CHAPTER 9

MATHEMATICAL LITERACY

The following report should be read in conjunction with the Mathematical Literacy question papers of the NSC November 2021 examinations.

9.1 PERFORMANCE TRENDS (2017–2021)

The number of candidates who sat for the Mathematical Literacy examinations in 2021 increased significantly by 99 704 compared to that of 2020, i.e. an increase of 29% in the cohort.

A decline in the pass rate was evident this year. This followed a steady positive trend in the pass rates over the previous four years. In 2021, candidates who passed at 30% (Level 2) declined from 80,8% in 2020 to 74,5% in 2021. There was a corresponding decline in the pass rate at 40% (Level 3) over the past two years from 57,7% to 49,1%.

Despite the decrease in pass rates, given the increase in the size of the cohort, the number of passes achieved at Levels 2 and 3 increased considerably by 52 698 and 19 561 respectively. Furthermore, the percentage of distinctions (over 80%; Level 7) improved from 1,7% to 2,3% which converts into a pleasing increase in the total number of distinctions from 5 803 in 2020 to 10 145 in 2021.

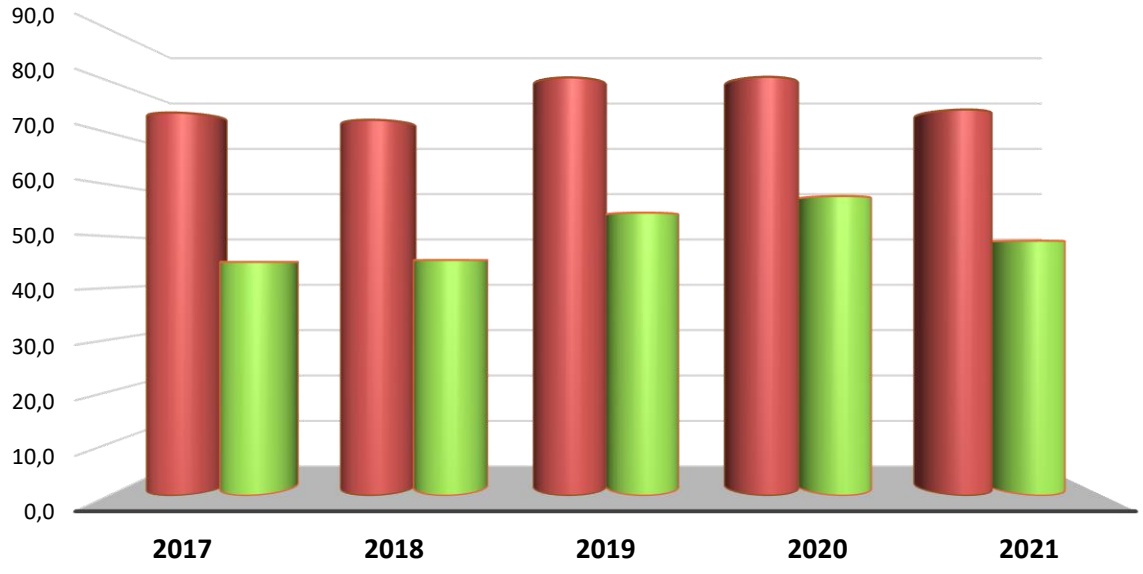
However, the challenging circumstances of the Covid-19 pandemic which affected teaching and learning activities over the past two years, clearly affected the Mathematical Literacy cohort more profoundly in 2021. This was particularly relevant in the case of weaker learners who tend to rely heavily on continuous practice and teacher contact.

The various commendable intervention strategies employed by teachers, subject advisors and provincial education departments were continued in 2021. The resourcefulness and diligence of the above-average candidates also contributed to the overall performance in the subject.

