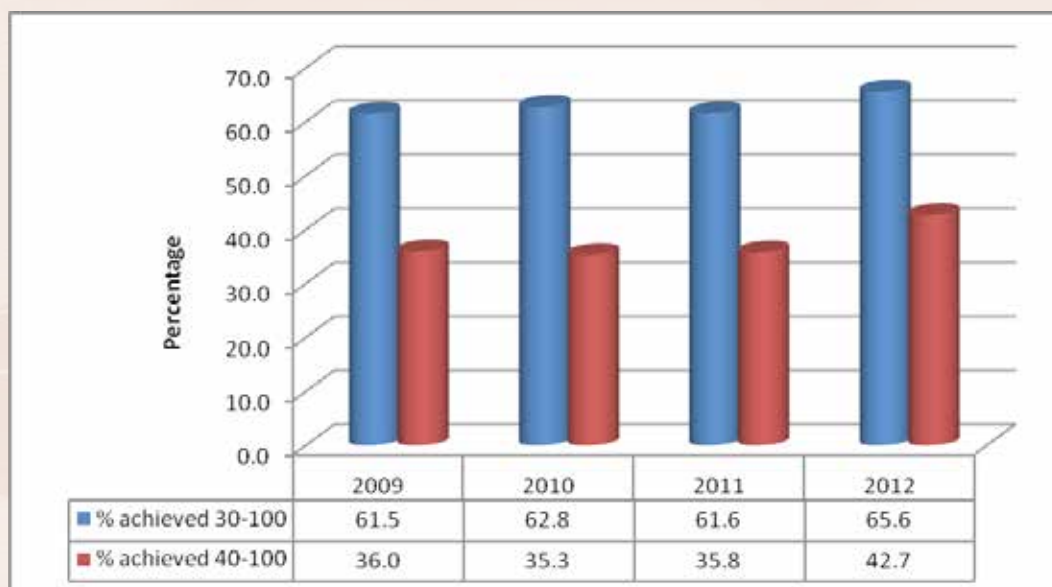
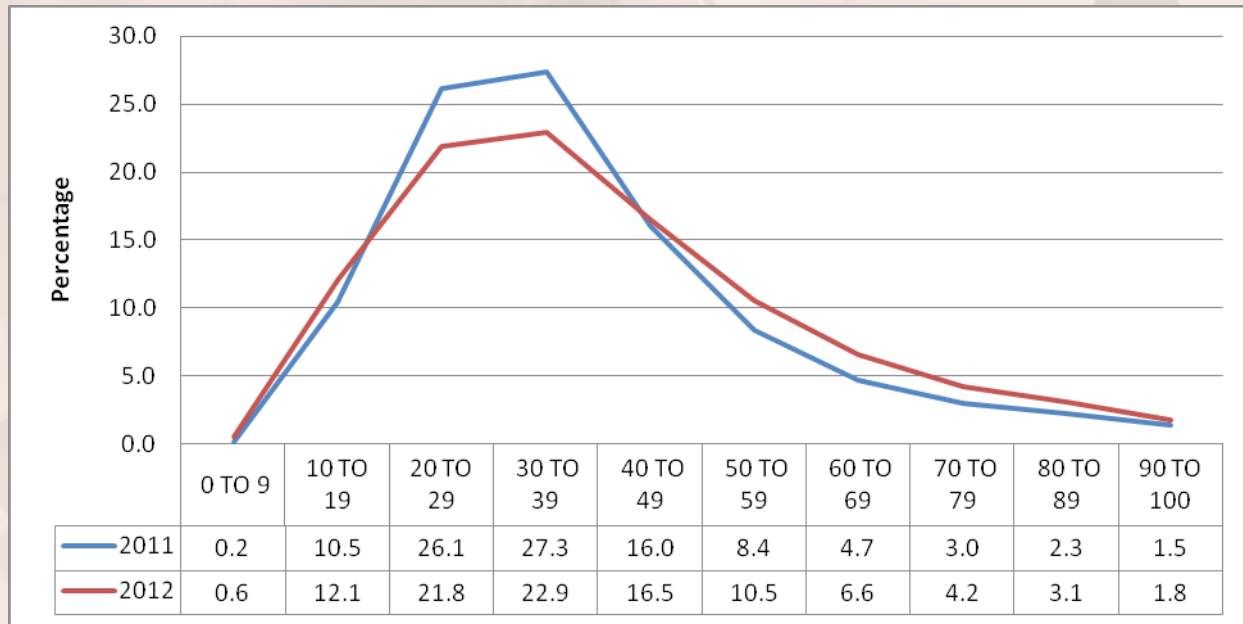


Figure 2.2: Performance distribution curves (Accounting: 2011 – 2012)



In 2012, there was a decrease in the percentage of candidates who performed at 0-29% compared to 2011. However, it is encouraging to note an improvement in the percentage of learners who performed at 40% and above.

2.2 Overview of learner performance

General comments

- (a) The performance of candidates on this paper reflects an encouraging improvement. It appears that the contents of the 2011 Diagnostic Report for Accounting were seriously considered by the PEDs and that interventions were put in place to assist teachers and learners. These interventions included the *Mind the Gap* series published by the DBE to assist weaker learners in taking advantage of the low-difficulty questions that comprised approximately 30% of any paper. The interventions appeared to have had a noticeably positive effect on the performance of candidates.
- (b) Regrettably, there still seem to be many centres that did not make use of the eight available past papers to prepare their learners. The reasons for this could be a lack of finances to cover costs of reproducing the past papers, or a lack of willingness on the part of teachers and/or learners to engage with these resources or the 2011 Diagnostic Report.
- (c) In past years, it was noticeable that certain major NCS topics that were also included in the old Higher Grade (Report 550) curriculum presented major problems for candidates in many centres. These candidates either neglected to answer these sections or performed poorly in them. Such topics included analysis and interpretation of financial information, Balance Sheets and Cash Flow Statements. The performance of candidates in the 2012 paper indicated that a smaller number of centres than in previous years appeared to be unfamiliar with these important sections of work. Many of the easy sub-questions covered basic theoretical knowledge which is essential for enabling candidates to engage with the more complex applications pertaining to each topic. It was expected that all learners would have been able to answer these questions correctly. The failure of

weaker candidates in some centres to do so indicates deficiencies in the teaching and learning process, where basic theory is not covered and the basic formats of financial statements are not regularly reinforced. Specific examples of this are provided in the analysis of each question below. Teachers are earnestly encouraged to focus on this aspect of the teaching and learning process.

- (d) Judging from the performance of the 2012 candidates in comparison to that of previous years, the general improvements also seem to have resulted from (not exclusively from) the following:
- **Coverage of the curriculum and time-management:** It appears that in 2012 a greater proportion of candidates engaged with every question, at least in part. There were fewer cases where candidates ignored certain questions. This could be as a result of teachers becoming more confident in teaching each topic or candidates managing their time in the examination more effectively.
 - **Better engagement with specific information in the questions:** One skill that separates the successful candidate from the less able candidate is the ability to focus specifically on the information that is relevant to the answering of each sub-question. This skill was displayed by more candidates in 2012. This also enabled them to use their time more effectively.

General suggestions for improvement

Teachers are advised to build the following practices into the work plan for the year:

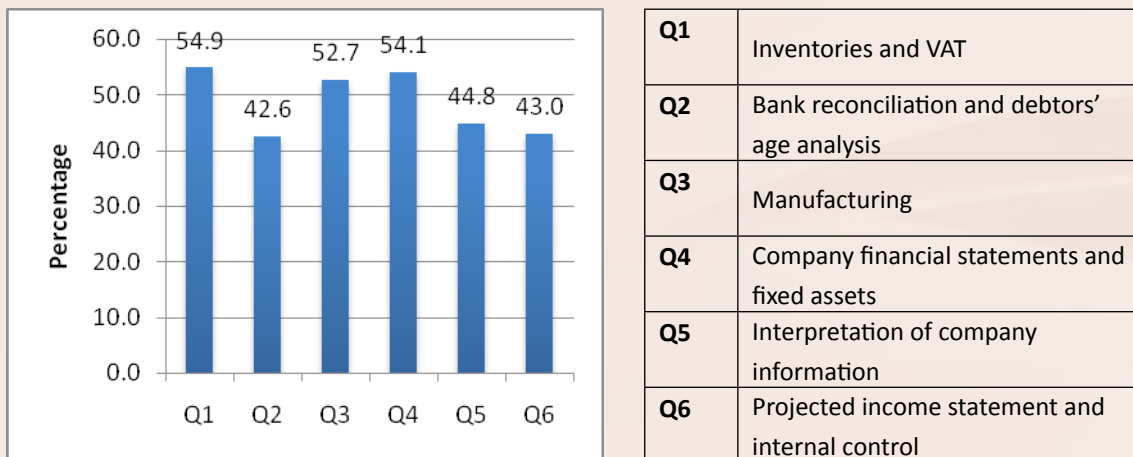
- (a) **Use of past NSC papers:** In preparation for the 2013 year-end paper, every learner should have access to five NSC November papers and five NSC supplementary papers. Teachers should also answer these papers themselves to improve their own confidence in their ability to teach each topic.
- (b) **Basic concepts:** Teachers should ensure that learners understand and can explain the essential basic concepts and terminology before engaging in Accounting applications in each topic. For example, in preparing a Balance Sheet, learners should know what is meant by non-current assets or current liabilities; they need to know what is meant by liquidity, solvency and return when interpreting financial information.
- (c) **Revision of relevant Grades 10 and 11 content:** The SAGs state that up to 20% of an examination paper may contain content from previous grades that is pertinent to Grade 12 content. Teachers must ensure that revision of relevant Grade 11 work is done before engaging with Grade 12 content. Meaningful liaison with teachers of Grade 11 classes should also serve to reduce the time spent in Grade 12 on revision of these aspects.
- (d) **Memorising and understanding basic formats:** Teachers should ensure that the basic formats of financial statements and ledger accounts are fully understood by learners. These formats must cover Income statements, balance sheets, cash flow statements, cash Budgets, production cost statements and relevant notes to the financial statements, as well as ledger accounts for items such as asset disposal, share capital, dividends, taxation and appropriation of profit.

- (e) **Internal control and ethical issues:** Teachers should teach not only the logic and the process of each Accounting application in the curriculum, but also the internal control measures and ethical considerations that are relevant to each application. To save time, these aspects should be integrated into the teaching of the relevant application.
- (f) **Requirements of questions:** Teachers must ensure that learners understand the requirements of typical questions in NSC papers. For example, if a question requires a figure to be provided in an explanation, this must be done to earn the relevant mark. Teachers should ensure that learners understand the basic layout of examination questions and where to look for the relevant information.
- (g) **Time allocations:** Teachers should train learners in the art of managing their time and to adhere to the suggested time allocations provided in the paper.
- (h) **Comments and explanations:** Teachers need to train learners to express themselves clearly and simply where explanations are required. In Accounting, the use of bullet points and short, concise sentences is acceptable.
- (i) **The importance of formative testing:** Teachers should ensure that they build up the confidence of learners in all topics through the use of short, informal formative tests. It is the most effective practice if learners mark these formative tests themselves for immediate feedback and for an appreciation of how marks for easy parts of an examination question can easily be obtained. This will also force learners to take ownership of the learning process. The ‘confidence-booster’ easy sections in each of the questions in the NSC Accounting papers can be used as formative tests that may be self-marked by learners.

2.3 Diagnostic question analysis

A sample of scripts from each province revealed the following average percentages on each question.

Figure 2.3: Average marks per question expressed as a percentage



Q1	Inventories and VAT
Q2	Bank reconciliation and debtors' age analysis
Q3	Manufacturing
Q4	Company financial statements and fixed assets
Q5	Interpretation of company information
Q6	Projected income statement and internal control

2.4 Analysis of learner performance in individual questions

QUESTION 1: INVENTORIES AND VAT

This question was well answered in certain parts.

Common errors and misconceptions

- (a) The easily-obtainable marks in this question were the True/False questions (Q1.1), the calculation of opening stock (Q1.2.2) and the value to tiles received (Q1.2.2). These marks should have been obtained by the vast majority of candidates, but it was disappointing that this was not necessarily the case in certain centres.
- (b) The calculation of VAT owed to SARS (Q1.3.1) was poorly done. Although most candidates attempted to calculate the specific components of the VAT calculation, many did not add up the components to calculate the final amount due to SARS.
- (c) Regarding the ethical scenario relating to VAT (Q1.3.2), many candidates mentioned the unethical nature of the fraud, thereby earning a part-mark, without explaining the action required of the internal auditor.

Suggestions for improvement

- (a) Short formative tests on basic concepts and calculations are advised.
- (b) Exposure to ethical scenarios can be conducted in class activities or through class tests and internal examinations. It is not necessary for the teacher to undertake detailed explanation of every possible scenario, but simply to provide opportunities for learners to gain confidence in answering such questions. It is important, however, for different explanations to be shared by learners when test or examination revisions are done.

QUESTION 2: BANK RECONCILIATION AND DEBTORS' AGE ANALYSIS

Performance on this question was poor.

Common errors and misconceptions

- (a) Many candidates could not adequately explain the basic purpose of both the bank reconciliation and age analysis (Q2.1), nor provide practical solutions for preventing the write off of the large outstanding deposit in future (Q2.2.1).
- (b) Preparation of the bank reconciliation is normally regarded by teachers as a relatively easy topic (Q2.2.2) but many candidates placed irrelevant figures in this statement.
- (c) Most candidates were able to offer comments on the debtors' age analysis (Q2.3) which was encouraging.

Suggestions for improvement

- (a) The preparation of the Bank Reconciliation Statement is a Grade 11 curriculum topic. It is essential that teachers revise this topic in Grade 12 as required.
- (b) Teachers are advised to incorporate interpretation of the bank reconciliation statement, and its implications for internal control when learners revise the preparation of the (bank reconciliation) statement as this is a specific requirement of the Grade 12 curriculum.
- (c) The potential internal control problem of 'rolling' of cash requires attention. This problem relates to fraudulent use of cash received in subsequent months to make up shortages in deposits relating to previous months. Large deposits that are outstanding for lengthy periods of time could indicate this problem.

QUESTION 3: MANUFACTURING

Performance on this question was generally good, although weaker candidates committed serious errors of principle in their answers. However, this year there was much improvement in the calculation of the break-even point (Q3.2.2).

Common errors and misconceptions

- (a) In the factory overhead note (Q3.1.1), marks were easily obtainable on the pre-adjustment figures from the question. However, weaker candidates included irrelevant foreign entries in this note which implied that they did not understand the difference between factory overheads and administration, selling or direct production costs.
- (b) There were many instances where candidates incorrectly entered the direct labour costs in both the factory overhead note as well as the production cost statement.
- (c) The allocation of costs using ratios or percentages was poorly done by weaker candidates indicating a lack of basic mathematical ability.
- (d) The preparation of the production cost statement (Q3.1.2) revealed that many weaker candidates did not remember the fixed basic format of this statement.
- (e) Performance on the interpretation of unit costs and the break-even point (Q3.2) ranged from poor to excellent. In commenting on the current year's unit costs or break-even point, many candidates neglected to mention increase or decrease in relation to the previous year.

Suggestions for improvement

- (a) Both the preparation and interpretation of the production cost statement and the factory overhead note are Grade 12 topics. Neither of these aspects can be ignored.
- (b) Short formative tests on the following topics are advised:

- memorisation of the fixed format of the production cost statement and notes; and
 - allocation of expenses to the five basic cost categories i.e. direct materials, direct labour, factory overheads, selling and administration costs
- (c) The interpretation of unit costs and the break-even point involves higher-order evaluation skills. In this regard, learners must be advised to focus specifically on the relevant figures and to quote the figures in their answers to earn part-marks. The resultant comment on the easier evaluation questions could then become self-evident to them.

QUESTION 4: COMPANY FINANCIAL STATEMENTS AND FIXED ASSETS

The matching of financial statements to a description (Q4.1) was well-answered. The preparation of the balance sheet and notes (Q4.2) reflected a wide range of performances. This was poorly done by many candidates although candidates from stronger centres were able to earn full marks on this topic.

Common errors and misconceptions

- (a) Although most candidates were able to earn part-marks on the workings in the balance sheet (Q4.2.3), placement of the items in the correct category in the balance sheet remains a significant problem. This indicated that many candidates did not understand the basic concepts of equity, assets and liabilities, and the sub-categorisation into current and non-current items. This is a major concern as it forms the crux of basic understanding of a balance sheet and other financial statements, which are major components of the Accounting curriculum.
- (b) Weaker candidates continued to experience problems in determining the figures to be inserted in the fixed assets and retained income notes.

Suggestions for improvement

- (a) Teachers should use formative tests to enable learners to understand and define what is meant by: non-current assets, current assets, non-current liabilities, current liabilities, equity, capital, income and expenses. This should be reinforced from Grades 8 and 9 level through coverage of the accounting equation, particularly the expanded accounting equation ($A+E+D=C+I+L$). This equation forms the basis of all Accounting study as it is mirrored in ledgers, trial balances and financial statements. Failure to internalise these concepts will always lead to shortcomings in the understanding of Accounting applications.
- (b) Formative tests on the fixed format of the balance sheet (without figures) must be regularly conducted, particularly for weaker learners, so that they identify the current placement of the various categories of items in the balance sheet. Similar tests can be carried out for the various notes.

- (c) Learners should understand that due to the structure of the NSC examination of 300 marks which has to be split over three learning outcomes or modules, it is impossible for all forms of financial statements to be asked in one paper. These financial statements will be rotated randomly over a three or four year period. Therefore, learners must be advised to know the basic formats of the major financial statements that they are required to prepare i.e. income statement, balance sheet, cash flow statement, ash budget, projected income statement, production cost statement and the relevant notes.

QUESTION 5: INTERPRETATION OF COMPANY INFORMATION

Candidates generally performed well on the selection of missing words relating to financial indicators (Q5.1), although weaker candidates did not take full advantage of the easy marks on offer here. The calculation of selected financial indicators (Q5.2) and the figures relating to the cash flow statement (Q5.2) were attempted by most candidates with the capable candidates achieving extremely well. There was considerable improvement in the section dealing with interpretation of the financial indicators (Q5.3). The innovation of comparing the results of two companies was well-handled by most candidates. This was particularly encouraging as this style of question has not been utilised in previous NSC papers. The interpretation of the audit reports (Q5.4) was satisfactory.

Common errors and misconceptions

- (a) In identifying the relevant words relating to financial indicators (Q5.1), weaker candidates often performed poorly indicating that the concepts of profitability, liquidity, solvency, return, and gearing/risk were not properly understood.
- (b) The question on interpreting the liquidity ratios (Q5.3.1) created problems for several centres with many candidates incorrectly believing that the bigger ratios were the more efficient ones.
- (c) Another concern was that many candidates were not able to use the debt/equity ratio to identify the company making more use of loans (Q5.3.2).
- (d) Many candidates did not quote evidence from the question as required. The question specifically stipulated that candidates must quote the financial indicators (actual figures, ratios or percentages) to support their comments on the different aspects of the two companies. This was to provide evidence that the candidate was fully aware of the relevant reasons for his/her answers.
- (e) Regarding the interpretation of the audit reports (Q5.4), many candidates were not able to use the words 'qualified' or 'unqualified' correctly.

Suggestions for improvement

- (a) Formative tests must be used to ensure that learners are able to understand and define what is meant by profitability, liquidity, solvency, return and gearing.

- (b) Formative tests can also be used to reinforce skills in calculating the financial indicators at regular intervals. Learners should be taught to understand the logic underlying each financial indicator. It is a retrogressive step to expect learners to memorise formulae because these can easily be forgotten if the underlying logic is not understood. Also, inserting figures into a rote-remembered formula serves no positive educational purpose as learners will not be able to offer meaningful interpretations of the results. The formative tests should therefore cover both the calculation and the purpose of the financial indicator.
- (c) Regarding the liquidity ratios, teachers must note that the out-dated 'norms' of 2:1 for the current ratio and 1:1 for the acid-test ratio no longer apply. Teachers are advised to amend the textbooks. A study of the published financial statements of very successful companies will often reveal that many of these companies may maintain liquidity ratios well below these old 'norms'. Maintaining a low current ratio and low acid-test ratio on an annual basis often indicates that the company is using its working capital more efficiently in a sustainable way. Crucial factors to consider will be the efficiency of stock turnover and collection from debtors. In modern times, if companies experience unexpected liquidity problems, they may borrow against non-current financial assets or they might access mortgage bond facilities to borrow additional funds on a short-term basis until the liquidity problem abates.
- (d) The question on the interpretation of the audit reports (Q5.4) reflected the importance of focusing on specific relevant aspects. The key words were highlighted, making it unnecessary for candidates to study an entire extract which was merely provided as a context for the key words. Learners must be encouraged to understand the constant parts of a typical independent audit report and the variable aspects.
- (e) The difference between a 'qualified' and 'unqualified' audit report needs to be clearly understood. An 'unqualified' report is the normally acceptable report because the independent auditor is satisfied with all matters pertaining to the financial statements and does not need to qualify or modify his opinion in any way. The 'qualified' report is the unacceptable report because the independent auditor has to modify his opinion to cater for the unacceptable circumstance that exists in the company.

QUESTION 6: PROJECTED INCOME STATEMENT AND INTERNAL CONTROL

This question was intentionally placed at the end of the paper as it contains creative problem-solving aspects (Q6.6 and Q6.7) which were intended to extend the more capable candidates. Many of them performed very well on these sub-questions while many of the weaker candidates were able to achieve part-marks.

Common errors and misconceptions

- (a) It appears that many teachers focused only on the preparation aspects of cash budgets or projected income statements, or they chose to complete both the preparation and the interpretation in Grade 11 without meaningful revision of both in Grade 12. As a result, candidates in several centres did not appear confident with either the preparation or the interpretation of these statements.
- (b) Weaker candidates could not calculate the mark-up percentage (Q6.3), the percentage increase in sales (Q6.2) and the specific items in the projected income statement (Q6.4), indicating severe deficiencies in their basic arithmetical skills.

- (c) The weaker candidates in some centres could not identify which three expenses were poorly controlled by comparing actual to budget (Q6.5). This implied that these centres may have neglected the interpretation aspects of the topic.

Suggestions for improvement

- (a) Teachers are advised to actively encourage learners to engage with these questions in class and in their revision activities as this is a topic that is often based on common-sense, for example, comparing actual figures to budgeted figures to identify a positive or negative variance. The practical solutions to these negative variances are often self-evident.
- (b) The basic calculations are often not challenging and merely require practice, which can be provided through short formative tests.
- (c) It was encouraging that many weaker candidates engaged with the problem-solving questions (Q6.6 and Q6.7) and were able to earn part-marks. Further, positive encouragement by teachers will benefit weaker candidates in future.

CHAPTER 3

AGRICULTURAL SCIENCES

The following report should be read in conjunction with the Agricultural Sciences question papers of the November 2012 Examination.

3.1 Performance trends (2009 – 2012)

The performance of the NSC 2012 Agricultural Sciences candidates reflects a significant improvement in the quality of work produced and in the pass rates at both the 30% and above, and the 40% and above levels. The general upward trend in these indicators since 2009 is encouraging.

Table 3.1: Overall achievement rates in Agricultural Sciences

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	90 136	46 597	51.7%	19 723	21.9%
2010	85 523	53 573	62.6%	27 427	32.1%
2011	77 719	56 404	71.3%	30 678	39.5%
2012	77 978	57 441	73.7%	31 999	41.0%

Figure 3.1: Overall achievement rates in Agricultural Sciences

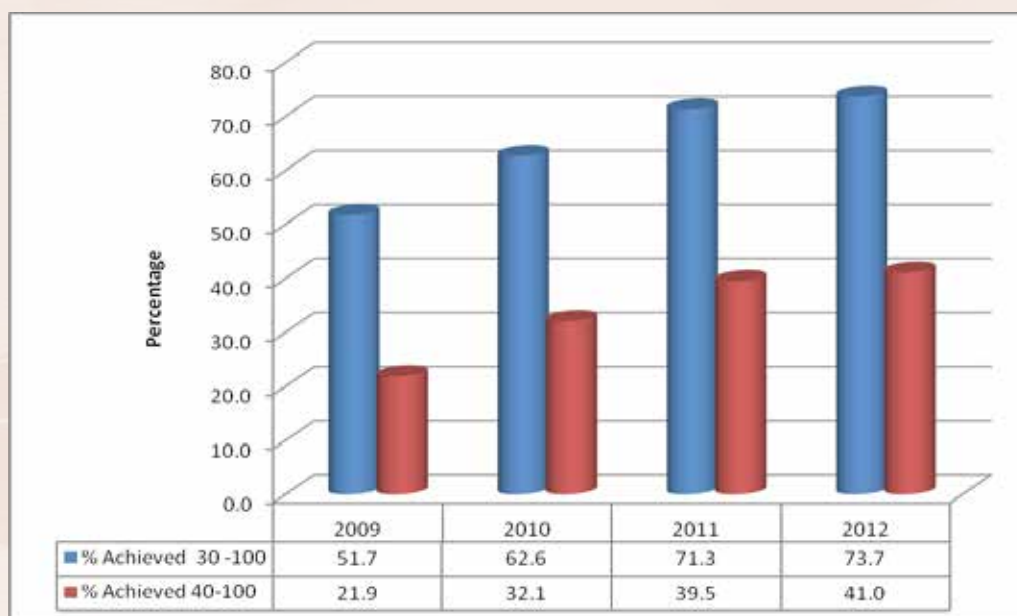
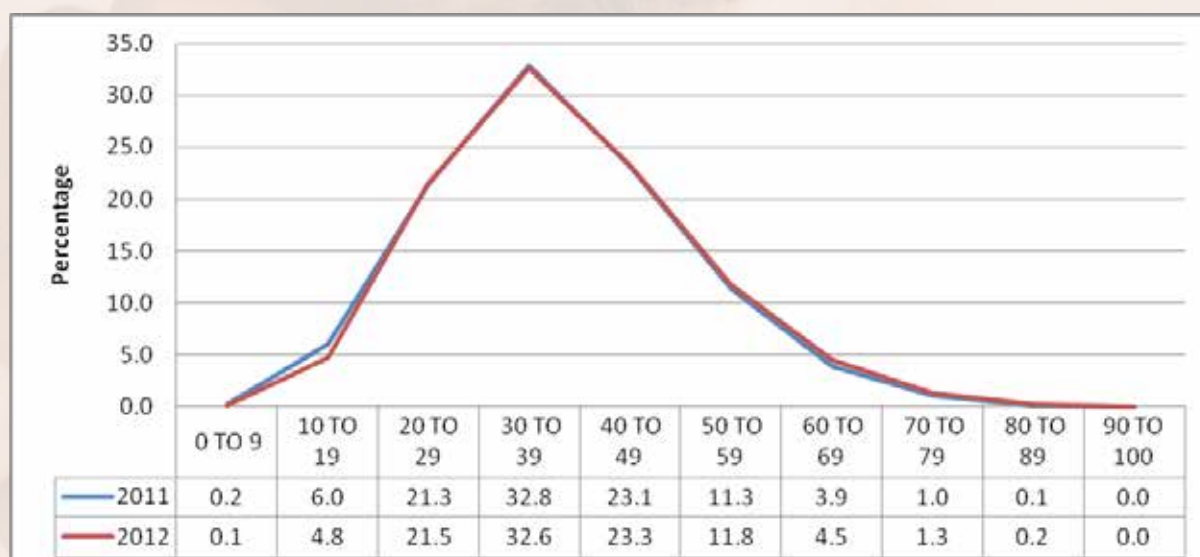


Figure 3.2: Performance distribution curves (Agricultural Sciences: 2011 – 2012)



In 2012, there was a decrease in the percentage of learners who performed at 0 - 29% compared to 2011.

3.2 Overview of learner performance for Paper 1

General comments

- There was a slight improvement in the performance of candidates in this question paper compared to that in previous years. This slightly better performance could be linked to some concepts, calculations and content which appeared in some of the previous NCS question papers. Learners and teachers appeared to have had a clear idea of what to expect in the NSC papers.
- It seems that in Section A (short questions), there was a significant improvement in the performance of learners, which also contributed to the overall improvement.
- Some examination centres performed extremely well, with averages between 60% and 70%, while it is a concern that other centres did extremely poorly with averages below 30%.
- School-based factors that might have contributed to poor performances in certain centres are:
 - Teachers of Agricultural Sciences who have not been trained in the subject:** Such teachers might not be confident when dealing with the subject content and rely almost exclusively on the SAGs and Examination Guidelines to develop their teaching and learning programmes.
 - Quality and quantity of school-based assessment tasks:** Learners who are exposed only to the minimum number of formal school-based assessment tasks are severely disadvantaged, particularly if these tasks are of variable standard.
- It is apparent that most candidates struggled with data response questions and that they were unable to interpret graphs, tables, illustrations, pictures and diagrams.

- (f) For many candidates, language and terminology deficiencies are barriers to understanding and expression. Misinterpretation of questions was often evident.

General suggestions for improvement

- (a) Judging from the general performance of candidates in the 2012 paper, greater focus on the following practices should assist in improving the performance of learners in future papers:
- **Knowledge of practical situations:** Teachers need to broaden their knowledge and practical experience in certain areas of the curriculum so as to be able to expose learners to practical situations. For example, animal production (Q 3) requires candidates to understand the basic handling of farm animals and the facilities required; and animal health and protection (Q4) requires candidates to understand the different diseases, parasites and challenges. Teachers are advised to organise excursions (for learners) to expos, farms, research stations and agricultural organizations; to make use of publications such as *Farmer's Weekly*; to provide access to DVDs and other video material linked to the course content; and to involve learners in agricultural youth conferences or entrepreneurship programmes. These strategies would enable learners to acquire a broad perspective of agriculture in South Africa. Teachers are also advised to make use of the short courses on offer so as to broaden their knowledge of these topics.
 - **Alignment of school-based assessment tasks to NSC standards and exposure to different types of questions:** Teachers need to follow and interpret the work schedule correctly in order to spread the content evenly throughout the year. Teachers need to utilise the SAGs, Examination Guidelines and previous NSC examination papers, together with other available resource material, to prepare learners more effectively and to inform the development of teaching and assessment programmes. More intensive moderation of internally generated SBA are necessary carried out to ensure that they are of the required standard and in line with the guideline documents. Class tests and school-based examinations should be in line with the format, style, standard and level of difficulty of questions in NSC papers. Teachers must set tasks involving case studies, scenarios and short essays more often for application-type and interpretation-type questions. They must gain exposure to questions which link case studies to the subject content and questions which require interpretation of information so as to arrive at conclusions.
- (b) Teachers should refer to several available textbooks, although the learners might use only one. The different titles provide a good opportunity to expose teachers and learners to a wide range of activities.
- (c) Many learners still lack basic conceptual knowledge and teachers should use various approaches to expose and explain terminology and concepts to learners. Some resources other than textbooks should be used e.g. agricultural magazines. Learners should also be encouraged to follow television programmes such as *AgriTV* on SABC 2 and to develop a comprehensive understanding of concepts in the subject.
- (d) It is advised that learners in Agricultural Science include subjects such as Mathematics, Life Sciences and/or Physical Sciences and Accounting in their subject package because of the demands of the subject .

- (e) Teachers should expose learners to regular informal assessment tasks or activities that will improve their confidence in dealing with the subject content. Short, formative tasks can be marked by the learners themselves and it is arguably more effective for them to do so.
- (f) The setting of quality-assured common tasks on more challenging sections of the curriculum such as graphs and data response questions is advised at the cluster or district level.
- (g) Greater exposure to past NSC papers is likely to lead to improvement in the performance of candidates, but learners should be aware that they cannot prepare their responses in rote fashion as answers to previous questions will not necessarily apply if the questions are modified.
- (h) Teachers must ensure that learners are exposed to the language in which they will be writing the examination, as many learners struggle with reading, understanding and interpreting questions in their second language. Such learners also find it challenging to express their responses.
- (i) Learners should be exposed to simple science calculations involving percentages, ratios, conversions of decimals, mass, weight and length, as well as their respective units. Calculations are an integral part of the subject. It is recommended that a calculation be started with the formula/formulae given, then the correct substitution followed by the calculation and ultimately the correct answer. The final answer should also be re-checked, if time allows. Formative class tests on the calculations are advised.

3.3 Analysis of learner performance in individual questions

QUESTION 1: SHORT QUESTIONS (ANIMAL SCIENCES)

This question was generally answered well and reflected an improvement in performance in comparison to previous years. This was particularly evident in the multiple choice question (Q1.1), the matching items (Q1.2) and the replacement of underlined words (Q1.4).

Common errors and misconceptions

Only the question on terminology (Q1.3) was answered poorly by most candidates.

Suggestions for improvement

- (a) Learners need to be exposed to similar types of questions in their formal SBA activities (tests and examinations). This will continue to make them more comfortable with the expected format of questions.
- (b) It is clear that learners continue to struggle with terminology questions. Learners need to be tested informally on a regular basis on items from a glossary list to provide them with more exposure to the terminology.
- (c) Some learners still write their responses to this question in the answer book, even though a special answer sheet is provided. Learners should be exposed to using similar answer sheets in SBA tasks.

- (d) Short questions can be effectively practiced as formative class tests marked by the learners themselves.

QUESTION 2: ANIMAL NUTRITION

Most centres performed reasonably well in this question.

Common errors and misconceptions

- (a) A large portion of this question was devoted to the common calculations (Q2.4, Q2.5 and Q2.6) which are evident in all the previous NSC papers. Basic calculations that involve the nutritive ratio and Pearson Square method still caused serious challenges for the majority of candidates.
- (b) Many candidates were labelling and not selecting parts of the fore stomach (Q2.1.1) and confused requirements and functions of rumen microbes (Q2.1.2 and Q2.1.3).
- (c) Most candidates simply referred to nutrients in general and could not locate where these were absorbed (Q2.2.2), and defined a *villus* but could not state its suitability and adaptability (Q2.2.3).

Suggestions for improvement

- (a) Teachers need to be aware that inadequate preparation of learners for all the relevant calculations contributes significantly to the poor performances of candidates. Learners need to be exposed to similar examples in their SBA tasks. The calculations need to be practiced regularly with learners and they need to be exposed to different ways of doing the calculations.
- (b) Learners need to plan their learning well ahead of time as large volumes of content are linked to the topic of nutrition.
- (c) Subject advisors should conduct intervention workshops for teachers on this topic. These should be supported by team-teaching, lesson studies in cluster groups and classroom support visits.

QUESTION 3: ANIMAL PRODUCTION

Most candidates performed reasonably well in this question. Most candidates are now more adept at drawing graphs than their counterparts in previous years.

Common errors and misconceptions

- (a) This question was strongly linked to applications of knowledge, data response and practicalities in animal production. Many learners were not exposed to facilities, equipment and animal behaviour in this context and they consequently found some of these questions very challenging. Some candidates' responses were incorrect answers taken directly from the case study. This indicates that data response questions are proving challenging (Q3.4.1).

- (b) Most candidates failed to interpret the case study and therefore could not provide the production system that was asked (Q3.1.1).
- (c) Many candidates provided general ways of handling livestock and did not compare sheep to cattle (Q3.2.3).

Suggestions for improvement

- (a) Teachers should use excursions and DVDs to assist learners to understand concepts of a more practical nature.
- (b) Learners also need to be given scenarios and case studies to strengthen their skills with regard to this topic.
- (c) Teachers must encourage learners not to simply repeat information from the question, but to identify what is required by the question and to provide insightful comments in their responses.
- (d) Teachers are referred to the general overview of learner performance on this paper for suggestions concerning the alignment of school-based assessment tasks to NSC learning outcomes. Learners should be exposed to different types of questions. They should also be exposed to various LTSM resources so as to enhance their experience of practical situations.
- (e) Learners should be encouraged to read agricultural magazines, such as the *Farmers' Weekly* and other agricultural magazines, in order to enhance their grasp of the terminology used in connection with this topic.
- (f) Teachers should provide enrichment activities, particularly in the form of worksheets that would enhance reading and interpretation of data/information.
- (g) All types of graphs should be taught, with emphasis also on the interpretation thereof. Important aspects assessed when drawing a graph include the following:
- A correct heading;
 - Correct labelling of both axes and inclusion of units;
 - The correct type of graph and scale;
 - Values correctly plotted/indicated; and
 - Relevant keys.

QUESTION 4: ANIMAL REPRODUCTION, PROTECTION AND CONTROL

The performance of candidates in this question ranged from poor to excellent.

Common errors and misconceptions

- (a) Many candidates had problems with labelling diagrams and identifying the functions of each part of the diagrams.
- (b) Many candidates also experienced problems with the data response-type questions and were not able to identify relevant information from the material provided.
- (c) The question on external parasites was poorly answered (Q 4.3) indicating this topic has been neglected in many centres. This is probably because external parasites had not been covered in recent NSC papers.
- (d) Most candidates failed to interpret the graph and could then not provide the evidence for fertilisation (Q 4.2.3).

Suggestions for improvement

- (a) Teachers should provide diagrams when setting formative assessment tasks in which learners need to label parts. The diagrams required for the topics related to this question could be found in the different textbooks or be downloaded from the internet. It is important to expose learners to different types of diagrams and not only the diagrams found in their textbook.
- (b) Labelling skills can be developed through short formative tests which could be marked by the learners themselves.
- (c) Learners need to be exposed to more data response questions through worksheets and case studies. There are also several appropriate questions from past NSC papers that can be used in this regard.
- (d) Some learners did not complete the questions and this indicates that they had not managed their time effectively.
- (e) In teaching the section on reproductive organs, charts, pictures and diagrams from a variety of resources should be used to reinforce and enhance understanding. Learners must understand how to distinguish between, and describe functions and adaptations of, the various organs.
- (f) Graphs form an integral part of learner assessment in this topic. Learners need to be able to interpret and draw graphs. This skill is developed through regular practice.

3.4 Overview of Learner Performance for Paper 2**General comments**

- (a) Generally, the performance of the candidates in this paper was better than that of previous years. Basic Agricultural Genetics (Q4) posed a serious challenge to many candidates and problems with basic concepts in this regard persist.

- (b) Question 1 (Section A) was the best-answered question in Paper 2. While most candidates performed well, with a few cases of exceptionally good work, weaker candidates revealed a lack of understanding of content terminology in basic genetics.
- (c) In most cases, candidates performed poorly in data response questions. They struggled with interpretation of case studies, tables, illustrations and diagrams. Deficiencies in calculations may be attributed to candidates' unfamiliarity with formulae.
- (d) Because of the nature of the paper, a significant amount of reading was required, which caused problems for many candidates.
- (e) Candidates writing the examination in a language other than their home language tend to experience difficulty in interpreting questions. They also find it challenging to phrase their responses.

General suggestions for improvement

- (a) Teachers are advised to do more than the minimum number of school-based assessment tasks that comprise the formal requirement, because learners require additional practice in answering more lengthy questions.
- (b) Teachers should make use of previous NSC question papers as a guide to the required standard for SBA tasks. Many of these questions could be adapted for assignments, which would also assist learners to prepare for the NSC examination.
- (c) The suggestions for improvement reflected in the overview of Paper 1 apply equally to Paper 2. Refer specifically to the points relating to visual LTSM resources, exposure to practical situations, mathematical calculations and terminology.
- (d) Suggestions, specifically in the context of Paper 2, are as follows:
- **Effective use of formative assessment tasks:** Learners need to be taught how to answer the different types of short questions, and should practice the answering of different types of questions in formative class tests and examinations.
 - **Coverage of curriculum content:** Teachers need to pace the coverage of content so that this can be completed prior to the start of the preparatory examination, and leave sufficient time for revision thereafter.
 - **Coping with demands of reading:** Teachers should expose learners to different types of longer questions that involve more reading. It is clear that learners battle with case studies, scenarios and data response questions. It is imperative that learners engage with previous NSC question papers from the beginning of the Grade 12 year so that they are familiar with the applicable format and style. This will relieve pressure towards the end of the year when time is limited.

3.5 Analysis of learner performance in individual questions

QUESTION 1: SHORT QUESTIONS (AGRICULTURAL MANAGEMENT AND GENETICS)

This question was generally well answered; particularly the multiple choice (Q1.1) and the matching columns (Q1.2) questions.

Common errors and misconceptions

- (a) The question on terminology (Q1.3) was generally poorly answered by most candidates.
- (b) The question on replacing underlined words (Q1.4) was also poorly answered by most of the candidates, which is also indicative of problems with terminology.

Suggestions for improvement

- (a) Learners need to be exposed to similar types of questions in their formal SBA activities (tests and examinations). This will continue to make them more comfortable with the expected format of the question.
- (b) It is clear that learners continue to struggle with terminology questions. Learners need to be tested informally on a regular basis on items from a glossary list to provide them with more exposure to the terminology.
- (c) Some learners wrote their responses to this question in the answer book. They might not have been used to answer sheets. Teachers are therefore advised to use answer sheets for school examinations in the course of the year. The following suggestions are made in the context of this question:
 - It is important to remember that only the most correct answer is accepted in a multiple choice question. Learners need to take note of this and not choose the answer that appears to be correct at first glance.
 - In order to get used to marking the correct answer with an X, learners need to be exposed to the same answer sheet format as that which is used in the NSC examination.
 - Since learners still struggle with the matching of items in the two-column question format, teachers should expose learners to this type of format in their informal class tests.

QUESTION 2: AGRICULTURAL MANAGEMENT

This question was generally poorly answered. The question allowed for many open-ended answers and the marker had to identify alternative valid responses that were not necessarily anticipated in the marking guideline.

Common errors and misconceptions

- (a) Most candidates performed poorly in this question. There were some centres that still could not cope with some of the questions that referred to marketing elements and management concepts (Q2.1).
- (b) Many candidates struggled to interpret the demand and supply graph in question 2.4, and did not understand the inelasticity of supply.
- (c) Many poor performances in the paper as a whole might be attributable to inadequate preparation of material related to this question.

Suggestions for improvement

- (a) Teachers are encouraged to expose learners to all possibilities related to the demand and supply graph, and the elasticity of demand and supply that is visible in these graphs should be explained.
- (b) Teachers should ensure that there is a comprehensive understanding of formulae and correct calculations.
- (c) It seems some candidates were not adequately prepared for the content topics linked to this question. Learners need to plan their learning well ahead of time as large volumes of content are also linked to this question.
- (d) Teachers should expose learners to all the marketing concepts that are linked to agricultural products.
- (e) Teachers need to be careful to focus on all aspects of the content that are listed in the Examination Guidelines. There might be topics which have not been covered in recent question papers, but they remain important content topics.
- (f) Regarding the responses to open-ended questions, teachers are advised to expose learners to these types of questions in the classroom and encourage them to be creative in thinking of valid responses. However, teachers must make learners aware that their responses must be valid, based on fact and in line with the requirements of the question. Open-ended questions can be obtained from previous NSC papers and can be developed from media articles.

QUESTION 3: PRODUCTION FACTORS AND MANAGEMENT

Most of the centres and learners performed well when answering this question.

Common errors and misconceptions

- (a) Many candidates found it difficult to identify the specific problem related to capital and the correct production factor from the diagrams that were given.
- (b) Many candidates could not identify and explain the given financial statement. They also experienced difficulty when defining and calculating the net value of the enterprise based on this statement.
- (c) Many candidates simply repeated some of the data in the case studies, which was not necessarily linked to the specific requirements of the question.

Suggestions for improvement

- (a) Teachers should refer to suggestions made earlier in this report, particularly with regard to dealing with the reading required, terminology, language, concepts, graphs, use of previous NSC papers and exposure to different types of questions, and case studies.
- (b) Teachers are advised to train learners in specifically identifying what is required in a question. If this is done before the learners start writing class tests, the problem of learners not addressing exam questions should be reduced.
- (c) Case studies, diagrams and scenarios need to be included in assessment tasks given to learners during the school year, in order to expose them to activities which would improve their skills in answering these types of questions. These interventions could assist in improving reading and understanding skills, application of knowledge, and awareness of how to follow instructions.
- (d) Subject advisers should use workshops that are linked to these topics to strengthen the knowledge and skills of teachers and to avoid possible content gaps.

QUESTION 4: BASIC AGRICULTURAL GENETICS

Performance on this question was poor as this type of question has received significant attention in the past.

Common errors and misconceptions

- (a) Many candidates could not calculate the response rate as a percentage from the given data on the graph (Q4.1). This reflects a lack of the skill needed to deduce and interpret facts correctly.
- (b) Many candidates struggled with the calculations of the phenotypic ratios and could not use the Punnett square to indicate the genotypes of the parents.
- (c) Some candidates found it difficult to understand basic concepts like heritability and the index value.
- (d) The crossing of the two incomplete dominant parents posed a challenge to some of the candidates.
- (e) Some candidates had obviously prepared their responses based on previous NSC questions. However, this was often inappropriate as the responses did not necessarily meet the requirements of the question in the 2012 paper.

Suggestions for improvement

- (a) Teachers should give special attention to basic crossing, genetic concepts and terminology in their teaching of this topic.
- (b) Teachers need to strengthen the learners' ability to do the calculations that deal with percentages, fractions, and ratios of the phenotype and genotype of the parents and their offspring in a crossing. This can be done by using worksheets and other formative assessment tasks that the teacher could provide.
- (c) Specific classroom attention needs to be devoted to selection methods and techniques. These, together with the different methods of improving the condition of animals with the focus on aim, advantages and disadvantages, must be clearly explained to and illustrated for learners.
- (d) Subject advisers should design workshops to address shortcomings in the content knowledge related to genetics.
- (e) Teachers must inform learners that while it is good preparation to make use of past NSC papers, the responses to past questions will not necessarily suit a question in a future paper if the context of the question is modified. Learners should be discouraged from providing responses learnt by rote without judiciously assessing whether the response is fully valid or not.
- (f) The following suggestions should improve performance in this area:
 - The teaching of genetics could be enhanced by providing practical examples within the learning site, such as plants, flowers and livestock.

- There should also be integration with Life Sciences, as genetics is taught comprehensively in Life Sciences.
- Key to mastering basic genetics is the understanding of terminology. Learners should be able to describe concepts and provide practical examples to illustrate them. Refer above for suggestions about enhancing learners' grasp of terminology.

CHAPTER 4

BUSINESS STUDIES

The following report should be read in conjunction with the Business Studies question paper of the November 2012 Examination.

4.1 Performance trends (2009 – 2012)

The performance of candidates in the 2012 Business Studies examination reflects a slight decline in achievement. There was a 1.2% decrease in the percentage of learners who achieved 30% and above, and a 2.5% decrease in the percentage of learners who achieved 40% and above in 2012 compared to 2011.