Table 9.1.1 Overall achievement rates in Mathematical Literacy

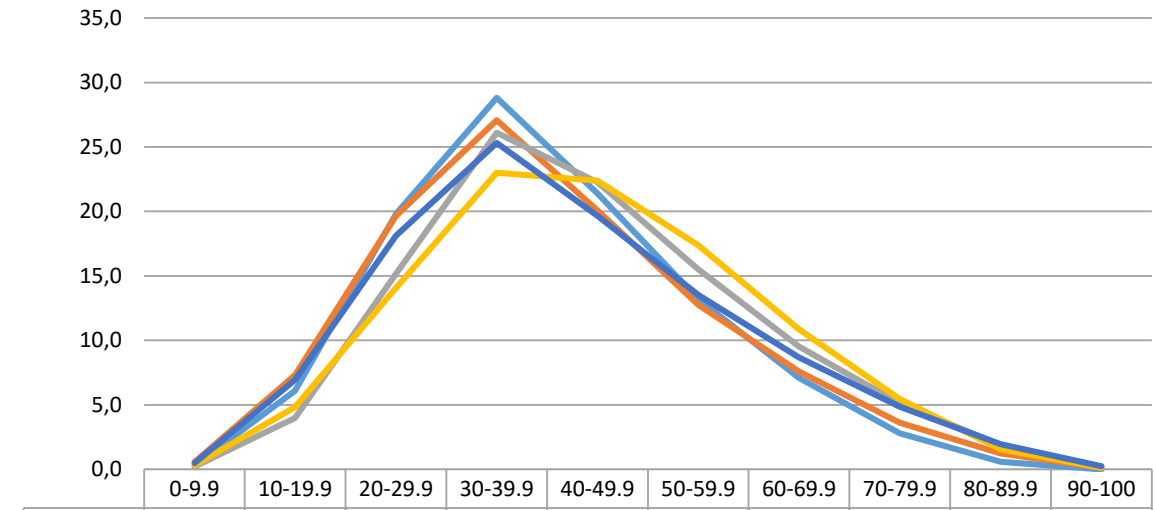
Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2017	313 030	231 230	73,9	140 991	45,0
2018	294 204	213 225	72,5	133 568	45,4
2019	298 607	240 816	80,6	162 877	54,5
2020	341 363	275 684	80,8	197 131	57,7
2021	441 067	328 382	74,5	216 692	49,1

Graph 9.1.1 Overall achievement rates in Mathematical Literacy (percentage)



	2017	2018	2019	2020	2021
% achieved at 30% and above	73,9	72,5	80,6	80,8	74,5
% achieved at 40% and above	45,0	45,4	54,5	57,7	49,1

Graph 9.1.2 Performance distribution curves in Mathematical Literacy (percentage)



	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50-59.9	60-69.9	70-79.9	80-89.9	90-100
2017	0,3	6,1	19,8	28,8	21,4	13,2	7,1	2,8	0,6	0,0
2018	0,6	7,3	19,6	27,1	20,1	12,8	7,6	3,6	1,2	0,1
2019	0,2	4,0	15,2	26,1	22,2	15,5	9,5	5,1	1,9	0,2
2020	0,3	4,8	14,1	23,0	22,4	17,4	10,9	5,5	1,6	0,1
2021	0,5	6,9	18,1	25,3	19,6	13,5	8,7	4,9	2,0	0,3

9.2 GENERAL COMMENTS ON PAPER 1 AND PAPER 2

(a) The year 2021 marked a change in the splitting of the Mathematical Literacy topics and a redistribution in the weighting of the taxonomy levels.

The *2021 Examination Guidelines* reflect the following:

- **Paper 1 content:** Finance Data and Probability
- **Paper 2 content:** Maps and Plans
- **Weighting of taxonomy levels:** L1: 30%; L2: 30%; L3: 20%; L4: 20%

Exemplar papers were distributed to schools to support teachers and learners in their preparation for the 2021 NSC papers.

(b) **Terminology:** English Across the Curriculum should be emphasised. Learners should be taught the definitions of commonly used terms in Mathematical Literacy such as 'radius' and 'median'. Learners should compile a topic-wise glossary of terms at the back of their notebooks with a brief but clear definition next to each term. A separate notebook may also be kept for this purpose. By the end of the year, all learners should have a comprehensive glossary of all the relevant terms.

(c) **Enhance learners' skills in accurately interpreting specific questions and using information that is relevant:** Teachers are advised to read through and interpret the requirements of each question with learners. Learners should also be guided on how to extract relevant information and how to identify the information that is relevant to each subquestion. Tables are often used to reduce written text.

(d) **Use of past NSC papers:** Firstly, it must be noted that past examination question papers serve as one of many teaching and learning resources. They must be used for revision purposes only. Past papers cannot replace the *CAPS* document and *Examination Guidelines*. Teachers can adapt certain questions for use in class, especially those that include working with large numbers. Secondly, teachers should ensure that learners revise questions that define mathematical terms, especially in a given context.

(e) **The importance of formative testing:** Short, informal formative tests must be used to build the confidence of learners in all topics. If learners do their own corrections, it provides them with immediate feedback and an understanding of the mark allocation. The less challenging sections in each of the questions in the NSC Mathematical Literacy papers can be used as confidence-boosters. Formative tests can be used to great effect to introduce new subtopics in the *CAPS*, such as personal income tax and box-and-whisker plots.

(f) **Previous recommendations:** Teachers should consult past diagnostic reports to establish if there are topics or concepts that are repeatedly indicated as problematic to most learners. For example, it has been noted over time that learners' basic mathematical knowledge is problematic and this includes learners' inability to work with big numbers.