Table 4.1: Overall achievement rates in Business Studies

Year	No. wrote	No. achieved at 30% and above	No. achieved at 30% and above	No. achieved at 30% and above	No. achieved at 30% and above
2009	206 553	148 469	71.9%	96 487	46.7%
2010	200 795	142 742	71.1%	92 259	45.9%
2011	187 677	147 559	78.6%	104 027	55.4%
2012	195 507	151 237	77.4%	103 470	52.9%

Figure: 4.1 Overall achievement rates in Business

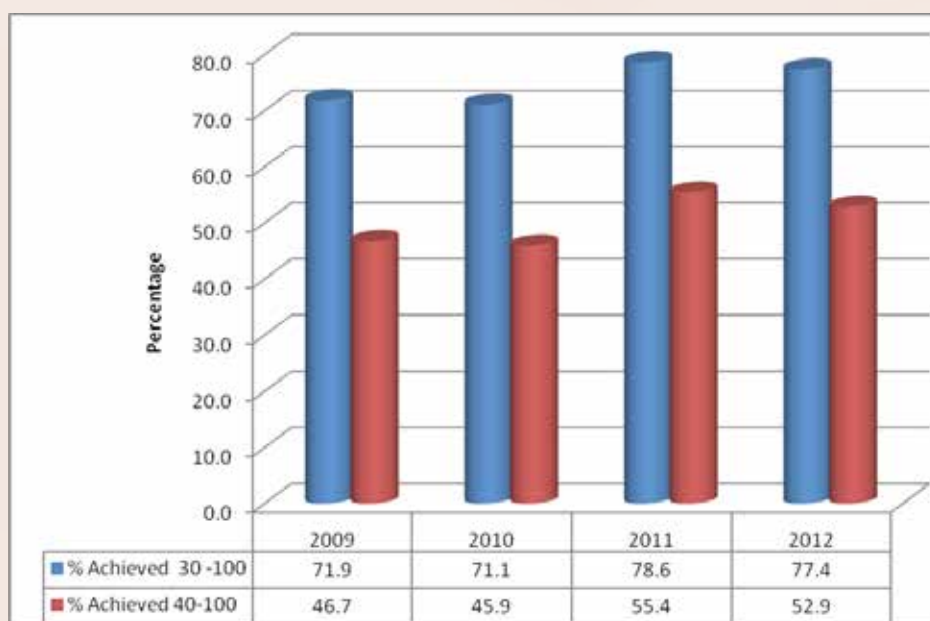
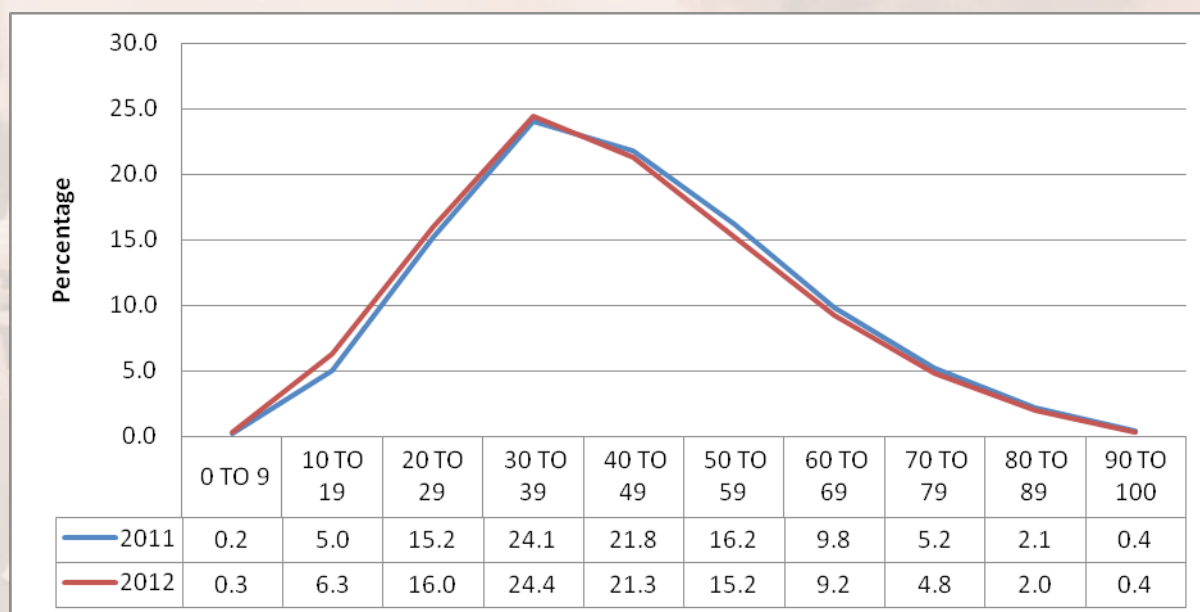


Figure 4.2 Performance distribution curves (Business Studies: 2011 – 2012)



In 2012, there was an increase in the percentage of candidates who performed at 0 - 29% compared to 2011.

4.2 Overview of learner performance

General comments

- (a) Many candidates misinterpreted questions. Instructions such as differentiate, evaluate, interpret and analyse were problematic to many learners.
- (b) Candidates performed quite well in Section A (short questions) and there was a general improvement in Section C (essays) compared to the previous years.
- (c) Many candidates studied previous NSC essay questions with memoranda and then attempted to answer questions in the current NSC paper based on the previous memoranda. As a result some examples, comments and recommendations that were made by the candidates, did not befit the prescribed question.

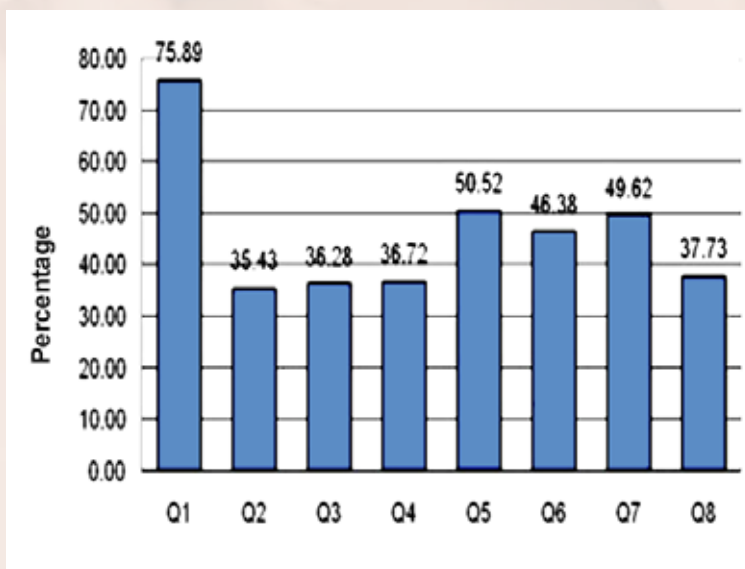
General suggestions for improvements

- (a) Teachers should ensure that learners engage with topics in the prescribed content. Regular class tests and informal assessment can help teachers to achieve this objective. Teachers must rigorously analyse the assessment standards to ensure that they cover all relevant content. When assessing learners on specific assessment standards, teachers should make use of the Examination Guidelines which will enable them to ensure that the core content is taught and assessed.
- (b) After presenting a specific topic to learners, teachers must use previous NSC examination papers and provide learners with practice questions related to each topic. This way the learners will accumulate resource material to assist them in preparing for the NSC examination and will be able to identify key words through regular use of typical exam questions.

- (c) It is important for learners to practice essay questions in the classroom. In doing so, teachers must emphasise the layout, analysis, synthesis and originality (LASO) aspects of a good Business Studies essay as well as provide practical examples to illustrate points, thereby achieving marks for originality. Teachers ought to read the “Instructions to Markers” in the memorandum of the NSC examination of 2012. This reflects the importance of a proper “introduction” and “conclusion” of a Business Studies essay and the method of marking recommended for 2013.
- (d) Teachers must use previous NSC examination papers for revision, but they must be creative in developing formative assessment tasks to expose learners to different ways in which a specific topic can be asked.

4.3 Diagnostic question analysis

Figure 4.3: Average mark per question expressed as a percentage



Q1	Compulsory (Multichoice, Choosing correct words and matching columns)
Q2	Business environments, business ventures and business operations
Q3	Business environments, business roles and business operations
Q4	Business environments, business ventures, business roles and business operations
Q5	Corporate social investment
Q6	Investments
Q7	Ethics
Q8	Induction and basic conditions of Employment Act

4.4 Analysis of learner performance in individual questions

SECTION A: MULTIPLE CHOICE/SHORT ANSWER QUESTIONS

QUESTION 1: COMPULSORY (MULTIPLE CHOICE, CHOOSING CORRECT WORDS AND MATCHING COLUMNS)

This question was well answered. The majority of candidates achieved 60% or above.

Common errors and misconceptions

- (a) In Q1.1.1, candidates could not identify an example of horizontal integration. One of the reasons could be that some textbooks do not cover business strategies and therefore, this work may not have been covered in class. Another possible reason is that the learners were not given examples of the different types of business strategies.
- (b) In Q1.1.7, the candidates did not know the contents or focus of King Code III. This is a relatively new topic which is not covered in many textbooks.
- (c) Q1.2.1 was poorly answered by some candidates who confused *product development* with *market development*.
- (d) Q1.2.2 contained the terms “prime/repo” which seemed to be unknown to many candidates.
- (e) Q1.2.3 revealed a lack of understanding of problem-solving techniques.
- (f) In Q1.2.5, some candidates could not define what a job description or job specification is.

Suggestions for improvement

- (a) Teachers ought to cover all the different business strategies as indicated in the Examination Guideline, and should give practical examples of each strategy to learners.
- (b) With regard to King Code III, if this is not covered in the textbook used, teachers should use the Examination Guideline as a starting point for class teaching and link this to practical examples and case studies that cover professional business behaviour. Teachers must ensure that the learners are able to apply the King Code to specific corporate governance situations.
- (c) With regard to *product development* and *market development*, practical examples should be used when teaching these concepts. Assessment tasks should focus on the relationship between theory and practice.
- (d) With regard to the question (1.2.2) on prime/repo rates and investments, teachers must give learners more background information on areas such as the different interest rates and the leading role-players in the SA economy, for example the President of the Reserve Bank.

- (e) With regard to problem-solving questions, techniques (for example Delphi, Force-field, Scamper, Empty-chair techniques) should be thoroughly revised in Grade 12 so that gaps are identified at an early stage, particularly on topics taught in Grade 11. Teachers should ensure that a variety of scenarios is covered so that learners are able to differentiate between different techniques.
- (f) Teachers must make a point of covering all essential basic definitions of basic business concepts as this forms the basis to all knowledge in Business Studies. This type of question is a common feature of a well-set question paper. Definitions of concepts can be reinforced through regular, short formative tests.

SECTION B: LONGER AND PARAGRAPH QUESTIONS, USING CASE STUDIES AND INFORMATION

QUESTION 2: BUSINESS ENVIRONMENTS, BUSINESS VENTURES AND BUSINESS OPERATIONS

This question was poorly answered. Most candidates earned very low marks.

Common errors and misconceptions

- (a) Most sub-questions needed a discussion from the candidates, which they were unable to do. Applying knowledge remains a problem. This was particularly evident in the questions on the specific Acts, where they had to justify, evaluate and examine.
- (b) In Q2.1, the candidates' responses were based on handling and presentation rather than how a presenter should handle feedback and respond to questions after a presentation.
- (c) In Q2.2, the candidates confused the question on SETAs with the Skills Development Act and repeated themselves considerably in their responses.
- (d) In Q2.3.1, the candidates did not understand the difference between sectors and business environments.
- (e) In Q2.3.2, the majority of candidates could not respond accurately to the question on "evaluation of strategies". They repeated their responses considerably and referred to "strategy formulation" which was not asked.
- (f) The candidates answered Q2.3.3 poorly. They could not identify the challenges and also had a problem identifying a possible strategy. They appeared to be unable to apply the PESTLE model.
- (g) In Q2.4.1, many candidates could not calculate the compensation. Therefore, they could not give the motivation why the customer would receive a specific amount.
- (h) In Q2.5, many candidates could not attempt higher cognitive level questions on evaluating the impact of the EEA and could not propose how the government can contribute to the implementation of the EEA.

Suggestions for improvement

- (a) With regard to answering paragraph-type questions, teachers should make use of specific questions from past NSC papers to guide learners on how to identify the specific requirements of each question and how to structure an appropriate response.
- (b) With regard to presentations, teachers ought to ensure that learners understand the different phases of a presentation, that is to say, preparation, actual presentation and feedback.
- (c) SETAs are very important in South Africa and must be covered as this is specifically required in the Examination Guideline.
- (d) These two concepts (sectors and environments) are being taught from Grade 10 and teachers must ensure to reinforce these basic concepts on a daily basis using short formative tests.
- (e) Teachers should ensure that learners know the difference between steps in formulating strategies and evaluating strategies. Case studies should be used to illustrate the difference between formulating and evaluating.
- (f) Teachers must deal with all models to evaluate the extent of control over business environments. Focus needs to be placed on models such as SWOT analysis, PESTLE, Porters Five Forces and Balanced Score Cards. Teachers must be aware that not all textbooks contain the content of these models. Case studies should be provided to learners to gain practice in applying these models.
- (g) There are only a few calculations that learners must be able to do and it is important that teachers give learners practice in these kinds of calculations. Questions regarding calculations can be found in old NSC question papers and teachers can make use of these for informal and formal assessment.
- (h) Teachers should focus more on pages 9, 10, 23 and 24 of the Examination Guideline when teaching the various Acts. The Guideline gives a clear indication of the content to be covered and the details of what the learners must be able to do.

QUESTION 3: BUSINESS ENVIRONMENTS, BUSINESS ROLES AND BUSINESS OPERATIONS

There is often a tendency for candidates to ignore some words in this question. They were selective in what they chose to respond to, resulting in poor marks or no marks at all in the sub-questions.

Common errors and misconceptions

- (a) In Q3.1, candidates were expected to respond on the grievance procedure on unfair dismissals. Candidates gave general responses and were unable to apply knowledge.
- (b) With regard to Q3.2.2, most candidates explained the autocratic style instead of referring to situations where it can be applied successfully.

- (c) Understanding Business Studies concepts was a challenge to the candidates: especially the difference between a manager and a leader (Q3.3) and the difference between mediation and arbitration (Q3.4). Most Afrikaans candidates were misled by the term "*mediasie*".
- (d) In response to Q3.5, many candidates did not write full sentences. An answer such as "Trade unions protect workers" is not a full sentence and is not a complete fact that would earn full marks.
- (e) Most candidates did not understand Q3.6 which is on quality of big and small businesses. This forms the last part of LO4 and it appears that some teachers concentrated only on the quality of business functions and not on the mentioned topic.
- (f) It appears that the National Credit Act, covered in Q3.7 is still not dealt with in all classes. Some candidates could answer the question, while others focused on implications of this Act on the customer instead of on the business.

Suggestions for improvement

- (a) Teachers should use more practical scenarios (from daily newspapers) when teaching conflict and grievance procedures.
- (b) Teachers should not focus only on the characteristics of a leadership style, but also on the application of the leadership style in certain situations. Examples and case studies or scenarios should be used.
- (c) In distinguishing between the concepts of leadership and management, teachers must require learners to compare specific aspects of the roles. For example, if the role is to set goals, then managers' and leaders' roles in setting goals must be compared. The best way to do this is in table form instead of answering in paragraphs. Teachers must also ensure that learners know the distinction between "similarity" and "difference". Both mediators and arbitrators helped conflicting parties to resolve the dispute/conflict. This is a similarity. The difference is that during mediation, the third party helps the conflicting parties to reach agreement or suggests possible solutions. Teachers teaching in Afrikaans must teach the synonyms of words like "*mediasie*" and "*bemiddelling*".
- (d) Learners must be specific as to what it is that workers are protected against. An answer which states that "trade unions organise strikes" is too vague. Learners must be guided in writing full sentences. Preferable answers would be: "trade unions protect worker rights/workers from unfair treatment" or "trade unions organise legal strikes as a final resort to get the employer to give in to their demands".
- (e) Teachers should ensure that learners understand the instruction "*examine*". More attention must be given to key verbs/instructional words that may appear in questions. Teachers should use practical examples when dealing with quality in business. Teachers teaching in Afrikaans must teach the synonyms of words like "*kwaliteit*" and "*gehalte*".

- (f) The National Credit Act must be covered in class. Teachers should use the many cases appearing in newspapers as practical examples of the application of this Act. Information may be obtained from Government departmental websites. Teachers are also referred to the November 2011 NSC paper for another example of a question and memorandum on this topic which may be used in class.

QUESTION 4: BUSINESS ENVIRONMENTS, BUSINESS VENTURES, BUSINESS ROLES AND BUSINESS OPERATIONS

Performance in this question was below average.

Common errors and misconceptions

- (a) In Q4.1, the candidates confused the functions of workplace forums with that of trade unions.
- (b) The candidates did not know the meaning of “*preferential procurement*” in Q4.2.2 and instead quoted answers directly from the case study provided.
- (c) Q4.3 was answered vaguely. Some candidates did not know how contributions are made to the UIF for employers and employees.
- (d) In Q4.4, the candidates did not know the difference between the “company” as a form of ownership and that of a general business.
- (e) Numerous candidates misinterpreted Q4.5. They assumed that punitive and legal matters should be covered in their answer. This is not the case as the question clearly refers to how the manager can ensure the wellbeing of the employee. The employee is still working in the business and the manager wants to assist with his wellbeing.
- (f) Q4.6 required four types of conflict to be analysed for 12 marks. Many candidates provided only phrases instead of giving a heading and an explanation for each type.

Suggestions for improvement

- (a) Teachers should ensure that they cover both workplace forums and trade unions in lessons, and that they also highlight the difference between the two. Focus should not only be on the unions. Workplace forums should be covered as a conflict management skill (LO3 AS6) and trade unions as part of industrial relations (LO4 AS5).
- (b) Learners need to understand the concept of preferential procurement clearly, as it is a very important part of BBBEE. Teachers must spend more time on BBBEE with practical examples that can be found in daily newspapers.
- (c) Teachers should ensure that learners know that there is a 2% contribution made to UIF. The employer contributes 1% and the employee also contributes 1%.

- (d) Teachers should use this specific question when teaching this topic to the learners in future. Focus should be placed not only on the general characteristics of the forms of ownership but also on the characteristics of each form of ownership individually.
- (e) Teachers need to guide learners in understanding that there is a difference in the measures that can be applied to ensure the wellbeing of employees. Teaching must cover both punitive and non-punitive measures as well as legal matters outside the business if the employee has already been fired.
- (f) The Examination Guideline document (page 21) clearly states that learners must make a detailed study of the types and causes of conflict. It is important to note that not all textbooks contain content on the types of conflict.

SECTION C: ESSAY QUESTIONS (LEARNERS HAD TO ANSWER ANY TWO OF THE FOUR QUESTIONS)

QUESTION 5: CORPORATE SOCIAL INVESTMENT (CSI)

This was the most popular essay question answered by the candidates.

Common errors and misconceptions

- (a) Many candidates did not structure the question. They confused the nature and purpose of CSI under one heading or simply combined their answers on both of these aspects.
- (b) Instead of focusing on CSI, some candidates discussed general social economic issues in detail, for example HIV/AIDS, poverty and gambling.
- (c) Most candidates omitted the part on implementation of CSI by businesses.
- (d) Not all candidates knew that “*impact*” meant they had to discuss the benefits and problems/disadvantages of CSI.
- (e) Many candidates achieved limited marks for LASO. Most of them did not clearly indicate their introduction and conclusion, despite this being a normal requirement of the subject.

Suggestions for improvement

- (a) Teachers should ensure that learners understand the required structure for essays required in Section C. Teachers must explain to learners the importance of correct sub-headings that should be used. These should be underlined as well.
- (b) Teachers should focus more on Section C essay-type questions in the classroom, and should ask learners to do at least one such question per week. This will help the learners to analyse or ‘unpack’ the question and give them experience in responding specifically to the verbs in the question.

- (c) Teachers should guide learners in analysing the requirements of each question. This will help ensure that they do not omit any crucial aspect in their answers.
- (d) Teachers are advised to make use of a glossary which can be displayed in the classroom to reflect commonly used terms in the subject. For example, words such as 'impact', 'benefit', 'advantage', 'problem' and 'disadvantage' should be used regularly in lessons and tests.
- (e) When requiring learners to practice essay questions in the classroom, teachers must continually reinforce the basic layout of a good Business Studies essay as well as the practical examples to illustrate points, thereby achieving marks for originality.

QUESTION 6: INVESTMENTS

Very few candidates answered this question even though easily-obtainable marks were on offer in this question. Those candidates who knew the content on investments fared very well, but unfortunately the general performance was poor.

Common errors and misconceptions

- (a) The poor performance of this question implies that the topic is neglected in many centres.
- (b) The scenario refers to a partnership that wants to increase its wealth and capital by investing some of the business income. Many of the candidates concentrated their answers on partnerships and other forms of ownerships instead of investment.
- (c) The first part of the question regarding the factors to be taken into consideration was not well answered. Some candidates who attempted the question neglected to answer this part.
- (d) Vague answers were often provided for the explanations of the five types of investment required in the question and the risk factor applicable to each type of investment.
- (e) Candidates did not interpret the different aspects of the question correctly thereby losing marks for analysis.

Suggestions for improvement

- (a) Teachers ought to cover investments in detail and refer to the Examination Guidelines (page 15) for the specific requirements.
- (b) Teachers should guide learners in analysing the requirements of each question. This will tend to ensure that they do not omit any crucial aspect in their answers.
- (c) Teachers are advised to make use of a glossary which can be displayed in the classroom to reflect commonly used terms in the subject. For example, words such as 'evaluate' should be used regularly in lessons and tests.

- (d) In planning lessons, teachers should incorporate practical tasks on a topic immediately after explaining or presenting the topic to a class. This will assist in ensuring that learners focus on the specifics of the topic.
- (e) When requiring learners to practice essay questions in the classroom, teachers must emphasise the LASO aspects of a good Business Studies essay as well as the practical examples to illustrate points, so that learners achieve marks for originality.

QUESTION 7: ETHICS

Most learners answered this question; however, performance was generally very poor.

Common errors and misconceptions

- (a) A number of candidates failed to analyse the question. Instead of focusing on the required ethical challenges, they covered all the challenges to ethical behaviour, for example pricing in rural areas and sexual harassment.
- (b) Most candidates who attempted this question could not offer comments on price-fixing. This is probably because price-fixing is not specifically mentioned in the Examination Guideline. However learners were expected to identify an issue such as this as being an unethical practice and to offer valid comments.
- (c) Most candidates confused price-fixing with pricing of goods in rural areas. Candidates who wrote in Afrikaans also did not know the synonym of “*prysknoeiery*”.
- (d) Abuse of working time was confused with provisions of the Basic Conditions of Employment Act (BCEA) which contains sections regarding payment for overtime.
- (e) Candidates did not address both aspects of the question for example evaluation/description and a recommendation or solution to the ethical issues relating to abuse of working time.

Suggestions for improvement

- (a) Teachers should guide learners in analysing the requirements of each question. This will tend to ensure that they do not omit any crucial aspect in their answers.
- (b) It is not possible for the Examination Guidelines to list every unethical practice, but if learners understand the basic nature of ethical and unethical practices, they should be able to deal with scenarios that might be unfamiliar to them. Teachers are advised to keep up-to-date through the media on new unethical practices, and expose learners to a variety of these in class either through discussion or by way of formative tasks.
- (c) It is important that teachers focus on areas that can cause confusion to learners such as the distinction between *price fixing* and pricing in rural areas. Teachers teaching in Afrikaans must teach the synonyms of words like “*prysvasstelling*” and “*prysknoeiery*”.

- (d) Teachers must guide learners in analysing the requirements of each question. This will help to ensure that they do not omit any crucial aspect in their answers.
- (e) Teachers must ensure that they do not simply cover the nature of an unethical practice but also ask learners to think creatively about practical solutions to each problem. Case studies and class discussions can be used gainfully in this regard.

QUESTION 8: INDUCTION AND THE BASIC CONDITIONS OF EMPLOYMENT ACT (BCEA)

This was the least popular question in Section C. It was answered rather poorly.

Common errors and misconceptions

- (a) Candidates' responses were mostly on human resource processes instead of induction process. Candidates lacked information on the induction process.
- (b) The sub-question on the BCEA was answered relatively better but some candidates did not relate their responses to the financial manager. Many candidates did not know that some of the conditions in the BCEA do not apply to managerial positions, for example overtime, working hours, working on Sundays and Public Holidays.

Suggestions for improvement

- (a) Teachers should ensure that they teach all aspects covered in the assessment standard (LO4 AS3). The Subject Assessment Guidelines and Examination Guideline should be used when developing lesson plans so as to ensure that relevant content and context is taught.
- (b) With regard to the BCEA, networking amongst teachers is highly recommended. Teachers should also use various sources of information to illustrate practical aspects and understanding of the content.
- (c) Teachers should keep abreast with current news pertinent to aspects of Business Studies and discuss them with learners.
- (d) Teachers should use exam language in class and use old examination papers to set control tests.

CHAPTER 5

ECONOMICS

The following report should be read in conjunction with the Economics question paper of the November 2012 Examination.

5.1 Performance trends (2009 – 2012)

In 2012, as compared to 2011, there was an increase in the percentage of candidates who achieved at 30% and above and at 40% and above levels.

Table 5.1: Overall achievement rates in Economics

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	153 522	109 955	71.6%	47 969	31.2%
2010	147 289	110 824	75.2%	68 164	46.3%
2011	133 358	85 411	64.0%	44 205	33.1%
2012	134 369	97 842	72.8%	61 452	45.7%

Figure 5.1: Overall achievement rates in Economics

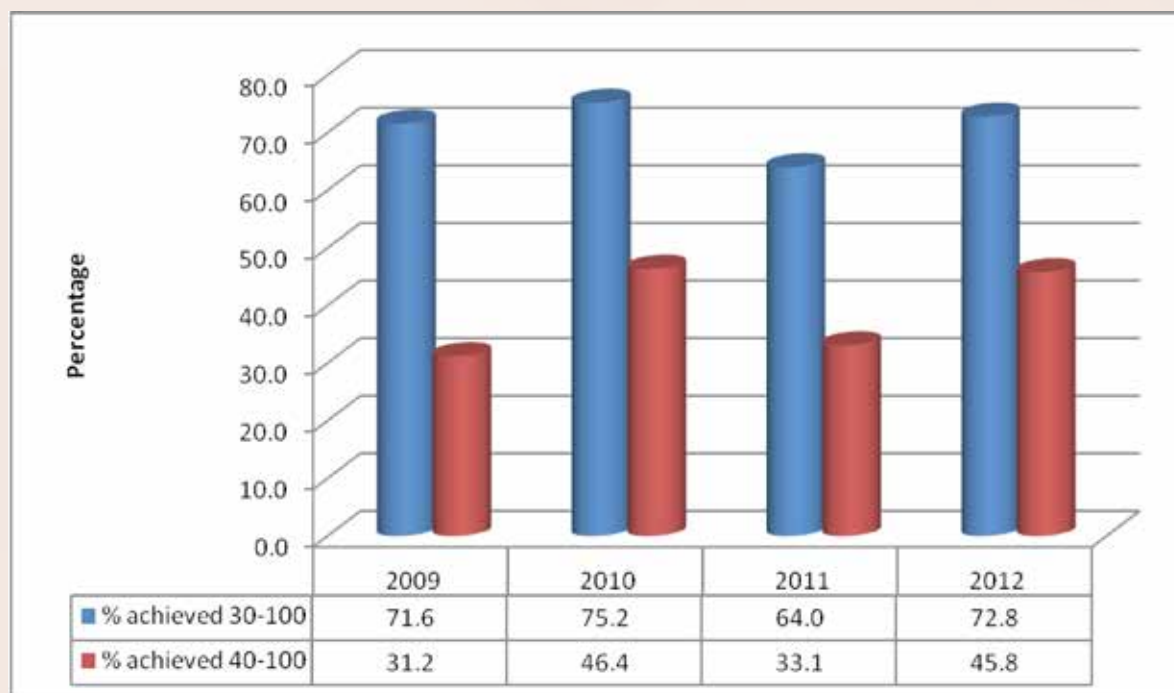
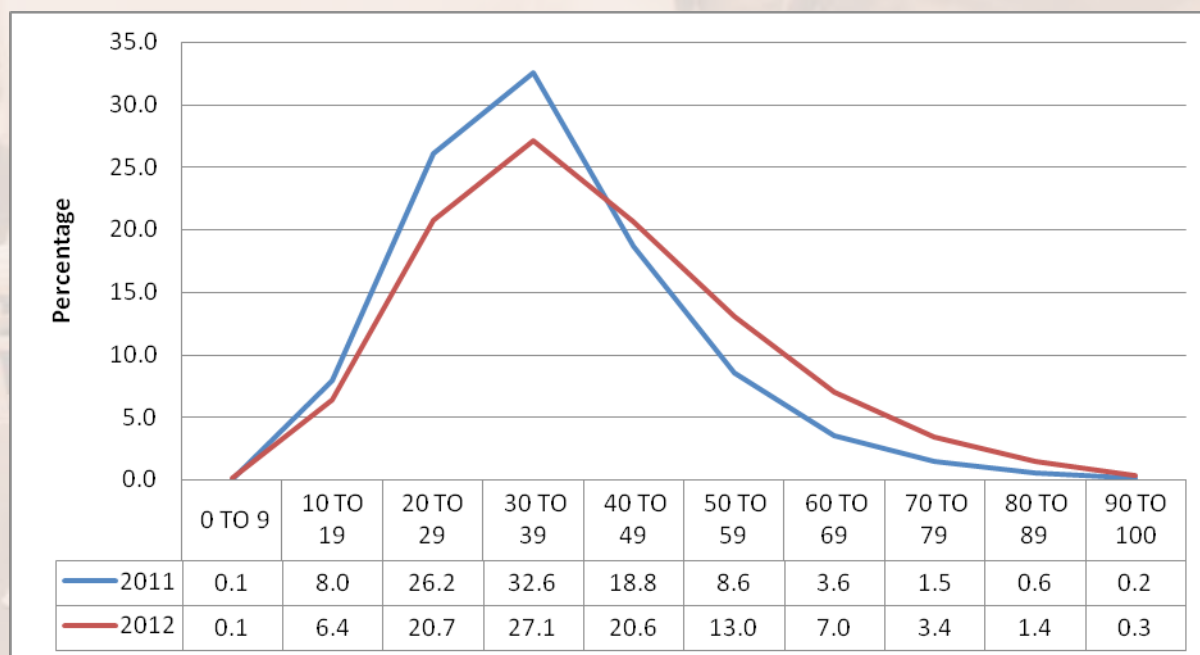


Figure 5.2: Performance distribution curves (Economics: 2011 – 2012)



There was a decrease in the percentage of candidates that performed at 0 - 39% in 2012, compared to 2011; and an increase in the percentage of candidates that performed between 40% and 100%.

5.2 Overview of learner performance

General comments

- (a) The performance of candidates reflected a general improvement. It is clear that in many centres candidates used previous question papers to prepare themselves more thoroughly for the 2012 paper. Many teachers showed dedication in teaching the more difficult topics, and with noticeable success (see question 8, where learners were asked to draw a graph on profit over the long term for the perfect competitor or the monopolist). The much needed *Mind the Gap* initiative from the DBE supplied uniformity in factual content that benefitted candidates in general, and specifically those who needed to achieve the 30% or 40% level of pass. It is clear from the results which candidates were supplied on a daily basis with extracts, news articles and graphs or figures.
- (b) It is however clear that many centres did not make use of the eight available previous papers to prepare their learners. Owing to the big literacy problem, many candidates lack comprehension and interpretation skills. This is evident in the answers they provided on the different data response questions (Section B) and the lack of planning in writing an essay (Section C). Candidates should be able to deal with small changes to the question paper (see question 1.2 that involves basic subject terminology). The poor quality of answers in many centres indicates that problems still exist in the teaching and learning processes.
- (c) Easier sub-questions were spread across all questions to enable the weaker candidate to engage with every question.

- (d) Judging from the performance of candidates in the 2012 paper, the general improvements tend to result from the following:
- **Content coverage:** Centres with increased pass rates have produced candidates who were exposed to the entire syllabus. These candidates made sound choices between questions in Section B and Section C, where there were options from which to choose.
 - **Exposure to different types of questions:** A skilled Economics learner is someone who writes essays and paragraphs and offers her or his opinions with confidence on a daily basis. The role of the teacher is crucial to the preparation of the learner to respond to a variety of questions. Teachers should use a variety of strategies in order to unlock knowledge.
 - **Language ability:** Language deficiency is still a major drawback for many second- and third-language learners, but many centres in deep rural areas have excellent results compared to others whose circumstances are similar but which do not produce a single pass. Teaching should take place in such a way that the learners understand the content. Examples of higher-order questions should be discussed in the immediate context of the subject content being taught. Learners should understand how and why they should answer a specific question in a specific way.

General suggestions for improvement

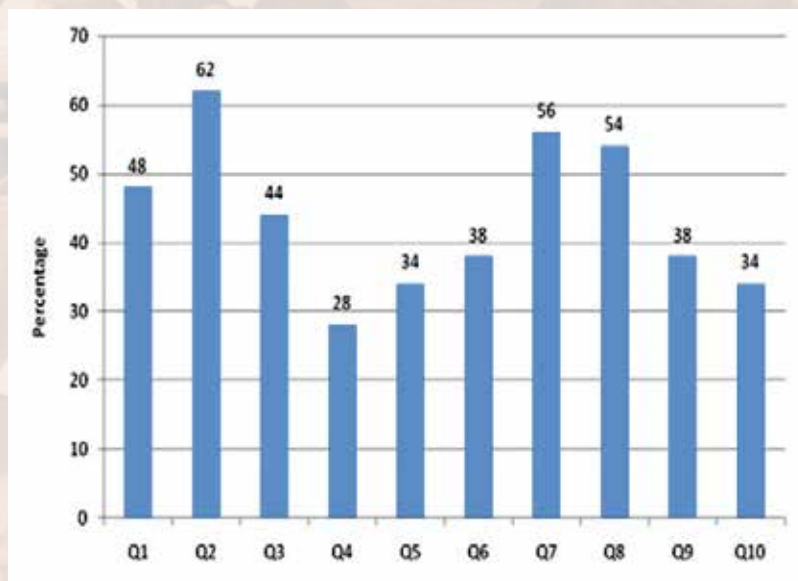
Teachers are advised to build the following practices into the work plan for the year:

- (a) **Use of past NSC papers:** In preparation for the 2013 year-end paper, every learner should have access to five NSC November papers and five NSC supplementary papers. Teachers should build their own confidence in their ability to deal with each topic in the classroom situation and to assist learners through their teaching.
- (b) **Basic concepts:** Teachers should ensure that learners understand and are able to explain the essential basic concepts and terminology applicable to Economics. More time should be spent by teachers on upgrading the reading skills of second- and third-language learners especially.
- (c) **Requirements of questions:** Teachers should ensure that learners understand the requirements of typical questions in NSC papers. For example, if a question requires a figure to be provided as part of the explanation, this must be done to earn the relevant mark. Teachers should ensure that learners understand the basic layout of questions and where to find relevant information.
- (d) **Comments and explanations:** Teachers need to train learners to express themselves clearly and simply where comments or explanations are required. Learners need guidance on how to express opinions that are relevant in context.
- (e) **The importance of formative testing:** Teachers should ensure that they build up the confidence of learners in all topics through the use of short, informal formative tests and tasks. Small, formative assessment tasks should be used to ascertain whether learners are able to apply their knowledge, placing emphasis on their own opinion and understanding. This will also force learners to take ownership of the learning process.

5.3 Diagnostic question analysis

Candidates struggled with a number of questions in the paper, particularly, Q4 which focused on Economic Pursuits.

Figure 5.3: Average marks per question expressed as a percentage



Q1	Microeconomics
Q2	Macroeconomics
Q3	Microeconomics
Q4	Economic pursuits
Q5	Contemporary Economic Issues
Q6	Macroeconomics and Economic pursuits
Q7	Macroeconomics
Q8	Microeconomics
Q9	Economic pursuits
Q10	Contemporary Economic Issues

5.4 Analysis of learner performance in each question

QUESTION 1: MICROECONOMICS

The performance of candidates in this question ranged from very poor to excellent.

Common errors and misconceptions

- (a) A small change took place with Q1.2. In the past, the answers were provided but as from 2012 candidates had to identify the concept with only the definition given. Most candidates lost marks in this sub-section of Q1.
- (b) In Q1.3, most of the candidates performed fairly well. In some cases, learners left out a specific part of this question, with serious consequences for their results. Generally, a lack of content knowledge impaired performances.

Suggestions for improvement

- (a) With regard to Q1.1, learners should write only the letter (A, B or C) of their choice next to the question number. If they prefer to write the answer out in full, they should not leave out any part of the answer, otherwise it is incorrect. Learners should first determine what the answers are before they look at the three distractors to make their choice. Short formative tests on basic concepts are advised. In setting new multiple choice tests, teachers should be aware that changing one word in an existing question can result in a new answer to that question. For example:

- if 'money' market is replaced by 'capital' market in Q1.1.1, the answer would change to C;
 - if 'input' efficiency is replaced by 'output' efficiency in Q1.1.3, the answer would change to B; and
 - if 'monopolistic' competitor is replaced by 'perfect' competitor in Q1.1.4, the answer would change to B.
- (b) The importance of subject terminology cannot be over-emphasised. Teachers should ensure that learners know the terminology necessary if they are to score high marks for this part of the question paper (Q1.2). Teachers should supply learners with class tests consisting of 10 to 20 definitions for the learner to identify the concept. A quiz bowl can be an interesting tool to assess knowledge of economic concepts. Class work or homework that tests knowledge of definitions, and other short questions, will ensure that learners become and remain familiar with these basic concepts.
- (c) Teachers should expose learners to a variety of short questions so as to build their confidence in answering Q1.
- (d) Learners should know that no marks will be awarded when they provide more than one answer to a short question.

QUESTION 2: **MACROECONOMICS**

The performance of candidates on this question ranged from fairly good to excellent.

Common errors and misconceptions

- (a) Many candidates struggled to reason and debate issues. Data response questions (Q2.3 and Q2.4) should not be seen as comprehension tests. Some answers might appear in the extract, but learners should be able to evaluate information and use it when dealing with problems.
- (b) Many candidates were unable to define nationalisation (Q2.4.1), which inability led to poor performance in this question, since this whole subsection dealt with nationalisation.
- (c) Candidates found it difficult to explain exogenous reasons for business cycles (Q2.5) and supplied only examples thereof.
- (d) Candidates struggled to differentiate between appreciation and depreciation (Q2.6). Most candidates got only half the marks and could not link a correct example to the two concepts respectively.

Suggestions for improvement

- (a) There is a clear shift toward *own opinion* as an element in the data response questions (Q2.3 and Q2.4). The number of facts a candidate should provide as the answer is indicated between brackets, for example, Q2.3.2 (2 x 2). Many learners provided only one reason for a specific event, which impaired their performance dramatically.
- (b) When privatisation is discussed in class, teachers should also explain the term 'nationalisation' (Q2.4).

- (c) Teachers are advised to use examples when they teach concepts, especially where eight-mark questions are involved – a good definition with one or two examples ensures full marks for this sub-question (Q2.5 and Q2.6). It is however very important that learners first discuss a topic before they add examples.
- (d) Teachers and learners should collect a variety of cartoons from newspapers to be discussed in class. Learners should be guided to express their opinion in context.
- (e) Candidates should read questions carefully to determine what is expected in an answer. Teachers should expose learners to data response questions on current economic events. It is important that learners be guided as to how to express opinion. Own opinion should always be relevant to the question and its context.

QUESTION 3: MICROECONOMICS

Learner performance on this question ranged from poor to fairly good. Most candidates found Q3.1 and Q3.2 straightforward.

Common errors and misconceptions

- (a) Question 3.2 was poorly answered by some candidates, who still confuse *public sector* failure with *market* failure, or confuse the *causes* with the *consequences* of market failure.
- (b) Graphs are mentioned in general in the NCS. The kinked demand curve of the oligopoly was not expected by most candidates and led to very poor performances in response to Q3.3.
- (c) Candidates gave causes or consequences of market failure in general, instead of concentrating on *inefficiencies* as a consequence of market failure (Q3.5).
- (d) Q3.6 on non-price competition was poorly answered.

Suggestions for improvement

- (a) Public sector failure forms part of Macroeconomics (Q2), whereas market failure forms part of Microeconomics (Q3). Each question in Section B focuses on a specific learning outcome. Microeconomics needs to be taught in much more detail. Teachers should focus on the drawing of graphs in detail and make use of the *Mind the Gap* series, where the drawing of graphs is explained clearly. It is evident that many problems still exist in the teaching of Microeconomics, and this might be the main reason for the poor performance of candidates.
- (b) Content is not taught in enough detail. Candidates' responses show a serious lack of knowledge of the topic. The reason might be an insufficient variety of forms of classroom assessment. Teachers should set an essay, a paragraph, a data base or a short question on a topic. They need to make use of the SAG and Examination Guideline when planning lessons. This will ensure that all topics are taught according to the relevant cognitive levels.

QUESTION 4: ECONOMIC PURSUITS

The general performance of learners in this question was poor.

Common errors and misconceptions

- (a) Some learners confused economic growth and economic development (Q4.1.1). This indicates that candidates do not understand the basic economic concepts of growth and development.
- (b) Some of the data response items were misunderstood or misinterpreted (Q4.3 and Q4.4). Some candidates could not find the link to real world situations. They could not contextualise content.
- (c) Weaker learners discussed dumping (Q4.5) as pollution. They were not able to give an accurate account of economic concepts in this context.
- (d) Paragraph responses showed a lack of in-depth knowledge (Q4.5 and Q4.6). Candidates were not able to describe topics in enough detail to earn full marks.

Suggestions for improvement

- (a) Teachers should use formative tests to ensure that learners are able to understand and define what is meant by: 'international benchmark', 'dumping', 'economic indicator', 'social indicator', 'economic growth' and 'economic development'.
- (b) Moreover, teachers should provide extra learning material during the academic year. Data provided in data response questions should be read like a newspaper (two or three times) before candidates attempt any questions. A general complaint is that candidates do not know whether the answer appears in the extract of whether they should give their own opinion. If candidates studied the extract or table (4.3 and 4.4) closely they would have found possible answers to some of the questions asked. If not found, they should provide their own opinions.
- (c) Teachers need to teach all economic concepts relating to growth and development policies. A clear distinction must be made between employment as an economic indicator and the effects of employment on the economy. Learners need to improve their comprehension skills and their ability to answer text-based questions.

QUESTION 5: CONTEMPORARY ECONOMIC ISSUES

The general performance of learners in this question ranged from poor to excellent.

Common errors and misconceptions

- (a) Many candidates used the wrong formula to do the calculations (Q5.4). Some of the data response items were misunderstood or misinterpreted. Candidates could not 'see' the data to be used in the calculations, even though they are clearly indicated in the graph.

- (b) Many candidates gave *reasons for demand pull inflation* instead of *causes of cost push inflation* (Q5.5). Paragraph responses showed a lack of in-depth knowledge. Candidates were only able to list facts, but their responses lacked the comprehensiveness that would have earned full marks.

Suggestions for improvement

- (a) With regard to Q5.3 and Q5.4:
- A variety of learning material on data response questions should be provided and discussed in detail with learners;
 - During teaching, current economic issues should be used as examples to illustrate the subject under discussion;
 - Learners should be encouraged to give their own opinions regarding current economic issues in class; and
 - Teachers should use old question papers to prepare learners for data base questions.
- (b) Teachers should prioritise improving learners' reading skills.
- (c) Learners should be encouraged to participate in discussions of paragraph-type questions. Homework should be given to differentiate between cost push inflation and demand pull inflation (in terms of definitions, characteristics, causes and consequences respectively).
- (d) Teachers need to expose learners to contemporary issues by organising debates and symposiums relating to these topics. This would encourage learners to show interest in current issues related to the subject.

QUESTION 6: MACROECONOMICS AND ECONOMIC PURSUITS

The general performance of learners in this question ranged from extremely poor to fair.

Common errors and misconceptions

- (a) Some candidates answered Q6.2 poorly because they confused *problems of public sector provisioning* with *reasons for public sector failure*.
- (b) Candidates could not differentiate between GDP and GNP (Q6.3.2). Further, they did not supply enough detail when providing definitions.
- (c) Candidates did not know the definition and advantages of an IDZ. It seems as if some teachers exclude certain difficult parts of the curriculum.
- (d) Candidates are not able to give an accurate account of economic concepts.

- (e) Some of the data response items were misunderstood or misinterpreted. Candidates could not find the link to real-world situations. They could not contextualise content learnt (Q6.4.3).
- (f) Paragraph responses showed a lack of in-depth knowledge. Candidates were not able to provide enough detail to earn full marks. Some provided more than two monetary policy instruments, although only two instruments were asked for. The majority of candidates did not attempt Q6.5 and the few who attempted it could not discuss monetary policy instruments in enough detail to earn full marks.

Suggestions for improvement

- (a) Thorough revision of the whole syllabus is recommended.
- (b) Teachers should expose learners to a variety of relevant data from newspapers and magazines, tables, graphs and maps so that they do not meet unknown data in the final exam for the first time.
- (c) Specific key words should be used to differentiate between the monetary and the fiscal policy of the state e.g. the monetary policy concentrates on what SARB does and fiscal policy concerns taxation and expenditure.
- (d) Networking among educators is highly recommended. Teachers should allow themselves enough time to teach economic pursuits to improve the candidates' understanding of and performance in this type of question.

QUESTION 7: MACROECONOMICS

The general performance of candidates in this question ranged from good to excellent.

Common errors and misconceptions

- (a) Some learners misinterpreted the question and focused on discussing phases of business cycles instead of business cycle indicators. Some candidates even discussed the causes of business cycles or substituted data regarding business cycles with the circular flow model.
- (b) Weaker learners who did not perform well as the others focused on the *phases* and an analysis thereof, as opposed to an analysis of the *indicators and features*. They received a maximum of 8 marks out of a possible 50.
- (c) Most candidates were able to draw the diagram, but detailed labelling of the graph was lacking.
- (d) Many candidates did not use the correct structure for writing essays, i.e. introduction, body and conclusion.
- (e) Many candidates who performed poorly everywhere else in the paper, managed to do well in this question.