9.3 OVERVIEW OF CANDIDATES' PERFORMANCE IN PAPER 1

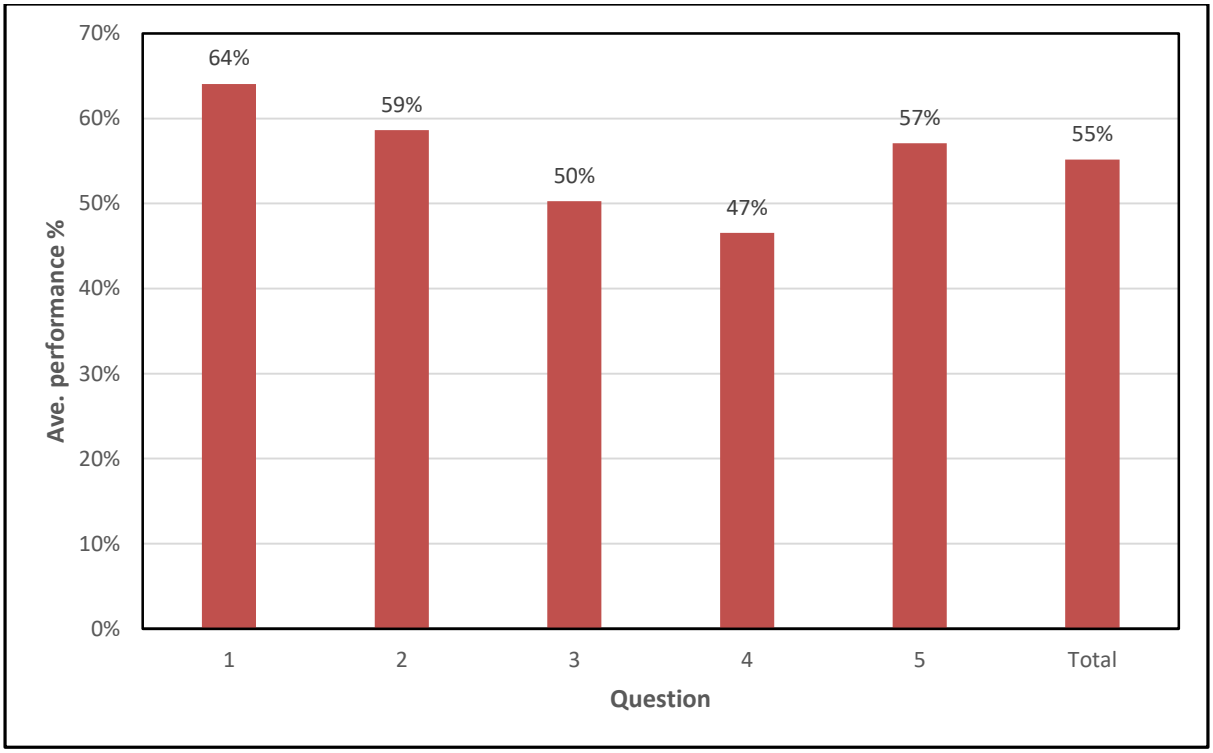
General comments

(a) The 2021 question paper was set according to the new *Examination Guideline*s. Consequently, Q1 was based entirely on short contexts with all questions pitched at Level 1. The Application topics tested in Paper 1 were reduced from 5 to 3 topics, i.e. Finance, Data Handling and Probability.

(b) Teachers are advised that the format of the 2022 examination paper will not change. Teachers are encouraged to read the new *Examination Guidelines* and use the exemplar papers of 2021 and November 2021 and the May/June 2022 papers as a guide.