Suggestions for improvement

- (a) Better performance by most learners could be ascribed to the detailed structure indicated in Section C (the main and additional parts).
- (b) Teachers and learners should make use of *Mind the Gap* to cover 'gaps' left by some textbooks.
- (c) Tests and mid-year examinations should be structured in such a manner that they prepare learners for the final examination.
- (d) Teachers need to teach learners to read all aspects of the question before attempting it, so as to avoid losing marks unnecessarily.
- (e) The wording of essay-type questions is very important: learners need to know exactly what to include in their answers.

QUESTION 8: MICROECONOMICS

The general performance of learners in this question ranged from poor to excellent.

Common errors and misconceptions

- (a) Many learners still experience problems with graphs. These include:
 - incorrect drawing and labelling of curves;
 - inability to distinguish between long-term and short-term graphs; and
 - not reading the question and including most graphs discussed in Micro-economics.
- (b) Some learners gave the market structure for all four types of markets, or became confused about where facts should appear.

Suggestions for improvement

- (a) For most learners, the graph was the most challenging part of the question. The fact that learners could choose between the graphs as well as the fact that learners could answer this question in table format, helped learners to achieve high marks for this question. Learners should practise different graphs and supply detailed information as part of each graph. They should use the explanations of graphs in *Mind the Gap*.
- (b) The majority of learners used short phrases to compare instead of using full sentences as the question required, especially where they presented facts in tabular form.

QUESTION 9: ECONOMIC PURSUITS

The general performance of candidates in this question ranged from poor to fairly good.

Common errors and misconceptions

- (a) Candidates who performed badly wrote on protection and excluded factual content on import substitution and export promotion.
- (b) Candidates spotted certain questions and included answers that were not relevant at all.
- (c) Many candidates repeated facts already mentioned in the introduction, body and/or conclusion of the essay.
- (d) Candidates who failed to produce good marks for this question mostly obtained marks for listing some of the methods of import substitution and export promotion. There were no factual explanations or discussions.

Suggestions for improvement

- (a) Part of the question requested examples of how successful the country is regarding import substitution and export promotion. Most candidates mentioned that the country was successful, without giving any examples. Teachers should assist learners not to confuse the policies on international trade.

QUESTION 10: CONTEMPORARY ECONOMIC ISSUES

Some learners who attempted this question performed very well and even gave more than enough to receive marks. Those who did not perform well were confused by the differences between: market-related policies and market structures, public sector intervention and public sector control, and public sector provisioning and public sector necessities.

Common errors and misconceptions

- (a) Many candidates included irrelevant data on pollution and protection, or wrote on inflation or tourism, which they had spotted as essays to be included in the final exam.
- (b) Weaker candidates could not evaluate the success of international protocols and agreements. In some cases, generic information was given that had no bearing on the economic content.

Suggestions for improvement

- (a) Teachers should use formative tests to ensure that learners are able to understand and define what is meant by: 'international protocols', 'market sector intervention', 'public sector control' and 'public section intervention'.
- (b) Teachers need to ensure that after the syllabus has been completed, there is sufficient time for revision.

CHAPTER 6

ENGLISH FIRST ADDITIONAL LANGUAGE

The following report should be read in conjunction with the three English FAL papers of the November 2012 Examination.

6.1 Performance trends (2009 – 2012)

In 2012, as compared to 2011, there was an increase in the percentage of candidates who achieved at 30% and above, and at 40% and above.

Table 6.1: Overall achievement rates in English First Additional Language

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	469 486	435 104	92.7%	339 715	72.4%
2010	449 080	424 392	94.5%	320 350	71.3%
2011	414 480	398 740	96.2%	315 313	76.1%
2012	420 039	410 999	97.9%	348 261	82.9%

Figure 6.1: Overall achievement rates in English First Additional Language

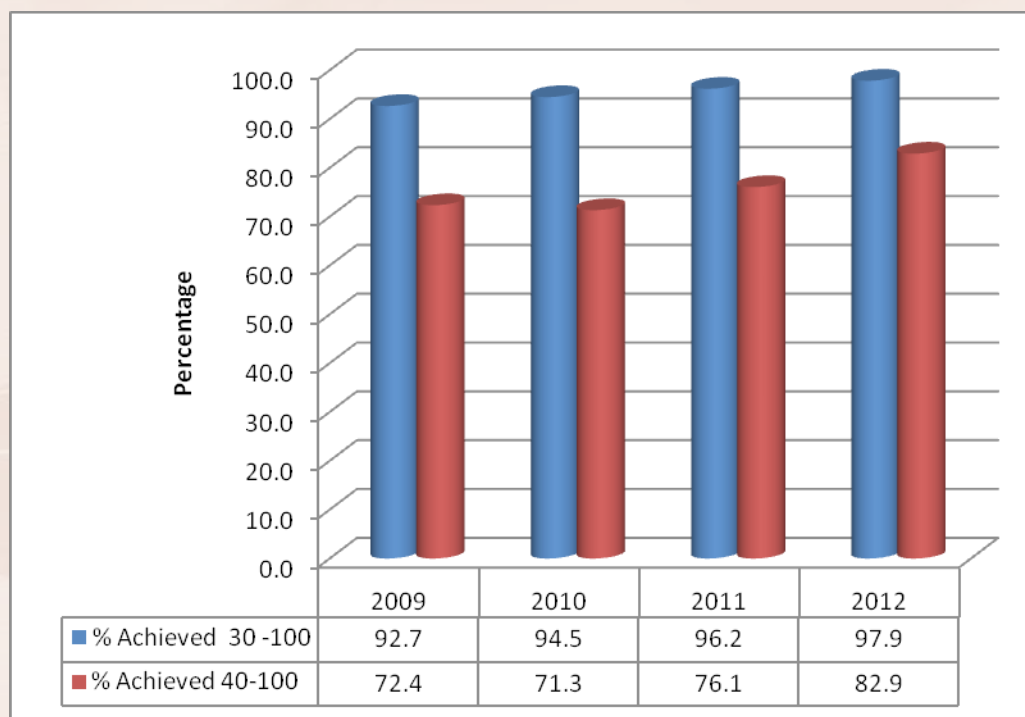
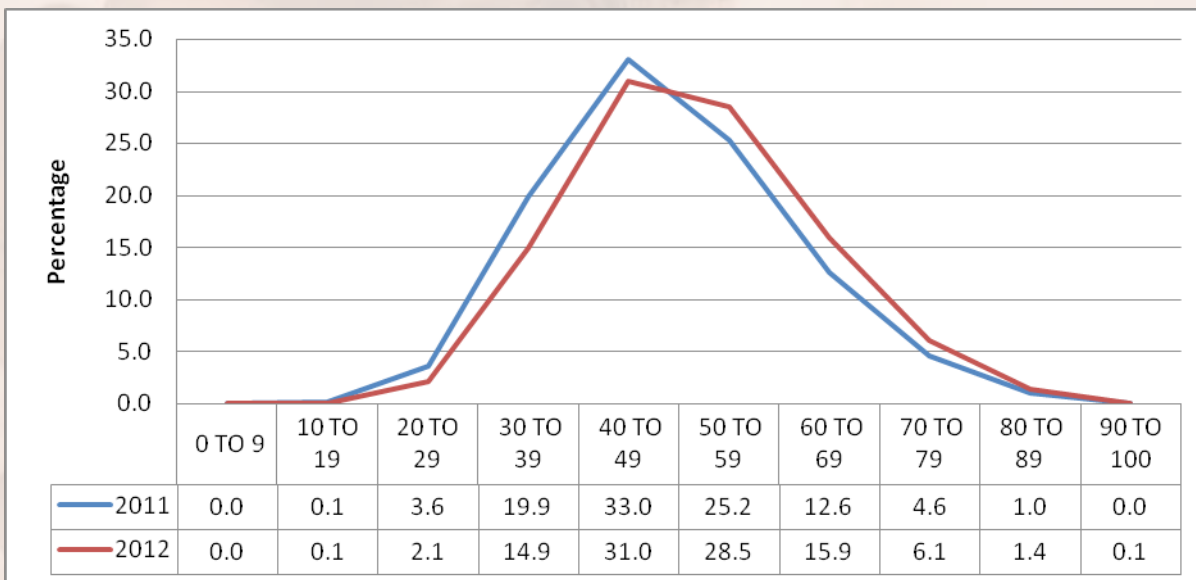


Figure 6.2: Performance distribution curves (English First Additional Language: 2011 -2012)



In 2012, there was a decrease in the percentage of candidates who performed at 0 - 39% compared to 2011; and an increase in the percentage of candidates who performed at 40% to 100%.

6.2 Overview of learner performance on Paper 1

Performance in the three Sections that make up Paper 1 improved slightly in comparison to the results in previous years. Learner attainment in Section B (Summary) has reached a plateau at an average performance of 6 marks out of 10, as was the case in the 2011 examinations.

General suggestions

- (a) Teachers should expose learners to numerous question papers to enable wider awareness of different question types.
- (b) Over and above literal readings of texts, learners need to be guided to read between the lines, infer and evaluate texts, as well as use their own words to express their views.
- (c) Learners should be exposed to questions on all levels of difficulty during class activities, tests and internal examinations.
- (d) Teachers should provide learners with different types of texts when teaching comprehension skills.
- (e) Learners need to be taught to identify key words in every text they deal with, whether it is a question or an instruction.
- (f) Learners should be taught to read questions carefully and respond only to what is being asked.
- (g) Learners need to be exposed to memoranda for marking and how marks are allocated.

- (h) Learners need to be exposed to all study and support material made available by the Department of Basic Education as well as Provincial Education Departments.

QUESTION 1: COMPREHENSION

- (a) Weaker candidates scored up to 10 marks out of the possible 30 for the comprehension question while strong candidates achieved close to 30 marks. In one sample of a hundred scripts, about 48 candidates obtained 20 marks and above out of 30. Only one candidate scored full marks.
- (b) Analysis showed a slight improvement in learner response to higher order questions. Although learner expression is still a major hindrance, learners are gradually learning to express their ideas.

SECTION B: SUMMARY

QUESTION 2: SUMMARY

- (a) In the summary question, only the candidates who had not understood the instructions received no marks, because they wrote a 'creative' piece on a safe summer. Most candidates managed to identify at least 2 or 3 of the 7 facts required.
- (b) Further, because of the removal of punitive rules in the marking of the Summary, most of the candidates scored at least 3 marks out of 10. Only a few candidates obtained less than 3 marks in this question.
- (c) The strong candidates did exceptionally well. Quite a significant number obtained full marks for this question.

SECTION C: LANGUAGE

QUESTION 3: ANALYSING AND ADVERTISEMENT

- (a) Some candidates did not read the text and relied only on the picture, thus thinking that the advertised product was meant for dogs. Those who read the text managed fairly well, and some even achieved full marks.
- (b) Compared to the 2011 learner performance, a gradual improvement is noted in responses to analysing and advertisement.

QUESTION 4: ANALYSING A CARTOON

- (a) While most candidates seem to be coping well with the lower-level questions, most still encounter problems in dealing with those that require more insight. Candidates do not heed instructions to refer: e.g. in 4.3 they did not refer to frame 3.
- (b) As they did in the case of the advertisement, candidates struggled to find the link between the visual and the written texts, i.e. how the written text can help them grasp the meaning of the visual text, thus decoding the humour in that text.

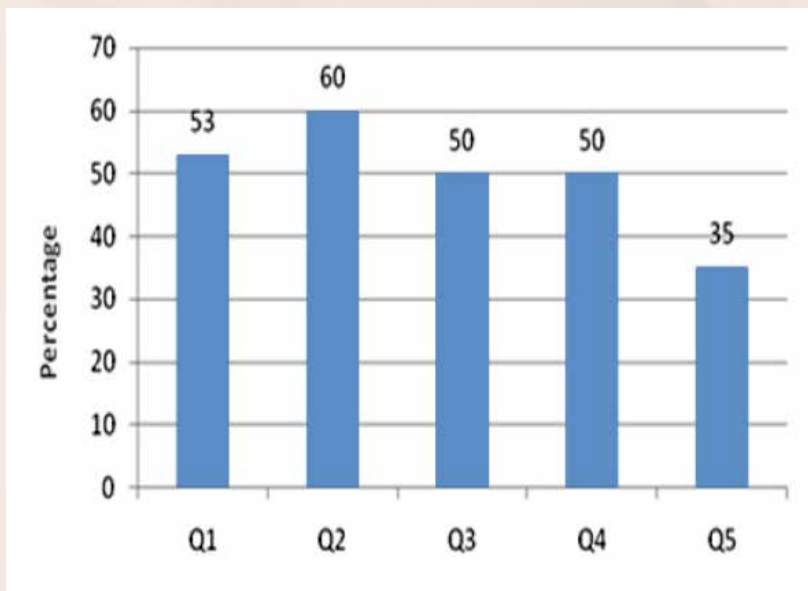
QUESTION 5: LANGUAGE AND EDITING SKILLS

- (a) As has been the case in past years, the language and editing section still yields the weakest performances.
- (b) Candidates still struggle with basic concepts like, among others, the question tag, the negative form, voice and speech.
- (c) Candidates are not able to identify or apply the language aspects in the provided texts. As a result, most of the marks for this question were lost.

6.3 Diagnostic question analysis of Paper 1

Candidates performed the least in the skills question (Q5).

Figure 6.3: Average marks per question expressed as a percentage in Paper 1



Q1	Comprehension
Q2	Summary
Q3	Analysing and advertisement
Q4	Analysing a cartoon
Q5	Language and editing skills

6.4 Analysis of learner performance in individual questions in Paper 1

Common errors and misconceptions

QUESTION 1: COMPREHENSION

Some candidates were not able to identify key words in the question and as a result lost marks. A number of candidates answered 'No' instead of 'False' in response to the True/False questions. Text B (questions 1.12 – 1.15) required candidates to study and interpret a picture or an image and then respond to the questions. Some candidates could not use the visual clues to arrive at their answers. Most of them were still not able to answer questions that required insight.

Suggestions for improvement

- (a) Teachers should expose learners to numerous question papers to enable wider awareness of different question types.
- (b) Over and above literal access to text, learners must be guided to read between the lines, infer and evaluate texts, as well as use their own words to express their views.
- (c) Learners must be exposed to questions on all levels of difficulty during class activities, tests and internal examinations.
- (d) Educators should provide learners with different types of text in their teaching of comprehension skills.
- (e) Learners should be taught to identify key words in every text they deal with, whether it be a question or an instruction.
- (f) Learners should be taught to read questions carefully and respond only to what is being asked.

QUESTION 2: SUMMARY**Common errors and misconceptions**

- (a) This question yielded the best average (60%) compared to the other questions. However, the attention of teachers and Subject Advisers is called to the areas hereunder discussed.
- (b) Most candidates did not use their own words when writing a summary. The facts were lifted directly from the passage.
- (c) Candidates ignored instructions: e.g. inaccurate reflection of the number of words used; writing more than one fact per line; veering from the text by incorporating general knowledge, as in 'use an umbrella/cap/spray for protection against the sun' instead of 'insect repellent'.

Suggestions for improvement

- (a) Teachers should intensify the teaching of summary-writing skills.
- (b) Emphasis should be placed on using one's own words.
- (c) Learners should practise summary writing regularly and not only during tests and examinations.
- (d) Learners should be encouraged to write a draft and then a final piece so as to eliminate or at least minimise language and spelling errors.

SECTION C: LANGUAGE

Questions 3 and 4 of Section C were answered well. There was also a notable improvement in learner performance compared to that recorded in previous years.

Suggestions for improvement

- (a) More emphasis on and attention to matters listed below may help learners to do better than they are doing at the moment.
- (b) The terms and conventions used in cartoon strips should be taught more extensively. This would not only increase the learners' marks, but will also enrich their understanding and enjoyment of visual literacy.
- (c) Learners should learn the following terms:
- frames (panels);
 - speech balloons and thought bubbles;
 - font types and sizes and the reasons for capitalisation;
 - captions (used to convey information that cannot be communicated by graphics or speech), motion/speed lines;
 - symbolism, such as the light bulb above a character's head to indicate an idea;
 - the indication of sleep by a saw's cutting a log or a line of 'zzzz';
 - the use of dotted lines to indicate a line of sight (with daggers being used instead of dotted lines to indicate an evil look);
 - * %@#! (and the like) for swearing;
 - squiggles and stars for loud, discordant sounds;
 - sound effects: onomatopoeic words suggesting specific sounds; and
 - typical facial features associated with particular emotions.
- (d) Learners should be taught to interpret the literal and figurative meanings of visual stimuli.
- (e) One of the many ways to assist learners in answering Q5 is for learners to be exposed to texts in which language

is used correctly. These texts may range from their literature, their own writing, and newspaper articles, to formal academic writing that is suitable to their level.

- (f) The Subject Adviser and the teacher should work together in making this an exciting learning experience. For example, learners could be required to report, on a weekly basis, on where and when a particular language structure was used to good effect (e.g. passive voice in the State of the Nation Address); informal language use and possible effective melding with formal expression; language use in various genres. Not only would this increase learners' awareness of language use (critical language awareness), but it would also turn them into critical thinkers.

6.5 Overview of Learner Performance on Paper 2

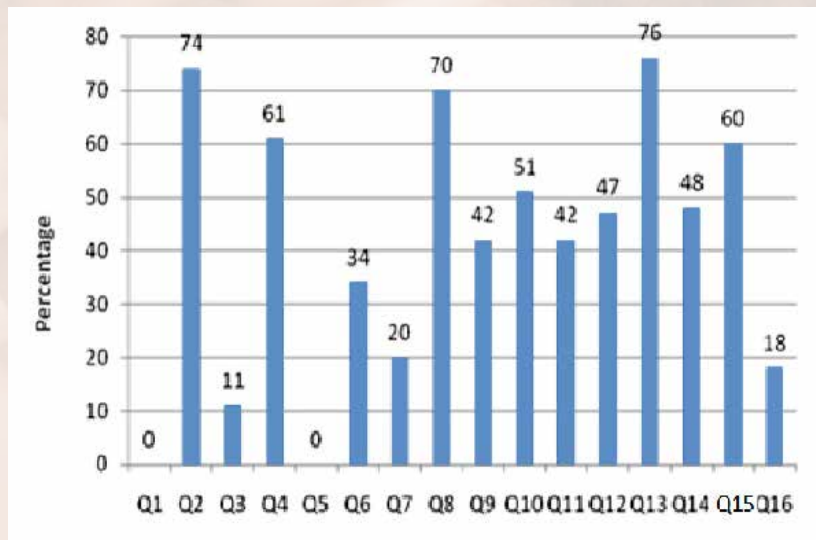
General comments

- (a) Candidates were required to respond only to the *two* genres they had studied at school. In order to accommodate the spread of choices, the examination question papers comprised questions based on the four prescribed genres. The unintended consequence of this generosity was that some candidates, particularly the least prepared, responded to the first question they came across. Despite the unfamiliar content, candidates soldiered on, giving answers that were far from what was required. While provincial reports suggest a decline in this tendency, there were still those who offered such answers, or attempted all the texts that were set. This problem is similar to that of candidates' choosing to answer essay questions while they can do nothing but repeat the instructions.
- (b) Essay questions, on the whole, were the least popular choice, with *A Grain of Wheat's* being the least popular novel. While *Nothing But the Truth* was the most popular choice, followed by poetry and short stories, some candidates showed a lack of understanding of the drama. This may be attributed to either poor reading skills or poor preparation for the examination.
- (c) Credit must be given to candidates who came prepared, chose and responded to the texts they had studied and which they had prepared.

6.6 Diagnostic question analysis of Paper 2

The figure below indicates the average marks on each question expressed as a percentage. The limited sample shows major preference for drama and poetry. Further, most candidates responded to contextual questions.

Figure 6.4: Average marks per question expressed as a percentage in Paper 2



Q1	To Kill a Mockingbird (Essay)
Q2	To Kill a Mockingbird (Contextual)
Q3	Lord of the Flies (Essay)
Q4	Lord of the Flies (Contextual)
Q5	A Grain of Wheat (Essay)
Q6	A Grain of Wheat (Contextual)
Q7	Romeo and Juliet (Essay)
Q8	Romeo and Juliet (Contextual)
Q9	Nothing but the Truth (Essay)
Q10	Nothing but the Truth (Contextual)
Q11	The Coffee-cart Girl (Essay)
Q12	Relatives (Contextual)
Q13	On his blindness (Contextual)
Q14	The Serf (Contextual)
Q15	Auto Wreck (Contextual)
Q16	Cheetah (Contextual)

6.7 Analysis of learner performance in individual questions in Paper 2

Common errors and misconceptions

- (a) Some candidates answered the first question they came across. This led to a dismal performance.
- (b) Some candidates tried to answer all the questions in the question paper. They lost marks as they eventually had to rush through the genres they had studied.
- (c) Weaker learners who attempted essay questions regurgitated the bullets provided to guide thinking, as well as anything they could remember about the book, without responding to the question. They also used the wrong format for the essay as they left out the introduction and the conclusion.
- (d) Most candidates struggled to answer the higher order questions.

- (e) Some candidates expected to find answers from the extract only, and did not realise that their understanding of the full text was required.
- (f) Some candidates did not follow the instructions fully.

Suggestions for improvement

- (a) Learners should be exposed to various question types as well as ways in which to answer them. This can be achieved through peer assessment, among other means.
- (b) Learners need to be taught to follow instructions to the letter.
- (c) Learners need to be taught to respond to a mark.
- (d) Learners should be taught to use their own words, give views and opinions and quote, and the differences between instructions.
- (e) The hints listed below might help learners to do better in preparing for literature examinations. Teachers should:
 - read the texts with learners and discuss the diction so that they do not get lost on the very first level of understanding;
 - summarise the text to help learners understand the contents clearly;
 - explain figurative language use and all other poetic and literary devices;
 - expose learners to a variety of questions on the literature so that they do not become anxious when they have to answer an examination paper;
 - teach learners how to use their own words (the paraphrase can be used as a starting point); and
 - practice examination instructions with the class so that they learn how to follow instructions to the letter in each question.

6.8 Overview of learner performance on Paper 3

General comments

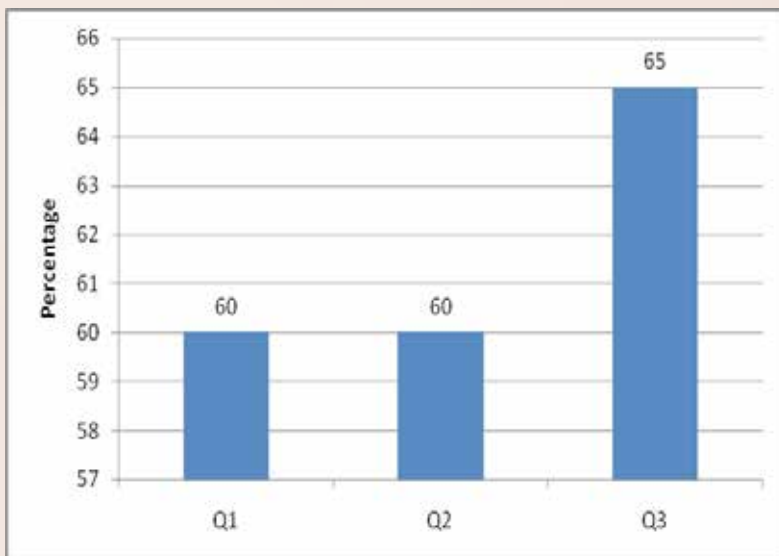
- (a) Candidates performed fairly well in this paper, with more Level 7 performances this year. In general, candidates performed well compared to their predecessors. The reason for this success, besides the possible thorough preparation, might be candidates' making the correct choices. Those who made wrong choices – for example, some who attempted questions 1.5 or 1.6 – did not answer well. Most of those who attempted either of those two questions were unable to understand the difference between an argumentative and a discursive essay and thus lost marks.

- (b) The issue of misinterpretation was also apparent in responses to Question 1.1. Some candidates did not write the story of an old desk, but wrote a story about themselves, not related to the desk.
- (c) Visual stimuli questions were answered well by the few who chose them. A number of excellent essays were produced.
- (d) Longer transactional pieces: Questions 2.2 and 2.3 – Obituary and Memorandum. Candidates who chose these pieces generally struggled, perhaps because these types of transactional writing have not appeared regularly in past papers. Candidates struggled mainly with the format and also confused the Obituary with a Eulogy. However, the inclusion of these pieces was a good idea as it serves as a reminder to teachers to teach the entire range of prescribed work.
- (e) Shorter pieces: In general, candidates answered these questions well, although some struggled to identify the appropriate *style* and *tone* required by the different pieces.

6.9 Diagnostic question analysis of Paper 3

Candidates generally achieved consistent results over the three questions in this paper.

Figure 6.5: Average marks per question expressed as a percentage in Paper 3



Q1	Essay
Q2	Longer transitional text
Q3	Shorter text

6.10 Analysis of learner performance in individual questions in Paper 3**Common errors and misconceptions****SECTION A: COMPREHENSION**

- (a) For Q1.2, many candidates were not able to create a narrative with a strong storyline which would suitably use the words 'suddenly there was absolute silence'. Many submissions were mundane and very pedestrian. More often than not, the events in the candidates' narration failed to capture a genuine relation to the words quoted in the question.
- (b) Question 1.5 was highly misinterpreted by candidates.
- (c) Most of the responses did not address Q1.6. Most candidates wrote about human rights rather than the advantages and disadvantages of freedom of choice.

SECTION B: LONGER TRANSACTIONAL PIECES**Common errors and misconceptions**

- (a) Question 2.1 should have been a well-written piece overall, but many candidates overlooked the very basic things – the format, language, purpose and tone. Many candidates approached this letter in a very informal, conversational way. Some candidates regarded the Human Resource Department as the name of the company and did not give the name of a company. In some cases, the intended career was not mentioned and very little motivation as to why the writer deserved the bursary was given.
- (b) About 60% of the candidates who attempted Q2.2 did not get the format right. This obituary placed more emphasis on the tribute the deceased should be given for involvement in charity work in the community. As a result, if a candidate did not mention the charity work, a lower-content mark category would be regarded as appropriate; that is, less than the marks they would have received had they addressed the requirements of the piece fully.
- (c) Very few candidates presented a disciplined approach to Q2.3. The format was mainly incorrect. However, the content of many candidates again was spot on. They could raise a concern about the water and electricity wastage at the school and give genuine suggestions as solutions.
- (d) Some candidates could not adhere to the structure of the text for Q2.4. The style and language use were informal, thus suggesting a poor grasp of what was required of the candidates.

SECTION C: SHORTER TEXT

- (a) The majority of candidates who attempted Q3.1 performed very well, and achieved high marks. However, many of them did not know suitable phrasing as used in a formal Invitation card. Some were confused by the word 'formal', and wrote two addresses on a card!

- (b) Many candidates responded very well to Q3.2. However, some did not include emotions, which caused them to score fewer marks than those who did. Some pieces were not dated, and some did not record two separate dates but presented a whole long paragraph combining the two sections.
- (a) Question 3.3 was generally well written. However, some candidates did not start their directions from the school gate, but somewhere in the middle of the town which was contrary to the demands of the question.
- (b) Candidates struggled with paragraphing.
- (c) Punctuation proved to be problematic. Candidates wrote extremely long and clumsy sentences. This ultimately led to poor expression, and poor marks.
- (d) Basic rules of grammar are not taught, e.g. how to construct a proper sentence. The use of verbs especially was a problem: candidates used present participles as if they were finite verbs.

Suggestions for improvement

- (a) More attention should be given to spelling and teaching learners more precise alternatives to vague words such as 'nice' and 'stuff'.
- (b) Teachers should abstain from teaching learners general phrases which they then try to force into any topic. Verbosity and inflated expression do not make a favourable impression or earn good marks.
- (c) Teachers should ensure that by Grade 12 all of the different types of writing pieces have been taught.
- (d) Emphasis should be put on requirements regarding *format*, *tone* and *style* when writing the pieces for Section B and C.
- (e) Learners should be taught to make the right choices when they choose their topic; wrong choices cost many candidates marks.
- (f) Planning is of the utmost importance. A detailed plan is worth much more than writing a first draft and merely re-writing it, mistakes and all.
- (g) Learners should be taught how to structure an essay logically: the sequence of components should be coherent. Strong introductions and conclusions are valuable.
- (h) Learners should be taught *not* to do corrections in pencil on the final product. They should also be taught to *cross out* their planning and indicate their final product.
- (i) Each final product should start on a new page.
- (j) If possible, examples of good pieces of writing should be distributed to teachers to read to their learners to stimulate their minds and acquaint them with what is possible.

- (k) Teachers should spend time on teaching writing skills, as Paper 3 is the paper on which learners should *gain* marks, not lose them.
- (l) Experienced teachers should assist teachers who are struggling and share good practices with them.
- (m) Novice teachers should be assisted in using and interpreting the marking rubrics. Descriptors used in the rubrics are often confusing and many markers find it difficult to place writing pieces in the correct category.

CHAPTER 7

GEOGRAPHY

The following report should be read in conjunction with the Geography question papers of the November 2012 Examination.

7.1 Performance trends (2009 – 2012)

The percentage of candidates who achieved at 30% and above shows an increase from 2010. The percentage who achieved at 40% and above shows a steady increase from 2009. It is gratifying to see that the number of learners undertaking Geography has increased after a steady decline was noted over a number of previous years.

Table 7.1: Overall achievement rates in Geography

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	215 120	155 481	72.3%	84 279	39.2%
2010	209 854	145 187	69.2%	85 241	40.6%
2011	199 248	139 405	70.0%	84 169	42.2%
2012	213 735	162 046	75.8%	99 760	46.7%

Figure 7.1: Overall achievement rates in Geography

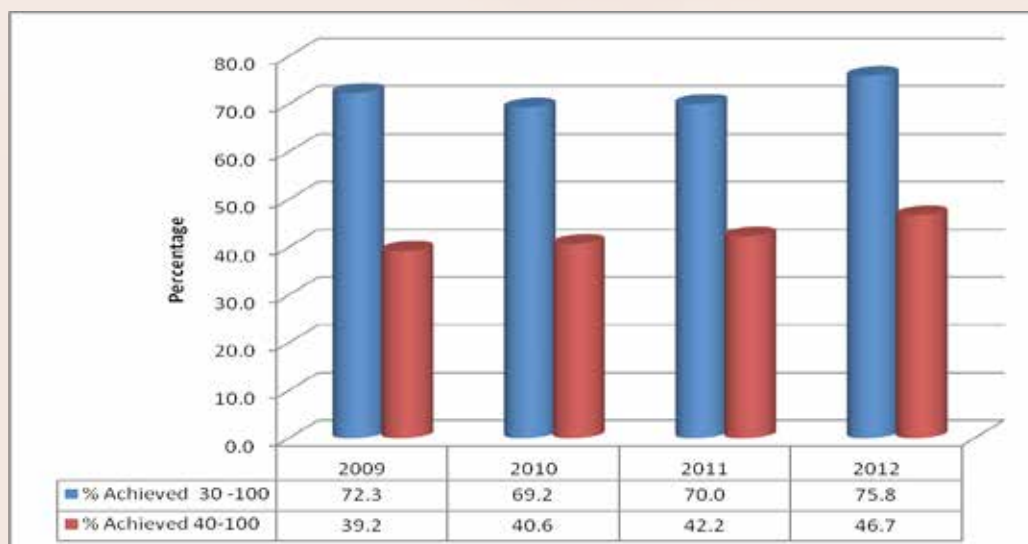
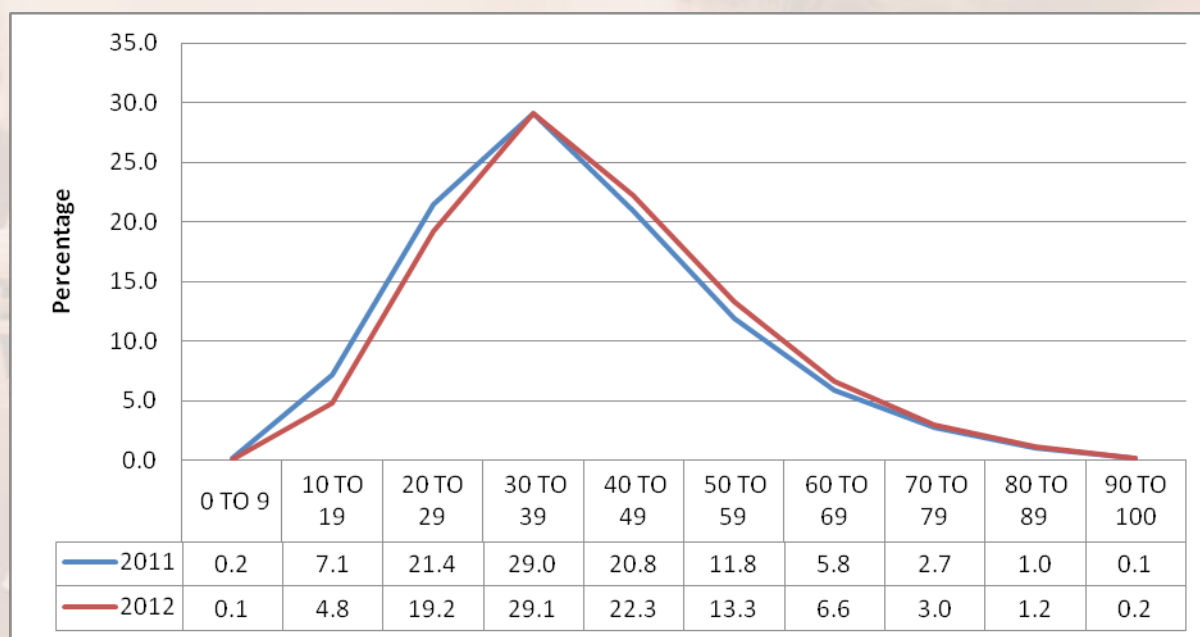


Figure 7.2: Performance distribution curves (Geography: 2011 – 2012)



There was a decrease in the percentage of candidates who performed at 0-29% in 2012 compared to 2011 and the percentage of candidates who performed in each of the categories above 40%.

7.2 Overview of learner performance in Paper 1

General comments

- (a) Many candidates showed a lack of content knowledge and did not know the basic definitions of concepts. Candidates who did not understand the basic concepts struggled, as some questions followed on after candidates had been tested on the basic concept. It also appears that many teachers were not fully aware of all the issues mentioned in the SAG or Examination Guideline, or it had not been properly communicated to them.

General suggestions for improvement

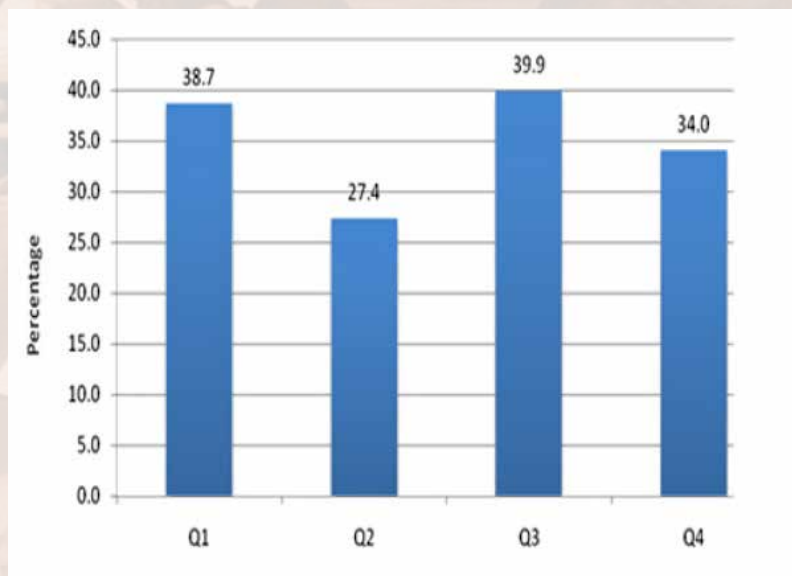
- (a) Emphasis should be placed on terminology. Teachers should make sure that learners know the importance of definitions and have a clear understanding of the basic concepts taught in Geography. A glossary of terms should be provided to all learners, with examples, in order for learners to have a clear understanding of concepts. Where alternative terms exist for a specific concept, learners must be provided with all possible terms and not the term preferred by the teacher only.
- (b) Repetitive formative tests should be written to show the mastering of terms.
- (c) Teachers must collect resources on an ongoing basis and be aware of what is happening worldwide, particularly, be familiar with natural disasters. Research the topics that are commonly questioned and ensure that content is taught correctly.
- (d) Teachers should be aware of relevant subject content by constantly referring to the SAG document and Examination Guideline. All the subject content does not always appear in prescribed textbooks.

- (e) To improve on learner performance, teachers must use previous examination papers to ensure that the standard of questions, used in the assessment at school, is appropriate. This will also assist teachers to get candidates accustomed to the style of question setting.
- (f) Teachers need to ensure that the distribution of marks in the internal assessment tasks is according to the SAG document it is 30% lower order, 40% middle order, 30% high order. If too many lower order questions are presented in the internal assessment conducted at school, learners are not exposed to the higher order questions that are presented in the final examination and are therefore presented with a false notion of their performance. Teachers must locate an interesting variety of fresh resources to base their questions on.
- (g) Learners should be taught how to analyse the question in order to get the answer sought by it. The action verbs such as discuss, explain, outline, describe, etc. should be clearly explained to learners. Learners should ensure that they know whether causes, impacts or measures to reduce impacts are being asked and not merely answer based on the facts/contents that they know. Further, learners should attempt to answer every question. They should not neglect to answer any question as easy parts are evident in each question.
- (h) Teachers should focus on the interpretation of diagrams, sketches, photographs, cartoons, graphs and graphical data. The learners should be taught how to draw on information from different sources.
- (i) Although there has been an improvement in the writing of essay-type questions, knowledge is often lacking to answer the question fully.
- (j) Learners should be thoroughly taught in essay-writing and interpretation techniques. Areas which need attention are repetition and poor punctuation. Teachers and learners should be aware of action/key words when answering questions; describe, discuss, explain, name, give, evaluate, etc. as each demand a certain type of response.
- (k) Subject Advisers should make sure that all teachers expose learners to paragraph questions. It is important that teachers give learners feedback on the mistakes that they have made.
- (l) Many learners do not read questions properly. They see common words and fail to determine what the question actually requires of them. Learners should be guided in the interpretation of questions, e.g. underlining key words.
- (m) An opportunity should be provided for teachers to mark dummy scripts in clusters, using the latest National Marking Guidelines in order to see how to interpret responses from candidates.
- (n) Teachers should share information and ideas. The internet has a wealth of information.
- (o) Some teachers need in-service training or workshops in physical geography. The uncertainty in the section manifests itself in poor results attained by candidates. Any training/workshops must be presented with relevant material/pictures/maps/articles pertaining to the NCS. This section needs a dynamic approach and must be brought to 'life' by the teacher. When teaching theory, link it with mapwork. It creates a better understanding of the sections covered. Relate your work to reality/real life situations.

7.3 Diagnostic question analysis for Paper 1

A sample of scripts from each province revealed the following average percentages on each question.

Figure 7.3: Average marks per question expressed as a percentage in Paper1



Q1	Climate and weather, fluvial processes and structural landforms
Q2	Climate and weather, fluvial and structural landforms
Q3	People and places: rural and urban settlements, people and their needs
Q4	People and places: rural and urban settlements, people and their needs

7.4 Analysis of learner performance in individual questions in Paper 1

QUESTION 1: CLIMATE AND WEATHER, FLUVIAL PROCESSES AND STRUCTURAL LANDFORMS

Although this was a popular choice question, learners performed poorly to fair in it.

Common errors and misconceptions

- (a) Many candidates confused the urban heat island with inversion conditions in a valley (Q1.1).
- (b) The term *interfluve* was not familiar to many candidates, and many interchanged it with the term *watershed* (Q1.2.5).
- (c) Many candidates struggled with the interpretation of the synoptic weather map (Q1.3).
- (d) Most candidates interchanged the terms *climate change* and *global warming* (Q1.4).
- (e) Most candidates gave *causes* of climate change and not *measures to reduce* it as asked (Q1.4.1).
- (f) Most candidates showed that they lacked understanding of the term *headward erosion* and reasons for it taking place (Q1.5.2).
- (g) Most candidates had a problem with the question on river profiles (Q1.6).

Suggestions for improvements

- (a) Teachers should encourage learners to make a glossary of terms used in the back of their notebooks.
- (b) The interpretation of synoptic weather maps should be done in detail in class. Different types of synoptic weather maps and synoptic weather maps of different seasons must be studied to note the specific differences that can be observed.
- (c) Teachers should focus on the interpretation of different resources, for example newspaper articles, photographs, line sketches, cartoons and graphs.
- (d) All aspects of *river capture* should be taught with the aid of diagrams. Learners must be able to identify all the features of *river capture* as mentioned in the SAGs.
- (e) The river profile is a difficult concept to teach. The use of a variety of diagrams is essential when teaching this concept.
- (f) Teachers need to use source-based questions in class assignments, tests and examinations. Teachers should make use of relevant and recent resources. Question 1 allows teachers to use newspapers as useful resources. Teachers should organise trips to weather service centres in their areas for example airports. Learners must be encouraged to watch weather reports on various television channels to learn about aspects of weather elements. Teachers could subscribe to the SAWS to receive monthly synoptic weather charts that are relevant and up to date.
- (g) Learners should be taught how to read the questions carefully and ensure that they answer what has been asked. Many learners seemed to have focused on a specific word/concept that they know and give an answer based on that word/concept.
- (h) Teachers should share information and ideas with each other. Subject advisers should organise content workshops for teachers on climatology. Subject advisers should organise extra resource materials such as DVDs on difficult content areas, previous examination papers, the internet, to access 'You tube' live feeds, Xtremepapers.com, Mind the Gap, Telematics and other useful resources.
- (i) Climate change is a very current topic and frequently asked in examination papers. Teachers should research the topic and find relevant information that can be used in class; especially measures that can be introduced to reduce climate change. The difference between *climate change* and *global warming* should be emphasised.

QUESTION 2: CLIMATE AND WEATHER, FLUVIAL PROCESSES AND LANDFORMS

This question was poorly answered and scored the lowest average of the four choice questions.

Common errors and misconceptions

- (a) Many candidates could not identify the four slope forms/elements (Q2.2).
- (b) Many candidates could not interpret the diagram on the frequency of the occurrence of tropical cyclones in certain areas (Q2.3).
- (c) Most candidates listed *causes* of drought and river pollution and not the *impact* as asked (Q2.4.4).
- (d) Many candidates could not interpret the cartoon because they took them literally rather than what is implied (Q2.4).
- (e) Most candidates showed a lack of knowledge of structural landscapes associated with horizontal underlying rock strata (Q2.5).
- (f) Many candidates could not link the canyon landscape to human utilisation (Q2.5.6).
- (g) Some candidates could not link urban areas to river pollution (Q2.6).

Suggestions for improvement

- (a) Learners need to know the slope forms/elements and the characteristics of each of those.
- (b) Teachers should use cartoons as resource material and teach learners how to interpret the implied meaning of cartoons. Further, they must make use of relevant and recent resources. Newspapers serve as useful resources for recent events.
- (c) The latest information on hurricanes in the United States of America and the typhoon in the Philippines should be collected and studied. This will help with identifying the differences in managing these events in developed and developing countries.
- (d) Questions on structural landforms are commonly asked in question papers. The development of the specific landscape - canyon landscape - that was examined was not clearly understood by many candidates. Teachers must concentrate on the theoretical aspects of the development of these landforms and how these landforms can be used by humans.

QUESTION 3: PEOPLE AND PLACES: RURAL AND URBAN SETTLEMENTS, PEOPLE AND THEIR NEEDS

Candidates performed fairly in this question. It was a popular choice question and scored the highest average of the four choice questions.

Common errors and misconceptions

- (a) Many candidates confused the term *rural-urban fringe* with *rural-urban migration* (Q3.3.3).
- (b) The term *balance of trade* was unfamiliar to many candidates (Q3.4.3).
- (c) Some candidates could not define the term *globalisation* and answer the follow up question (Q3.5.4).
- (d) Some candidates struggled with the concept of *food insecurity* (Q3.6.1).
- (e) Few candidates understood the concept of *genetic modification* (Q3.6.3).
- (f) Many candidates struggled to give reasons for Southern African countries to meet their food demands (Q3.6.4).

Suggestions for improvement

- (a) Learners did not know the difference between *characteristics* and *functions*, and between *effects* and *causes*. Teachers must put more emphasis on teaching the difference between these aspects.
- (b) Learners must be given an examination kit as early as the first term. Teachers must keep up-to-date with world events, for example recent economic developments and duplicate these to learners.
- (c) Teachers should make sure the NCS/Examination Guideline is covered fully with as many examples as possible. Subject Advisors must hold workshops for teachers to assist them with handling the areas of difficulties.
- (d) Questions on globalisation and food security/insecurity are commonly asked in question papers. Teachers should research these topics and use case studies from southern Africa to explain these concepts. The use of cartoons is often linked to these topics and teachers should find relevant examples.

QUESTION 4: PEOPLE AND PLACES: RURAL AND URBAN SETTLEMENTS, PEOPLE AND THEIR NEEDS

This question was answered poorly.

Common errors and misconceptions

- (a) Many candidates confused the term *urban growth* with *urban expansion* and *urbanisation* (Q4.3.1).
- (b) Many candidates cannot distinguish between *push* and *pull* factors (Q4.3.3).

- (c) Some candidates could not provide solutions for urban blight. Many referred to solutions in rural areas to prevent rural-urban migration (Q4.3.4).
- (d) Most candidates could not answer the question on the Orange River Project (Q4.5).
- (e) The term *bridge industries* proved to be foreign to the majority of candidates (Q4.6.1).

Suggestions for improvement

- (a) Careful consideration of the abovementioned topics needs to be taken. Learners need to be given a full explanation of the content.
- (b) More exposure to contextual analysis questions is needed. These types of questions are common in Questions 3 and 4.
- (c) Learners struggle with water transfer schemes. Teachers should not use textbooks only. In addition to textbooks, teachers should find additional information, for example the Orange River Project is not covered in many textbooks, although it is clearly stated in the SAG and Examination Guideline as a water transfer scheme to be studied.
- (d) It is important to link industrial development with issues that might impact on the society within which those industries occur. Teachers should not only focus on the positive spin-offs of industrial development, but should focus also on the societal injustices that might occur as a result of industrialisation.
- (e) Further the term *injustice* must be made clear to learners. This is a geographical concept that is examined regularly. The term injustice must be linked to settlements and the environment. Learners must be able to distinguish between environmental, social and economic injustices.
- (f) Questions on water transfer schemes are commonly asked in examination papers. Teachers must research these topics and refer to all the major water transfer schemes in South Africa; it is Orange River Project, Lesotho Highlands Water Scheme, Tugela-Vaal Water Transfer Scheme and The Boland Project. Often these transfer schemes are also known by other names and candidates must be made aware of this.

7.5 Overview of learner performance in Paper 2

General comments

- (a) It appears that second and third language candidates cannot express themselves clearly.
- (b) Candidates seem to be ignorant because they did not read instructions, nor did they use the given information (sketches, graphs, photos) to help/support their responses.
- (c) Middle to higher order level response posed a great challenge to the candidates. Action words/verbs like comment/explain/describe/differentiate confused candidates. Many could not express themselves clearly and did not know how to approach these questions.

- (d) With practical application, candidates tended to answer these questions from personal experiences, rather than using map or photo evidence.
- (e) Although there has been a remarkable increase in the number of candidates who attempted the calculations, the fundamental knowledge is still lacking.

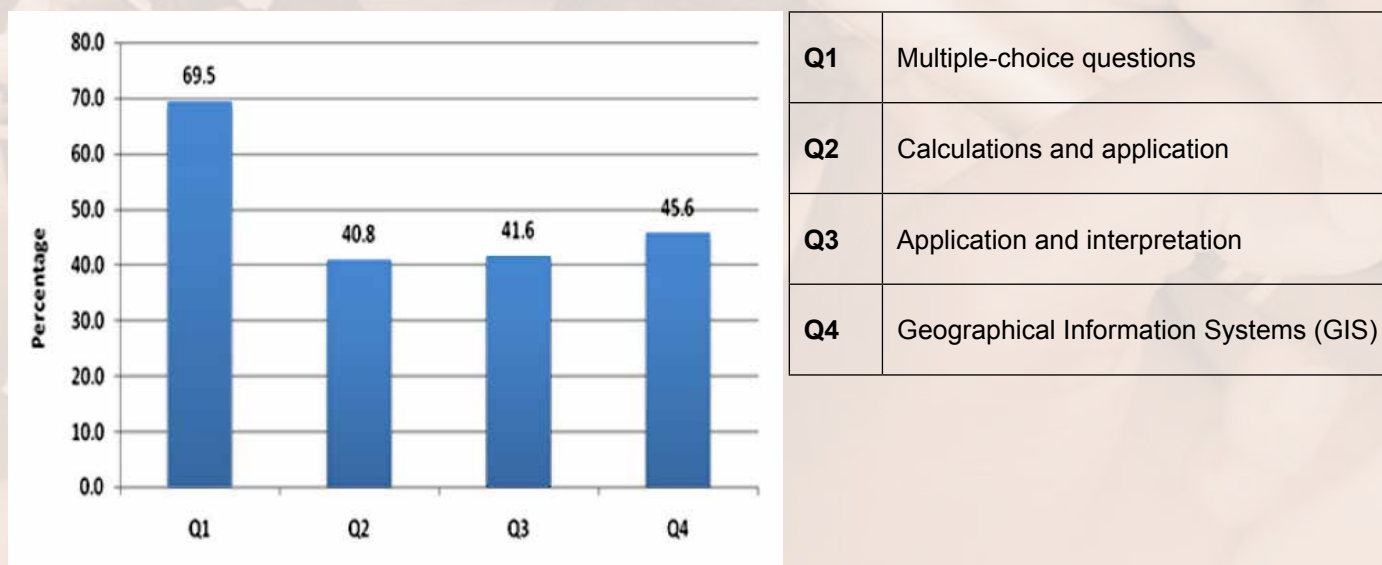
General suggestions for improvement

- (a) Teachers should also help learners to relate the orthophoto map with a specific area on the topographic map using latitude and longitude.
- (b) Teachers should work together in cluster meetings and assist in setting common papers that are more practical.
- (c) The learners should be taught to recognise small differences in the choice of answers given in a multiple choice question. Further, teachers should be trained in the proper way of setting multiple choice questions.
- (d) The Geomorphology and Settlements sections of the NCS must be taught by integrating maps. With proper planning learners would be able to see how theory can be applied.
- (e) Teachers should use what is at their disposal to teach the learners, for example go outside the class to show certain features and characteristics of features. Taking learners on excursions would be a bonus.
- (f) The integration between theory and mapwork must be taught in the classroom. Teachers should also emphasise the importance of geographic terminology in tests and examinations. For example, candidates often use words such as 'left' and 'right' instead of north, south, east or west.
- (g) The teaching of map and photo interpretation is not purely textbook based. Teachers must make sure that all topographic maps and orthophoto maps are kept safely at school. These topographic maps and orthophoto maps are valuable resource materials that should be engaged with on a regular basis.
- (h) The integration of theory and mapwork cannot be emphasised enough. Learners must be made aware that Geography Paper 1 and Paper 2 are inter-related and not two separate entities.

7.6 Diagnostic question analysis for Paper 2

A sample of scripts from each province revealed the following average percentages on each question.

Figure 7.6: Average percentage performance per question in Paper 2



Q1	Multiple-choice questions
Q2	Calculations and application
Q3	Application and interpretation
Q4	Geographical Information Systems (GIS)

7.7 Analysis of learner performance in individual questions in Paper 2

QUESTION 1: MULTIPLE CHOICE QUESTIONS

Candidates performed exceptionally well in this question.

Common errors and misconceptions

- Candidates had poor knowledge of conventional signs.
- Many candidates did not refer to the topographic map and/or orthophoto to find answers.
- Many candidates did not know how to use the map index.
- Many candidates did not know how to use clues on the map to determine the flow direction of a river.

Suggestions for improvement

- Learners should not only know the different types of landforms and slopes, but they should also be able to identify them on the map and in the surrounding environment.
- Learners should be taught to use the information supplied at the bottom of the map, for example projection used to draw the map, map symbols, magnetic declination, contour interval and map code, because this will make answering Question 1 easier.
- Teachers should emphasise the use of conventional signs, and that learners should study the key of the map before attempting to answer questions. More tasks on the conventional signs can assist the learners.

QUESTION 2: CALCULATIONS AND APPLICATION**Common errors and misconceptions**

The common errors that candidates made were:

- calculating gradient (Q2.1.3);
- determining magnetic declination (Q2.2); and
- drawing a cross-section (Q2.3)

Suggestions for improvement

(a) The following exercises/activities could be undertaken to overcome challenges relating to the calculation of gradient:

- Calculation problems can be resolved through continuous exercise. Calculation problems cannot be solved if learners are given limited exercises.
- From time to time learners should be given exercises on calculations. This could be given as homework and marked in class.
- Ensure that all areas of calculations are covered and that learners know how to follow the steps when doing calculations as calculation steps are awarded marks.
- The following formula should be used when calculating gradient. Take note that there are other variations to this formula that can be used to calculate gradient. This formula, however, covers all the steps needed to gain full marks when gradient is calculated.

$$\text{Gradient} = \frac{\text{Vertical Interval}}{\text{Horizontal Equivalent}}$$

Horizontal equivalent referred to in the formula is the same as *distance in reality*. Always calculate horizontal equivalent in metres.

- In order to calculate gradient, one should first calculate the *vertical interval* and then the *horizontal equivalent*. Vertical interval is the difference in height between two given points on a map. Horizontal equivalent is the distance in reality, in metres, between the same two points on the map.
- Refer to the following example which is the question used in the November 2012 examination paper, i.e. Question 2.1.3: Calculate the average gradient of the slope between spot height 1797 and spot height 2263 in block **A10** on the topographical map. Show ALL calculations. The desired answer is:

$$\begin{aligned} \text{Vertical Interval} &= 2\,263\text{ m} - 1\,797\text{ m} \\ &= 466\text{ m} \end{aligned}$$

NEVER round-off any numbers used in calculating vertical interval.

$$\begin{aligned} \text{Horizontal Equivalent} &= \frac{\text{map distance (mm)} \times \text{map scale denominator}}{1\,000} \\ &= \frac{38\text{ mm} \times 50\,000}{1\,000} \\ &= \frac{1\,900\,000}{1\,000} \\ &= 1\,900\text{ m} \end{aligned}$$

$$\begin{aligned} \text{Gradient} &= \frac{\text{Vertical Interval}}{\text{Horizontal Equivalent}} \\ &= \frac{466}{1\,900} \\ &= \frac{1}{4.07} \\ &= 1:4.07 \text{ OR } 1 \text{ in } 4.07 \end{aligned}$$

Calculate horizontal equivalent in metres.

- In order to keep the ratio in the formula the same, the 'top' and the 'bottom' must be divided by the same number. The 'top' must always be 1.
- For this example the 'top' and 'bottom' must therefore be divide by 466.
- Do not round-off your answer to a whole number. Round-off to two decimals.
- Your final answer may be given as a fraction, or it may be changed to a ratio scale or word statement.

This answer means that for every 4.07 m that one walks across (horizontal equivalent) one will rise by 1 m (vertical interval). This means the gradient is steep as one rises by 1 m over a very short distance. The greater the answer (horizontal equivalent), the more gradual the gradient becomes as one walks further before one rises by 1 m.

(b) The following exercises/activities could be undertaken to overcome challenges relating to the calculation of magnetic declination:

- Calculation problems can be resolved through continuous exercise. Calculation problems cannot be solved if learners are given limited exercises.
- From time to time learners should be given exercises on calculations. This should not necessarily be done in class, but can be given as homework and marked in class.
- Ensure that all areas of calculations are covered and that learners know how to follow the steps when doing calculations as calculation steps are awarded marks.

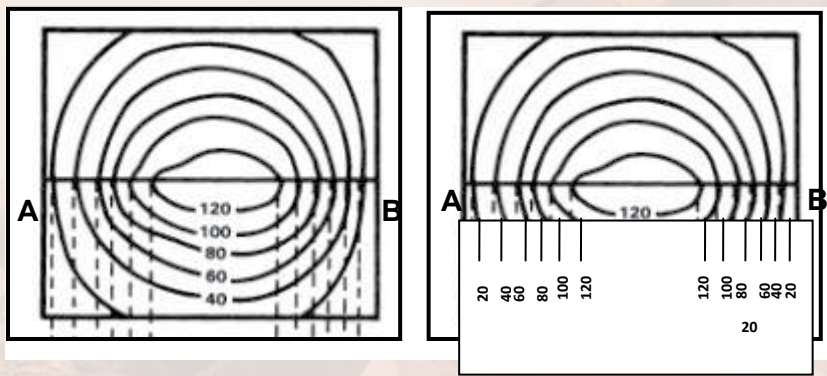
- Follow the steps in the example given below as this will allow learners to score full marks in the final examination paper.
- Refer to the following example which is the question used in the November 2012 examination paper. That is, question 2.2: Using the information on the topographical map, determine the magnetic declination for this year. Show ALL calculations/steps followed. The desired answer is:

<u>Date of map:</u>	2001	Find in corner bottom left on map.
<u>Magnetic declination 2001:</u>	20°28'W	Find in corner bottom left on map.
<u>Mean annual change:</u>	8'W	Find in corner bottom left on map.
<u>Difference in years:</u>	11	2012 – 2001 (The current date will always be the year you are in).
<u>Total annual change:</u>	88'W/1°28'W	Mean annual change (8'W) x difference in years (11) = 88'W. Change 88'W to degrees and minutes
<u>Magnetic declination 2012:</u>	21°56'W	Magnetic declination 2001 (20°28'W) + total annual change (1°28'W)

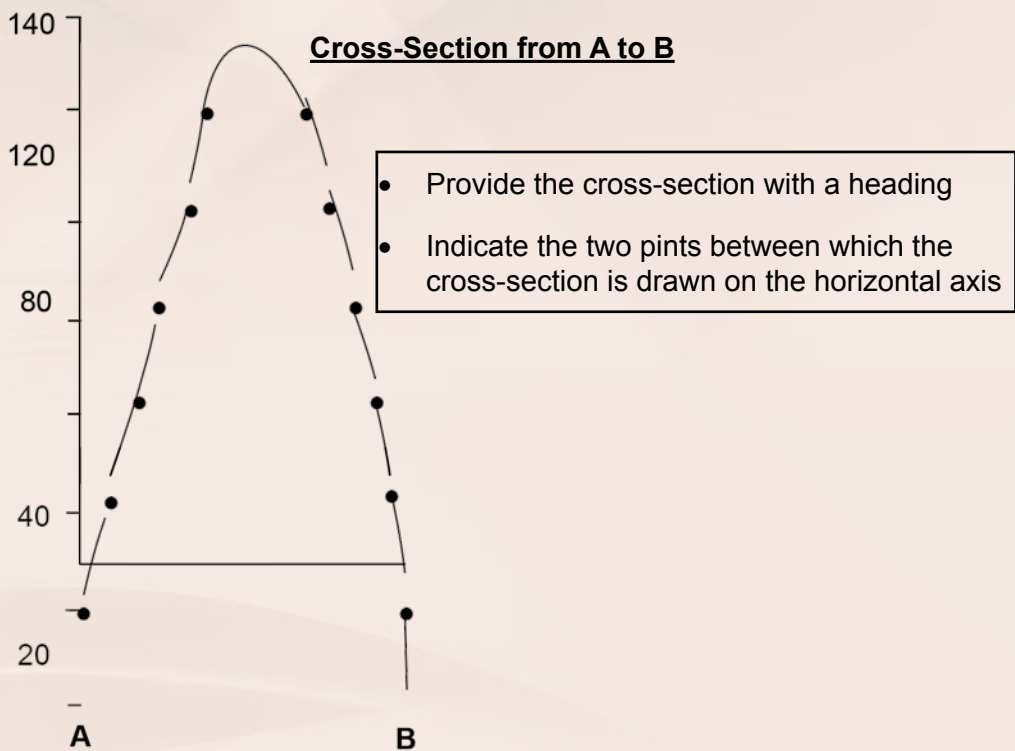
- Teachers should do similar exercises on as many different maps as possible to get a variety of answers. Using only ONE map will not give learners enough exercises as the majority of readings will be the same.

(c) The challenges relating to the drawing of a cross-section can be overcome in the following ways:

- Drawing a line on the map from where the profile is to begin to where it is to end.
- Placing a blank strip of paper along the line that you have drawn.
- On the blank strip of paper, making a mark for each of the contour lines that cross or touch the profile line.
- Writing down the height, which represents each of the contour lines marked on the strip of paper, under each of the marks.



- Draw a graph on which the cross-section will be drawn. The horizontal axis must be exactly the same length as the line between the two points where the cross-section is drawn. The vertical axis must be drawn according to a predetermined scale e.g. 1 cm represents 20 m. This means the vertical axis must be divided into units of 1 cm each. Each one of these 1 cm units must show an increase of 20 m on the vertical axis. Find the value of the highest and lowest contour lines that cross or touch the profile line. Add one value above the highest and one below the lowest to determine the height of the vertical axis. For example, the highest contour value is 120 m, therefore the vertical axis must extend to 140 m. The lowest contour value is 20 m therefore the vertical axis must start at 0 m.



- (d) Teachers should not only teach learners how to calculate gradient, but also to interpret the answer of the gradient after calculations.
- (e) Teachers should teach learners the additions and subtractions of magnetic declination. If the angle moves to the west it increases, then an addition must be made. If it moves to the east it decreases, then a subtraction must be made. This will assist learners to understand it better. An addition or subtraction sign should be clearly indicated in the answer.

- (f) Learners should know that when you draw a cross section, the starting point is always on the left vertical line of the graph. Learners lost marks because they started from right to left - therefore drawing a mirror image. The starting point of a cross-section is always the point from where one must draw the cross-section.
- (g) Step-by-step instructions on how to draw a cross-section should be taught in the classroom from Grade 10 already.
- (h) Building of models by using contour lines will allow learners immediately to see the correlation between contour lines, landforms and slopes.
- (i) Learners must be shown how to identify landforms and slope types on topographical and orthophoto maps. This should be included in regular practice tests and exams.
- (j) All calculations should be taught from Grade 10 already and practiced regularly.
- (k) All units of measurement must be included. Marks are lost if units of measurements are not included.
- (l) Learners need to familiarise themselves with all the different formulas.

QUESTION 3: APPLICATION AND INTERPRETATION

Common errors and misconceptions

Common errors candidates made include the following:

- Applying theoretical concepts to the topographic map and orthophoto map.
- Identifying features studied in theory on topographic map and orthophoto map.
- Orientation of topographic map and orthophoto map.
- Finding similar features on the topographic map and orthophoto map.
- Not taking scale into account of topographic map and orthophoto map for example when distance between two points on topographic map is 20 mm, also measuring 20 mm on the orthophoto map and not adjusting measurement.
- Not knowing how to use clues on the topographic map and orthophoto map to determine whether residential areas are high, middle or low income residential areas.
- Not using their theoretical knowledge in answering mapwork questions.

Suggestions for improvement

- (a) Regular and correct use of geographical concepts in class to improve learners' understanding thereof.
- (b) Continuous integration of content knowledge with map work must be introduced as early as early as Grades 10 and 11.
- (c) Teachers should give regular worksheets to learners to improve map reading and interpretation skills.
- (d) Teachers should expose learners to previous examination papers where similar questions and questions of the correct difficulty levels are provided.
- (e) Exercises to identify landforms and drainage patterns on topographic maps when those concepts are taught in theory must be practiced in class.
- (f) Exercises to identify settlement outlines, street patterns and land use zones on topographic maps when those concepts are taught in theory.
- (g) Learners should be taught that scale influences distances between similar points when measured on the topographic map and orthophoto map respectively. Teachers must emphasise that the scale of the topographic map is 1:50 000 while the scale of an orthophoto map is 1:10 000.
- (h) Learners must be taught how to orientate the topographic map with the orthophoto map.

QUESTION 4: GEOGRAPHICAL INFORMATION SYSTEMS (GIS)**Common errors and misconceptions**

- (a) Many candidates did not know terminology such as *data layering*, *spatial data* and *attribute data*.
- (b) Most candidates did not know what a GPS is.
- (c) Many candidates did not know how GIS could be put into practice, for example during disaster management.

Suggestions for improvement

- (a) GIS concepts must be taught in context. While it is important for learners to know the concepts and be able to define them when required to, learners must be able to apply the concepts in practical life situations. Teachers must therefore be aware of the fact that GIS will not just consist of theory and definitions but rather be practically applied to the map examined.
- (b) Teachers are advised to create scenarios to challenge learners to apply knowledge on their understanding of concepts and to apply GIS knowledge across the various topics of the subject (integration). Learners:

- Could be required to apply GIS in flood prevention (buffering);
 - Could apply GIS in choosing a site for the development of a settlement (data layering);
 - Could create a new map from different types and sized maps (data integration);
 - Must know that GIS can contribute in solving social and environmental challenges; and
 - Must be aware that GIS can be used to manage various issues e.g. disasters, crime, etc.
- (c) Teachers should integrate GIS knowledge across the various topics of the subject. Learners could be asked to apply GIS concepts in Climate and Weather, Fluvial Processes, People and Places and People and their Needs. By so doing, learners will know that GIS can contribute in solving social and environmental challenges.
- (d) Refer to previous NSC question papers to get an idea as to how GIS questions are set. Teaching approaches should be adapted accordingly.
- (e) Teachers should be trained in GIS. A GIS specialist should be invited to assist at cluster or regional meetings. Very few teachers have a qualification in GIS and need help to be able to prepare the learners for this question in the final examination. A GIS intervention guide with all the information needed should be made available to Subject Advisers and teachers.
- (f) Teachers should devote ample time for planning GIS lessons. The curriculum currently requires learners to know and apply the GIS concepts. In developing lessons, teachers should make it priority to communicate the material in a meaningful way that takes cognisance of learners' personal experience.
- (g) Learners can be exposed to cell phones that have GPS, and the teacher should use GPS as a teaching aid in the classroom to expose learners to it.

CHAPTER 8

HISTORY

The following report should be read in conjunction with the History question papers of the November 2012 Examination.

8.1 Performance trends (2009 – 2012)

There has been a consistent improvement since 2009 in the percentage of candidates passing History. In 2012, the percentage of candidates passing History at 40% increased by 12.3% and at 30% by 10.1% as compared to the figures for 2011.

Table 8.1: Overall achievement rates in History

Year	No. Wrote	No. Achieved at 30% and Above	% Achieved at 30% and Above	No. Achieved at 40% and Above	% Achieved at 40% and Above
2009	90 054	65 025	72.2%	42 266	46.9%
2010	87 676	66 429	75.8%	46 042	52.5%
2011	85 928	65 239	75.9%	45 277	52.7%
2012	94 489	81 265	86.0%	61 403	65.0%

Figure 8.1: Overall achievement rates in History

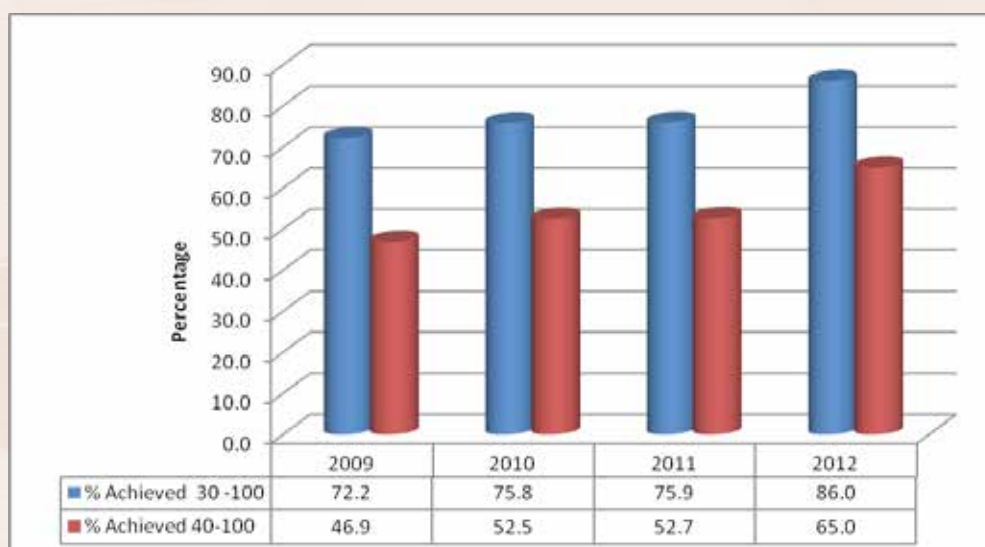
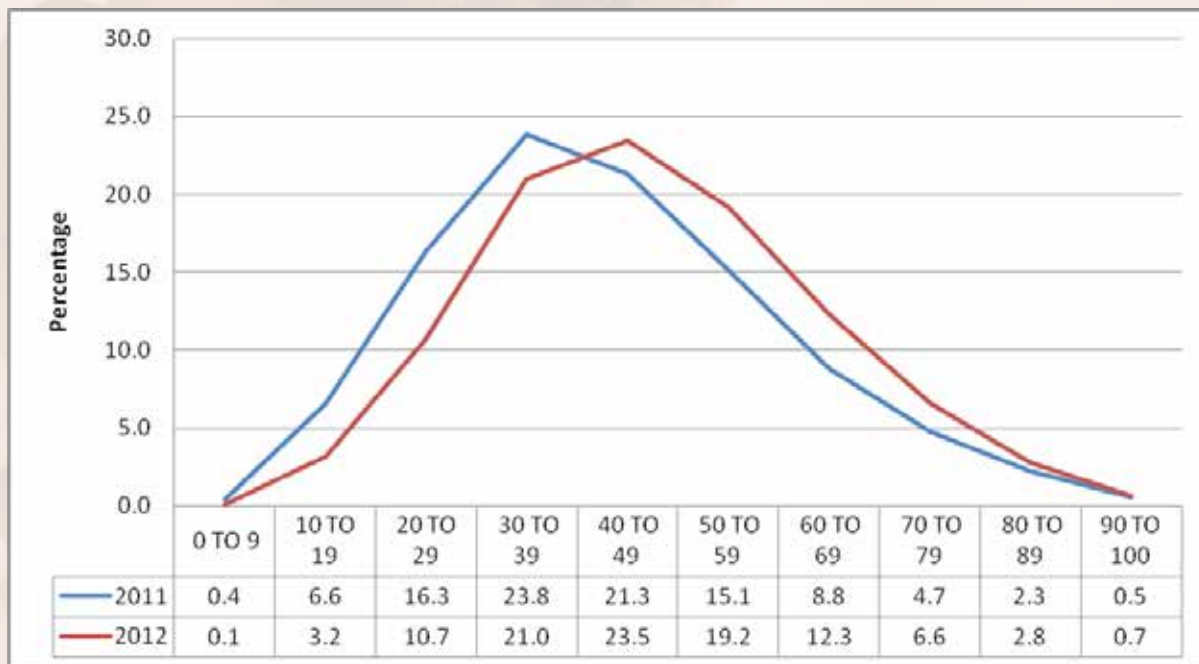


Figure 8.2: Performance distribution curves (History: 2011 – 2012)



In 2012, there was an increase in the percentage of the candidates who performed at 40% and above, compared 2011.

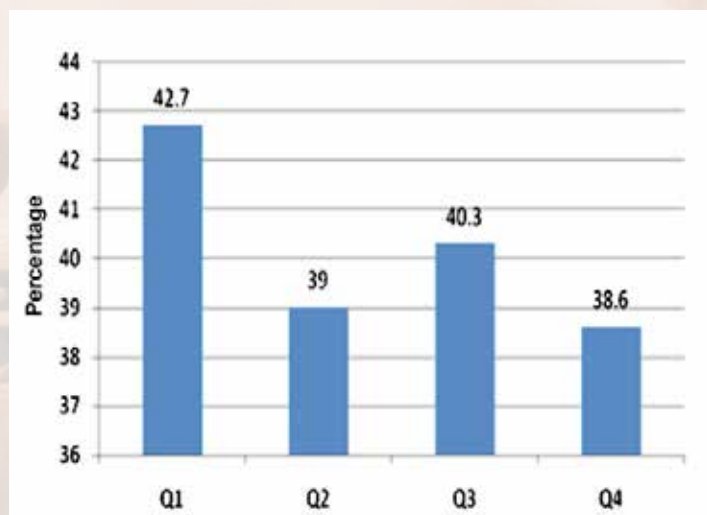
8.2 Overview of learner performance in Paper 1

- (a) Generally, candidates’ performances in this question paper ranged from fair to good and catered for both weaker and stronger candidates. Reports from PEDs indicated that candidates performed better overall than in previous years.
- (b) Most candidates completed the paper in the allocated time.
- (c) The most successful candidates, some of whom obtained full marks, were able to interpret, analyse, evaluate and synthesise evidence from the given sources and also use their own knowledge. They were able to comment on the usefulness, limitation and accuracy of the sources. With regard to paragraph and extended-writing questions, candidates were able to construct an original argument, and were able to synthesise evidence from the sources provided so to construct an original argument.
- (d) Candidates who performed poorly displayed a weak command and understanding of the English language. It is evident that some candidates had scant content knowledge and simply could not answer the questions posed. Moreover, some candidates appeared to be ill-prepared and had not studied hard enough.

8.3 Diagnostic question analysis for Paper 1

The graph below is based on a sample of scripts analysed. Question 1 (Cuban Missile Crisis) was the best answered question. Questions 2 (Tanzania) Question 3 (civil society protests USA) and Questions 4 (Black Consciousness) were more poorly answered questions.

Figure 8.3: Average marks per question in Paper 1 expressed as a percentage



Q1	Cuban Missile Crisis
Q2	Tanzania
Q3	Civil society protests (USA)
Q4	Black Consciousness

8.4 Analysis of learner performance in individual questions in Paper 1

Generally, the candidates' performances ranged from fair to good. Most candidates performed fairly well in the source-based questions, while many candidates struggled to provide cogent responses to the extended writing questions. It appeared that numerous centres lacked appropriate resources such as textbooks, especially those covering the new themes adequately, and that limited exposure to examination-type questions disadvantaged many candidates. Candidates who attempted Question 1 and Question 4 performed poorly, because of the lack of appropriate content knowledge. Teachers need to give urgent attention to this problem.

Common errors and misconceptions regarding source-based questions

(a) Many candidates performed poorly on the following source-based questions:

- Q1 (1.1.3; 1.1.4; 1.3.3; 1.3.4)
- Q2 (2.1.6; 2.1.8; 2.2.1; 2.2.4)
- Q3 (3.1.5 (a); 3.2.2; 3.2.4; 3.2.5)
- Q4 (4.1.5; 4.2.1; 4.2.2; 4.3; 4.5.2)

(b) The majority of the candidates are additional language English speakers and hence experienced difficulty in interpreting some of the questions. Some candidates were unable to understand the questions set. They were unable to ascertain the usefulness, degree of bias and degree of accuracy of source material; they also struggled to compare evidence; make judgements (justified or not justified) or interpret and analyse sources.

(c) Words such as 'limitations', 'bias', 'similarities' and 'differences' also contributed to candidates' poor performance. It is important that learners be familiar with such terms.

(d) Candidates displayed poor content knowledge, especially of themes 1 and 4. Theme 1 (Cuban Missile Crisis) was introduced only in 2011 and appeared to have been neglected by many centres.

- (e) Many candidates were unable to explain the role that Black Consciousness played in influencing the Soweto uprising.

Common errors and misconceptions regarding paragraph-type questions

- (a) Many candidates performed poorly on the following paragraph-type questions:
- Q1.4
 - Q3.4
 - Q4.6
- (b) Many candidates were unable to construct reasonable paragraphs for the following reasons:
- poor language and writing skills, which resulted in poorly-constructed paragraphs, with many candidates unable to summarise points coherently within the 80-word limit.
 - inability to use own knowledge to write an organised paragraph in response to the question posed and substantiate their responses with suitable evidence
 - use of a bullet-point format such as is not acceptable in the writing of paragraphs.
 - inability to synthesise the given information as reflected by their copying of the information directly from the sources provided.

Common errors and misconceptions regarding extended writing (level 1) questions

- (a) Many candidates performed poorly on extended writing questions:
- Q1.5.1
 - Q2.4.1
 - Q3.5.1
 - Q4.7.1
- (b) Many candidates wrote generally about the Civil Rights Movement and/or vague and generalised accounts of Steve Biko's contribution instead of focusing on how the philosophy of the Black Consciousness Movement influenced the Soweto Uprising of 1976.
- (c) Many candidates were unable to write a logical essay. Further, they displayed the following:

- inability to write a coherent, well-balanced and structured essay following the given line of argument
- inability to synthesise the information on the different forms of the Civil Rights Movement;
- technical flaws – no introduction, lack of a logical, coherent argument and conclusion;
- failure to attempt the question; inadequate content; responses mostly irrelevant and superficial;
- lack of the necessary skills to discuss the different forms of protest that the civil rights activists embarked upon in the 1960s; most candidates gave a narrative account of the protest action;
- absence of analysis and historical explanation; and
- using the telegraphic approach.

Common errors and misconceptions regarding extended writing (level 2) questions

(a) Many candidates performed poorly on extended writing questions

- Q1.5.2
- Q2.4.2
- Q3.5.2
- Q4.7.2

(b) Many candidates were unable to write this type of essay – which required the use of evidence from the sources together with own knowledge. Further, they displayed the following:

- no attempt to focus on the topic;
- technical flaws – lack of introduction and conclusion;
- poor or no historical knowledge of the topic; and
- very little evidence of interpretation, analysis and the ability to construct an original argument; little or no exposure to the demands of this genre of writing and how the holistic rubric is used to assess answers.

8.5 Overview of learner performance in Paper 2

- (a) Generally, candidates’ performances in this question paper ranged from fair to good.
- (b) In the main, most questions were satisfactorily answered. There seems to be an improvement in the quality of candidates’ responses and thus an improvement in their performance. Candidates who attempted questions 3 and 4 performed better than those who attempted questions 1 and 2.
- (c) Most candidates completed the paper in the allocated time.
- (d) Candidates who performed poorly generally displayed a poor command and understanding of the English language. It is evident that some candidates had scant content knowledge and simply could not answer the questions. On the other hand, some candidates were simply ill-prepared and did not study hard enough.

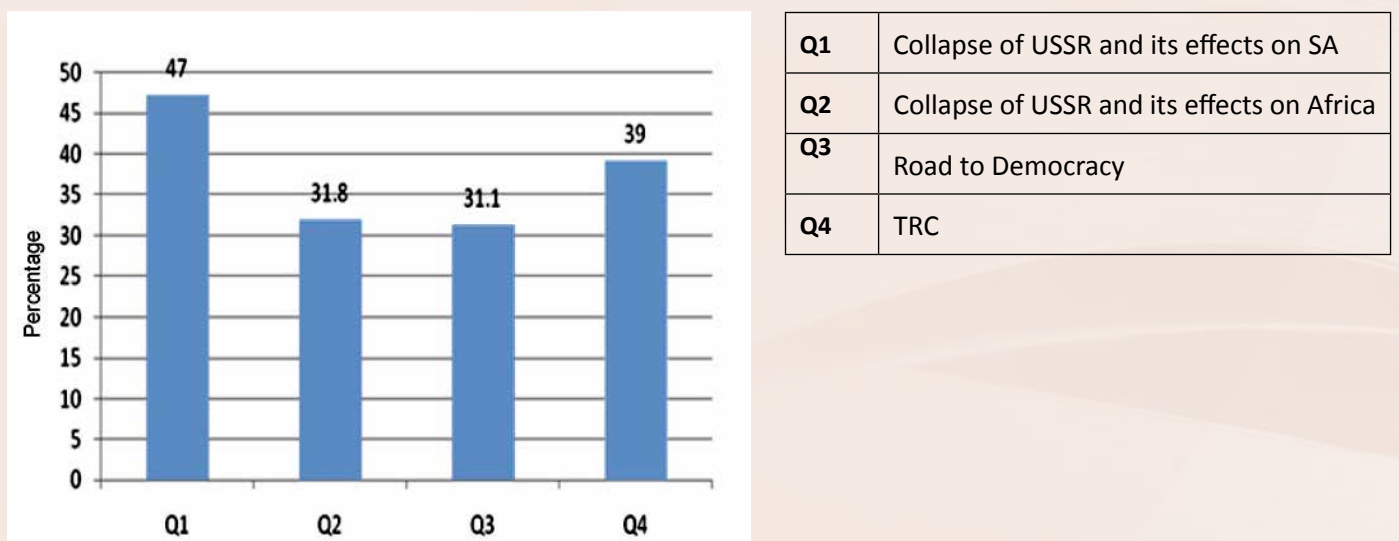
Suggestions for improvement

- a) Teachers need to develop methods to communicate content to learners who have difficulty with the prescribed content.

8.6 Diagnostic question analysis for Paper 2

The figure below is based on a sample of scripts analysed. Question 1 (Collapse of the USSR and its effects on SA) was the better answered question. Question 2 (Collapse of USSR and its effects on Africa), Question 3 (Road to Democracy) and Question 4 were relatively poorly answered questions.

Figure 8.6: Average marks per question in Paper 2 expressed as a percentage



8.7 Analysis of learner performance in individual questions in Paper 2

Generally, Questions 2 and 3 were poorly answered. It was evident that candidates had a lack of content knowledge. Because Angola is a new theme, textbooks are not covering this theme adequately.

Common errors and misconceptions regarding source-based questions

- (a) Many candidates performed poorly on the following source-based questions:
- Q1 (1.1.2; 1.1.4; 1.2.2; 1.3.2; 1.4)
 - Q2 (2.1.3; 2.1.5; 2.2.2; 2.2.3; 2.3.1; 2.3.2; 2.4)
 - Q3 (3.1.2; 3.2.1; 3.2.2; 3.3.1; 3.5.4)
 - Q4 (4.1.2; 4.1.5; 4.1.6; 4.2.3; 4.3.1; 4.4)
- (b) The majority of the candidates are additional language English speakers and hence experienced difficulty in interpreting some of the questions. Some candidates were unable to understand them. They were unable to ascertain the usefulness, degree of bias and degree of accuracy of source material. They also struggled to compare evidence; make judgements (justified or not justified) or interpret and analyse sources. Some candidates could not interpret the cartoons.
- (c) Candidates gave one response when the question required two.
- (d) They also displayed a limited understanding of the key historical concepts such as multi-party democracy and reconciliation.
- (e) Candidates displayed poor content knowledge, especially of theme 2. Theme 2 (Angola) was introduced only in 2011.
- (f) There was evidence of poor teaching and learning.
- (g) There was evidence of a lack of reading, writing and language skills, especially among FAL candidates.
- (h) Resources were lacking, especially for the new theme.
- (i) Exposure to examination-type questions appears to have been limited.

Common errors and misconceptions regarding paragraph-type questions

- (a) Many candidates performed poorly on the following paragraph-type questions:
- Q1.5
 - Q2.5
 - Q3.6
 - Q4.5

- (b) Many candidates were unable to construct reasonable paragraphs for the following:
- inability to write a coherent paragraph;
 - inability to use own knowledge to write an organised paragraph in response to the question posed and substantiate their responses with suitable evidence;
 - inability to interpret, analyse and integrate the information from the source to write a coherent and logical paragraph;
 - inability to synthesise the given information as reflected by their copying of the information directly from the sources provided;
 - being constrained by the number of words required to write a focused paragraph (80 words); and
 - poor language and writing skills.
- c) Many lacked the requisite content knowledge to answer the question posed, for example in Q3.6. Most candidates merely wrote on how the process of negotiations was disrupted. They were unable to explain how the right-wing groups attempted to disrupt the negotiations. This shows that candidates were not taught the necessary paragraph-writing skills and were also not exposed to the prescribed analytic rubric that was used in the assessment of paragraphs.

Common errors and misconceptions regarding extended writing (level 1) questions

- (a) Many candidates performed poorly in answering extended writing questions:
- Q1.6.1
 - Q2.6.1
 - Q3.7.1
 - Q4.6.1
- (b) Many candidates were unable to write logical essays for the following reason:
- inability to provide an argument in some cases, have a clear introduction and conclusion; for example Q3.7.1 most candidates focused exclusively on the negotiation process rather than on the obstacles that confronted South Africa's role players on the road to democracy; and
- (c) Candidates were unable to demonstrate their ability to understand e.g. in Q2.6.1, and candidates lacked the necessary content knowledge to discuss to what extent Angola was able to re-imagine itself. Also in Q4.6.1, most candidates mainly focussed on the attempt of the TRC to heal South Africa from its divided past.

(d) Candidates provided vague and disjointed responses in certain cases.

Common errors and misconceptions regarding extended writing (level 2) questions

(a) Many candidates performed poorly on extended writing questions:

- Q1.6.2
- Q2.6.2
- Q3.7.2
- Q4.6.2

(b) Many candidates were unable to write this type of essay, which required the use of evidence from the sources and own knowledge:

- failure to focus on the topic;
- lack of an introduction and a conclusion;
- poor or no historical knowledge of the topic, evident in Q2.6.2, Q3.6.2 and Q4.6.2, in which most candidates showed very little or no understanding of how to write/construct an essay using the information from the sources and their own knowledge;
- in many cases, no effort to use evidence from the sources to answer the question;
- some completely irrelevant responses that obtained a failure mark;
- direct copying from the sources without acknowledgement;
- very little evidence of interpretation, analysis and the ability to construct an original argument' for example in Q2.6.2; and
- evidence that candidates had not been taught how to respond to this type of essay question and how it would be assessed.

Suggestions for improvement

(a) Teachers need to ensure that they follow the National Examination Guidelines during the teaching and assessment of the sections prescribed. The Examination Guidelines are designed to provide clarity on the scope and depth of the concepts that need to be taught, learned and assessed.

(b) Teachers must cover the whole syllabus. More practice in coping with challenging content is required. In this respect, adequate support should be given to teachers and regular monitoring should take place.

- (c) In the teaching of History, learners should be exposed to a variety of sources and the related source-based skills such as reading, interpreting, analysing, evaluating, comparing/contrasting and ascertaining the limitations, usefulness and justification of such sources. Learners should be taught the relevant themes using interactive/ user-friendly teaching methodology and the relevant notes.
- (d) Teachers should use relevant resources to do justice to the themes. Teachers and learners should not rely on one textbook only, and they should be alert to new resource materials such as media articles or newspaper supplements. Radio or TV features can also be used productively.
- (e) User-friendly resource materials should be developed and used, especially for the new content areas (Angola) and case studies on the TRC.
- (f) Teachers need ongoing professional support (workshops) on how to work with different types of sources and how to write coherent essays. Comprehensive source/resource booklets should be developed and be made available to both teachers and candidates. Workshops and focused cluster meetings on curriculum and assessment matters should be considered as these will be very valuable.
- (g) Teacher workshops need to focus content knowledge, especially for themes 1 and 2 (Papers 1 and 2) as well as source-based skills and extended writing skills.
- (h) Using the prescribed SAG document, teachers should be guided in the setting of good questions by effectively understanding and using the content, LOs, ASs and an understanding of the applicable taxonomies. Reference to past question papers to benchmark the setting of questions for tests and classwork should be encouraged. Cluster groups should practise the setting of test and examination question papers and have them moderated by curriculum advisers to ensure standardisation.
- (i) Schools that have produced outstanding results should network with those which have difficulties i.e. twinning of schools. Under-performing schools should be regularly visited by the curriculum advisers so as to give support and assist development.
- (j) There should be monitoring of the SBA programme with a view to quality assurance.
- (k) Teachers need to teach in English and not in the vernacular, as candidates are required to write the paper in English.
- (l) Learners need to be taught techniques necessary for the construction of coherent, well-planned and structured paragraphs and essays. In this regard, educators are encouraged to use writing frames. Learners should be taught how to answer the questions posed, with an appropriate introduction, a body of historical knowledge and a relevant conclusion.
- (m) Assessment of learners' skills such as interpretation, analysis, evaluation and synthesis of evidence from given sources, both informal and formal, should be continual.

- (n) A detailed analysis of learners' results should be undertaken to identify common areas of concern/weakness. After this is done, appropriate remediation measures should be put in place to assist learners to develop the requisite skills.
- (o) Past NSC examination question papers should be made available and learners should be required to work with them. This would assist in familiarizing learners with the style of questioning required in the public examinations.
- (p) Candidate support materials should ideally include self-study activities based on the format of typical examination-type questions, i.e. source-based and extended writing questions.
- (q) Common controlled tests would conduce to an improvement in the quality of teaching, learning and assessment.
- (r) Regular assignments, homework and tests must be given.
- (s) Teachers should be exposed to how to plan, develop and effectively teach the new content areas to candidates.

CHAPTER 9

LIFE SCIENCES

The following report should be read in conjunction with the Life Sciences question papers of the November 2012 Examination.

9.1 Performance trends (2009 – 2012)

In 2012, as compared to 2011, there was a 3.7% decrease in the percentage of learners who achieved at 30% and above, and a 2.8% decrease in the percentage of learners who achieved at 40% and above.

Table 9.1: Overall achievement rates in the Life Sciences

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	298 663	195 652	65.5%	119 069	39.9%
2010	285 496	212 895	74.6%	147 518	51.7%
2011	264 819	193 946	73.2%	122 302	46.2%
2012	278 412	193 593	69.5%	120 734	43.4%

Figure 9.1: Overall achievement rates in the Life Sciences

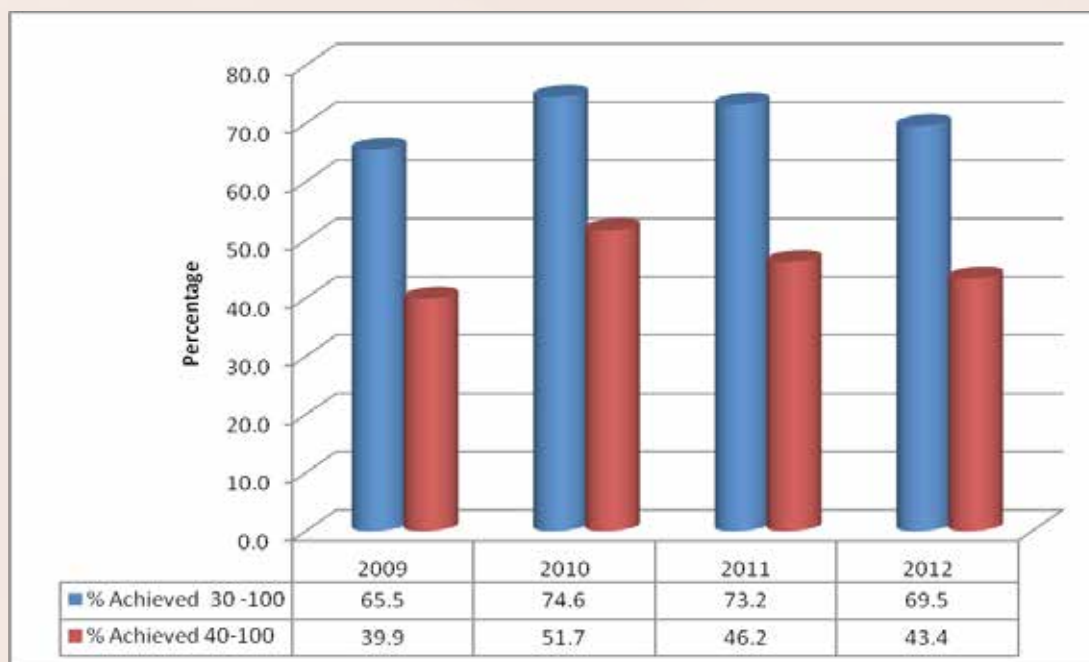
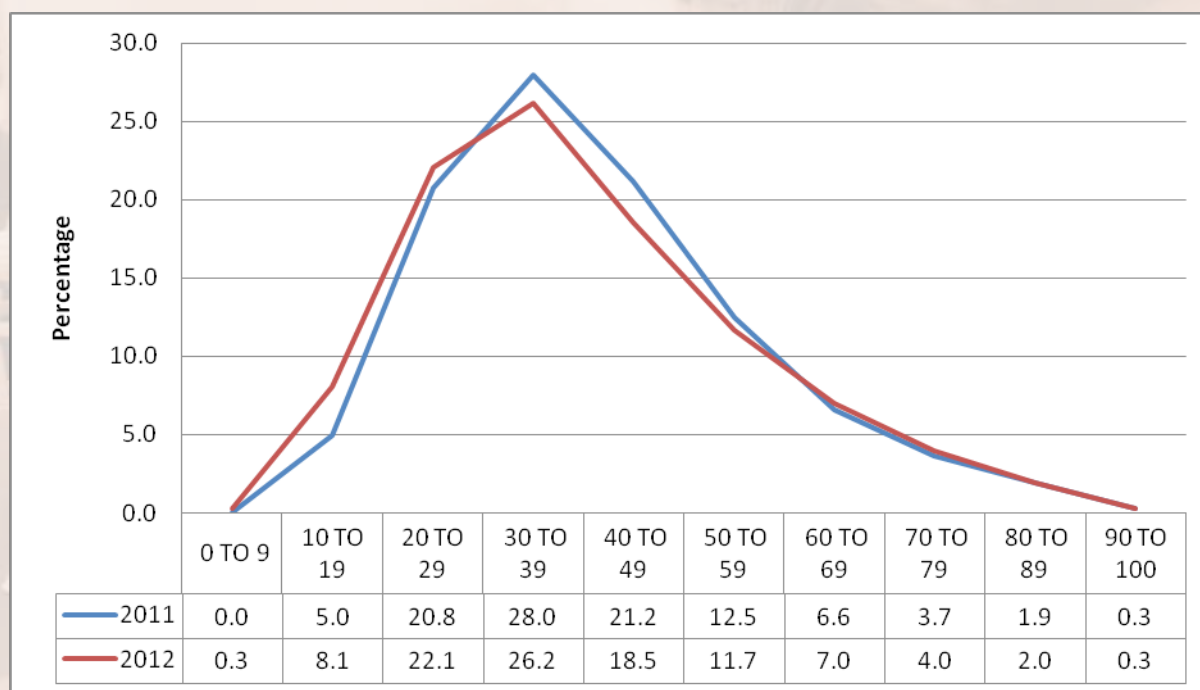


Figure 9.2: Performance distribution curves (Life Sciences: 2011 – 2012)



There was an increase in the percentage of candidates who performed at 0 -2 9% in 2012, compared to 2011. However, it is encouraging to see an increase in candidates' who performed at 60% and above.

9.2 Overview of learner performance in Paper 1

General comments

- (a) Performance was best in Question 1 but poorest in Question 4, as shown in Figure 9.3.
- (b) Many candidates were not familiar with basic terminology applicable to the different topics. This resulted in poor performances, even in the lower-order questions.
- (c) There are some topics that seem to be neglected. Candidates demonstrated very limited knowledge of concepts such as artificial selection, genetic engineering, the 'Out of Africa' hypothesis and meiosis.
- (d) A positive trend was that a greater proportion of candidates attempted the essay question than in previous years.
- (e) Many candidates still lack the skill needed to draw a pie chart. It was evident from the presentations of the answer that candidates came to the examination room without the necessary tools such as a compass and a protractor.
- (f) Many candidates experienced difficulty in interpreting the questions. In response to certain questions, they failed to give reasons when asked for them, or they provided reasons that were not observable when observable reasons were asked for. Many candidates also provided words for answers when letters were asked for and vice versa.

9.3 Diagnostic question analysis for Paper 1

A sample of scripts from each province revealed the following average percentages on each question.

Figure 9.3: Average performance per question in Life Sciences Paper 1

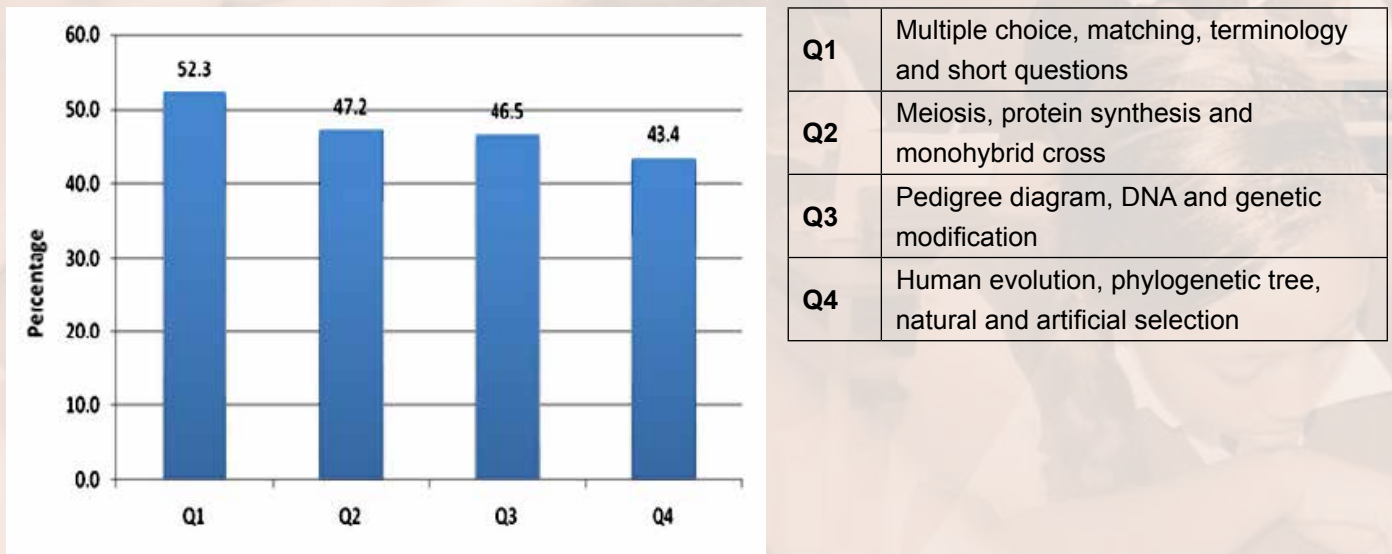
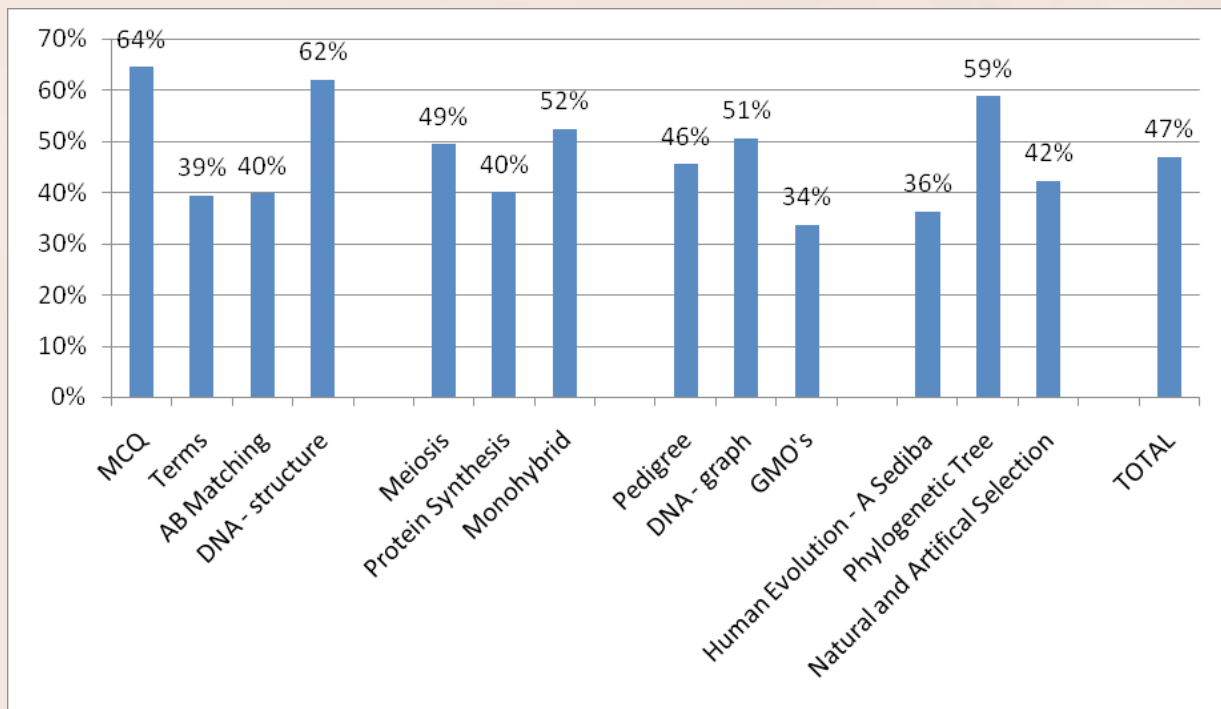


Figure 9.4: Average percentage performance per sub-question in Paper 1



9.4 Analysis of learner performance in individual questions in Paper 1

QUESTION 1: MULTIPLE CHOICE, MATCHING, TERMINOLOGY AND SHORT QUESTIONS

Common errors and misconceptions

- (a) Candidates lacked basic knowledge of terminology. They confused similar terms such as biodiversity and biogeography; homozygous, homologous and analogous; sympatric and allopatric; transcription and translation.
- (b) Examples of the concepts tested in 1.2 were provided rather than the comprehensive term for the concept. For example, in 1.2.4, triploidy and tetraploidy, which are specific examples of polyploidy, were given rather than polyploidy itself.
- (c) Generally, learners had poor knowledge of concepts such as the 'out of Africa' hypothesis and reproductive isolation mechanisms.

Suggestions for improvement

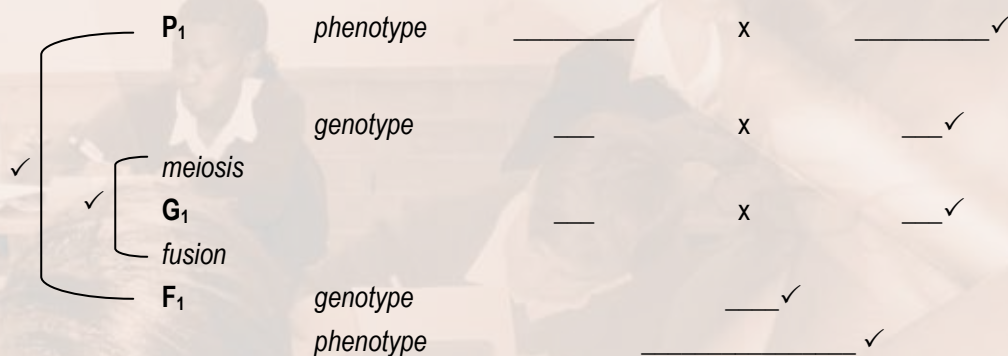
- (a) There needs to be a greater emphasis on the learning of appropriate terminology related to the various topics, together with the correct spelling of these terms. Teachers should use the following strategies to improve the teaching of terminology:
 - Identify new terms in every lesson and write them on the board;
 - Instruct learners to take down terms at the back of their notebooks, noting the correct spelling;
 - Encourage learners to write down the meanings of these words, as ascertained by being attentive during the lesson or finding the meaning in a dictionary or textbook;
 - Break down the term where possible, giving the meanings of prefixes, suffixes and other components, for example: photo (light) + synthesis (to build up);
 - Make learners aware of the meanings of new terms by using them in sentences.
 - Include biological terms in all daily assessment tasks; and
 - Ensure that by the end of the year, all learners have a comprehensive glossary of all terms.
- (b) No aspect of the syllabus should be omitted since all aspects are assessable. Teachers should follow the Exam Guideline document very strictly. If possible, learners should also have copies of this document to help them prepare for all assessments in a more relevant manner.

QUESTION 2: MEIOSIS, PROTEIN SYNTHESIS AND MONOHYBRID CROSS**Common errors and misconceptions**

- (a) In Q2.1, there was confusion of centrosome or centrioles with the centromere of the chromosome.
- (b) The process of crossing over was described instead of explaining its significance (Q2.1).
- (c) Candidates attributed variation to non-disjunction rather than to the random arrangement of chromosomes (Q2.1).
- (d) In Q2.2, numerous candidates were unable to derive the required amino acids from the anti-codons of tRNA (Q2.2).
- (e) Distinguishing the relationships among the DNA base triplet, the mRNA codon and the tRNA anticodon proved problematic for candidates (Q2.2).
- (f) There was confusion between various genetic sex-linked disorders such as haemophilia and sickle cell anaemia (Q2.2).
- (g) For Q2.3, many candidates did not produce answers to a genetic cross in a logical sequence. This could be due to a lack of knowledge of the format required for a genetics problem. Incorrect answers were due to a lack of understanding of basic genetics terminology such as homozygous and heterozygous; phenotype and genotype; dominant and recessive.

Suggestions for improvement

- (a) More emphasis is required on the significance of crossing over and the random arrangement of chromosomes during meiosis, in contributing to genetic variation.
- (b) Learners require multiple exposures to questions on protein synthesis. There should be opportunities to work forward from DNA base triplets to mRNA codons to tRNA codons and finally to the appropriate amino acids, as well as backwards from amino acids to the DNA triplets. This is necessary to the strengthening of the learners' knowledge of protein synthesis.
- (c) If the genetic disorders are presented in tabular form, it would be easier to see differences among the various disorders. Both disorders mentioned above are due to mutations. One mutation leads to the non-production of the clotting factor, thereby leading to haemophilia, while another mutation leads to the formation of a different form of haemoglobin which distorts the shape of red blood corpuscles, causing sickle cell anaemia.
- (d) The format required in solving genetics problems needs emphasis. Two out of six marks are awarded for the format alone. The following format applies to monohybrid crosses:



any (6)

- (e) There needs to be a greater emphasis on the learning of appropriate terminology related to genetics, together with the correct spelling of these terms.

QUESTION 3: PEDIGREE DIAGRAM, DNA AND GENETIC MODIFICATION

Common errors and misconceptions

- (a) In Q3.1, candidates were not able to:
- interpret a pedigree diagram;
 - describe the role of genetic counselling; and
 - explain the higher frequency of haemophilia in males.
- (b) In Q3.2, candidates experienced problems in differentiating between the reliability and the validity of scientific investigations. Further, they were not able to perform basic calculations required for the drawing of the pie-chart. Many candidates provided a rough sketch rather than a pie-chart drawn using a compass and a protractor.
- (c) In Q3.3, there was poor understanding of genetic modification and the debate about its advantages and disadvantages.

Suggestions for improvement

- (a) Below is a set of simple steps to follow to interpret a pedigree diagram. These steps can be used successfully with pedigree diagrams of any sort:
- Study any key and opening statement/s and look for dominant and recessive characteristics and phenotypes;
 - Write in the phenotypes of all the individuals as given in the key/question;

- Fill in the genotype of all the individuals with the recessive condition: it has to have 2 recessive alleles (two lower case letters, for example ff);
- For every individual in the diagram that has the recessive condition, each gene was obtained from each of the parents. Work backwards and fill in one recessive allele for each parent;
- If the parents showed the dominant characteristic, fill in the second letter, which has to represent the dominant allele (a capital letter, for example F);
- Any other individual showing the dominant characteristic will most likely be homozygous dominant (FF) or heterozygous dominant (Ff);
- Squares represent males and circles represent females;
- The horizontal line between a square and a circle represents their having mated; and
- The vertical line flowing from the horizontal line represents the offspring/children of the two parents.

(b) Among others, the following benefits of genetic counselling should be emphasised:

- determining if a female is a carrier for a particular genetic disorder;
- determining the risk of having a child with a particular disorder;
- understanding the procedures/risks involved in genetic screening of the foetus for genetic disorders;
- understanding the results of genetic screening;
- helping prospective parents evaluate whether they would cope with a child that has a genetic disorder; and
- understanding the options of conceiving a baby and terminating a pregnancy.

(c) The reason for the higher frequency of haemophilia in males can be explained as follows:

- The allele for the trait is carried on the x-chromosome/the y-chromosome does not carry the allele for the trait.
- A male has only one x chromosome.
- A male needs only one recessive allele to be haemophiliac.
- For a female to be haemophiliac, both alleles must be recessive.

(d) Teachers should provide sufficient opportunity for the drawing of different types of graphs in both formal and informal assessments.

(e) Teachers need to teach learners to differentiate between the issues of validity and reliability in scientific investigations, because the principles of validity and reliability are fundamental cornerstones of the scientific method.

- What is reliability?
 - The idea behind reliability is that any significant results of an investigation must be more than a once-off finding and be repeatable.
 - Other researchers must be able to perform exactly the same experiment, under the same conditions, and generate the same results.
 - This would reinforce the findings of the experiment and ensure that the wider scientific community accepts the hypothesis.
 - To questions which ask learners to state how the reliability of the investigation could have been improved, the following answers apply: repeat the investigation OR increase the sample size.

- What is validity?
 - Validity questions how the experiment/investigation was carried out. It is important to be sure that all the factors/variables have been controlled/fixed except the variable/factor being tested.
 - The samples must be chosen randomly.
 - The design for the investigation must be appropriate.
 - Validity therefore speaks to whether the scientific research method was used with the appropriate degree of care and diligence.
 - In questions which ask learners to suggest some factors that might have decreased the validity of an investigation, the answers should centre in criticism of the scientific process; for example, some factors/variables that were not fixed/controlled when carrying out the investigation.

(f) Teachers should consult memoranda of previous question papers that assess aspects of genetic modification, in order to obtain a long list of both advantages and disadvantages of genetic modification.

QUESTION 4: HUMAN EVOLUTION, PHYLOGENETIC TREE, NATURAL AND ARTIFICIAL SELECTION**Common errors and misconceptions**

- (a) For Q4.1, candidates could not explain the concept of a transitional form, despite information provided in the extract. This term is important in studying progressive trends in evolution. The discovery of transitional fossils strengthens the theory of evolution.
- (b) Answers to Q4.1 showed that candidates are not in touch with the latest discoveries relating to evolution.
- (c) In Question 4.2.2, candidates provided letters instead of the names of the elephants, and in Question 4.2.4 answered with time in mya rather than the name of the period.
- (a) Although many candidates answered well on Q4.3, their knowledge of artificial selection was very poor. Many candidates included the theory of Lamarck even though this did not relate to Natural Selection. Candidates included accounts on cloning rather than natural selection. When candidates did provide accounts of Natural and Artificial selection, in many cases these accounts were mixed and not presented in a logical sequence.

Suggestions for improvement

- (a) Articles relating to trends and developments in evolution as documented in newspapers and magazines should form an integral part of the teaching and learning process.
- (b) Teachers should ensure that learners understand that the term, 'transitional form' refers to a species that has characteristics which are intermediate between species that appeared earlier and those that appeared on Earth later. For example, it may be a species that has a cranium that is larger than that characteristic of an earlier species, but still smaller than that of a later species. These transitional forms show that the characteristics of modern humans are a result of gradual changes that took place over a long period of time. The intermediate characteristics typical of transitional forms also point to the possible common ancestry of many species.
- (c) Training should be given in interpreting questions by using past examination question papers. In addition, learners should understand what is required by the different action verbs

(such as 'state', 'describe', 'explain' ...) used in questions.
- (d) Learners should be given sufficient practice in answering essay questions.
- (e) A good grasp of the various concepts of Paper 1 is critical to formulating an appropriate answer to the essay question.
- (f) The following steps might be useful in answering an essay question:
- Read the essay question thoroughly (more than once);

- Write down all the aspects of the essay that the question requires to be discussed;
- Decide on sub-headings to be used;
- Write the essay in a logical and sequential manner, linking each aspect that is discussed;
- Read the draft of your essay and make changes/corrections if necessary; and
- Write out the final version of your essay.

9.5 Overview of learner performance in Paper 2

General comments

- (a) Performance was best in Question 3 but poorest in Question 4, as shown in Figure 8.5 below.
- (b) Many candidates were not familiar with basic terminology in the different topics. This resulted in poor performance even in the lower-order questions.
- (c) There are some topics that seem to be neglected. Learners demonstrated very limited knowledge of concepts such as culling, competition and the functioning of the eye.
- (d) Although more candidates than in previous years attempted the essay question, the skill of answering all aspects required by the essay and the skill of differentiating between relevant and irrelevant information, still require attention. In many cases, the answers were not presented in a logical sequence.
- (e) It was pleasing to note that most candidates performed very well in the drawing of the line graph.
- (f) Many candidates demonstrated difficulty in interpreting the questions. They failed to give reasons when asked to do so, or they provided reasons that are not observable when observable reasons were asked for. Many also provided words for answers when letters were asked for and vice versa.

9.6 Diagnostic Question Analysis for Paper 2

A sample of scripts from each province revealed the following average percentage on each question:

Figure 9.6: Average marks achieved per question as expressed as a percentage

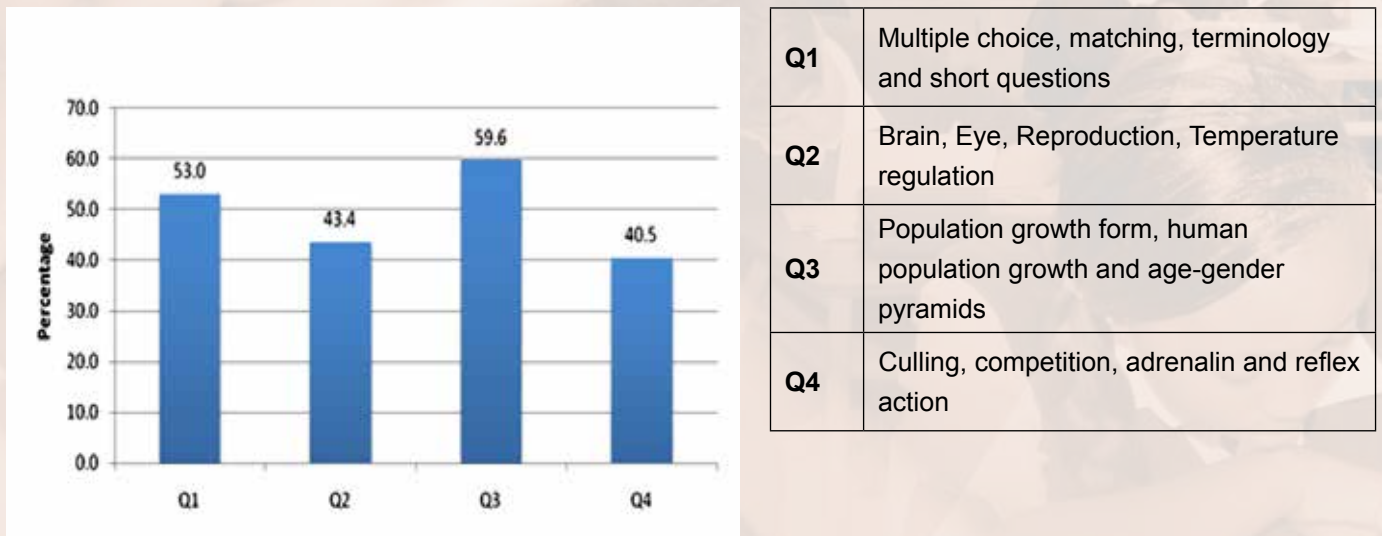
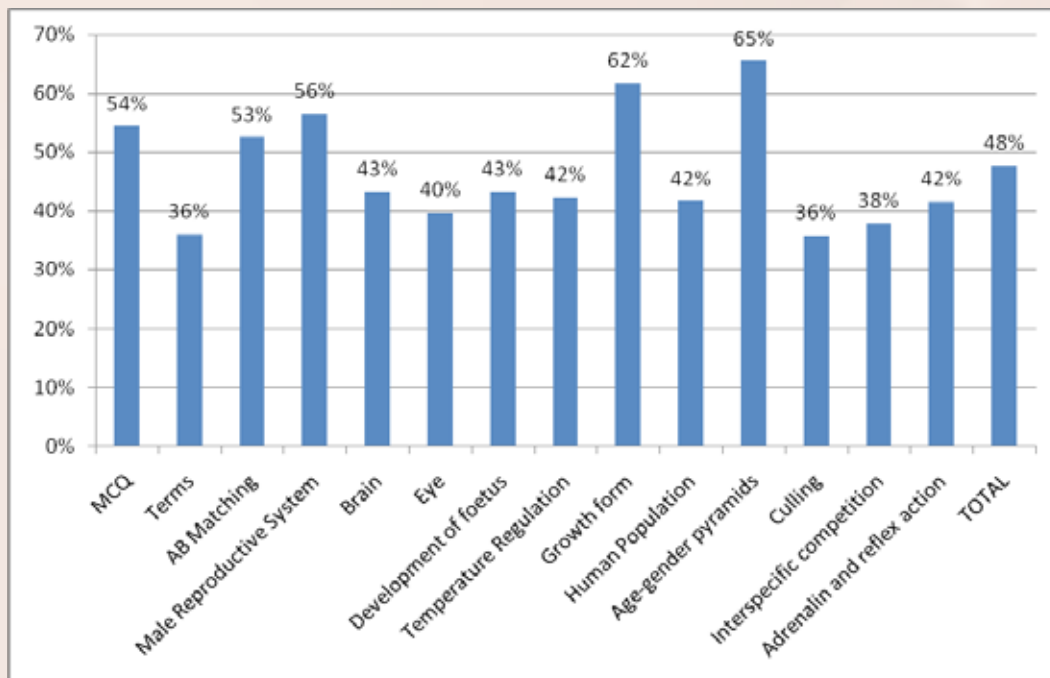


Figure 9.7: Average marks per sub-question expressed as a percentage



9.7 Analysis of learner performance in individual questions

QUESTION 1: MULTIPLE CHOICE; MATCHING; TERMINOLOGY; SHORT QUESTIONS

Common errors and misconceptions

- (a) Candidates demonstrated poor knowledge of basic terminology as well as poor spelling of the terms that were correctly used.
- (b) Candidates were not able to provide the name and functions of the various parts.
- (c) Words were provided as answers when letters were asked for and vice versa.

Suggestions for improvement

- (a) Teachers should place greater emphasis on the learning of appropriate terminology related to the various topics, together with correct spelling of these terms. Refer to the strategies for teaching and learning terminology provided for Paper 1.
- (b) Teachers need to train learners in interpreting the requirement/s of different questions: they must ask themselves whether the question requires, as an answer, a letter only, a name only or both a letter and a name.
- (c) It is difficult to understand or describe a process if one does not know the names and functions of the relevant parts involved in the process. Learners can practise this skill by providing labels and functions of labelled parts using unlabelled diagrams (such as those provided in the Life Sciences *Mind the Gap* study guide – pages 94 to 115).

QUESTION 2: BRAIN, EYE, REPRODUCTION, TEMPERATURE REGULATION

Common errors and misconceptions

- (a) In Q2.1, candidates focused on symptoms of goitre as the consequence of non-secretion of TSH instead of describing hypothyroidism and its effects.
- (b) For Q2.2, answers to questions on the scientific method were generally poor.
- (c) Many candidates were unable to write out a general conclusion. Many provided a conclusion that took only some of the data into account.
- (d) Many candidates indicated that accommodation occurs only for distances greater than 6m.
- (e) Candidates did not understand the difference between the processes of accommodation and the pupillary

mechanism.

- (f) In Q2.3, processes were named when names of systems were asked for. Many candidates were unable to explain why egg production stops during pregnancy.
- (g) Numerous candidates were unable to describe temperature regulation under hot conditions in Q2.4. Many included the role of the hair in thermoregulation whereas only the roles of the blood vessels and the sweat glands are required by the syllabus.

Suggestions for improvement

- (a) Learners should be taught to differentiate between goitre, which is caused by a deficiency of iodine in the diet, and hypothyroidism, which is caused by an under-secretion of thyroxine due to lack of stimulation of the thyroid gland by TSH.
- (b) Questions based on the scientific method from past examination papers should form part of the daily assessment tasks given to the learner. The skills generally associated with this are as follows:
- formulating a hypothesis;
 - identifying dependent and independent variables;
 - listing variables that should be controlled;
 - identifying safety precautions that should be taken into account;
 - analysing the results of an investigation and applications thereof;
 - drawing conclusions;
 - listing ways of improving the reliability of the investigation; and
 - listing ways of improving the validity of the investigation.
- (c) Teachers should emphasise that a general conclusion should take the trend that emanates from all the data provided. The general conclusion should be a statement that describes the relationship between the two variables (independent and dependent) in the investigation.
- (d) It should be explained to learners that no changes take place when the object is at a distance of 6m away from the eye. Accommodation for distant vision occurs as the object moves further than 6m away. Accommodation for near vision occurs when the object moves closer than 6m from the eye.
- (e) Teachers need to emphasise that accommodation refers to changes that take place in the eye based on the distance of the object from the eye. The pupillary mechanism changes the size of the pupil according to the amount of light in the surroundings. The uses of diagrams to explain both processes could also assist learners

to understand the difference between these processes. In addition, a list of the parts involved in each process should be learnt first as shown below, before each process is described:

	Accommodation	Pupillary mechanism
In response to	Distance of object	Light Intensity
Parts involved	<ul style="list-style-type: none"> • Ciliary muscles • Suspensory ligaments • Lens 	<ul style="list-style-type: none"> • Radial muscles of iris • Circular muscles of iris • Pupil

- (f) Teachers should emphasise that a high level of progesterone due to the activity of the corpus luteum inhibits the production of FSH by the hypophysis. The level of FSH is therefore not sufficient to stimulate egg production.
- (g) The Examination Guideline should be consulted when lessons are being planned. This document specifies that only the roles of the blood vessels and the sweat glands are required. In humans (unlike in other mammals) the hair does not play any meaningful role in thermoregulation and is therefore not included any more. Although many textbooks still include the role of the hair, it is important to access information from a textbook which accords with the prescripts of the exam guideline document.

QUESTION 3: POPULATION GROWTH FORM, HUMAN POPULATION GROWTH AND AGE-GENDER PYRAMIDS

Common errors and misconceptions

- (a) Although the drawing of line graphs has improved, marks are still being lost for the caption and for scale (Q3.1). Further, candidates provided descriptions rather than an explanation for the growth pattern in the lag phase.
- (b) In Q3.2, Marks were lost because of errors in the calculation of the percentage increase of the human population. Many candidates did not understand the concept of doubling time.
- (c) Numerous candidates were unable to access information from age-gender pyramids (Q3.3).

Suggestions for improvement

- (a) Learners should be given the assessment criteria for different types of graphs so that they can be aware of how marks are distributed for the various sub-skills: caption; scale; titles of the X- and Y-axes, including units; plotting of points and joining of points.
- (b) Teachers should emphasise that to explain the lag phase means to say *what happens* in the lag phase and then say *why it happens*.
- (c) The calculation in 3.2 involved two components:
 - The calculation of the increase: this is done by subtracting the death rate from the birth rate i.e. (45 – 16)

per 1 000 = 29 per thousand.

- Calculation of the percentage increase: this involved taking the increase per 1000 x 100 to get a percentage
i.e. $\frac{29}{1000} \times 100$.

- (d) Learners should be taught that doubling time refers to the time taken for a population to double in size. If the doubling time is decreasing, it means that the population is growing very rapidly. If the doubling time is increasing, it means that the population is growing more slowly.
- (e) Teachers should emphasise the following clues in comparing age-gender pyramids:
- A pyramid with a broader base indicates a higher birth rate.
 - A pyramid with a broader apex indicates high life expectancy.
 - A pyramid that goes from very broad to very narrow shows a population that is growing.
 - A pyramid that is more or less rectangular shows a stable population.
 - In a developing country, the birth rate is high, whereas the life expectancy is low.
 - In a developed country, the birth rate is low, whereas life expectancy is high.

QUESTION FOUR: CULLING, COMPETITION, ADRENALIN AND REFLEX ACTION

Common errors and misconceptions

- (a) Many candidates showed that they have a poor understanding of the concepts of culling and carrying capacity (Q4.1).
- (b) Many candidates could not identify the interaction as being inter-specific competition. In many cases it was confused with predation (Q4.2).
- (c) For Q4.3, candidates tend to write everything they know on the topic without determining what is relevant and what is irrelevant in terms of the particular phrasing of the topic. When candidates provided accounts of Adrenalin and the Reflex Action, in many cases these accounts were mixed and not presented in a logical sequence.

Suggestions for improvement

- (a) Emphasise that carrying capacity refers to the maximum population size a habitat can support in terms of the available resources.
- (b) Emphasise that culling refers to the killing/removing of organisms to reduce habitat destruction, and/or prevent

overpopulation and/or prevent the spread of disease.

- (c) Teachers need to differentiate clearly between competition and predation. This can be done using graphs showing both types of interaction. In inter-specific competition, one species thrives at the expense of the other. As a result, the population size of one species increases, while the population size of the other species eventually decreases. In predation, there will be phases of increase and decrease of both the predator and the prey population.
- (d) Learners should be given sufficient practice in answering essay questions.
- (e) A good grasp of the various concepts of Paper 2 is critical in formulating an appropriate answer to an essay question.
- (f) Refer to the steps outlined for Paper 1, as these might be useful in answering an essay question.

CHAPTER 10

MATHEMATICS

The following report should be read in conjunction with the Mathematics question papers of the November 2012 Examination.

10.1 Performance trends (2009 – 2012)

There was a 7.7% increase in the number of candidates who achieved at 30% and above, and a 5.6% increase in the number of candidates who achieved at 40% and above in 2012 when compared to 2011.

Table 10.1 Overall achievement rates in Mathematics

Year	No. Wrote	No achieved at 30% and above	% achieved at 30% and above	No achieved at 40% and above	% achieved at 40% and above
2009	290 407	133 505	46.0%	85 356	29.4%
2010	263 034	127 785	47.4%	81 473	30.9%
2011	224 635	106 327	46.3%	61 592	30.1%
2012	225 874	121 970	54.0%	80 716	35.7%

Figure 10.1: Overall achievement rates in Mathematics

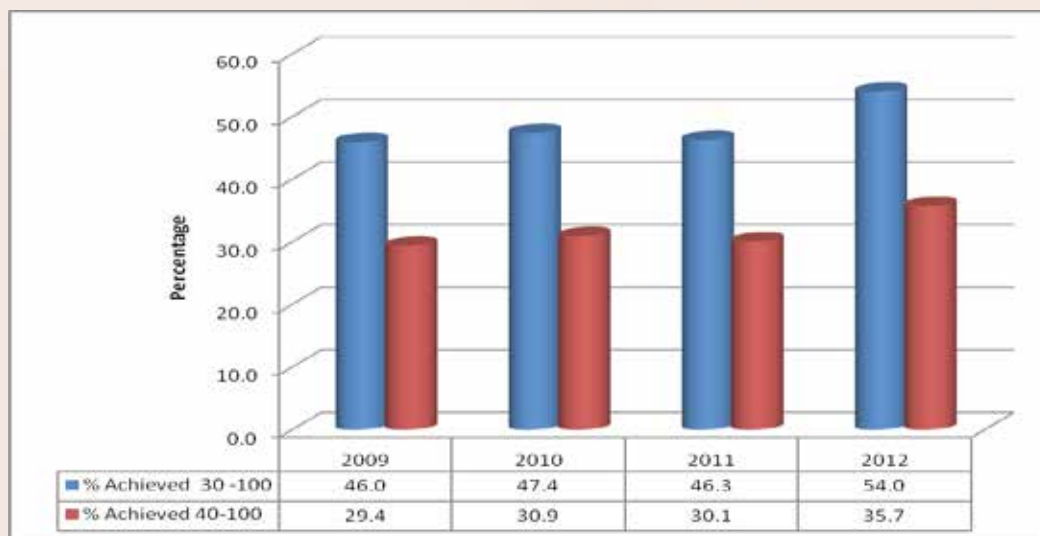


Figure 10.2: Performance distribution curves (Mathematics: 2011 – 2012)



There was a decrease in the percentage of candidates who performed at 0-29% in 2012 compared to 2011; further, there was an increase in the percentage of candidates who performed at 40% and above.

10.2 Overview of learner performance in Paper 1

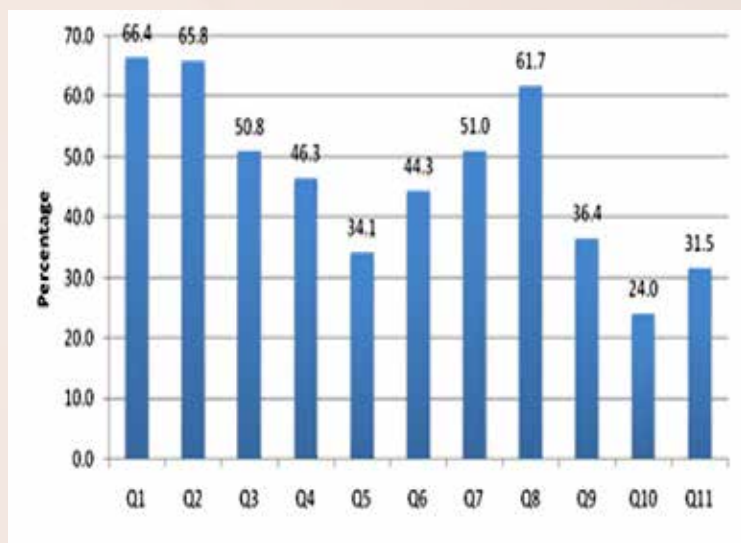
- (a) While some candidates performed excellently in this paper, many performed poorly. Many of the errors made in answering this paper have their origins in a poor understanding of the basics and foundational competencies taught in the earlier grades. For example, algebraic manipulation, factorisation, solution of equations and inequalities. This suggests that interventions to improve learners’ performances should also focus on knowledge, concepts and skills learnt in earlier grades and not only on the final year of the FET phase.
- (b) Modelling in Mathematics is an important aspect of the curriculum. Questions of these types are by their nature often embedded in words. The literacy level of many candidates is however a cause for concern. This was evident in problems candidates experienced with the questions embedded in language and context. Teachers are encouraged to share with and mediate for learners the glossary of Mathematics terminology in the National Curriculum Statement.
- (c) The item-by-item analysis reveals that candidates are mostly exposed to knowledge- and routine-type questions. Many candidates struggled with concepts that required deeper understanding. Questions which required candidates to interpret information, explain or provide justification presented challenges to most. This suggests that the ‘stimulus-response’ method makes up much of the teaching strategy. Consequently, candidates lack the ability to respond to complex and higher-order questions that require a deeper understanding.
- (d) Although there was improvement in candidates’ use of calculators, they should realise that it is not the answer to all their Mathematics problems. Candidates need to realise that conceptual development and algebraic manipulation are often impeded as a result of overdependence on the calculator.

- (e) It appears that teaching and learning focuses too much on previous examination papers. This practice compromises conceptual understanding as learners are not exposed to innovative, fresh questions from other sources. They do not learn to read, think, comprehend and then answer the questions. Memoranda with answers are readily available from newspapers, the Internet and schools. Learners often do not attempt questions before consulting the memorandum. They simply follow algorithms in the memorandum without much understanding of why and how each step develops.
- (f) Throughout the paper, there were questions involving problem-solving. Since these questions are not clearly predictable, teachers are not able to specifically teach learners to answer questions of this nature. Rather, they should expose learners to non-routine questions more regularly, starting from as far back as the primary school. Learners should realise that to be successful at solving problems they require a solid foundation in Mathematics. Participation in Mathematics challenges and Olympiads must be encouraged by all schools at all grade levels.

10.3 Diagnostic question analysis of Paper 1 (2012)

A sample of scripts from each province revealed the following average percentages on each questions:

Figure 10.3: Average marks per question expressed as a percentage



Q1	Algebra, equations and inequalities
Q2	Patterns and sequences
Q3	Patterns and sequences
Q4	Functions and graphs
Q5	Functions and graphs
Q6	Functions and graphs
Q7	Annuities and finance
Q8	Calculus
Q9	Calculus
Q10	Calculus
Q11	Linear Programming

10.4 Analysis of learner performance in individual questions

QUESTION 1: ALGEBRA, EQUATIONS AND INEQUALITIES

Common errors and misconceptions

- (a) This was the question to which candidates responded best. It was the 'lead-in' question, so most parts, with the exception of Q1.2.2 and Q1.3, were of a routine nature and made lower cognitive demands.
- (b) In Q1.1.1, many candidates expanded the brackets (which was not necessary), then attempted to factorise or use the formula to solve and in the process made many errors.
- (c) Q1.1.2 was mostly well answered but substitution errors were frequent and rounding off was still a problem.

- (d) Q1.1.3 revealed that as in previous years there is still generally a poor understanding of inequalities. Most could obtain the critical values but many could not represent the final solution as an inequality. Although some provided the graphical solution, they then lost marks because they attempted to represent the solution as an inequality and failed to write it correctly. For example they would state that $x < -8$ or $x < 1$ as though solving a normal equation. Many candidates do not clearly understand the meaning of 'and' and 'or' in Mathematics as well as proper notation for expressing intervals when dealing with quadratic inequalities. There were also many mistakes with multiplying an inequality with a negative number. Many failed to invert the equality sign when doing so.
- (e) Although Q1.2.1 was generally well done, some candidates incorrectly converted $xy = 8$ to $x = 8 - y$, which is cause for concern.
- (f) In trying to answer Q1.2.2, some candidates failed to understand the essence of inverse functions and merely re-wrote and manipulated the equation in terms of y .
- (g) Question 1.3 integrated an understanding of the solution of quadratic equations and the number system and was poorly answered. The essence of this question is recognising that $\sqrt{2p + 5} = 0$ results in equal solutions and that $2p + 5 < 0$ results in solutions not being real. The question did not require a theoretical study of the nature of roots but could be answered intuitively from an understanding of the solving of quadratic equations and the nature of number.

Suggestions for improvement

- (a) Learners should be taught to analyse the questions carefully before rushing into answering them.
- (b) Learners should have more practice in basic algebraic manipulations.
- (c) More emphasis should be placed on representing solutions to inequalities. Most candidates had difficulty in representing the solution symbolically as their error occurred when writing down the inequality. The writing of the inequalities needs to be taught more thoroughly, especially at Grade 10 level. Learners must be taught to check/verify their solutions
- (d) Teachers should make sure that learners understand equal, real and undefined solutions. The difference between 'non-real' and 'undefined' in the school curriculum needs to be made explicit.
- (e) An understanding of the number system when dealing with expressions such as $\sqrt{2p + 5}$ must be practised. Teachers need to go beyond the rote use of the quadratic formula in solving quadratic equations. 'What if . . .?' discussions would encourage learners to reflect on their work and strengthen their understanding.

QUESTION 2: PATTERNS AND SEQUENCES

Common errors and misconceptions

- (a) Many candidates realised that the essential characteristic of an arithmetic sequence means that $T_2 - T_1 = T_3 - T_2$ but made errors in algebraic manipulation in obtaining the value of x .

- (b) Many candidates failed to realise that n should be a natural number. A fair number of candidates also had problems in dealing with the fraction embedded in the equation. A common error in the manipulation process was that $-560 = \frac{n}{2}(20 - 4n + 4)$ was rewritten as $-1120 = n(40 - 8n + 8)$.
- (c) It appears that some candidates still did not clearly understand the appropriate formulae. For example, some used the n -th term formula in Q2.2.2.
- (d) Those candidates who were able to substitute correctly in Q2.2.2 often made algebraic errors in writing the resulting quadratic equation in standard form. This illustrates how important it is to ensure that a sound foundation is laid when the basics of algebraic operations are taught in earlier grades.

Suggestions for improvement

- (a) The definition and meaning of n in sequences and series should be emphasized.
- (b) Also learners should be exposed to more problems where they have to select the appropriate formula in series and sequences. This should be followed by classroom discussions in which learners verbalise their justifications for their selection of formula.
- (c) Patterns, series and sequences are important and permeate all topics in Mathematics; so learners need to be able to identify and continue a pattern. The link between patterns, series and sequences and functions should be made explicit and supported by the teaching process.
- (d) Instruction 4 states that 'Answers only will not necessarily be awarded full marks'. Learners should be made aware of this instruction since candidates lost marks for providing answers only in Q2.2.2. Teachers should also be aware that no marks were awarded if candidates used the wrong formula.
- (e) Also in Question 2.2.2 many substituted as follows: $-560 = \frac{n}{2}[2(10) + (n-1) - 4]$, omitting the correct use of brackets around -4 . They then worked as though they were multiplying $(n-1)$ with -4 . This is sloppy mathematics and is penalised.

QUESTION 3: PATTERNS AND SEQUENCES

Common errors and misconceptions

- (a) Many candidates could write the sequence in Q3.1.1 as a general term, but then went on to manipulate the general term and made many algebraic errors; for example,

$$\begin{aligned} T_n &= 27\left(\frac{1}{3}\right)^{n-1} \\ &= 9^{n-1} \end{aligned}$$

- (b) Many candidates could not explain why the sum to infinity exists.

- (c) Although Q3.2 is an example of problem-solving, it was not necessarily a difficult question. It gave weaker candidates a chance to apply their Mathematics in a practical way. Many candidates indicated that the first tank would be able to hold all the water from the other 19 tanks, but failed to validate their conclusion. Many candidates who provided a descriptive motivation devoid of calculations merely re-wrote the given information in an attempt to justify their conclusion. Some calculated the sum to infinity but then did not adequately explain their answer.
- (d) Q3.3.2 was poorly answered since many candidates did not clearly understand that the question required the ranking of the term with the greatest value. Perhaps these candidates did not see the link between patterns and functions where reading the turning point from the quadratic form $y = a(x - p)^2 + q$ is routine work.
- (e) Many candidates were adept at finding the second difference in Q3.3.3, but many made calculation errors when subtracting negative integers.
- (f) Q3.3.4 involved inequalities and the misconceptions, as discussed earlier, once again prevailed. Many treated the question as an equation and did not revert to a solution that answered the inequality.

Suggestions for improvement

- (a) The link between patterns, series, sequences and functions needs to be emphasised in the teaching process, and learners should be exposed regularly to integrated examples.
- (b) The theory underpinning infinite sequences needs to be made explicit in the teaching process. Learners need to understand that it is not sufficient to say that the common difference is a fraction and thus the sequence converges.
- (c) It appears that candidates are drilled in calculating the general term of a quadratic sequence, as many set about doing this in Q3.3.4, despite the fact that the n -th term was given. It is important that learners should also practise reading questions carefully and answering only what is required.
- (d) Educators should include higher-level-thinking questions regularly in their school-based assessment.

QUESTION 4: FUNCTIONS AND GRAPHS

Common errors and misconceptions

- (a) Although Q4.1.1 and Q4.1.2 were cognitive level 1 questions, some candidates still did not realise that the y -intercept is obtained when $x = 0$ and the x -intercept is obtained when $y = 0$. This is basic knowledge.

(b) A common algebraic error was:

$$3.2^x = 6$$

$$6^x = 6$$

$$\therefore x = 1$$

Although $x = 1$ is the correct answer, it was obtained by violating mathematical rules. This again illustrates how mastery of work covered in earlier grades is important and that competence in algebraic manipulation and understanding of algebraic properties are required in answering questions in all topics in Mathematics.

(c) Many candidates could not interpret the range from the graph, which points to the difficulty candidates had with graphic interpretation. Some candidates did not identify the exponential function in Q4 and drew any type of graph that fitted their intercepts. The basic knowledge regarding domain and range is lacking in many candidates.

(d) In Q4.2.2, many candidates did not use the correct method in expressing the quadratic equation if given the roots, i.e. $y = a(x - R_1)(x - R_2)$. Rather, they started with $y = (x + 2)(x - 6) = x^2 - 4x - 12$

then just multiplied with a negative throughout when they realised that the constant should be +12.

(e) Q4.2.4 and Q4.2.5 were extremely poorly answered. This once again points to the difficulty that candidates have with interpreting graphs. The common wrong answer among the candidates who attempted Q4.2.4 was $k = 16$, once again illustrating difficulties with representing inequalities.

Suggestions for improvement

- (a) Learners should be regularly exposed to solving equations in the context of graphs.
- (b) Teachers should place more emphasis on the characteristics and behaviour of functions, including:
- interval notation;
 - domain and range; and
 - maximum and minimum values of a graph.

QUESTION 5: FUNCTIONS AND GRAPHS

Common errors and misconceptions

- (a) This question required candidates to integrate graphs and inequalities. Both of these sections were poorly handled by most candidates.
- (b) Candidates showed little grasp of restrictions embedded in inverse functions.

- (c) Since most questions in the past have involved the inverse of exponential functions, many candidates automatically involved logarithms in their solution. This again points to the stimulus-response approach of many candidates. The mere use of the word 'inverse' in the question triggered the idea that logarithms must be involved.
- (d) Some candidates could draw some graph in Q5.3, but many drew it in the wrong direction and the wrong quadrant. This suggests that they do not clearly understand reflections in the graphic context.
- (e) The majority of the candidates did not recognise the transformation in Q5.4.

Suggestions for improvement

- (a) Teachers need to ensure that inverses of graphs are taught not only in exponential functions. More practice in dealing with inverses of quadratic functions, as prescribed in the curriculum, is required.
- (b) The restrictions embedded in inverse functions to ensure that the inverse is a function must be made explicit.
- (c) Teachers need to make learners aware that reflections and inverses are related. In the curriculum, inverses are reflections along the straight line $y = x$ while reflections are always along the same straight line (this could also be the x - and y -axes).
- (d) Transformations are regularly integrated with graphs and learners should be given practice in identifying these.

QUESTION 6: FUNCTIONS AND GRAPHS

Common errors and misconceptions

- (a) Some candidates misinterpreted the question and drew the curve instead of finding its equation.
- (b) Another common error was to confuse the values of p and q in $y = \frac{a}{x - p} + q$
- (c) It was clear that some candidates did not understand the characteristics of a hyperbola and presented any type of equation, e.g. $y = 2(x - 5) + 1$.
- (d) Many did not know the general equation of a hyperbola.

Suggestions for improvement

- (a) Functions need much more attention in the teaching process. Learners should be able to understand the different characteristics of the various functions.
- (b) Teachers should ensure that they begin to teach functions by showing the learners the general equation.
- (c) Many candidates find working with functions challenging. Regular revision and attention to detail are important.

- (d) Teachers must ensure that learners have a thorough and holistic understanding of the functions dealt with in Grades 10, 11 and 12.

QUESTION 7: ANNUITIES AND FINANCE

Common errors and misconceptions

- (a) Contrary to the case in previous years, the question on Financial Mathematics was relatively accessible. It was expected that most candidates would perform well, especially, in Q7.1. However, many candidates confused the formulae they had to use. Language could also have been a contributing factor to the weaker than expected performance in this question.
- (b) In Q7.1.3, few candidates used $n = 61$ months. This could be attributed to the language complexity embedded in the question.
- (c) Many candidates clearly could not differentiate between future value and present value in setting up correct equations. Manipulation errors occurred, which resulted in the application of logarithms to negative numbers, which is clearly not valid. These candidates, however, ignored the negative sign and calculated the answers.

Suggestions for improvement

- (a) It appears as if many teachers did not show the learners how the F_v and P_v formulae are derived and how to apply them in real-life situations. This could be the reason for the candidates' lack of clarity in applying the formulae correctly.
- (b) Candidates did not understand how each formula works: they tend to associate a formula with a certain form of phrasing in the question. It appears that learners might have been misled in the teaching process as it appeared that once they saw the word 'invest' in the question, they thought it meant the use of the future value formula. This must be corrected and must be taught with understanding.
- (c) Making a variable the subject of the formula and reading in context must be emphasised.

QUESTION 8: CALCULUS

Common errors and misconceptions

- (a) Notation is still a problem. There were many basic algebraic manipulation errors such as:

- the lim in the incorrect place e.g. $\lim_{h \rightarrow 0} = \frac{f(x+h) - f(x)}{h}$;
- leaving out the bracket in $\lim_{h \rightarrow 0} (4x + 2h)$ and writing $\lim_{h \rightarrow 0} 4x + 2h$; and
- substituting 0 into $\lim_{h \rightarrow 0} (4x + 2h)$.

- (b) Q8.3 tested understanding in a simple way. The differentiation part of the question (Q8.3.1) should be familiar and is an example which candidates should have practised. The question was, however, poorly answered. Many candidates did not first simplify $g(x)$ to $x + 2$ by factorising the numerator and then dividing by the denominator. Many of those that did this were unable to determine that $g'(x) = 1$. A common error was determining the derivative of the numerator and the denominator separately.
- (c) In answering Q8.3.2, many candidates had great difficulty in explaining their responses mathematically, but many realised that division by zero is not allowed.

Suggestions for improvement

- (a) Teachers need to stress the importance of notation in finding the derivative from first principles.
- (b) The drill and practice of the rules of differentiation is necessary. The original function must be in power form where one can correctly identify the coefficient, variable and exponent before the rules of differentiation can be applied.

QUESTION 9: CALCULUS

Common errors and misconceptions

- (a) Many candidates did not understand the concept of the maximum of a derivative.
- (b) In answering Q9.3, many candidates found the derivative which gives the gradient of the tangent, but were unable to argue why this had to be positive. Many candidates equated the derivative to 0 and showed that this equation did not have a real solution. This, however, only shows that the derivative is never zero and not that it is always positive. An argument based on the fact that a perfect square is never negative is often used in the curriculum. Such arguments should be demonstrated to learners when teaching quadratic functions and completing the square.

Suggestions for improvement

- (a) Teachers need to do more examples of application of Calculus as this is a considerable part of Mathematics.
- (b) The understanding that the instantaneous rate of change and the gradient at a point (implies the derivative) should be stressed in the teaching of the differential calculus.
- (c) It is important that Calculus be taught in such a way that concepts are understood and techniques are not merely applied mechanically. Most learners experience calculus as an abstract section and struggle to answer any higher level questions.
- (d) Regularly asking learners to explain the reasons for steps and taking time when basic concepts are taught can promote understanding.

QUESTION 10: CALCULUS**Common errors and misconceptions**

- (a) This was the worst answered question on the paper. The term 'velocity', although explained in the question, is clearly not understood.
- (b) In responding to Q10.2 and Q10.3, candidates struggled with the application of differential calculus to answer the questions.
- (c) There was a clear lack of understanding of the rate of change of velocity, which implies the second derivative.

Suggestions for improvement

- (a) In every examination, candidates revealed deficient understanding in the application of Differential Calculus. Solution attempts suggest that understanding of Calculus is based on practising algorithmic procedures devoid of any understanding.
- (b) At a meeting hosted by AMESA to discuss and evaluate the Final 2012 Mathematics examination papers, it was revealed that some teachers thought questions relating to speed and distance were not in the curriculum. This misunderstanding must be corrected, since these questions deal with rate of change, which is the essence of application of Differential Calculus.
- (c) Teachers need to expose learners to more examples involving a variety of applications of Differential Calculus, as this is a considerable part of Mathematics. Learners need to be exposed to questions involving rate of change in practical situations and not just graphs. Teachers are advised to make use of different textbooks to cover a wide variety of examples.
- (d) Educators could establish cluster groups to support one another in understanding and sharing teaching strategies for Calculus.

QUESTION 11: LINEAR PROGRAMMING**Common errors and misconceptions**

- (a) A fair number of candidates could answer this question. There were, however, surprisingly many who indicated that it was possible, without providing justification.
- (b) Many candidates struggled to represent the constraints symbolically even though this could be determined from the straight line graphs and not words as in many of the questions in past examinations. It shows that learners cannot convert flexibly from graphs to symbols as the curriculum requires. Many struggled to provide the correct inequality sign. The implicit constraint applicable was often omitted (in this case, $y \geq 0$).

- (c) Q11.3.3 was extremely poorly answered. Candidates who illustrated some understanding often did not consider both the upper and the lower bounds in determining a maximum at B. They often considered only the upper bound and obtained only 50% of the marks allotted to this question.

Suggestions for improvement

- (a) A variety of problems of this nature should be set in school-based assessment tasks and preparatory examinations.
- (b) Learners appear to think that solutions are possible only on vertices of the feasible region. They do not understand that all points within the feasible region are possible options for production.
- (c) Learners should be provided with sufficient opportunities to practise representing constraints – that is, from words to symbols, from symbols to graphs and from graphs to symbols and words.
- (d) They should regularly be exposed to problems where the objective is not necessarily unique and at one of the vertices. Logical thought in a practical situation should be encouraged and not mere rote application of method.
- (e) The role of the search-line in solving problems of these types should be emphasized and practised.

10.5 Overview of learner performance in Paper 2

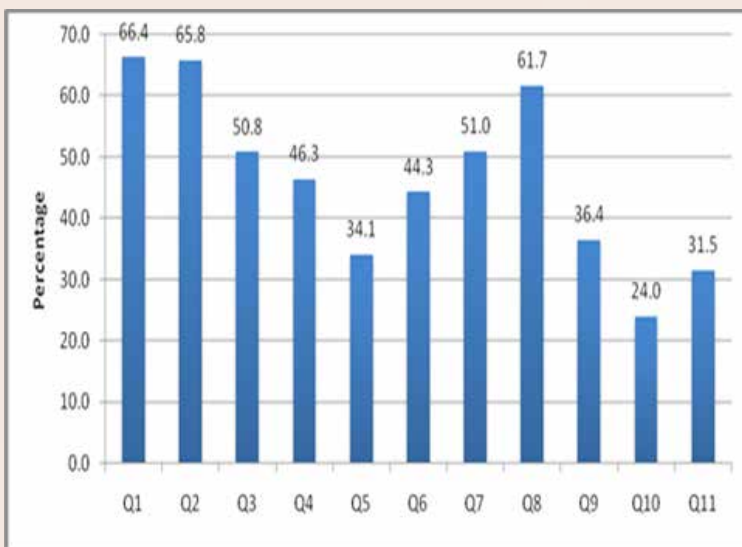
- (a) Candidates performed reasonably well in data handling, analytical geometry and transformation geometry. The level of performance in these sections varied from province to province. However, the consensus from provinces is that Trigonometry still poses the greatest challenge in the paper.
- (b) The literacy level of many candidates is a cause for concern. This is evident in the many instances in which responses to questions were far removed from the required answer. For example, where a trend is required, candidates responded about the curve of best fit and where a description of the transformation from one graph to the other is required, candidates wrote about the similarities of the two graphs.
- (c) It is evident that many of the errors made by candidates in answering this paper have their origins in the poor understanding of the basics and foundational competencies taught in the earlier grades. For example, lack of knowledge that a trigonometric ratio is equal to some numeric value, a lack of understanding of the definitions and properties of quadrilaterals, the inability to distinguish between a rule and a description in Transformation Geometry and the poor recall of reduction formula and trigonometric identities.
- (d) The item-by-item analysis reveals that many candidates are mostly exposed to knowledge - and routine-type questions. They struggled with concepts (in the curriculum) that required deeper conceptual understanding. Questions which required candidates to interpret information, explain or provide justification presented challenges to most candidates. There is also evidence that some candidates' preparation includes standard responses to questions; for example, some candidates speak of skewness of the box and whisker diagrams when in fact the response required relates to the number of data points between the minimum value and the median.

- (e) Many candidates had difficulty in responding to concepts tested previously but asked differently in this paper. This suggests that the 'stimulus-response' method makes up much of the teaching strategy. Consequently, these candidates lack the ability to respond to complex and higher-order questions that require a deeper understanding.
- (f) A number of candidates lacked the necessary insight to deal with questions based on compound angles and interpretative questions on trigonometric functions. Many candidates did not answer Q13 or they made a poor attempt at it. This shows that many candidates cannot relate the Mathematics theory to everyday situations. It was good, however, that this question came at the end of the paper and did not have an adverse impact on candidates early in the examination.
- (g) In general, candidates need to exercise caution with algebraic manipulation skills as overlooking certain basic principles or practices results in an unnecessary loss of marks. Although the calculator is an effective and necessary tool in Mathematics, learners appear to believe that the calculator provides the answer to all their Mathematics problems. Some candidates need to realise that conceptual development and algebraic manipulation are often impeded as a result of dependence on the calculator.
- (h) Euclidean Geometry does not form part of the core Mathematics curriculum. However, it is expected that candidates have knowledge of the definitions and properties of triangles and quadrilaterals, as this is covered in the Grade 10 curriculum. This should be revised in the lead up to the teaching of Analytical Geometry.

10.6 Diagnostic question analysis on Paper 2

A sample of scripts from each province revealed the following average percentages on each questions:

Figure 10.6 Average marks per question expressed as a percentage



Q1	Data handling
Q2	Data handling
Q3	Data handling
Q4	Data handling
Q5	Analytical geometry
Q6	Analytical geometry
Q7	Transformation geometry
Q8	Trigonometry
Q9	Trigonometry
Q10	Trigonometry functions
Q11	Trigonometry
Q12	Trigonometry
Q13	Transformation geometry

10.7 Analysis of learner performance in individual questions

QUESTION 1: DATA HANDLING

Common errors and misconceptions

- (a) It is evident that many candidates experienced a great deal of difficulty with language, both in expressing themselves and with reading and comprehending the written word. Their understanding of the words, 'trend' and 'indefinitely' were very poor. Consequently, the responses provided did not satisfy the questions concerned.
- (b) There was confusion between the concepts 'trend' and 'line of best fit'.
- (c) Most candidates could not interpret that Q1.3 required the average gradient between the two points. Moreover, some candidates homed in on the word 'average' in Q1.3, and therefore attempted to calculate some kind of mean age. A number of candidates failed to realise that the best estimate of all the boys of a particular age will be the 'average height'. Hence the variable for the y -axis is called the average height.
- (d) In Q1.4, many candidates failed to understand that they needed to extrapolate from the given information in order to answer the question.

Suggestions for improvement

- (a) Teachers need to make learners aware of the differences between the concepts: trend, line of best fit and correlation.
- (b) The concept of rate of change is not restricted to Paper 1 and can be tested in any modelling situation.
- (c) It is insufficient for learners to merely draw a scatter plot and/or insert a curve of best fit. Learners are also required to observe any pattern in the given data, interpret information that is presented graphically and make meaningful conclusions about a real-life context.
- (d) In the classroom situation, emphasis should be placed on analysis and interpretation. Learners should be encouraged to verbalise their findings.

QUESTION 2: DATA HANDLING

Common errors and misconceptions

- (a) In Q2.1, some candidates failed to realise that average and arithmetic mean are one and the same concept.
- (b) While candidates are able to use the calculator to calculate the standard deviation correctly, few fully understand the concept of standard deviation. Some candidates still persist in using the pen-and-paper method to calculate the standard deviation.

- (c) In Q2.3, many candidates indicated that the addition of the three values to the data set would result in an increase of the standard deviation, but were unable to explain why this is so.
- (d) In Q2.4, many candidates were able to establish that 133 runs should be scored in the last five innings but failed to calculate the average number of runs that should be scored per innings. Again it seems that some candidates' ability to solve problems is being hampered by poor comprehension skills (in this case the word 'per' was overlooked).

Suggestions for improvement

- (a) The concept of standard deviation runs far beyond the calculation of some value. Unless learners are taught the concept of standard deviation, the calculated value is meaningless. In this regard, teachers are advised to discuss the formula and perform a few calculations using the formula so that learners become familiar with the concept. Learners should then be able to visualise that a small standard deviation indicates that the data values are closely grouped around the mean whereas a large standard deviation indicates that the data values are more widely spread around the mean. Once this generalisation is established, learners should be allowed to use the calculator to calculate the standard deviation as it is by far a more efficient method.
- (b) Learners should be informed that in an examination situation, unless told otherwise, it is expected that a calculator will be used to calculate the standard deviation and no working details are to be shown.
- (c) Teachers should create opportunities for learners to focus on the interpretation of standard deviations; for example: comparing two data sets having the same mean but different standard deviations.
- (d) Learners should be made to read every word in a question.

QUESTION 3: DATA HANDLING

Common errors and misconceptions

- (a) In the absence of the data set, candidates had to use the given information to establish the five-number summary and then draw the box and whisker diagram. Some candidates could not relate range and interquartile-range with points in the five-number summary.
- (b) A fair number of candidates also failed to establish the link that each quartile represents 25% of the number of points in the data set. Hence the questions (Q3.3. and Q3.4) that required candidates to interpret information from the box and whisker diagram were poorly answered.
- (c) Seemingly, some candidates are prepared for 'standard' responses: for example, in Q3.4 some candidates referred to the skewness of the plots. This was not required.

Suggestions for improvement

- (a) Teachers should reinforce the concept of quartiles and emphasise that the length of each quartile might be different, but that each quartile will have exactly the same number of data points (25%).
- (b) Teachers should also highlight the concepts of range and interquartile-range in relation to the box and whisker diagram. This should give learners a visual understanding of these concepts. Further, this should also reinforce the notion that the range is not a reliable measure of dispersion as it is influenced by outliers in the data set.

QUESTION 4: DATA HANDLING**Common errors and misconceptions**

- (a) The major challenge in this question was that candidates had to ascertain the relevant information from a cumulative frequency graph. Many candidates had difficulty in determining the median, a concept that they are familiar with from the earlier grades.
- (b) A fair number of candidates understood modal class to be a single point value rather than a class interval. Some understood modal class to mean highest value instead of highest frequency.
- (c) Many candidates determined the position of the median and thought that this was the answer. This suggests that many candidates do not realise the difference between the position of the median and the value of the median.
- (d) In Q4.3, some candidates read off correctly from the graph the value of 23 but overlooked the fact that the question was looking for more than 60 kilograms. Hence they did not perform the calculation $30 - 23 = 7$.

Suggestions for improvement

- (a) The link between the frequency table, the cumulative frequency table and the ogive should be explained. Learners should be able to translate back and forth between these representations.
- (b) Teachers should show the link between the frequency of a class and its corresponding gradient on the ogive. In this way, learners should be able to identify the modal class as the interval having the highest gradient.
- (c) The interpretation of questions should form part of the teaching of statistics. Learners should be made aware that the study of statistics encompasses the gathering of information, summarising this information and interpreting the results so that meaningful conclusions and predictions can be made in the future.

QUESTION 5: ANALYTICAL GEOMETRY**Common errors and misconceptions**

- (a) Many candidates failed to recall the properties of a rhombus. In Q5.3, a number of candidates failed to make the link that the opposite sides of the rhombus are parallel and hence were unable to establish the gradient of the line AD.
- (b) Instruction 7 reads that diagrams are not necessarily drawn to scale. However, for the sake of correctness, the sketch in this question is drawn to scale. Although no mention is made of E's being the midpoint or that the coordinates of B are (7; 6) or that ABCD is a square, many candidates made these assumptions without proof. By making such assumptions, these candidates made the solution of Q5.4 much simpler and hence they were penalised accordingly.
- (c) Other misconceptions include: interior angle of a rhombus is 90° , the diagonals of a rhombus are equal ($AM = MB$) and in the context of a triangle if $\tan \theta =$ a negative number then θ is a negative angle.

Suggestions for improvement

- (a) Analytical Geometry should not be taught or tested in isolation from polygons. Therefore, prior to starting with Analytical Geometry, a quick revision of the properties of triangles and quadrilaterals is encouraged.
- (b) Learners should answer the question by making use of the information provided in the question and not make any assumptions based on the diagram even if they appear evident. Learners should prove any fact that is not given as part of the information before it is used in a solution.
- (c) Learners should refrain from indiscriminately using $\tan \theta = m$ for every instance involving inclination of a line. This results in many angles being labelled as θ and they are often not equal in size. This creates further confusion.
- (d) Also learners should label angles as α , β , etc on the diagram if these are used in calculations. It makes it easy to refer to these angles when one is trying to follow an argument. However, learners should be encouraged to use the labels provided in the diagram, for example $\tan \hat{BST} = m_B$.

QUESTION 6: ANALYTICAL GEOMETRY**Common errors and misconceptions**

- (a) Many candidates could not state the axiom that makes PQ perpendicular to AB. Instead, argued that $m_{PQ} \times m_{AB} = -1$ and therefore PQ is perpendicular to AB.
- (b) In Q6.3, some candidates used the distance formula to calculate the length of the radius, whereas this could have been read off directly from the diagram.

- (c) In Q6.4, a fair number of candidates used the fact that K has coordinates $(-1 ; 0)$ without calculating these values.
- (d) In Q6.5, many candidates failed to recognise that AB is perpendicular to PQ and use this to determine the gradient of AB. Instead, they used the fact that A has coordinates $\left(\frac{7}{5}; \frac{16}{5}\right)$ as given in 6.6 to determine the equation of AB. As they had not calculated the coordinates of A previously, the candidates who adopted this approach were penalised.
- (e) In Q6.6, a number of candidates used the coordinates $\left(\frac{7}{5}; \frac{16}{5}\right)$ to prove that the coordinates of A are $\left(\frac{7}{5}; \frac{16}{5}\right)$. This is a circular argument. Many candidates did not consider simultaneous equations as an option to solve this question.
- (f) In Q6.8, a large number of the candidates were unable to recall the definition of a kite.
- (g) In Q6.9, many candidates failed to identify the angle ABK in the diagram and consequently had no idea what was required of them. Since it was given that $\hat{A}BK = 45^\circ$, some candidates started the answer with $\tan \hat{A}BK = 1$ without any indication as to why this should be so.

Suggestions for improvement

- (a) While Euclidean Geometry is no longer tested in the core curriculum, definitions and properties of polygons are regarded as prior learning knowledge in the answering of problems in Analytical Geometry. Teachers, therefore need to reinforce these before commencing the teaching of Analytical Geometry.
- (b) Teachers should develop the skill of analysing a given diagram for salient features. Learners should be encouraged to identify equal sides, equal angles, right angles, etc in a diagram. This information could be used in the answers without having to perform tedious calculations.
- (c) Learners should be informed that it is not acceptable to use the result of a later question in an earlier answer without first answering the later question.

QUESTION 7: TRANSFORMATION GEOMETRY

Common errors and misconceptions

- (a) This question was generally well received by most of the candidates. A large number of them showed competence in drawing the image for a given transformation.
- (b) There was confusion between describing a transformation and giving the general rule; a fair number of candidates gave the rule when a description was required and vice versa.
- (c) Some candidates did not provide a full description of the transformation; for example: 90° rotation, clockwise rotation, reflection, etc.

- (d) The double transformation in Q7.5 posed a challenge to some candidates. When writing the general rule, some candidates did not observe the order of the transformations and consequently ended up with different answers.

Suggestions for improvement

- (a) Teachers should explain the different ways of representing transformations, emphasising that a description is a verbal (word) representation while a rule is a symbolic representation.
- (b) Teachers should explain that reflections occur about some line of symmetry and that rotations take place in a certain direction about a central point. Therefore, a full description of a reflection must also include the line of symmetry and a full description of a rotation must include the size of the angle, the direction and the centre of rotation.
- (c) This topic lends itself to a lot of practical work. Teachers are encouraged to allow learners to investigate concepts rather than to ask them to memorise a set of rules.
- (d) Examples should not be limited to a single transformation but should include a series of transformations.

QUESTION 8: TRIGONOMETRY

Common errors and misconceptions

- (a) Many candidates answered Q8.1.1 and Q8.1.2 correctly as these were routine questions. However, there are still some candidates who do not understand that a trigonometric ratio is equal to a number. They wrote $\cos \alpha = \cos\left(\frac{15}{17}\right)$.
- (b) Many candidates chose to ignore the instruction regarding the use of a calculator in answering Q8.1.3 and Q8.1.4. Consequently they were not awarded any marks.
- (c) Candidates did not use the information given in Q8.1.3 to express β in terms of α .
- (d) In Q8.1.4, some candidates copied the expansion from the information sheet without realising that α and β were interchanged in the question.
- (e) In Q8.2.1, a number of candidates merely replaced $\cos 2x$ with $1 - 2 \sin^2 x$, without taking into consideration the minus sign immediately before $\cos 2x$. This resulted in the numerator's being written as $1 - 1 - 2 \sin^2 x - \sin x$ instead of $1 - (1 - 2 \sin^2 x) - \sin x$. The omission of the brackets created problems with the signs when these candidates attempted to factorise further on.
- (f) In Q8.2.2, many candidates made the necessary expansion but then divided by $\cos x$, without realising that $\cos x$ could be zero. Also, many candidates found the general solution for this equation but failed to provide the solutions for the given interval.

Suggestions for improvement

- (a) Learners should be reminded to follow the instructions regarding the use of the calculator.
- (b) Teachers should ensure that learners receive a good grounding in Trigonometry in the earlier grades.
- (c) Teachers should constantly revise the basic ratios, identities and expansions.
- (d) Learners should be encouraged to use brackets when making substitutions, as this should eliminate problems with signs.
- (e) Learners should be circumspect about using the general solution in solving trigonometric equations. This is especially so when the domain is restricted to the four quadrants.
- (f) Learners should be exposed to a wide variety of examples that require different approaches to solve them.

QUESTION 9: TRIGONOMETRY**Common errors and misconceptions**

- (a) This question was answered satisfactorily. Many candidates struggled with reduction formulae, especially for $\cos(90^\circ + \theta)$, double angle expansions and identities.
- (b) In Q9.1, many candidates changed the '+' sign in the denominator to a 'x' sign.
- (c) Some candidates cancelled terms rather than factors.
- (d) In Q9.2, many candidates failed to recognise that the expansion $2\cos^2 15^\circ - 1$ could have been written as $\cos 30^\circ$.
- (e) Another misconception is that $2\cos^2 15^\circ - 1$ can be written as $2\cos^2 14^\circ$. These candidates could not differentiate between an angle and a number.
- (f) The vast majority of the candidates could not reduce all the given angles to a common angle before simplifying.
- (g) Other misconceptions that were noted include: $\tan 38^\circ = \tan 52^\circ$, $\frac{\sin 2(38^\circ)}{\sin 38^\circ} = \sin 38^\circ$.

Suggestions for improvement

- (a) Teachers should emphasise the importance of learning the basic theory in Trigonometry. This knowledge is essential to answering the more complex questions.
- (b) Learners must take cognisance of Instruction 4, which reads that answers only will not necessarily be awarded full marks. In questions where the angle sizes are given and the use of a calculator is prohibited, all working steps must be shown, otherwise it is assumed that learners used a calculator to arrive at the answer.

- (c) The reduction formulae must be dealt with not only in the general sense, but also where angles are given. Learners should practise writing several angles in terms of a common angle; for example: $412^\circ = 360^\circ + 52^\circ$ but $52^\circ = 90^\circ - 38^\circ$, $104^\circ = 180^\circ - 76^\circ$ but $76^\circ = 2(38^\circ)$.
- (d) Learners should be exposed to higher order questions of this nature in the classroom situation in order for them to cope with such questions under examination conditions.

QUESTION 10: TRIGONOMETRIC FUNCTIONS

Common errors and misconceptions

- (a) With the exception of Q10.1, this question was answered very poorly.
- (b) In Q10.2, many candidates were able to set up the equation but go no further.
- (c) Some of the common errors in Q10.2 were: $\sin(x + 30^\circ) = \sin x + \sin 30^\circ$ and from $\sin(x + 30^\circ) = -2 \sin(90^\circ - x)$ some candidates made the deduction that $x + 30^\circ = -2(90^\circ - x)$.
- (d) In 10.3, a fair number of candidates were unable to interpret the inequality and hence could not establish which section of the graphs gave the answer.
- (e) Most candidates were unable to link Q10.2 with Q10.3. In cases where candidates had the correct x -values, they confused which inequality sign should be used in the answer: () or [] or < or \leq . It is encouraging to note that some candidates were unable to solve Q 10.2 but used estimates in the answer to Q10.3. These candidates were credited accordingly.
- (f) In Q10.4, many candidates struggled to deal with the transformation. The common error in this question was that many candidates spoke about the similarities between the two graphs rather than describing the relationship between them.

Suggestions for improvement

- (a) Learners should be exposed to different types of trigonometric equations, particularly those that include compound angles and co-ratios.
- (b) More practice is required on trigonometric graphs and also on interpretation questions.
- (c) It is advisable that when drawing graphs that involve some kind of shift, comparison be made with the basic graphs. The integration of transformations and graphs should be encouraged.
- (d) Dealing with higher order questions should be an integral part of the classroom teaching situation and should not be left to examination situations only. Practice with higher order questions in the classroom should increase learners' proficiency in dealing with such questions in the examinations.

QUESTION 11: TRIGONOMETRY**Common errors and misconceptions**

- (a) This question was also poorly answered. A fair number of candidates who did not answer Q11.1 did not move on to Q11.2 and Q11.3, even though the result was given in Q11.1.
- (b) Many candidates realised that they needed to use the area formula of a triangle but had no idea how this would relate to a parallelogram, i.e. these candidates were not aware that the area of a parallelogram is twice the area of a triangle.
- (c) Some candidates tried to use: area of parallelogram = length \times breadth.
- (d) In Q11.2, some candidates tried to determine the value of θ by using $\tan \theta = m$ even though the gradient of any line was not given. Other candidates established the equation $6 \sin \theta = 3\sqrt{3}$ but found this too difficult to solve.
- (e) In Q11.3, many candidates could not link the maximum value of the parallelogram with the maximum value of $\sin \theta$. Some did not realise that a rectangle is a parallelogram and hence rejected 90° as a solution. Instead, they gave $89,9^\circ$ or 89° as an answer. A number of candidates attempted to solve this question by using Calculus.

Suggestions for improvement

- (a) Learners should be made aware that if they are unable to prove an earlier result, they may assume this to be true and use it in the subsequent questions. There is no penalty for this.
- (b) Although Euclidean Geometry is not part of the core curriculum, it is essential that learners be familiar with the definition and properties of triangles and quadrilaterals.
- (c) Learners should be taught that to optimise (minimise or maximise) a constant multiplied by a variable, they need to optimise the variable only.
- (d) In order for learners to do well in the Grade 12 examinations, a solid understanding of the work covered in earlier grades is essential. In this regard, learners should constantly revise ideas taught in previous grades.

QUESTION 12: TRIGONOMETRY**Common errors and misconceptions**

- (a) This question was well answered in some centres but poorly answered in others. Clearly the way this topic is dealt with at school makes a difference to the candidate's ability to answer such questions.
- (b) Generally, candidates struggled to visualise a three-dimensional object that is represented in two dimensions on paper.
- (c) A large number of candidates chose the incorrect triangle to work in or used values from one triangle that do not apply to another triangle.

- (d) A fair number of candidates who had no idea on how to answer Q12.1 made a series of unrelated statements and then stated that $CB = 2k \sin x$, as this had been given.
- (e) In Q2.2 and Q12.3, many candidates chose the incorrect rule to answer the questions.

Suggestions for improvement

- (a) When teaching the sine rule, the cosine rule and the area formula, teachers should focus not only on using these rules to solve triangles but also on paying attention to the minimum conditions required for the use of each rule.
- (b) Visualising 3D objects poses a challenge for most learners. Initially, teachers are encouraged to illustrate examples by way of a model. Such models can be constructed by using sticks/straws and Prestik or by cutting out the corner section of a cardboard box. These 3D models should then be decomposed into 2D shapes, namely triangles. In doing so, learners are creating a familiar situation in that they have solved triangles using the sine, cosine and area rules in Grade 11. With sufficient practice, learners should be able to develop this skill and overcome the challenges of dealing with 3D problems.

QUESTION 13: TRANSFORMATION GEOMETRY

Common errors and misconceptions

- (a) This question was perceived to be the most challenging question and was answered very poorly. Many candidates could not relate the time on the clock face to angles of rotation.
- (b) In Q13.1, many candidates used 37° as the angle of rotation instead of converting 37 minutes to 222° .
- (c) In cases where candidates correctly calculated the angle of rotation in the clockwise direction, they did not make the necessary adjustment when substituting into the anti-clockwise formula that had been given on the information sheet.
- (d) As there was no information about D or D' in the question, many candidates had no idea where to start answering this question. The answer was not specific to any topic in the Grade 12 curriculum but required logical reasoning.

Suggestions for improvement

- (a) Teachers cannot specifically prepare learners to answer questions of this nature.
- (b) There are two essential ingredients in problem-solving: Firstly, in order for learners to be successful at solving problems, they require a solid foundation in Mathematics from earlier grades, starting from as far back as the primary school. The second is that learners should be exposed to non-routine questions more regularly. In this regard, participation in Mathematics challenges and Olympiads is encouraged.

MATHEMATICS PAPER 3: PROBABILITY AND DATA HANDLING

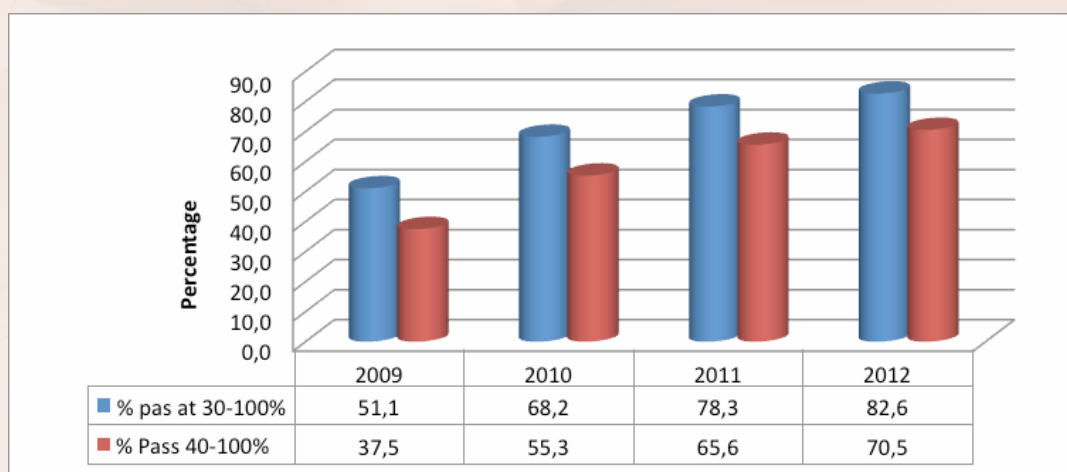
10.8 Performance trends in Paper 3 (2009 – 2012)

There was a 4.3% increase in the number of candidates who achieved at 30% or more and a 4.9% increase in the number of candidates who achieved at 40% or more in 2012 when compared to 2011.

Table 10.8: Overall achievement rates in Mathematics Paper 3

Year	No. Wrote	No achieved at 30% and above	% achieved at 30% and above	No achieved at 40% and above	% achieved at 40% and above
2009	11 755	6 007	51.1%	4 409	37.5%
2010	9 454	6 451	68.2%	5 230	55.3%
2011	8 871	6 948	78.3%	5 821	65.6%
2012	8 878	7 337	82.6%	6 263	70.5%

Figure 10.8: Overall achievement rates in Mathematics Paper 3



10.9 Overview of learner performance in Paper 3

- (a) Learner performance in this paper ranged from satisfactory to very good. Teachers and learners must be commended for the extra effort that they make and the commitment shown in tackling the optional paper.
- (b) A larger number of candidates showed greater proficiency in answering the Statistics and Probability section of the paper than in the Geometry section.
- (c) It is encouraging to note that schools that have not offered Paper 3 in the past are now taking up the challenge.

10.10 Analysis of learner performance in individual questions

QUESTION 1: BIVARIATE DATA

Common errors and misconceptions

- (a) A large number of the candidates were unable to identify the independent variable in the context.
- (b) Some candidates used the pen-and-paper method to determine the values of a , b and r . This is time-consuming.
- (c) In Q1.5, some candidates misread the question and substituted 50 instead of 45. A fair number of the candidates were also unable to round off the answer to the nearest 50 as required.
- (d) Many candidates could not distinguish the difference between the least squares regression line and the line of best fit. In Q1.5, some candidates drew the line of best fit and used this to predict the number of sales.
- (e) In Q1.6, some candidates were confused about the difference between the strength of a relationship and the trend.

Suggestions for improvement

- (a) The SAG makes provision for the use of technology in answering questions in Mathematics. Therefore, learners should be encouraged to use a calculator to determine the value of a , b and r . Candidates should be informed that in this case they will not be penalised for not showing the working.
- (b) Learners should be reminded about reading the questions carefully.
- (c) Teachers should inform learners that a line of best fit is an arbitrary line drawn by using intuition, whereas the least squares line is an exact line. The gradient of the least squares line is given by the value of b and the y -intercept is given by the value of a . Hence, the equation of the least squares line is defined as $y = a + bx$.
- (d) Learners should be taught that the correlation coefficient is a numeric description of the association between the two variables. Therefore, when asked to comment about the strength of the relationship, learners are required to translate the numeric value into words.
- (e) The concept trend refers to the general pattern (or direction) that is observed from the scatter plot.

QUESTION 2: MUTUALLY EXCLUSIVE EVENTS AND INDEPENDENT EVENTS

Common errors and misconceptions

- (a) A large number of the candidates showed lack of knowledge of the concepts; mutually exclusive events and independent events.

- (b) Some candidates used $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ to answer both questions. Clearly, they do not understand what this formula represents.
- (c) A few candidates attempted to answer Q2.2 by showing that the conditional probability of a male's passing is equal to the conditional probability of a female's passing. They then concluded that the events, being male and passing and being female and passing are independent. In this case, they were not familiar with the definition of conditional probability.

Suggestions for improvement

- (a) Learners should be taught that mutually exclusive events A and B cannot take place simultaneously. There is no intersection of the events A and B. Therefore, $P(A \text{ and } B) = 0$.
- (b) Learners should be told that events A and B are independent if the occurrence of A does not influence the outcome of B. In this case, $P(A \text{ and } B) = P(A) \times P(B)$.
- (c) Learners should be shown where to read off the value for $n(A)$, $n(B)$, $n(A \text{ and } B)$ and $n(S)$ from the contingency table so that the appropriate probabilities could be calculated.

QUESTION 3: STATISTICS AND NORMAL DISTRIBUTION

Common errors and misconceptions

- (a) Most candidates drew the histogram correctly. However, few of them drew a bar graph or a frequency polygon.
- (b) Many candidates did not realise that they required the class midpoint to estimate the mean lifespan of the television sets. Some candidates divided by 6, the number of classes, rather than 50, the number of observations.
- (c) In Q3.3, some candidates worked with 3 standard deviations from the mean instead of 2 standard deviations from the mean.
- (d) Many candidates failed to see the link between Q3.2 and Q3.3 with Q3.4. Many made unsubstantiated remarks about issuing the guarantee.

Suggestions for improvement

- (a) Learners should be able to identify the different types of graphs.
- (b) Learners should expect to estimate the measures of central tendency for grouped data. In this regard, the method for estimating these should be explained and followed with a number of illustrative examples.
- (c) Learners should be taught that they must substantiate their responses with statistics that are given in the question or that they have already calculated. It is insufficient to simply respond yes/no or valid/invalid.

QUESTION 4: TREE DIAGRAM AND PROBABILITY**Common errors and misconceptions**

- (a) Most candidates completed the tree diagram correctly but did not indicate the outcomes. This implies either that they had not read the question correctly or that they had no knowledge of an outcome of an experiment.
- (b) In Q4.2, some candidates were confused about when to add or multiply the probabilities of simple events that form a compound event.
- (c) In Q4.3, a fair number of the candidates failed to realise that they needed to use the probability that Vusi drives to work and 245 working days in order to calculate the number of days that Vusi will drive to work.

Suggestions for improvement

- (a) For the sake of completeness, teachers should ask learners to always indicate the outcomes on a tree diagram. The outcome reflects how each compound event is made up of a series of simple events. The outcome shows the path taken on each branch to arrive at the compound event at the end.
- (b) Teachers should use the principle that if the word 'and' is used between two simple events, the probabilities are multiplied. This is so that the number of observations satisfying both conditions simultaneously will be less than the number of observations in each simple event.
- (c) Teachers should use the principle that if the word 'or' is used between two simple events, the probabilities are added. This is so the number of observations satisfying both conditions together will be more than the number of observations of each event separately.
- (d) Teachers should link the theory with real-life situations. Therefore application questions of this nature should be dealt with in class.

QUESTION 5: COUNTING PRINCIPLE**Common errors and misconceptions**

- (a) Generally, this question was poorly answered, even though Q5.1 was a routine question involving the concepts, with repetition and without repetition.
- (b) Some candidates did not know whether there are 9 or 10 digits from the numbers 0 to 9.
- (c) Many candidates did not simplify the answers in Q5.1. They left them as 10^5 , $\frac{10!}{5!}$ or $5! \times 10!$.
- (d) Many candidates had very little idea of what was expected of them in 5.2 as this was an unfamiliar question. They did not consider using the complementary rule as an option to answer this question.

- (e) A large number of the candidates could not see the link between the counting principle and probability.

Suggestions for improvement

- (a) Teachers should teach the counting principle by making use of the pigeon-hole concept. In this way, the learners should get a clearer picture of the number of options that would satisfy each box. For example, a five-digit number would have five boxes. Learners would then have to determine the number of options that would satisfy the condition of each box in turn.
- (b) Learners should be told to give the answer in simplified form. If the answer is left as 10^5 , $\frac{10!}{5!}$ or $5! \times 10!$, it does not give the final answer to the question, 'How many?'. One more calculation is required in order to answer this question.

- (c) The definition of probability of an event A is
$$P(A) = \frac{\text{number of outcomes satisfying the event A}}{\text{total number of outcomes}}$$

Where it is not possible to count the number of outcomes that satisfy an event, learners can use the counting principle to obtain this number in a more efficient manner.

- (d) It is easier to count the total number of observations for fewer events and subtract this number from the total in order to work out the total for the remainder. For example, consider the experiment when two dice are rolled and the numbers on the uppermost face are added. If the question requires candidates to count the number of times that the sum will be 3 or more, they are required to count the number of times that the sum will be 3, 4, 5 up to 12 and add these up. It would be more efficient to count up the number of times that the sum will be 1 or 2 and subtract this from the total number of observations.
- (e) A wide variety of examples of when the counting principle could be used in real-life contexts should be discussed in class.

QUESTION 6: RECURSIVE SEQUENCES

Common errors and misconceptions

- (a) Some candidates did not understand the meaning of a recursive sequence and therefore provided an explicit formula in Q6.1.
- (b) Most candidates did not state the three parts to the recursive formula, namely the general formula, the restriction on the variable and the initial value/s.
- (c) In Q6.2, many candidates obtained the answer by finding a constant difference at some level, and used this to determine the next term.

Suggestions for improvement

- (a) Recursive sequences are generated by applying a certain rule to the preceding term/s in the sequence to generate the next term. For example, consider $T_{n+1} = T_n + 5$ where $T_1 = 4$ and $n \geq 1$. The first term is 4. According to the rule, the second term is obtained by adding 5 to the first term. Therefore the second term is 9. The third term is obtained by adding 5 to 9. The third term is 14. The rest of the sequence is generated in the same manner. The approach is thus different from the case in which the general term is obtained by an explicit formula, as is the case in arithmetic sequences, etc.
- (b) Teachers should give learners numerous examples on this section, particularly where the terms are given and a recursive formula is required.
- (c) Learners should be reminded that a recursive definition has three parts; namely the general formula, the restriction on the variable and the initial value/s.

QUESTION 7: RATIO AND PROPORTION**Common errors and misconceptions**

- (a) It is disappointing that many candidates were unable to prove the theorem. It seems that these candidates had taken for granted that the theorems from Grade 11 would not be tested.
- (b) Some candidates stated that $\triangle LMN \parallel \triangle FGH$ and then concluded that $\frac{LM}{FG} = \frac{LN}{FH}$.
- No marks were awarded in this case.
- (c) A large number of the candidates were able to establish the correct proportion in 7.2 and arrive at the correct answer. However, many of them omitted the reason.

Suggestions for improvement

- (a) Bookwork is an essential component of Euclidean Geometry. Learners should be able to prove the theorems; otherwise they stand to forfeit from 5 to 7 marks in the examination.
- (b) The progression of the Euclidean Geometry theory follows a certain order. Learners may use the theorems learnt previously in proving a particular theorem but they may not use theorems that follow to prove an earlier theorem.
- (c) Learners should be encouraged to provide reasons for each significant statement that they make. This will reinforce the theory that has been learnt as well as develop logic in their arguments.
- (d) While integration of topics is encouraged, it is unacceptable to use Trigonometry to prove a Euclidean Geometry theorem. Euclidean Geometry is based on axioms and definitions that relate to points, lines and angles. These are used to develop all the theorems, noting very carefully the order in which they are done.

QUESTION 8: CIRCLE GEOMETRY**Common errors and misconceptions**

- (a) In Q8.1, many candidates were able to give the abbreviated form of the theorem (tan-chord theorem), but were unable to provide the correct enunciation of it. A fair number of the candidates provided a wide variety of the abbreviated forms of the same theorem, for example, butterfly theorem instead of angles in the same segment.
- (b) In Q8.2, a number of candidates wrote a number of statements that are true but are not required in the calculation of a , b , c or d . This led to answers becoming unnecessarily lengthy and some candidates confused themselves along the way.
- (c) Some candidates made the assumption that angles marked with 1 are equal in size or that PR is a diameter.
- (d) Some candidates did not label the angles correctly; for example, instead of writing \hat{Q}_1 or $T\hat{Q}R$, they would simply write $\hat{1}$.

Suggestions for improvement

- (a) Teachers should emphasise that diagrams are not drawn to scale. Therefore, making assumptions from the diagram without proof leads to a breakdown in the answer.
- (b) Teachers should develop the skill whereby learners must read the question and transfer the given information or any other information that they may infer from the given information onto the diagram. This should assist learners in solving riders in the most efficient manner.
- (c) The abbreviated form of the theorems should be standardised. While certain ideas may be used in the classroom to reinforce a particular theorem, the abbreviated form should be relevant to the enunciation.
- (d) Teachers should make use of past examination papers and various textbooks as sources for questions.

QUESTION 9: CYCLIC QUADRILATERALS AND SIMILAR TRIANGLES**Common errors and misconceptions**

- (a) Most candidates made a poor attempt at answering Q9.2 and Q9.4.
- (b) Many candidates could not identify the two cyclic quadrilaterals in the diagram.
- (c) A number of candidates made the assumption that $BK = BT$ or that $TC = TA$. This led to a breakdown.
- (d) Some candidates omitted to provide the reason for $AC \parallel KB$.

- (e) In Q9.4, many candidates were unable to deduce the correct proportion of sides from the two similar triangles. They were unable to make the link between the ratio given in the question and the proportion that they deduced from similar triangles.

Suggestions for improvement

- (a) More practice is required in Geometry, especially in identifying shapes in a complex diagram. Once a shape is identified, learners should be able to associate the relevant theory with that shape. This should provide some clues on how to solve the rider.
- (b) Teachers should emphasise that learners desist from making assumptions based on what they see in the diagram. The diagrams are not necessarily drawn to scale.
- (c) When stating that two triangles are similar, it is advisable to name them so that the corresponding vertices follow in order. This assists in establishing the correct proportion.
- (d) Learners must provide reasons for significant statements that they make.

QUESTION 10: CHORDS OF A CIRCLE

Common errors and misconceptions

- (a) Some candidates had the misconception that if $CM : MD = 4 : 9$, then $CM = 4$ and $MD = 9$ instead of $CM = 4x$ and $MD = 9x$.
- (b) A few candidates made the assumption that M is the midpoint of OC and therefore stated that $OM = MC$.
- (c) Many candidates were unable to apply the Theorem of Pythagoras correctly. Some did not see the relationship between OC and OB, the radii of the circle.
- (d) Some candidates did not use brackets and hence made incorrect calculations thereafter. For example:
 $2,5x^2 + 12^2 = 6,5x^2 \Rightarrow 4x^2 = 12^2$.

Suggestions for improvement

- (a) Learners should realise that convention requires that a proportion be expressed in its simplest form. Therefore, they cannot make direct assumptions about the length of sides from a given proportion. For example, if $CM : MD = 4 : 9$, then it is possible that $CM = 8$ units and $MD = 18$ units.
- (b) Learners should be reminded that there is a difference between $2,5x^2$ and $(2,5x)^2$. In the first instance, only the x is squared whereas in the second instance $2,5x$ is squared.
- (c) Learners can become proficient at solving geometry riders only through rigorous practice.

CHAPTER 11

MATHEMATICAL LITERACY

The following report should be read in conjunction with the Mathematical Literacy question papers of the November 2012 Examination.

11.1 Performance trends (2009 – 2012)

The overall performance at the 30% level and above has shown an increase from 2011 to 2012; however the achievement at the 40% and above level has shown a decrease from 2011 to 2012.

Table 11.1: Overall achievement rates in Mathematical Literacy

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	277 677	207 326	74.7%	141 708	51.0%
2010	280 836	241 576	86.0%	181 794	64.7%
2011	275 380	236 548	85.9%	178 899	65.0%
2012	291 341	254 611	87.4%	178 788	61.4%

Figure 11.1: Overall achievement in Mathematical Literacy

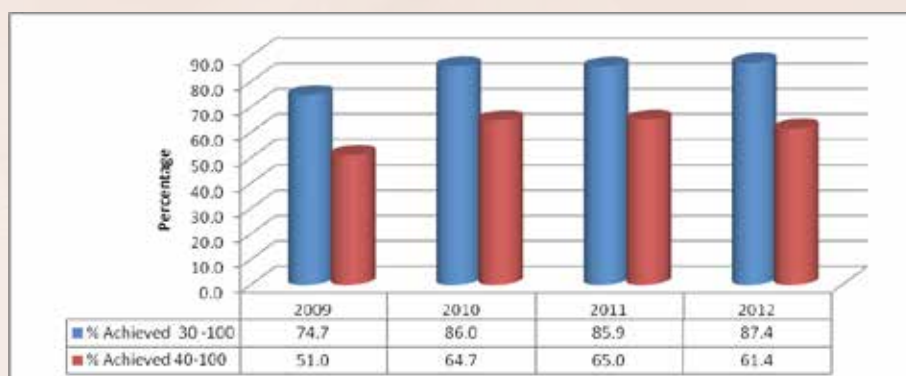
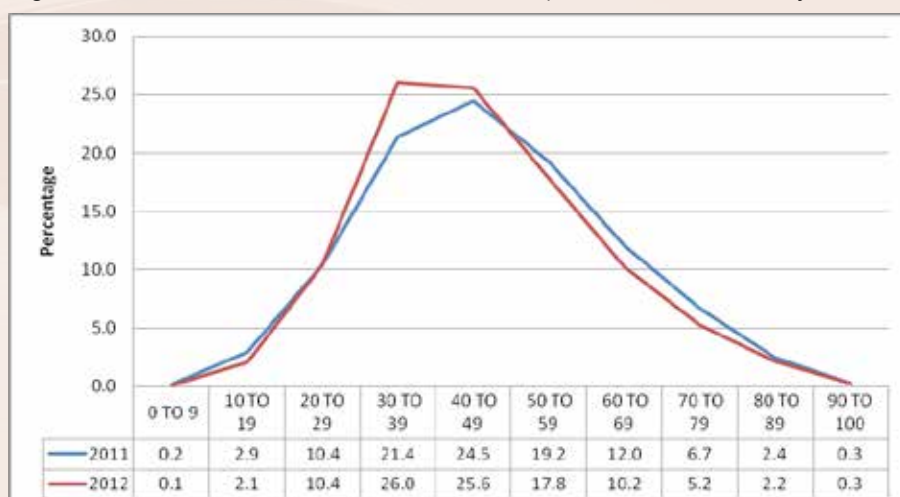


Figure 11.2: Performance distribution curves (Mathematical Literacy: 2011 – 2012)



There was a decrease in the percentage of candidates who performed at 0 - 29% ; and at 50% to 89% in 2012 compared to 2011.

11.2 Overview of learner performance

General comments

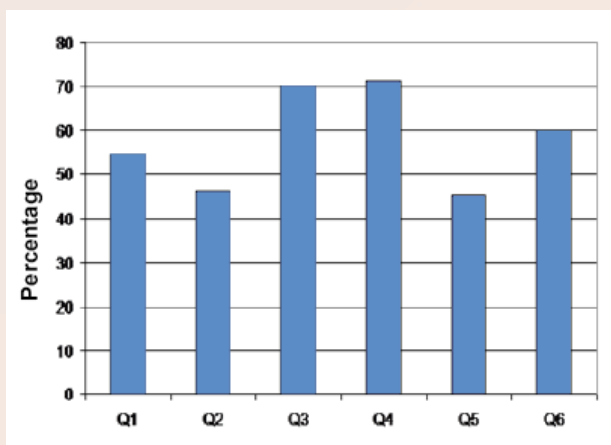
- (a) There was a small increase in the number of candidates passing at the 30% and above level, but a small decrease at the number of candidates passing at the 40% and above level.
- (b) There was a small decrease in the number of candidates obtaining 80% to 100%, and the number of candidates obtaining 70% to 79%.
- (c) However, a larger number of candidates have obtained 60% to 69%. This could be because learner and teachers are becoming more familiar with the content in Mathematical Literacy.

General suggestions for improvement

- (a) Practical real life examples of graphical representation of data from newspapers and other media should be used in the classroom.
- (b) Substitution into formula should be emphasised in classroom teaching. This will help to improve learners' ability to answer questions related to perimeter, area and volume.
- (c) Learners must be encouraged to include units in all steps of their calculations. This will assist them in understanding if the method they are using is correct.
- (d) Learners need to be exposed to more level 4 (problem solving) questions in the classroom.

11.3 Diagnostic question analysis for Paper 1

Figure 11.3: Average mark per question in Paper 1 reflected as a percentage



Q1	Short questions
Q2	Longer questions
Q3	Mr De Haan's Car, Petrol consumption and street map
Q4	Lunje's do – statistics; calculating dimensions
Q5	Maria's house – floor plans, ratios, volume, area and substitution
Q6	Gracia race preparation and plan; frequency table and pie chart

11.4 Analysis of learner performance in individual questions in Paper 1

QUESTION 1: FOUR SHORTER QUESTIONS

This question was based on simple calculations, interpreting a bar graph, analysing a till slip and analysing tabled data.

The performance of learners in this question ranged from good to poor with an average of 54.4%.

Common errors and misconceptions

(a) Candidates made the following errors:

- They were unable to differentiate between a square and a square root;
- They did not understand how to apply BODMAS under the square root;
- Converting from a decimal to a fraction was a problem;
- Candidates convert from litres to millilitres was problematic. Candidates multiplied by 100 instead of 1 000;
- Rounding-off money to the nearest cent was a struggle; and
- Inability to work with time - candidates could not recognise that 60 minutes = 1 hour.

(b) Lack of understanding of terminology used in probability.

(c) Candidates confused mean and median.

(d) Candidates could not read scales correctly from graphs.

(e) Candidates were unable to interpret a till slip.

(f) Calculating price of items excluding VAT when VAT inclusive prices are given.

(g) Inability to substitute correctly into a given formula.

(h) Omitting the word, 'millions' when writing large numbers led to incorrect answers.

Suggestions for improvement

- (a) Many problem areas can only be improved through constant practice at all grade levels.

- (b) Learners should be taught how to use their calculators correctly. Candidates must have their own calculators and familiarise themselves with how to operate them. Teachers should also emphasise the difference between a square and a square root.
- (c) Teachers should assist learners to commit to memory the different conversion scales in the metric system, such as are used in everyday situations.
- (d) More exercises on rounding off should be done. Teachers should emphasise rounding off to the nearest cent when working with money.
- (e) When teaching and learning on probability, appropriate mathematical terminology should be used by teachers and learners. The difference between the median and mean should be clearly outlined.
- (f) The difference between VAT inclusion and VAT exclusion should be emphasised and exercises should be done on how to calculate VAT.
- (g) Learners should understand that people cannot be fractions and that there is a big difference between 17,634 and 17,634 million.

QUESTION 2: FOUR LONGER QUESTIONS ON DIFFERENT CONTEXTS

This question was based on probability and circumference and area of a circle, substitution into formula, analysing a travel graph and calculating bank charges.

The performance of learners in this question was poor with an average of 46.2%.

Common errors and misconceptions

- (a) Writing whole number answers as a fraction.
- (b) Candidates substituted the radius by 30 cm instead of 60 cm i.e. assuming the radius was a diameter.
- (c) Calculator usage was a challenge to most candidates, other candidates substituted correctly but the final answer was incorrect.
- (d) Substitution into formula was very problematic.
- (e) Misinterpretation of scale used on axes.
- (f) Rounding off money to cents was problematic.

Suggestions for improvement

- (a) All types of pictures, charts and graphs should be studied and their interpretation practised. Revision of distance-time graphs must be emphasised in class.
- (b) Teachers should emphasise the difference between radius and diameter.
- (c) Teachers should encourage learners to use a calculator that they are familiar with during examination.
- (d) Learners should be taught the meaning of mathematical words like sum, difference and product.

QUESTION 3: MR DE HAAN'S CAR; PETROL CONSUMPTION AND STREET MAP

The question was fairly well-answered with an average of 70.3%

Common errors and misconceptions

- (a) The rule of dealing with the order of operation was a challenge (BODMAS) for candidates.
- (b) Candidates changed the formula from depreciation to appreciation. The rate of depreciation was compounded monthly when it should have been annually.
- (c) Other candidates substituted correctly, but calculator usage was a challenge.
- (d) Candidates could not round off the amount to the nearest R100.
- (e) Candidates confused 100 km covered with 100 in the given formula.
- (f) The given formula was not used to calculate petrol consumption.
- (g) Candidates named one street instead of two streets, and other candidates were penalised 1 mark for including incorrect streets.

Suggestions for improvement

- (a) Learners should be taught the BODMAS rule and how to use calculators properly.
- (b) Teachers should make learners aware that they are not allowed to change the given formula.
- (c) Rounding off to the nearest 10, 100, 1000 must be emphasised in class.
- (d) Teachers should make learners aware that they should read instructions carefully to avoid penalty.
- (e) Learners should be exposed to different street maps and taught how to read, interpret and extract important information from the map. How to use scales to calculate the actual distance must be emphasised.

QUESTION 4: LUNJE'S DOG – STATISTICS; CALCULATING DIMENSIONS

Learners' performances in this question was good with an average of 71.2%

Common errors and misconceptions

- (a) Some candidates did not include all 11 digits when arranging the litter size in ascending order.
- (b) Other candidates wrote the data in descending order or used the names of the dogs. Other candidates lost all the marks because the data was not correctly arranged in ascending order (Q 4.1.1).
- (c) Candidates wrote dog H because of seven female dogs and over looked the word 'seven more females'.
- (d) Candidates could not differentiate between a mode and a median.
- (e) Candidates lost all the marks because they used the three data sets in their calculations (Q4.1.3).
- (f) Candidates lost marks because they used the litter size or number of males to calculate the range (Q4.1.4).
- (g) Candidates lost marks because simplification was written as $\frac{1}{6}$ instead of $\frac{6}{1}$.
- (h) Candidates wrote fraction as ratio that is $\frac{10}{4}$ instead of 10 : 4 and some candidates did not simply 10 : 4 to 5 : 2.
- (i) Candidates lost marks due to inconsistent shading of males and females.
- (j) Candidates used different values within the context for example: $2,5 \text{ cm} \times 125 \div 6$ which was incorrect.

Suggestions for improvement

- (a) Learners should be given an opportunity to work with and analyse two or three sets of data.
- (b) Teachers must emphasise that all the digits must be included when arranging data in ascending order.
- (c) The difference between ascending and descending order should be clearly outlined.
- (d) Teachers should encourage learners to read instructions carefully.
- (e) Statistics must be practised continually so that learners do not confuse terminology like 'mean', 'median' and 'mode'.
- (f) Teachers should use data that include zero as a number when teaching LO4.
- (g) Teachers should emphasise that a fraction is not a ratio and the order of writing a ratio is very important.

- (h) Teachers need to emphasise the importance of shading when dealing with compound bar graphs and explain how to use annexure.
- (i) Conversions between units must be drilled and practiced.

QUESTION 5: MARIA'S HOUSE – FLOOR PLANS, RATIOS, VOLUME, AREA AND SUBSTITUTION

The performance of learners in this question was poor with an average of 45.2%.

Common errors and misconceptions

- (a) Candidates could not count windows on a floor plan.
- (b) Candidates could not link the length of the Northern wall of 70 mm with the dimension given.
- (c) Candidates could not link percentages with area.
- (d) When working with percentages, they do not know when to divide or multiply by 100.
- (e) The word “less” confused candidates, most of them subtracted 72% from $39,54 \text{ m}^2$
- (f) Candidates were unable to key $1\frac{1}{2}$ in their calculators.
- (g) They were not sure of what to do with the $1\frac{1}{2}$ and the given ratio and as a result most of candidates lost marks in this question.
- (h) Substitution into formulae was problematic for candidates.
- (i) Candidates cannot read information accurately, instead of substituting by $2,52 \text{ m}^2$ they substituted by $(2,52 \text{ m})^2$
- (j) Candidates could not round off the answer to the required decimals.
- (k) Candidates were unable to substitute the value of s and they substituted s by 5
- (l) Candidates were unable to work with unlike terms, for example, $1,3 + 2s = 3,3$.
- (m) Candidates changed s from formula to square, for example, $1,3 + 1.6^2 = 3,86$.
- (n) Candidates substituted as follows into the formula: $1,3 + 2 \cdot 1,6 = 22,9$ with no multiplication sign between 2 and 1,6.

Suggestions for improvement

- (a) More activities on plans and scale interpretation must be given to learners in class.
- (b) Teachers should note that learners are unable to interpret words like excluding, including otherwise they ignore those words when doing calculations
- (c) Teachers should ensure that they spend sufficient time in class on calculating the perimeter, area and volume of a variety of different shapes.
- (d) Teachers should do as much revision work as possible with a variety of questions to help learners develop the skill of correctly identifying the correct formula to use, substituting correctly into the formula, simplifying correctly and writing the answer with the correct unit.
- (e) Teachers should emphasise using a formula instead of a process of elimination to find answers.
- (f) Teachers should emphasise calculations on percentages and the use of 72% “less than” or “more than” should be taken into consideration.
- (g) Teachers should emphasise that $2,52 \text{ m}^2$ is not the same as $(2,52 \text{ m})^2$.

QUESTION 6: GRACIA RACE PREPARATIO AND PLAN; FREQUENCY TABLE AND PIE CHART

Learners scored either very well or poorly with an average of 60.1%

Common errors and misconceptions

- (a) Candidates found working with ratios problematic.
- (b) In Q6.2, candidates had problems identifying the MAXIMUM value and therefore added 1.4; 2.27g and 65 kg. Other candidates added the two given values and multiplied by 65 kg.
- (c) In Q6.3.1, candidates wrote the answer in hours and minutes when the question required the answer to be given in minutes only.
- (d) In Q6.3.2, candidates confused with the two given formulae and thus substituted into the two formulas differently as if they are not the same. Candidates also used any values from the table or inverted the substituted values
- (e) In Q6.3.3, some candidates joined the points to form a straight line graph and some candidates' points were not accurate and as such the shape was not accurate. Some candidates also drew a bar graph instead of line graph
- (f) In Q6.4.1, the frequency was given as tallies or as fractions.
- (g) Candidates subtracted 16% from 360% or 300%.

- (h) In Q6.4.2, candidates wrote “Harmony” as the answer, because they only considered the largest club not the second largest.
- (i) Candidates were confused not knowing whether to use 300 or 360 in Q6.4.2.

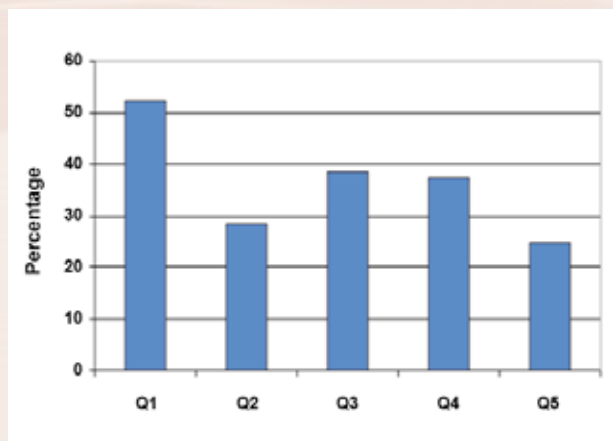
Suggestions for improvement

- (a) Teachers should emphasise more on calculations involving ratios and proportions.
- (b) Teachers should encourage learners to give the answer in the required units.
- (c) Teachers should make learners aware of the words such as “change” and “difference” as these led to low performance in this question.
- (d) Teachers need to assist learners in the interpretation of scales in annexure and make learners aware that a line graph is not necessarily a straight line graph.
- (e) Teachers should encourage learners to answer only the relevant questions, not to include tallies that were not asked.
- (f) Teachers should encourage learners to answer only the relevant questions, as the question require the percentage.
- (g) The word such as “second largest number” should be emphasised.
- (h) The concept of percentages needs to be explained to learners.

11.5 Diagnostic question analysis for Paper 2

A sample of scripts from each province revealed the following average percentages on each questions:

Figure 11.5: Average mark per question in Paper 2 reflected as a percentage



Q1	Nel family holiday (mapwork; holiday cost)
Q2	Danny’s diner (statistical analysis and interpretation; piece chard; area and volume)
Q3	Longhorn heights (inverse functions; analysis of profit options using graphs)
Q4	Air travel (analysing data; substitution into formulae)
Q5	Maria’s house – floor plans, ratios, volume, area and substitution
Q6	Income and expenses (break even analysis; table data and percentages; misinterpretation of bar graphs)

11.6 Analysis of learner performance in individual questions for Paper 2

QUESTION 1: NEL FAMILY HOLIDAY (MAPWORK; HOLIDAY COST)

This question was fairly well answered by learners who could interpret maps and tables. The average percentage for the paper was 52.3%

Common errors and misconceptions

- (a) Candidates were answering this question without considering the compass direction
- (b) Candidates were unable to identify national roads.
- (c) Candidates were not able to interpret key words; for example **to** and **from**, and reference points.
- (d) Most of the candidates did not read the last part of the question, “without turning back to Kimberly” and used the N8 and were penalised.
- (e) They also omitted the relevant towns in the description of the two routes.
- (f) A number of candidates struggled to understand the language in the question etc. ‘George *from* Klerkdorp’ to determine the general direction,
- (g) In Q1.2.2 (b), very few learners could find the precise amount of the meals at the guest house due to the wording ‘if they eat all 3 meals per day’ which learners misinterpret that all 3 meals were eaten daily at the guest house without skipping a meal. A significant number of learners recalculate the ‘total cost of meals at the guest house’ in 1.2.3 and in a number of cases they have then done it correctly.
- (h) Some learners also misinterpreted the cost of a return trip. The misconception leads to the doubling of the cost. This was evident in a huge number of learners’ answers.

Suggestions for improvement

- (a) Teachers need to emphasise analysis of map work.
- (b) Teachers should do more exercises on direction.
- (c) It is important that learners are taught how to derive a formula. A number of candidates did not use a variable to constitute formulae.
- (d) Learners should also be taught that any variable used in a formula must be explained.
- (e) More multi-steps procedure exercises’ should be given to candidates in the classroom to improve their skills in answering such questions.

QUESTION 2: DANNY'S DINER (STATISTICAL ANALYSIS AND INTERPRETATION; PIE CHART; AREA AND VOLUME)

On the whole, learners' performance in this question was very weak. The average percentage scored for this question was 28.2%.

Common errors and misconceptions

- (a) Candidates found this question very tricky because they could not do a reverse range calculation, that is given the range, calculate a missing value.
- (b) In Q2.1.2, many candidates had no understanding of quartiles.
- (c) Most candidates were unable to compare the measures of dispersion relating to the waiting times on 7 and 14 February and identify possible reasons to explain the difference in these waiting times.
- (d) In Q2.2, good candidates immediately realized that Chicken was the only meal that had no percentage provided to complete the whole. They would straight away calculate it using '100 – the sum of all others' and get 15%. Furthermore (in question 2.2.1), if 20%:40 people then 15%:30 people. The common alternative, though, was to first find the total number of people and get 15% thereof.
- (e) In Q2.3, Candidates were unable to convert volume from litres to millimeters cubed.
- (f) They were unable to change the diameter to the radius and to make height the subject of the formula.
- (g) They did not use the given information "semi-cylindrical" to multiply the volume of the braai drum by $\frac{1}{2}$ and increase the dimensions by 1%.

Suggestions for improvement

- (a) Data handling and statistics concepts should be revised before every summative assessments.
- (b) Teachers should vary questions based on the pie chart.
- (c) Teachers should refrain from giving candidates activities that require them to do simple calculations, but to expose them to questions that require multi-step procedures.
- (d) Learners should be exposed to reading so that they are able to deal with questions that require this skill.

QUESTION 3: LONGHORN HEIGHTS (INVERSE FUNCTIONS; ANALYSIS OF PROFIT OPTIONS USING GRAPHS)

This question was challenging for almost all of the candidates. The average percentage performance in this question was 38.5%.

Common errors and misconceptions

- (a) In Q3.1.1, most candidates were unable to derive a formula by using the provided information.
- (b) Candidates could not recognise that the tabled data in Question 2 was an inverse function.
- (c) In Q3.1.2 (b), candidates were unable to use the set of values on the table to determine the missing ones and this was caused by the fact that they could not derive a formula.
- (d) In Q3.1.2 (c), most of the candidates were able to draw the graph by using the information from table 2. However, they were unable to use the scale of the given graph.
- (e) In Q3.2.3, most candidates were not able to draw a curve representing the number of ticket sellers and the number of R5,00 tickets sold by each seller because they were unable to formulate their own equation to determine the X- and Y-axis.
- (f) The candidates were unable to use their graphs to determine the difference between the number of R2,00 and R5,00 tickets, because 3.2.4 was a follow-up from Q3.2.3.

Suggestions for improvement

- (a) Teachers should emphasise the difference between naming and explaining concepts.
- (b) Learners should be taught to correctly derive a formula which can be used to calculate the X- and Y-axis.
- (c) Teachers should ensure that they give learners the opportunity to draw graphs on grids of different scales with emphasis on scale.
- (d) In each and every task given, be it formal or informal, candidates should be given the opportunity to reason/justify their answers.
- (e) Functions should be taught by ensuring that learners develop their own formula, can substitute on the formula and calculate the X- and Y-axis as well as develop their own table to determine the X- and Y-axis. Once they are able to do the latter, they will be able to plot and draw graphs.
- (f) Candidates should be taught that not all graphs are straight line graphs, hence they do not all require their points to be joined by a ruler.

QUESTION 4: AIR TRAVEL (ANALYSING TABLE DATA; SUBSTITUTION INTO FORMULAE)

This question was challenging for almost all of the candidates. The average percentage performance in this question was 37.4%.

Common errors and misconceptions

- (a) In Q4.1, the candidates were unable to read the question with understanding and to identify the distracter “with 37 other passengers”. The statement meant that passengers were more than 37.
- (b) In Q4.1.2, the scale concept was a challenge to candidates. They were unable to convert to the same unit and divide to arrive at a unit ratio.
- (c) In Q4.1.3, reading from the table posed a problem to most candidates. They were unable to calculate the maximum operating altitude of the Jetstream.
- (d) In Q4.1.4, candidates were unable to select the correct aircraft by reading from the table and using calculations correctly by converting minutes to hours.
- (e) In Q4.1.5, very few candidates were able to substitute in the provided formula and were unable to convert kilograms to grams.
- (f) Candidates had a problem interpreting tabled data and graphs.

Suggestions for improvement

- (a) During lessons, activities that enforce terminology such as maximum and minimum should be emphasised.
- (b) Candidates should be given the opportunity to interpret the table on their own before they can be assisted by the teacher.
- (c) Candidates should be given more work that will require them to substitute and convert units without a conversion hint.
- (d) Teachers should also teach conversions using practical examples in class and by giving learners the opportunity to discover them by themselves.
- (e) Candidates to be given activities based on reading and interpretation of tables and as a result they will be in a position to perform better in formal assessment.
- (f) Teacher should use graphs not only from question papers and textbooks but to also use the ones from the media to present learners with more opportunities to interpret.

QUESTION 5: INCOME AND EXPENSES (BREAK EVEN ANALYSIS; TABLE DATA AND PERCENTAGES; MISINTERPRATATION OF BAR GRAPHS)

This question was very challenging for almost all of the candidates. The average percentage performance in this question was 24.6%.

Common errors and misconceptions

- (a) Candidates cannot read from the graph correctly.
- (b) In Q5.1.2, most candidates were unable to verify that at 40 items, cost = income, that is the break-even point.
- (c) Candidates showed a lack of knowledge on interpretation of tables.
- (d) In Q5.2.2, candidates were confused by too much information.
- (e) In Q5.2.3 (a), candidates were unable to synergise information on tables 5 and 6 to determine Henry's basic bonus. Candidates had a problem with the question because it involved multi-step procedures.
- (f) In Q5.3.2, candidates were not able to identify Mr Standford's errors in his interpretation of the graph and thus could not answer the question.

Suggestions for improvement

- (a) Candidates should be taught to interpret the table and the difference between loss, income and profit. They should also be taught to identify values of different scales.
- (b) Questions on break-even point should be varied so that candidates are able to attempt any question regarding the mentioned concept.
- (c) Reading with understanding should be emphasised and discussions of context encouraged during class activities to develop reading, analysis and interpretation skills.
- (d) Teachers should expose learners to questions entailing lengthy context in order to train them on how to extract information and answering the questions appropriately.
- (e) Teachers should expose learners to situations where they are supposed to integrate two types of sources of information to answer questions and draw conclusions.
- (f) The multi-steps type of questions must be frequently addressed by teachers and learners in order to be familiar with them.
- (g) Teachers must teach learners how to interpret graphs and make informed decisions.
- (h) Different types of graphs and their characteristics should be explained thoroughly with emphasis on stacked and compound bar graphs.

CHAPTER 12

PHYSICAL SCIENCES

The following report must be read in conjunction with Physical Sciences question papers of the November 2012 Examination.

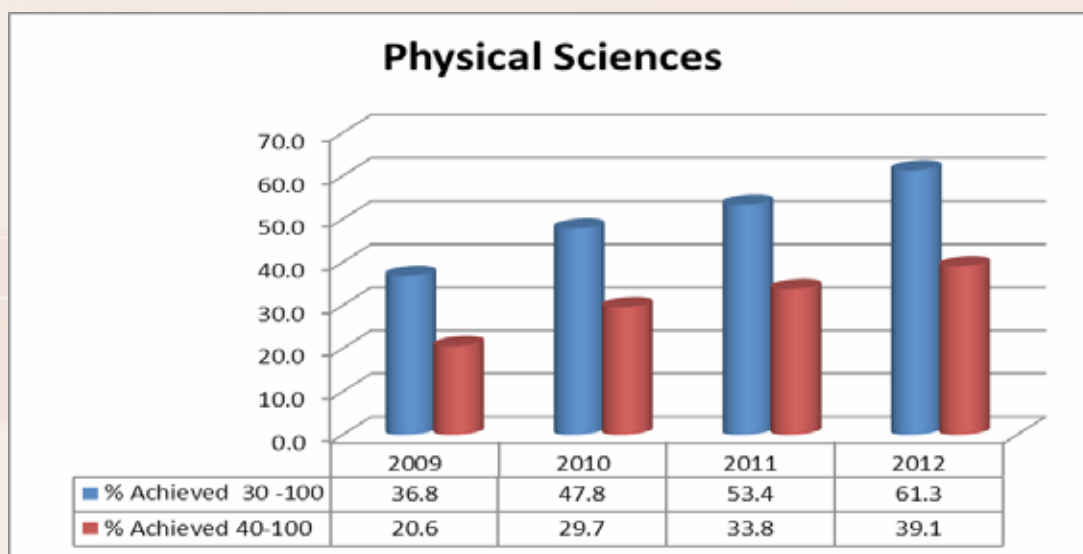
12.1 Performance trends (2009 – 2012)

The performance of learners shows a great improvement through the years. At the 30% and above level, there was a good 7.9% improvement, while at the 40% and above level there was a 5.3% improvement. These statistics reflect the improved quality of responses from candidates in the examination across all provinces. Even though many learners did not pass as expected, the number of learners who scored between 6 and 30 marks out of the total marks of 150 is far less than the previous years. This trend is consistent through all the performance intervals (Fig.11.2).

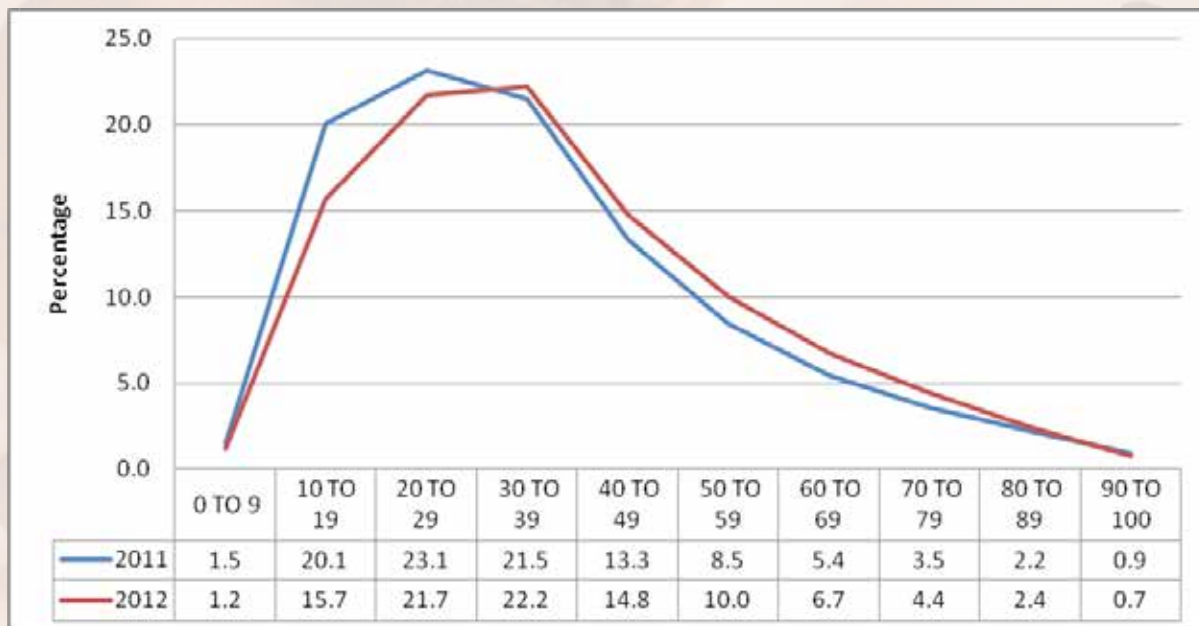
Table 12.1: Overall achievement rates in Physical Sciences

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2009	220 882	81 356	36.8%	45 452	20.6%
2010	205 364	98 260	47.8%	60 917	29.7%
2011	180 585	96 441	53.4%	61 109	33.8%
2012	178 887	109 700	61.3%	69 927	39.1%

Figure 12.1: Overall achievement rates in Physical Sciences



Graph 12.2 Performance distribution curves (Physical Science: 2011 – 2012)



Compared to the 2011 performance, in 2012 there was a decrease in the number of candidates who performed at 0 – 29% level, and an increase at all other levels above 30%.

12.2 Overview of learner performance: Paper 1

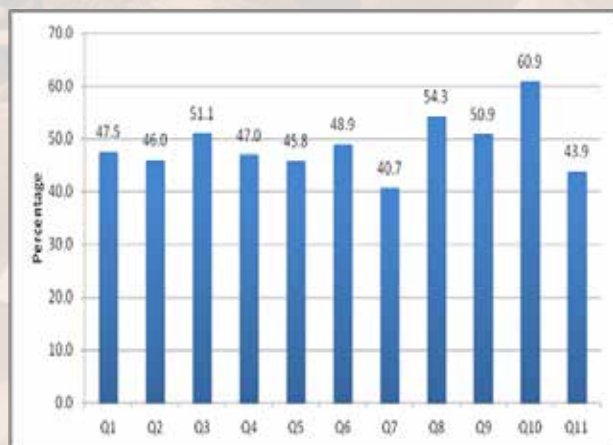
- (a) There was a general improvement in the performance of candidates in Physical Sciences.
- (b) However, a large number of candidates struggled to answer the paper. There still appear to be two distinct sets of candidates: Those who were well prepared for the examination and those who were seriously lacking the knowledge and skills required, with only a small percentage of candidates in the middle range.
- (c) In some centres, only one or two candidates performed well indicating that the majority of candidates in such centres lacked the necessary knowledge and skills.
- (d) Weaker candidates struggled to express themselves in questions that required explanations.
- (e) Question 10 (Generators & AC circuit) was the best answered question. Despite the new way of assessing capacitors, Question 8 was also well answered.
- (f) Although well prepared candidates answered Question 7 (diffraction & interference) well and obtained full marks, it was overall the poorest answered question in the paper.
- (g) The responses of many candidates showed that they were not exposed to practical work. Candidates who were exposed to practical work were in a better position to answer some of the questions in this paper.
- (h) Apart from poor graph reading skills and lack of knowledge of basic definitions, candidates tended to answer what they were drilled to answer instead of answering the question posed.

- (i) Poor mathematical skills and handling of calculators contributed to the poor performance of some centres.

12.3 Diagnostic question analysis: Paper 1

A sample of scripts from each province revealed the following average percentages on each question.

Graph 12.3 Average marks in each question expressed as a percentage (Paper 1)



Q1	One word items
Q2	Multiple choice questions
Q3	Vertical projectile motion
Q4	Momentum and relative velocity
Q5	Work and energy
Q6	Doppler Effect
Q7	2D and 3D wave fronts
Q8	Parallel plate capacitors and electric fields
Q9	Electric Circuits
Q10	AC circuits
Q11	Photo-electric effect

12.4 Analysis of learner performance in individual questions: Paper 1

QUESTION 1: ONE-WORD ITEMS

Common errors and misconceptions

- (a) Question 1.1 assessed one of the most basic concepts in waves studied in Grade 10. The most common incorrect answer was wavelength. This is an indication that candidates know concepts such as frequency and wavelength, but do not have an in-depth understanding of the meaning of these concepts. Other incorrect answers given were: period; cycle; wavelets.
- (b) Most of the candidates who answered question 1.2 incorrectly could not distinguish between the concepts capacitance (property of a capacitor) and capacitor (the device). Common incorrect answers were: capacitance; capacitor; diode; converter.

- (c) In Q1.3, candidates failed to differentiate between a slip ring and a split ring commutator and between AC & DC generators. Spelling was also a huge problem. For example, candidates wrote commuter or commentator instead of commutator, and slit ring instead of split ring. Common incorrect answers were: slit ring; rectifier; diode; transformer.
- (d) Many candidates did not understand the difference between photons and photo-electrons (Q1.4). Spelling was again a huge problem. Common incorrect answers were: photos; potons; photo-electrons; photocell
- (e) In Q1.5, common incorrect answers were: resultant velocity; frame of reference; relativity; relative motion; coordinates.

Suggestions for improvement

- (a) Teachers must ensure that learners know the meaning of concepts used when teaching a certain topic. For example, a proper understanding of the Doppler Effect is impossible if learners do not know the definitions (i.e. the meaning) of concepts such as frequency and wavelength.
- (b) Strategies of assisting learners to grasp and remember concepts should be used e.g. using posters and pasting them on the wall in the class and randomly asking learners to define the concepts during lessons.
- (c) The only way to ensure that learners study the basics is through frequent informal testing. Definitions and terminology must be tested regularly. Such items may be self- or peer- marked.
- (a) At the end of each chapter learners should be assisted in summarising the definitions, concepts or terms learners from the chapter.
- (b) During revision, grade 12 teachers need to ensure they allocate time to revise and clarify basic concepts from grade 10 - 12 instead of focusing on calculations only.
- (c) Learners should be assisted with clear explanations of the differences between concepts that are sometimes mistaken to have the same meaning e.g. photons & photoelectrons; capacitor and capacitance; relative motion & relativity; resultant velocity and relative velocity.
- (d) Teachers should emphasise correct spelling of scientific terms in class.
- (e) Subject advisors can assist by developing a booklet with definitions and explanations of terminology, using the examination guideline document and past examination papers and memoranda, and distributing it to schools.

QUESTION 2: MULTIPLE CHOICE QUESTIONS**Common errors and misconceptions**

- (a) In Q2.1, the most common incorrect answer was C, i.e. the net force is equal to the change in momentum.
- (b) In Q2.2, candidates had difficulty in interpreting the velocity versus time graph. A and C were the most common incorrect answers. Candidates who gave C as an answer failed to interpret the sign convention used (positive gradient, thus positive acceleration) for the velocity versus time graph given in the paper. Candidates who gave A as answer did not know that acceleration is constant. Regardless of whether an object moves upwards or downwards, the acceleration due to gravity is always downward. Further, there was a misconception regarding the sign convention for a vertical projectile. Many candidates thought that if an object moves upwards they must use a negative sign for acceleration and when it moves downwards they must use a positive sign.
- (c) For Q2.3, most candidates did not know the different ways to calculate the work done by weight. Some candidates gave B as an answer. They linked the work done by weight to the change in potential energy, but failed to see that the work done by weight is negative in this case (the car moves uphill, weight acts downwards), whilst the change in potential energy is positive $E_p(\text{final}) > E_p(\text{initial})$. The most common incorrect answer was A, i.e. the work done by the weight of the car (gravitational force on the car) is equal to the change in its kinetic energy. Candidates did not know that the work done by weight is related to the change in potential energy of the car.
- (d) In Q2.4, the most common incorrect answer was B. Some gave C as answer. Candidates who used B as answer did not read the question properly. They looked at the 2λ and then decided the slit width should be $\frac{1}{2}a$. Candidates did not make use of the formula given on the data sheet to derive the answer in cases where they were not sure of the relationship between degree of diffraction, wavelength and slit width.
- (e) In Q2.5, the most common incorrect answer was C. Candidates did not know that the detected frequency is independent of the distance between the source and listener. The detected frequency will be higher than the frequency of the source, but will be a constant higher frequency as long as the source approaches at a constant velocity.
- (f) In Q2.6, the poor performance in this question points to the lack of practical work in schools. Candidates did not know that an ammeter must be connected in series and a voltmeter in parallel. D was the common incorrect answer.
- (g) The question was the best answered multiple choice question (Q2.7). The most common incorrect answer was C. These candidates knew that the two spheres must have opposite charges, but got the direction of the field wrong.
- (h) The most common incorrect answer was D in Q2.8. Candidates chose the distractor that shows the radiation in order of decreasing frequency.
- (i) The most common incorrect answer was A in Q2.9. Candidates could not apply the right hand rule or Fleming's left hand motor rule to determine the direction of rotation of the coil.

- (j) In Q2.10, the most common incorrect answer was C, i.e. when the intensity of light increases, the ammeter reading decreases. Candidates who answered this question incorrectly did not know that light of higher intensity emits more photoelectrons per second and thus results in a larger electric current.

Suggestions for improvement

- (a) Learners must be exposed to good multiple choice questions in class tests.
- (b) Graphs are important tools in science. Teachers should make an effort to teach the use and interpretation of graphs and never assume that every learner is familiar with graphs. Questions 2.2 and 2.5 caused the most problems for learners. Both involved interpretation of graphs.
- (c) Teachers should use previous question papers to expose learners to answer this type of question.

QUESTION 3: VERTICAL PROJECTILE MOTION

Common errors and misconceptions

- (a) In Q3.2, most candidates gave zero as an answer. Some gave upward as an answer. The misconceptions leading to these incorrect answers are:
- The direction of the gravitational acceleration changes i.e. if an object moves upwards, the acceleration is upwards and if it moves downwards the acceleration is downwards.
 - At the highest point when the object is momentarily stationary, the acceleration is zero.
- (b) Due to the misconception regarding the sign convention mentioned in Q2.2 and also in Q3.1, many candidates used incorrect signs in the Q3.2.1 calculation. There was also an inability to analyse the scenario. Other common mistakes were:
- incorrect choice of formula/formulae to solve the problem;
 - incorrect copying formulae from the data sheet;
 - incorrect substitution;
 - Incorrect mathematical manipulation;
 - no or incorrect interpretation of the sign of the final answer; and
 - no or incorrect unit at final answer.
- (c) Due to the misconception regarding the sign convention mentioned above, candidates used incorrect signs in Q3.2.2. They started using upward as positive and then later switch to downward as positive. There was also an inability to analyse the scenario. Other common mistakes were:

- incorrect choice of formulae to solve the problem
- copying formulae incorrectly from the data sheet
- incorrect substitution
- incorrect mathematical manipulation
- No unit or an incorrect unit at the final answer
- not subtracting the calculated displacement from the height of the building (60 m) to obtain the height of the balcony above the ground.

(d) In Q3.3, drawing the required graph was a challenge to a number of candidates. Very few managed to get full marks in this question. The majority of candidates failed to illustrate the change in direction at $t = 4$ s and also did not realize that the object strikes the ground 10 seconds after leaving the roof. The second part of most diagrams therefore extended below the x axis but ended at $t = 6$ s. Other common mistakes were:

- no or incorrect labeling of the graph;
- drawing a position versus time instead of a velocity versus time graph;
- drawing the graph only above or below the x axis; upward and downward velocities thus was given the same sign.

Suggestions for improvement

- (a) Learners can be assisted by an exercise in which they have to draw a diagram of an object moving up and then down and describe the direction of and indicate the signs that should be assigned to the velocity and acceleration at different positions of the object's path.
- (b) Teach learners to indicate the choice of direction before attempting the question and to apply this choice throughout the question as they answer it. Keep to one direction as positive.
- (c) Learners need more practice in solving vertical projectile problems and in the drawing and interpretation of graphs related to vertical projectile motion. They must be given ample opportunity to work out problems on their own so that they get used to working with formulae, substitutions into formulae and mathematical manipulations.
- (d) Teachers should make learners aware that if they give two answers to the same question, the first answer will be marked regardless of whether the second answer is completely correct or not.

QUESTION 4: MOMENTUM AND RELATIVE VELOCITY**Common errors and misconceptions**

- (a) The majority of candidates answered Q4.1 without taking direction into account. They used $0 \text{ m}\cdot\text{s}^{-1}$ as answer. Many candidates omitted the correct direction even though they used $40 \text{ m}\cdot\text{s}^{-1}$ as answer. Others forfeited marks for not interpreting their answer of $-40 \text{ m}\cdot\text{s}^{-1}$.
- (b) Some candidates even used momentum / conservation of energy to solve the problem (Q4.1). It seems as if relative velocity was not even taught in most schools.
- (c) In Q4.2, common mistakes were omitting the key word 'total' in the definition and omitting the key words 'isolated system' in the definition
- (d) In Q4.3, the majority of candidates were unable to work with the masses given as m and $2m$. They substituted specific values. Other common errors were:
- not considering the direction of motion of the vehicles;
 - incorrect principle;
 - incorrect substitution;
 - incorrect mathematical manipulation;
 - omitting the unit and direction at the final answer;
 - using subscripts as superscripts e.g. m_2v^2
- (e) Many candidates had the misconception that the force acting on each body depends on the masses and did not relate their answers to Newton's third law of motion (Q4.4.1).
- (f) In Q4.1.1, many used an equation and tried to calculate the answer instead of working out the ratio and then explaining it in words. Candidates did not have the ability to express the answer in terms of a symbol (F in this case). Many of those who answered the question correctly, failed to give a correct reason.
- (g) In Q4.4.2, many candidates ignored the instructions to answer in terms of a . Once again candidates failed to give the answer in a ratio form before explaining it in words. They answered the question correctly, but failed to give a correct reason.
- (a) Although most candidates could answer the first part of the question correctly, they failed to give a correct explanation (Q4.4.3). Candidates tended to contradict themselves and many mentioned in Q4.4.1 that the forces on the two vehicles are the same, but in their explanation in this question they said the one force was greater. Common errors were:

- Not explaining in terms of acceleration and velocity (specified in the question), but only arguments in terms of mass;
- Inability to see the relationship between mass, acceleration, force and velocity;
- Describing acceleration as the rate of velocity instead of the rate of change of velocity.

Suggestions for improvement

- (a) Momentum is a vector quantity. Emphasis must be placed on the choice of direction when objects move in opposite directions.
- (b) Learners must be made aware of the importance of certain key words in definitions of concepts.
- (c) The relationship between different physical quantities should be explained and learners must be exposed to enough applications of such relationships to enable them to make predictions on how a change in one of the quantities will affect another.
- (d) Extensive workshops must be done to reinforce the teaching of momentum in terms of Newton's Second Law of Motion, impulse and energy, as well as frames of reference and relative motion.
- (e) Subject advisors can assist in providing additional material on relative velocity because text books lack the necessary information.
- (f) Learners doing Physical Science must be encouraged to take Mathematics to acquire all the necessary Mathematical skills needed in Physical Science.

QUESTION 5: WORK AND ENERGY

Common errors and misconceptions

- (a) The drawing of the free body diagram improved from previous years (Q5.1). Common errors were:
 - Inclusion of a frictional force despite the statement in the question that friction should be ignored;
 - Drawing a free body diagram for an object on an incline;
 - Incorrect labeling of forces;
 - Drawing arrows without arrow heads.
- (b) In Q5.2 candidates omitted key words such as 'net/total' and 'change'; and stated the principle of conservation of mechanical energy.

- (c) Q5.3.1 was poorly answered. Common errors were:
- substitution of $\cos 0^\circ$ instead of $\cos 180^\circ$;
 - omitting the square when substituting values into $\frac{1}{2}m(v_f^2 - v_i^2)$;
 - omitting subscripts i.e. W instead of W_{net} and F instead of F_{net} , and
 - swapping initial and final velocities in the calculation.
- (d) Question 5.3.2 was fairly well answered. Common errors were:
- not realising that the direction of the displacement is opposite to that of the net force hence a positive value was substituted for F_{net} ;
 - interchanging v_f and v_i and the use of $9,8 \text{ m}\cdot\text{s}^{-2}$ for acceleration.

Suggestions for improvement

- (a) Teachers must ensure that learners are aware of the importance of subscripts and correct symbols in formulae.
- (b) Teach learners to choose a sign convention and indicate it before attempting a momentum or relative velocity calculation and use this sign convention throughout the calculation.
- (c) Learners must be exposed to exercises in which numbers are replaced with letters e.g. as in this question where m and $2m$ were used as the masses of the vehicles.

QUESTION 6: DOPPLER EFFECT

Common errors and misconceptions

- (a) Performance in this question declined drastically in comparison to previous years. The style of questioning was very different from previous years hence the performance declined. This is an indication of the disadvantage of using only past examination papers for drilling candidates instead of using them for revision purposes to ensure candidates learn with insight instead of rote learning.
- (b) Candidates lacked knowledge of properties of sound waves such as frequency, speed, pitch and loudness.
- (c) In Q6.1, the majority of candidates provided Doppler Effect as answer. In previous papers this phenomenon used to be the first question. It seems as if candidates memorized previous papers and did not even read the question – they assumed the first answer must be Doppler effect.
- (d) It also seems as if some candidates did not understand the meaning of ‘property of sound’ (Q6.1).

- (e) In Q6.2, candidates failed to link the difference between the observed frequency and that of the source to the relative motion between observer and source of sound. They had a poor knowledge and understanding of the concepts 'pitch', 'frequency' and 'wavelength' and the relationship between these concepts.
- (f) The majority of candidates failed to read the wavelength correctly from the graph (Q6.3). They lacked basic knowledge that they should have acquired in Grade 10.
- (g) Common incorrect answers were: 0,1 m (length of half a wavelength); 0,5 m (length of 2,5 waves).
- (h) For Q6.4.1, many candidates tried to use the Doppler formula to answer the question. Others used the equation $c = f\lambda$. Many of those who used the correct formula ($v = f\lambda$), substituted v with the speed of light instead of the speed of sound in air.
- (i) In Q6.4.2, candidates wrote the Doppler formula correctly and a number of them made correct substitutions. However, most failed to get to the correct answer. The unknown value was part of the denominator. Due to poor mathematical manipulation skills it was a challenge for many to calculate the correct answer.

Suggestions for improvement

- (a) Learners should be encouraged to substitute values into formulae and simplify calculations before changing the subject of the formula.
- (b) Responses to Q6.3 and Q6.4.1 indicate that there is a need to ensure that learners have an in depth understanding of the basic concepts of waves.
- (c) Learners should be encouraged to use formulae as they appear on the data sheet and not derived formulae.
- (d) Teachers must ensure that learners get enough exercise in handling of calculators and how to solve mathematical problems such as the one in Q 6.4.2. Teaching learners specifically how to use calculators might well be necessary in enabling them to perform better. They should be discouraged from using a different calculator for the first time in an examination.
- (e) It might well be a good idea for Mathematics and Physical Sciences teachers to communicate and work together in assisting learners with mathematical calculations.

QUESTION 7: 2D AND 3D WAVEFRONTS

Common errors and misconceptions

- (a) Responses to this question showed that candidates do not know the difference between a diffraction pattern and an interference pattern (Q7.1). Common incorrect
- (b) Many candidates did not know the difference in patterns observed through a double and single slit (Q7.2). They were not exposed to practical work on diffraction and interference.

- (c) Most candidates did not realise that the width given for the central bright band had to be divided by 2 (Q7.3.1). They substituted 0,22 into the formula.
- (d) Many candidates tried to use the formula $\sin \theta = \frac{m\lambda}{a}$ to solve the problem.
- (e) Question 7.3.2 best answered sub-question in Q 7. Common errors were: incorrect or no conversion of nm to m and cm to m; omitting the unit at the final answer and omitting $\times 10^6$ in the final answer.
- (f) In Q7.4, many candidates had problems in adequately explaining the relationship between diffraction and wavelength. Many confused the wave nature with the particle nature of light and used statements such as 'red light is stronger than blue light' to explain the difference in wavelength and the bands formed in the interference pattern.

Suggestions for improvement

- (a) Teachers should emphasise the differences between 'diffraction' and 'interference' patterns.
- (b) More emphasis must be placed on the electromagnetic spectrum and the relationship between the wavelength and frequency of the different types of waves.
- (c) Although calculations in Physics are important, teaching should not only focus on calculations. Learners should be taught to do calculations with an understanding of the underlying principles instead of merely substituting numbers into a formula given on the data sheet. More emphasis should be placed on learners being able to explain answers.
- (d) Practical work will help learners to differentiate between the patterns observed on a screen when light shines through a double and a single slit.

QUESTION 8: PARALLEL PLATE CAPACITORS & ELECTRIC FIELDS

Common errors and misconceptions

- (a) Although Q8.1. was well answered, common errors observed in this question were:
- incorrect changing of the subject of the formula
 - incorrect substitution.
- (b) Some candidates omitted the unit of potential difference in Q8.2
- (c) Common mistakes observed in Q8.3 were:
- incorrect conversion from μF to farad

- using the formula $C = \frac{\epsilon_0 A}{d}$ instead of $C = \frac{Q}{V}$
 - incorrect manipulation of the formula $C = \frac{Q}{V}$
- (d) Many candidates still do not know the factors that will influence capacitance (Q8.4.1 and Q8.4.2).
- (e) Common errors made in Q8.5.1 were:
- not drawing properly spaced parallel lines
 - not showing the curved lines at the ends
 - omitting the direction of the electric field lines.
- (f) in Q8.5.2, many candidates did not know that the electric field between two parallel plates is uniform and therefore divided the 12 mm by two. Some also used E as the symbol for energy instead of the symbol for electric field.

Suggestions for improvement

- (a) Candidates must practice how to make sketches of electric field patterns. Emphasis should be placed on producing neat sketches with the correct properties.
- (b) Learners should be exposed to calculations involving the different formulae to calculate electric field to enable them to choose the correct formula for the situation. For example, learners used the formula for the electric field at a certain distance from a point charge to calculate the electric field between the parallel plates.
- (c) Teachers should ensure that time is allocated for revision of Grade 11.

QUESTION 9: ELECTRIC CIRCUITS

Common errors and misconceptions

- (a) In Q9.1.1, many candidates forfeited one mark for one of the following reasons:

- leaving the answer as $\frac{1}{R_p} = 30 \Omega$
- substituting without writing the formula
- using the incorrect formula e.g. $R_p = \frac{1}{R_1} + \frac{1}{R_2}$

- (b) The common errors in Q9.1.2 were:
- calculating the total resistance of the circuit without including the internal resistance
 - incorrect calculation of R_{external} and R_{total}
- (c) The common errors in Q9.1.3 were:
- substituting an incorrect value for the total resistance
 - calculating the parallel voltage by subtracting the other external voltage from the emf, thus ignoring the internal voltage (lost volts) of the battery.
- (d) The majority of candidates knew that the emf is the voltage at zero current and thus did not experience any problem with the question (Q9.2.1).
- (e) In Q9.2.2, a number of candidates could not calculate the gradient of the graph. Finding the correct coordinates from the graph was also a huge challenge to many candidates.
- (f) The majority of candidates provided 'resistance' as answer for Q9.2.3. Candidates thus did not realise that the variable resistor changes the external resistance of the circuit and thus also the total resistance of the circuit. The only constant resistance, as depicted by the gradient of the graph, is the internal resistance of the battery. (When writing the formula $\text{emf} = IR + Ir$ in the form $y = mx + c$ the following is obtained: $IR = -rI + \text{emf}$. From this expression it is clear that the gradient of the graph is the internal resistance of the battery and the y intercept is the emf of the battery.)
- (g) Most candidates could answer the question, but failed to give a correct explanation in terms of 'lost volts' (Q9.2.4).

Suggestions for improvement

- (a) Revision of Grade 11 work that is examinable in grade 12 should be done throughout the year.
- (b) Learners must show all the steps in their calculations and avoid short cuts. For example, $\frac{1}{R_p}$ and R_p are not the same.
- (c) Ensure that learners get enough exposure to interpretation of graphs and reading values from graphs.
- (d) There is need for a focused training on current electricity (both theory and practical work) so that it can be taught more effectively.

QUESTION 10: AC CIRCUITS**Common errors and misconceptions**

- (a) Those who answered Q10.1 incorrectly could not link the transformer to AC.
- (b) For Q10.2, some candidates could not differentiate between an AC and a DC graph. Many others drew a straight line graph through the origin.
- (c) Candidates who did not obtain full marks in Q10.3, forfeited marks due to one or more of the following:
- incorrect formulae e.g. using $I_{\text{rms}} = \frac{I_{\text{max}}}{\sqrt{2}}$ on its own and thus could not obtain the correct answer
 - incorrect substitutions
 - incorrect mathematical manipulations
 - omitting subscripts in the formula $V_{\text{rms}} = \frac{V_{\text{max}}}{\sqrt{2}}$
 - swapping rms and max values.
- (d) Candidates failed to apply their knowledge that (high) current has a heating effect and could cause damage to electric cables (Q10.4.1). The most common incorrect answer was 'cost effectiveness'.

Suggestion for improvement

- (a) Although learners performed well in this question, there is still room for improvement. Many teachers need guidance in the teaching of this topic.

QUESTION 11: PHOTO-ELECTRIC EFFECT**Common errors and misconceptions**

- (a) The most common incorrect answer in Q11.1.1 was 'frequency' i.e. the independent variable.
- (b) The most common incorrect answer in Q11.1.2 was 'kinetic energy' i.e. the dependent variable.
- (c) Many candidates could not identify which variable had to be controlled in Q11.1.3. It might also be that some candidates did not know that a controlled variable is the variable(s) that should be kept constant during the investigation.
- (d) The definition of 'work function' instead of 'threshold frequency' was used in Q11.2. Some of those who used the correct definition omitted key words and forfeited marks.

- (e) Many candidates failed to read the graph correctly due to lack of graph reading skills (Q11.3).
- (f) Candidates forfeited marks in Q11.4 for one or more of the following reasons:
- swapping f and f_0
 - calculation of the work function as final answer instead of the kinetic energy
 - incorrect mathematical manipulation.
- (g) The majority of candidates did not know that the kinetic energy of photoelectrons is not affected by the intensity of light (Q11.5).

Suggestions for improvement

Make use of PHET simulations to demonstrate the photo-electric effect and factors that influence it e.g. the effect of frequency and light intensity on the kinetic energy and number of photo-electrons emitted.

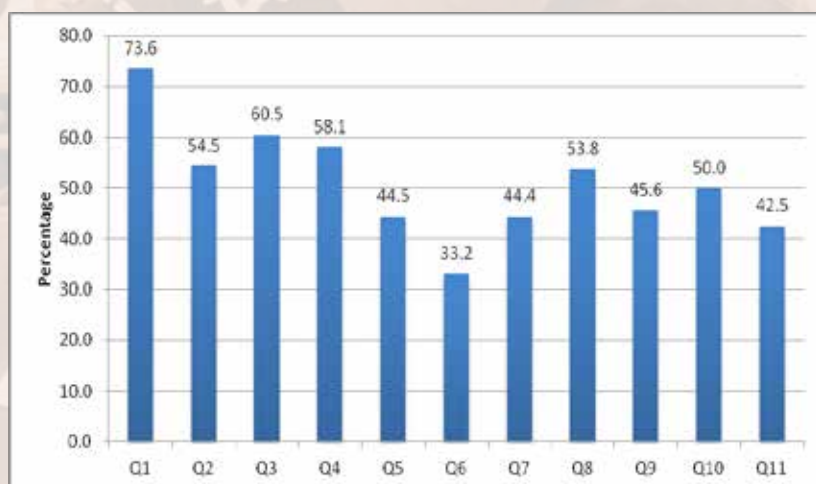
12.5 Overview of learner performance: Paper 2

- (a) There was a general improvement in the performance of candidates in 2012 in comparison to previous years.
- (b) It is clear that learners who prepare well are able to achieve excellent results. However there were numerous centres where poor preparation and lack of understanding of the content appeared to be serious problems.
- (c) Weaker candidates still experience problems answering the higher order, interpretative questions. Their explanations are poor and not detailed enough.
- (d) Question 6 (rate of reaction) was the most poorly answered question. In previous years similar questions were usually the best answered questions.
- (e) Responses to questions covering galvanic and electrolytic cells improved from previous years.
- (f) Many candidates performed poorly in questions included as level 1 and 2 questions due to lack of knowledge. Many did not know basic definitions.
- (g) Responses of many candidates showed that they were not exposed to practical work. Candidates who were exposed to practical work were in a better position to answer several of the questions in this paper.

12.6 Diagnostic question analysis: Paper 2

A sample of scripts from each province revealed the following average percentages on each question.

Figure 12.4: Average marks per question expressed as a percentage (Paper 2)



Q1	One word items
Q2	Multiple Choice
Q3	Nonmenclature of organic compounds
Q4	Physical properties of organic compounds
Q5	Reactions of organic compounds
Q6	Rate of reaction
Q7	Chemical equilibrium
Q8	Galvanic cells
Q9	Electrolytic cells
Q10	Batteries
Q11	Fertilisers

12.7 Analysis of learner performance in individual questions: Paper 2

QUESTION 1: ONE-WORD ITEMS

Common errors and misconceptions

Candidates confused the terms (in Q1.1) homologous series and functional group. Common incorrect answers were: ester; aldehyde; alcohol; alkene; alkyne; haloalkane.

- Candidates did not know their IUPAC rules. Common incorrect answers were: 1-ethene; 2-ethene; ethane; propene; methane.
- Candidates could recognise Q1.3 and they had ease in answering it. Many candidates however, gave their response as E_a , activated energy, activational energy and activating energy which was accepted. Common incorrect responses were: kinetic energy; chemical energy; bond energy; active energy; ΔH ; reaction energy; activated complex; complex energy.
- Candidates were familiar with Q1.4. Some incorrect responses were: addition substance; exothermic reaction; reaction rate; temperature; concentration; Pt; V_2O_5

- (d) Candidates seemed to be unfamiliar with the term brine as used in the chlor alkali industry (Q1.5). Many of them gave the formula (NaCl) instead of the chemical name as answer. Other common incorrect answers were: sodium hydroxide; sodium chloride; bromine; salt solution; chlorine

Suggestions for improvement

- (a) Teachers need to spend more time on the basics and need to use a greater variety of resource materials. Learners do not know the necessary terms, definitions, concepts and principles.
- (b) The best way to ensure that learners study the basics is through frequent informal testing. This is a strategy that is often neglected in schools. This should be done on a daily basis, sometimes orally and sometimes as a short test that can be written in homework books and marked by the learners.
- (c) Districts or clusters are advised to compile a list of possible one-word questions using previous Grade 12 NSC and provincial question papers, and distribute it to all schools. Teachers can use these in class tests after completion of a certain topic.
- (d) Learners also need to be visually stimulated by using pictures, videos, news, real life examples and most importantly practical work. Brine, for example, can be made in any laboratory or household. Teachers are advised to put some visually stimulating material such as articles from newspapers, or words and concepts that are problematic to their learners, on the walls of classrooms. Learners will learn better when these relate to the everyday lives.
- (e) Teachers must ensure that terms are properly pronounced, especially for second language speakers as this is carried through into the written word.
- (f) A document containing all definitions can be very helpful to learners to ensure that they learn the correct definitions and have them at hand at all times.
- (g) A summary of concepts taught should be given to learners at the end of each topic.
- (h) Teachers should pay enough attention to the language of science. Learners will always struggle to master concepts if they are not sure about the terminology used.

QUESTION 2: MULTIPLE CHOICE QUESTIONS

Common errors and misconceptions

- (a) Candidates who answered Q2.1 incorrectly mainly gave A as answer. Such candidates thought that the given compound was saturated.
- (b) Candidates did not know the difference between 'saturated' and 'unsaturated' solutions (Q2.1).
- (c) Candidates who answered Q2.2 incorrectly mainly gave B (2-methylbutane), as answer. Others did not understand the meaning of the term 'isomer'.

- (d) Candidates did not know the difference between chemical and physical properties (Q2.3). Although incorrect answers were a mixture of the three incorrect options, option C (similar molecular formulae) was most frequently given as the answer. The following misconceptions lead to wrong answers:
- Alcohols form a homologous series because they have the same physical properties.
 - Alcohols form a homologous series because they have the same molecular formula.
 - Alcohols form a homologous series because they have the same structural formulae.
- (e) The Maxwell-Boltzmann distribution curves appear not to have been taught and/or the candidates do not understand how to interpret the graph (Q2.4). Option C was the most common incorrect answer. Candidates thought that an increase in temperature decreases the activation energy of the reaction. They did not know that an increase in temperature increases the number of effective collisions whilst the activation energy of the reaction remains the same.
- (f) In Q2.5, misconceptions were as follows:
- Many candidates thought that the subscript of a formula (e.g. D_2) and not the coefficient (e.g. $2D$), is used as exponent in the K_c expression and gave C as an answer.
 - Many candidates did not know that solids and liquids do not appear in the K_c expression. They mainly provided A as answer, although in some cases B was also given as answer.
- (g) Application of Le Chatelier's principle (Q2.6) remains a challenge to many candidates. Misconceptions were as follows:
- Many candidates thought that an increase in temperature increases the yield of products. Thus C was a common incorrect answer.
 - Others thought that a catalyst increases yield. They gave A as answer.
- (h) Question 2.7 is a straight recall question and candidates who answered it incorrectly did not know their work. Terms such as oxidising agent, reducing agent, oxidation and reduction are basic concepts and all grade 12 Physical Sciences candidates should not have problems with these concepts. The common incorrect answers were:
- A - an oxidising agent is reduced because it loses electrons
 - C - an oxidising agent is oxidised because it gains electrons.

- (i) Misconceptions in Q2.8 were as follows:
- Electrons move through the salt bridge. (A and B were common incorrect answers);
 - Electrons move from cathode to anode. (D was a common incorrect answer).
- (j) Misconceptions in Q2.9 were as follows:
- Cryolite is used in the extraction of aluminium to increase the yield of aluminium – answer A;
 - Cryolite increases the melting point of aluminium oxide – answer C.
- (k) Question 2.10 is a straight recall question and candidates who answered it incorrectly did not know their work. Most candidates knew that the primary nutrients are N, P and K. However, option B (carbon) was the common incorrect answer provided by some candidates.

Suggestions for improvement

- (a) Learners must be exposed to multiple choice questions in class tests. Teachers are advised to compile a test bank of MCQs for learners.
- (b) Learners must be taught how to answer MCQs by eliminating obviously incorrect distractors. Guessing should not be used to answer these questions.
- (c) Ensure that learners are given enough practice in the writing of K_c expressions. The first homework after introducing the equilibrium constant should cover as many examples as possible. In this exercise learners can practice the writing of K_c expressions from given equations and also to identify an equation that matches a given K_c expression.

QUESTION 3: NOMENCLATURE OF ORGANIC COMPOUNDS

Common errors and misconceptions

- (a) Candidates had a poor understanding of the term 'structural isomer' (Q3.2.1). Most candidates could not identify the two structural isomers from the six given compounds. They did not know that an 'ester' containing five C atoms is a 'structural isomer' of a carboxylic acid with the same number of C atoms. Common incorrect answers were:
- F (ester) and E (aldehyde) are structural isomers - they were the only two compounds containing a carbonyl group each.
 - B (alcohol) and E (aldehyde) are structural isomers - they were the only two compounds containing one O atom each.

- (b) Many candidates were not familiar with the term carboxyl group (Q3.1.3).
- (c) A common incorrect answer was option F i.e. classifying the ester as an aldehyde (Q.3.1.4).
- (d) Most candidates could identify the alcohol from the given six compounds (Q3.1.5).
- (e) In Q3.2.1 many candidates were not able to name structures that are 'bent'. They saw the bent chain as a branch. Common incorrect answers were:
- 2-methylbutene (not specifying the position of the double bond)
 - 1,2-dimethylpropene (unable to identify the longest chain & number incorrectly)
 - 2,3-dimethylpropene (unable to identify the longest chain).
- (f) Other common mistakes in Q3.2.1 were:
- omitting hyphens
 - incorrect position of the double bond e.g. 2-methylbut-2-ene.
- (g) Most candidates could write the structural formulae for pentanoic acid in Q3.2.2. Common errors were:
- Using the wrong functional group e.g. giving the structural formula of the aldehyde i.e. pentanal
 - Giving the structure of butanoic acid
 - Adding a H atom to the carbonyl C atom
- (h) In Q3.3.1, candidates were generally not familiar with the property of esters i.e. a pleasant odour. Even well performing candidates answered this question poorly. If candidates have the opportunity to prepare an ester in the school laboratory, they should be in a position to answer this question correctly. The most common incorrect answer provided was 'carboxylic acid' and alcohol'.
- (i) In Q3.3.2, candidates obtained one mark for ending the name with -ol. This leniency in marking helped many candidates. Identification of the alcohol and carboxylic acid needed to prepare a specific ester is still not well understood by many candidates.
- (j) In Q3.3.3, most candidates were unable to give the correct name of the ester. In most cases they were unable to identify the alcohol part and the acid part. Hence, they wrote responses such as 'propyl ethanoate' instead of 'ethyl propanoate'.
- (k) Other common incorrect / partially correct answers were: 'pentanoate'; 'ethyl propanoate'; '1-ethyl-2-propanoate'.

Suggestions for improvement

- (a) Teachers need to spend more time teaching the basics of organic chemistry and reinforcing the IUPAC naming rules. Learners need to practice and know how to name various organic compounds. They need to practice naming straight chains, branched chains and bent chains as well as condensed and semi-condensed structural formulae.
- (b) Learners cannot identify 'structural isomers'. Teachers need to explain the term using different homologous series and also different structures e.g. structural formulae and condensed structures of straight chain as well as branched compounds.
- (c) Ensure that learners know that a carbon atom must always form four bonds. When drawing a structural formula, they should count the number of bonds formed by each carbon atom.
- (d) Teachers need to be strict when marking the structures and names of organic compounds at school so that the learners are encouraged to do it correctly and according to IUPAC notation.
- (e) Learners should be encouraged to read instructions before answering questions. For example Instead of writing the letters in Q 3.1, a few learners wrote the names of the compounds corresponding to those letters.
- (f) Subject advisors need to structure teacher developmental programmes to assist in lesson planning and teaching methodology to improve teaching of organic chemistry.

QUESTION 4: PHYSICAL PROPERTIES OF ORGANIC COMPOUNDS**Common errors and misconceptions**

- (a) The majority of learners did not know that the alkanes shown in the table are used as fuels. Common incorrect answers were: 'disinfectants'; 'used in food'; 'candles'.
- (b) It must be mentioned that many candidates misunderstood the question and answered that the alkanes are used to determine the relationship between boiling point and chain length. The last part of the question 'in the above table' confused many candidates and they provided the answer 'to measure the boiling point'.
- (c) Most common mistakes in Q4.1.2 were: CH_{2n+2} ; CH_{n+2} ; C_nH_{2n} ; C_nH_{n+2} .
- (d) Most candidates could identify 'boiling point' as the dependent variable in Q4.1.2. Common incorrect answers were: 'temperature'; 'molecular structure'; 'chain length'.
- (e) Most candidates could identify boiling point as the dependent variable (Q4.2.2). Common incorrect answers were: 'hydrocarbons'; 'temperature'; 'boiling point'.

(f) In Q4.2.3, some candidates apparently did not know that the dependent variable changes due to a change in the independent variable and not the other way round. For example, boiling point increases when the chain length of the straight chain alkanes increases AND NOT chain length of the straight chain alkanes increases when the boiling point increases. Common misconceptions when writing the conclusion were:

- temperature increases as the chain length increases.
- methane to butane is negative and pentane to hexane is positive.
- hexane has a high boiling point and methane has a low boiling point; this conclusion ignores the other alkanes and does not state a relationship between the dependent and independent variables; a correct conclusion would be 'boiling point increases from methane to hexane'
- boiling point is directly proportional to chain length.

(g) Many candidates did not know how to use the given boiling points to determine which of the given alkanes are liquids (Q4.3).

(h) The most common errors in Q4.4 were:

- Writing the reactants correctly but giving incorrect products;
- Incorrect balancing of correct reactants and products;
- Using structural formulae instead of molecular formulae (One mark was forfeited.).

(i) For Q4.5, the manner in which candidates explained why the isomers have lower boiling points than hexane itself reflected an improvement in comparison to previous years. Although marking was lenient, many candidates forfeited marks due to incorrect statements or statements that did not make sense at all. Candidates had a poor understanding of chemical bonding and intermolecular forces. Many thought that the intermolecular forces hold the atoms together in the chain. Some also thought that hydrogen bonds exist between alkane molecules. Many of them thought that the weaker the intermolecular forces, the higher the energy needed to overcome these forces. They reasoned according to the graph that explains the change in energy when, for example, two hydrogen atoms approach each other to form a molecule. The lower the energy of the molecule, the more energy is needed to break the bond between the two atoms. They did not understand that weaker intermolecular forces can be overcome with less energy than stronger intermolecular forces. Common incorrect partially incorrect answers were:

- Lower than ✓

Isomers are more compact ✓ and thus have weaker intermolecular forces ✓ resulting in more energy needed* to overcome the forces.

- Lower than ✓

Isomers are more compact ✓ and thus have weaker intermolecular forces between atoms ✕ resulting in less energy needed ✓ to overcome the forces.

Suggestions for improvement

- Practical investigations should be performed on a regular basis and emphasis should be placed on: the investigative question, the hypothesis, variables, method, results, interpretation of results and the conclusion.
- Candidates should be taught that a conclusion must be stated as a relationship, found experimentally or from given results, between the independent and the dependent variables. More practice is needed to ensure that candidates are familiar in formulating investigative questions, hypotheses and conclusions. In all three cases, the dependent and independent variables should first be identified and then a relationship between these two variables should be identified.
- Learners must be taught to answer questions such as Q 4.5. Proper sequencing of ideas is important. For example, a compound first has a branched structure, secondly intermolecular forces will then be weaker and lastly less energy will be needed to overcome these intermolecular forces. -
- Revision of intermolecular forces taught in Grade 10 and 11 should be done when teaching physical properties of organic compounds. Learners do not know the difference between intermolecular and intramolecular forces. Statements such as 'intermolecular forces between carbon atoms' do not make sense.
- Learners must be taught that a liquid changes to the gas phase at its boiling point. At a temperature higher than its boiling point, a substance will be a gas.

QUESTION 5: REACTIONS OF ORGANIC COMPOUNDS

Common errors and misconceptions

- Question 5.1.1 was one of the easier questions and should have been within reach of all Grade 12 Physical Sciences candidates. A common incorrect answer was 'alkanes'.
- Common errors in Q5.1.2 were:
 - Using br instead of Br as symbol for bromine;
 - Omitting the methyl substituent; and
 - Writing the methyl substituent as condensed.
- Many candidates used halogenation as answer Q5.2.1.

- (d) Many candidates answered Q5.2.1 correctly and did not realise that a similar structural formula in which the Br group is replaced by an OH group, is asked for in Q5.2.2. Other common mistakes were:
- incorrect bonding such as C-HO instead of C-OH
 - too few or too many bonds around C atoms
 - Omitting H atoms in structural formula
 - Incomplete structural formula
 - Not enough C atoms.
- (e) In Q5.3.1, most candidates did not know that a high temperature is a second reaction condition for the elimination reaction to take place. The other condition, concentrated strong base, was mentioned in the question.
- (f) Many candidates answered in terms of the strong base or the base that must be dissolved in ethanol, which was already included in the question (Q5.3.1).
- (g) In Q5.3.2 candidates did not know that the reaction between a haloalkane and a concentrated strong base will result in elimination / dehydrohalogenation. Some of those who knew that elimination will take place, gave dehalogenation as answer and thus forfeited the mark.
- (h) In Q5.3.3, very few candidates drew the correct structural formula of the alkene. Structural formulae containing several functional groups, e.g. more than one double bond or more than one hydroxyl group, were often found. Many candidates who drew the structural formulae of an alkene, made the following mistakes:
- correct structural formula, but the double bond was placed between the first and second C atoms;
 - attached too many H atoms to the C atoms forming the double bond – these C atoms then formed five bonds ;
 - omitting the methyl substituent.
- (i) Common incorrect in Q5.4 answers were: 3-methylbutene; 3-methyl-2-butene.

Suggestions for improvement

- (a) Teachers should emphasise the difference in reaction conditions needed for a haloalkane to undergo either elimination or a substitution reaction in the presence of sodium hydroxide.
- (b) Teachers should ensure that learners know the rules to predict products formed during both elimination and addition reactions.

- (c) Emphasise the application of rules in naming of organic compounds e.g. hyphens, from which side to number etc. and ensure that learners get enough practice in IUPAC naming.
- (d) Regular content workshops should be conducted for all teachers to share expertise and elaborations on the best way to approach teaching of organic chemistry.
- (e) Teachers should use models to demonstrate organic molecules. This can be achieved using simple items such as play dough or prestik.

QUESTION 6: RATE OF REACTION

Common errors and misconceptions

- (a) The formula of the gas was shown in the balanced equation and was also the only product indicated as (g) in Q6.1. Many candidates could not write down the name of $\text{CO}_2(\text{g})$ or else they did not know that (g) means gas.
- (b) Although Q6.2.1 was moderately well answered, some candidates did not know how to read the graph. This is another practical skill that should be practised. Common incorrect answers were: (6 ; 3); (5 ; 3.1); (6 ; 3.5)
- (c) Candidates did not understand the shape of the graph and what it represented (Q6.2.2). The majority of candidates thought the reaction ends at the time where the graphs ends and gave '16 minutes' as answer.
- (d) Many candidates gave 9 minutes instead of 4 minutes as answer to Q6.2.3. Reaction rate decreases as the reaction proceeds due to a decrease in concentration of the acid. The rate of the reaction changes and therefore after 75% of the time has elapsed, the reaction is not necessarily 75% completed.
- (e) Many candidates had no idea how to answer Q6.3 and did not even refer to the particles present and collisions between particles. Those who explained in terms of the collision theory often omitted important words, for example:
- stating 'more effective collisions' instead of 'more effective collisions per unit time'
 - stating 'more collisions per unit time' instead of 'more effective collisions per unit time'
 - omitting to mention that a 'higher concentration implies more particles present per unit area/volume'.
- (f) Candidates who could interpret graphs did well in Q6.4.1. Candidates who answered this question incorrectly failed to identify loss in mass per unit time as the rate of the reaction.
- (g) Candidates who answered Q6.4.2 incorrectly thought that the total loss in mass will increase if hydrochloric acid of higher concentration is used.
- (h) Many candidates thought that the time for the reaction to reach completion will remain constant (Q6.4.3).

- (i) Candidates did not know factors that can increase reaction rate (Q6.5). Many mentioned the use of a catalyst, but failed to give a second factor. Common incorrect answers were:
- increase pressure – an answer that was frequently used
 - surface area (without stating an increase in surface area)
 - decrease the surface area by using powder
 - the volume of the flask increases
 - change the surface area.
- (j) In Q6.6, many candidates did not know how to approach this question. They had a poor understanding of stoichiometry. Many candidates tried to use $c = \frac{n}{V}$ or a formula to calculate the rate of the reaction e.g. reaction rate $\propto \frac{\Delta \text{mass}}{\Delta t}$. They were confused as they did not know whether to calculate the initial amount of calcium carbonate used at the start of the reaction or to calculate the amount of calcium carbonate used up during the course of the reaction. Candidates who used the correct formula often made the following mistakes:
- Using the molar mass of HCl instead of the molar mass of CO₂
 - Using the incorrect ratio e.g. 1 mol of CaCO₃ will produce 2 moles of CO₂
 - Using the incorrect relationship e.g. 1 mol of CaCO₃ will produce 1 mole of CaCl₂

Suggestions for improvement

- (a) Graph reading: Give learners enough practice in graph reading. All grade 12 learners should be able to read a value from a graph and make deductions from the graph. It should be emphasised that data read from a graph given on graph paper must be as accurate as possible.
- (b) Stoichiometry should be thoroughly addressed in Grade 11 and again revised in Grade 12.
- (c) Stoichiometry should form part of future teacher development programmes for Grade 10, 11 and 12 teachers.
- (d) Learners should get enough exercise in the reading and interpreting of information such as phases given in equations.
- (e) More practical work needs to be done in the classroom. Learners need to see the reactions taking place and the gas evolving.
- (f) Teachers need to ensure that they teach the collision theory correctly and include the terms effective, per unit time, per second.

QUESTION 7: CHEMICAL EQUILIBRIUM**Common errors and misconceptions**

- (a) K_c expressions and application of Le Chatelier's principle remain problematic. Candidates also did not know basic definitions.
- (b) Most candidates obtained only 1 out of the total of 2 in Q7.1 because they omitted rate and only used the forward reaction is equal to the reverse reaction as answer. Other common incorrect answers were:
- The rate of the forward and reverse reactions is constant
 - The concentration of the reactants and products are equal
- (c) Although a table could be used to answer Q7.2, most candidates did not make use of it. They used the given answer and played with figures to show how this answer could be obtained. The following three steps were needed to prove the given answer:
- Calculate the change in the number of moles of B(g)
 - Use the ratio to determine the number of moles of C(g) at equilibrium
 - Calculate the equilibrium concentration of C(g) by dividing the equilibrium moles by 5 dm³

The majority of candidates only obtained one mark for showing the last step.

- (d) In Q7.3, the three marks were allocated for:
- stating that the yield of C(g) will increase
 - stating that an increase in pressure will favour the reaction that produces the least amount of moles of gas
 - identifying the forward reaction as the one that will be favoured.

The majority of candidates forfeited either the second or third mark.

- (e) Candidates answered only in terms of the yield of C(g) that will increase, which was already credited. Many of them did not understand how to explain the influence of an increase (or decrease) in pressure on a system in equilibrium.
- (f) The majority of candidates used a table to calculate the equilibrium concentrations of the reactants and products and it was evident that K_c calculations were taught in most schools (Q7.4). Candidates knew which steps to follow and were credited for each step correctly performed, regardless whether the answer of the particular step was correct. This method of marking explains why most candidates obtained marks for this question. Common errors were:

- starting with the incorrect value for the equilibrium concentration of C(g) that was given in the paper (however, if the candidate performed all steps correctly with this incorrect value, a maximum of 7 out of 9 could still be obtained)
- incorrect use of the mole ratio in the balanced equation
- incorrect K_c expression
- omitting exponents in the K_c expression
- omitting the K_c expression (but show correct substitutions)
- not substituting into the value of K_c
- omitting to square the equilibrium concentration of B when substituting.

Suggestions for improvement

- (a) When teaching K_c calculations, more emphasis should be placed on the writing of K_c expressions. Learners should be given enough exercises to practice writing of K_c expressions before engaging in calculations. Often too little time is spent on the basics and higher order calculations are introduced too soon. Furthermore, two to three K_c calculations taken from previous papers are not sufficient to ensure that learners understand how to do such calculations.
- (b) Stoichiometry is supposed to be taught in Grade 11 and has to be revised in Grade 12.

QUESTION 8: GALVANIC CELLS

Common errors and misconceptions

- (a) For Q8.1.1, most candidates realised that the reading on the thermometer will increase, but failed to link the rise in temperature to an exothermic reaction. They thought that heat is physically applied and did not understand that heat is released by the reaction that takes place. From answers given it is clear that the majority of candidates were not exposed to practical work such as a zinc plate placed in a copper(II) sulphate solution. Many tried to explain the answer in terms of kinetic energy and collisions. Other common incorrect explanations were:
- The reaction is spontaneous.
 - The thermometer gets heat from the solution.
 - When the reaction takes place the concentration increases causing the thermometer reading to rise.

- (b) Most candidates failed to explain why the solution turns colourless in Q8.1.2. Many of those who knew that aluminium is a strong reducing agent, failed to explain that it will reduce the copper(II) ions and therefore the solution turns colourless. Common partially correct answers were:
- Aluminium is a strong reducing agent ✓ and will reduce copper. ✗
 - Aluminium is a stronger reducing agent than copper ✓ and therefore it will be reduced. ✗
- (c) Many candidates wrote the reverse reaction as answer in Q8.1.3. This is a concern as the two reactants were given in symbol form in the paper. Common errors were:
- incorrect balancing of a correct equation
 - using both Al and Cu as reactants and the ions as products
 - use of an incorrect symbol for aluminium (AL)
 - not cancelling electrons on both sides of the equation
 - using an equal sign instead of an arrow.
- (d) Candidates who gave an incorrect answer in Q8.2.1 failed to use the Table of Standard Reduction Potentials to identify the anode of the cell. Although 'Cu' was the incorrect answer frequently given, ridiculous answers such as 'Ag' and 'Sn' were also found.
- (e) Many candidates still wrote the cell reaction instead of the cell notation in Q8.2.2. The difference between these two terms was not well understood by these candidates. Other common incorrect answers were:
- including electrons as part of the cell notation
e.g. $\text{Al} \parallel \text{Al}^{3+} + 3\text{e}^- \parallel \text{Cu}^{2+} + 2\text{e}^- \parallel \text{Cu}$
 - including coefficients from the balanced equation in the cell notation
e.g. $2\text{Al} \parallel 2\text{Al}^{3+} \parallel 3\text{Cu}^{2+} \parallel 3\text{Cu}$
 - grouping ions together on one side of the salt bridge e.g. $\text{Al}^{3+} \parallel \text{Cu}^{2+} \parallel \text{Al} \parallel \text{Cu}$
 - including more than one salt bridge e.g. $\text{Al} \parallel \text{Al}^{3+} \parallel \text{Cu}^{2+} \parallel \text{Cu}$
 - calculation of the cell potential (the same answer was then repeated at Q 8.2.3) instead of giving the cell notation.

- (f) The most common errors in Q8.2.3 were:
- using the reduction potential for the half-reaction $\text{Cu}^{2+} + \text{e}^{-} \rightarrow \text{Cu}^{+}$ (0,16 V) as $E_{\text{cathode}}^{\ominus}$
 - swapping of the anode and cathode
 - writing a formula with abbreviations such as 'ox' and 'red'.
- (g) Common incorrect answers to Q8.2.4 were:
- The two beakers are not connected anymore
 - Electrons cannot move from one electrolyte to the other
 - No current flows
 - Electrons cannot move through the salt bridge.

Suggestions for improvement

- (a) The correct use of the Table of Standard Reduction potentials must be thoroughly explained to and practised with learners.
- (b) Experiments should be conducted to enable learners to see, for example, the colour change that takes place when a piece of aluminium foil is placed in a copper(II) sulphate solution. A thermometer placed in the solution will show a temperature rise.
- (c) Teachers need to ensure that learners know the difference between symbolic cell notation and a cell reaction.
- (d) Discourage learners to use the word "it" when answering questions. For example, teach them to use the name of the element that will be oxidised instead of writing it will be oxidised.

QUESTION 9: ELECTROLYTIC CELLS

Common errors and misconceptions

- (a) Common incorrect answers in Q9.1 were: chemical to electrical energy; electrical to mechanical energy; direct current
- (b) Candidates did not refer to the direction of the current or the polarity of the electrodes in their answers to Q9.2.
- (c) Candidates who answered Q9.3 incorrectly still do not understand that reduction takes place at the object that has to be plated i.e. the spoons in this case.

- (d) Many candidates, who used the silver half-reaction as answer to Q9.4.1, often wrote it as a reduction instead of an oxidation. They used the aluminium half-reaction as answer.
- (e) Common incorrect answers were in Q9.4.2: 'Ag₂SO₄'; 'Ag⁺ solution'; 'AgCl'.
- (f) Common incorrect/partially correct answers in Q9.5 were:
- The rate at which Ag is oxidised ✓ is equal to rate at which Ag is reduced ✗.
 - The rate at which Ag goes into solution is equal to the rate at which Ag⁺ is deposited onto the cathode.
 - Oxidation equals reduction.
 - The rate of the forward reaction equals the rate of the reverse reaction.
 - The silver ions move to the spoon and other answers that are not at all related to the question.
- (g) Candidates who did not obtain marks for their answer to Q9.6 often used answers that were too vague.
- (h) Many answers used in Q9.7 were too vague e.g. maintenance of the cell.

Suggestions for improvement

- (a) Teachers should spend more time on the teaching of electrolytic cells. Learners need to understand why changes take place and not merely memorise observations or reactions that take place at the different electrodes.
- (b) Assist learners with a summary of the five different electrolytic cells prescribed i.e. the aluminium cell, electrolysis of CuCl₂(aq) using active electrodes (purification of copper), electrolysis of CuCl₂(aq) using inactive (carbon) electrodes, electroplating and the chlor-alkali cell. Learners should know the essential aspects of each cell to enable them to answer any question posed on one or more of these types of electrolytic cells.

QUESTION 10: BATTERIES

Common errors and misconceptions

- (a) Common incorrect in Q10.1 answers were: 'membrane cell'; 'secondary cell'; 'alkaline cell'.
- (b) Most candidates answered the first part of Q10.2 correctly, i.e. reaction 2, but failed to give a correct reason. Common incorrect/vague reasons were:
- Electrons are added on the left
 - Manganese is a strong oxidising agent
 - Mn is reduced

- (c) Most candidates answered Q10.3 without referring to the cell reaction. It was therefore not clear whether they know that the cell reaction is completed (because it is a primary cell) or whether it has reached equilibrium. Most common incorrect answers were:
- The cell is not rechargeable;
 - The cell does not have power anymore;
 - The cell lost all its energy;
 - The electrons are used up.
- (d) Most candidates who attempted Q10.4.1 obtained only 2 of the 4 marks. They calculated the charge transferred using $W = Vq$ and then use $A \cdot h$ as unit. The answer calculated (in coulomb) was thus not divided by 3 600 to obtain the cell capacity. In a few cases candidates rounded the answer of incorrectly to 2 decimal places i.e. 5.55 A·h instead of 5.56 A·h. Conversion from hours to seconds was problematic to many learners. Many others tried to use the formula for capacitance ($C = \frac{Q}{V}$) to calculate cell capacity.
- (e) The error carrying principle followed to mark this question partially explains the better performance in Q10.4.2.

Suggestions for improvement

- (a) Batteries need to be integrated with galvanic cells.
- (b) Teachers should emphasise the correct balancing of half-reactions to obtain a balanced cell reaction. Make learners aware of possible errors such as using double arrows in half-reactions, not cancelling electrons appearing on both sides of the balanced equation, omission of charges of ions, etc.
- (c) Subject Advisors can assist teachers in compiling a booklet that adequately covers batteries and battery capacity. The section is not adequately covered in many textbooks.

QUESTION 11: FERTILISERS

Common errors and misconceptions

- (a) Candidates were confused with the different processes in Q11.1.1 because they did not know their work well enough. The most common incorrect answers were: 'Haber process'; 'Ostwald process'; 'frictional process'; 'functional process'.

- (b) Most candidates knew the equation for the preparation of ammonia, but made one or more of the following mistakes in Q11.1.2:
- Writing N instead of N_2 and H instead of H_2 for nitrogen and hydrogen gas respectively;
 - Giving NH_2 as the formula for ammonia;
 - Incorrect balancing.
- (c) Many candidates were confused by the different processes in Q11.1.3. They might have used answers that showed that they understood the term 'contact process', but did not know their work well enough to give the correct answer. Further, the most common incorrect answers were: 'Ostwald process'; 'Construct process'; 'Contract processes'.
- (d) The most common errors in Q11.1.4 were:
- using the reaction of NH_3 and SO_4 instead of NH_3 and H_2SO_4 ;
 - writing of the formula of ammonium sulphate as $(NH_3)_2SO_4$ or NH_4SO_4 ;
 - incorrect balancing of the equation.
- (e) Common incorrect answers in Q11.1.5 were: 'addition'; 'elimination'; 'substitution'; 'hydrolysis'; 'redox reactions'.
- (f) A common incorrect answer in Q11.2 was: 'It contains N gas' or ' N_2 '.

Suggestions for improvement

- (a) More time should be spent to teach fertilisers. Learners can easily obtain good marks in this section, but due to lack of knowledge the performance is poor.
- (b) Assist learners with a summary of the whole section on fertilisers in the form of a flow diagram. It will help them to learn all the different processes and reactions.
- (c) Compile a question bank using all the fertiliser questions that appeared in previous papers and make sure learners work through all these questions with understanding.

CHAPTER 13

CONCLUSION

We celebrate another year of improved performance in the 2012 NSC results in most of the eleven high enrolment subjects, and a further improvement in the quality of answers presented by learners in each of the questions posed in the examination papers.

Informed by the 2011 NSC examination results, the findings in the 2011 NSC marking process and the 2011 National Diagnostic Report on Learner performance in the NSC examinations, PEDs developed support plans targeting the underperforming schools in 2012 focusing on Teacher support, the development of resources, content coverage, and assessment interventions. This seemed to have paid dividends.

It is hoped that teachers, SMTs and subject advisors will make full use of this report in planning interventions for 2013. Schools, circuits and districts should ensure that Grade 12 candidates are adequately prepared for NSC examinations. The DBE, working together with the PEDs will monitor the utilisation of this report, the quality and relevance of the intervention programmes derived from it, and the effect on teaching and learning.

NOTES

Lined area for notes, featuring horizontal brown lines on a light background with a faint image of students in a classroom.

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