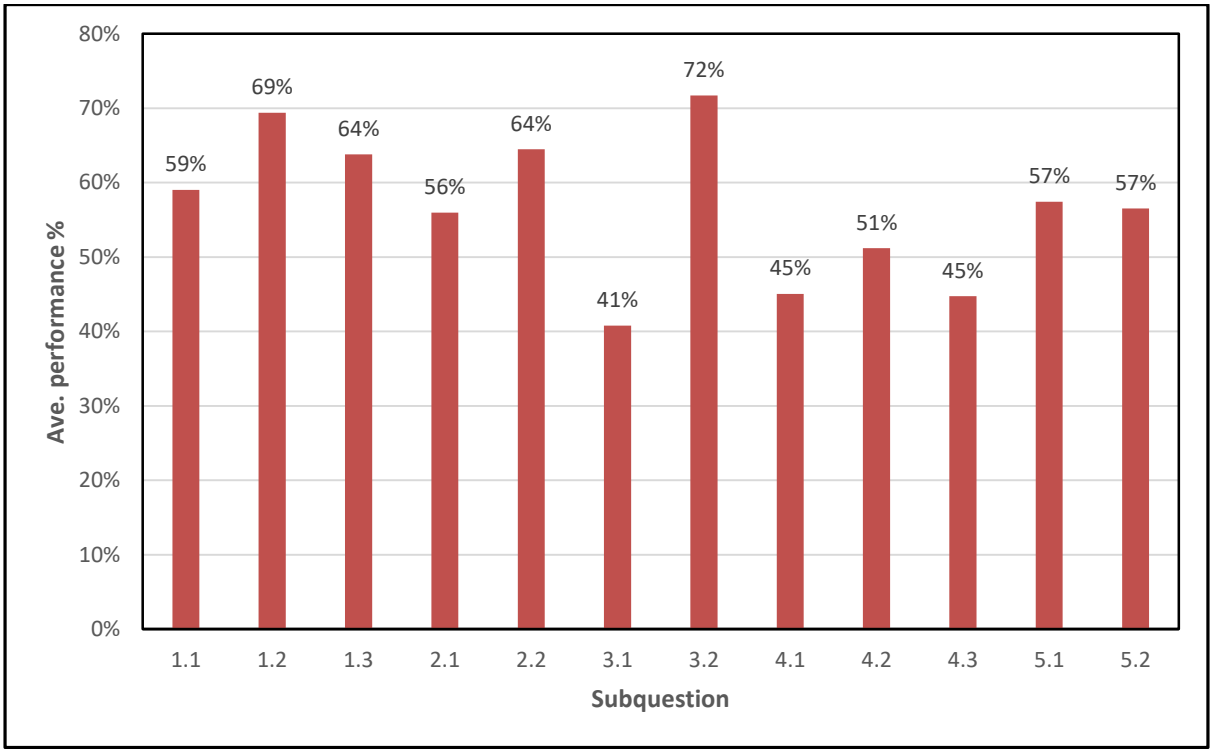
The following graph is based on data from a random sample of candidates. While this graph may not accurately reflect national averages, it is useful in assessing the relative degree of challenge of each question as experienced by candidates.

Graph 9.3.1 Average performance per question in Paper 1



Q	Topic
1	Finance, Data Handling & Probability
2	Finance & Probability
3	Data Handling & Probability
4	Finance, Data Handling & Probability
5	Finance & Data Handling

Graph 9.3.2 Average performance per subquestion in Paper 1



Subq.	Topic	Subq.	Topic
1.1	Finance, Data Handling & Probability	3.2	Data Handling
1.2–1.3	Data Handling & Finance	4.1-4.2	Finance
2.1	Finance	4.3	Data Handling & Probability
2.2	Finance & Probability	5.1	Finance
3.1	Data Handling & Probability	5.2	Data Handling

9.4 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 1

The reduction of the Application topics from five to three and the sequence of questions, where Q1 was based on short, Level 1 contextual questions, benefitted candidates. Q1 was the question answered best.

QUESTION 1: SHORT CONTEXTS (INTEGRATED LEVEL 1 QUESTIONS ONLY)

Common errors and misconceptions

(a) Candidates calculated the percentage increase and not the price increase in Q1.1.1.

(b) In Q1.1.2 some candidates could not read the correct table values to select the correct exchange rate. Others multiplied the exchange rate and some made rounding errors in the answer.

(c) In Q1.1.4 some candidates could not write the data in descending order while others struggled with decimal values where they concluded that 0,87 is less than 0,796 and 0,732 as well as 0,254.

(d) Some candidates in Q1.2.3a could not convert cents to rand.

(e) In Q1.2.3b a large percentage of candidates could not round off to the nearest rand.

(f) Candidates could not identify the next step in the data cycle in Q1.3.2. A large percentage of the candidates wrote data analysis which is the last step in the data cycle.

Suggestions for improvement

(a) Teachers should expose learners to different activities involving exchange rates within different contexts. Emphasis during teaching and learning should be placed on when to multiply and when to divide when converting from one currency to another currency.

(b) Teachers must revise the basic skills topics, i.e. percentages, converting and rounding (off, up, to the nearest and down) when Application topics are taught. When dealing with calculations within the topic of Finance, conversion from cents to rand and vice versa and rounding to two decimal places must be emphasised.

(c) The Application topic of Data Handling starts with the data cycle and all steps in the data cycle need to be covered during teaching time in class. Each step should be given equal status when planning for the teaching and learning activities.

(d) Mathematical terminology and definitions are as important as doing the basic Mathematical calculations. Therefore, a glossary of terms is an important tool in the learners' workbooks where they can write the definitions and use these as references when completing Mathematical Literacy activities.

(e) Mathematical definitions are an important part of basic Mathematics in the Mathematical Literacy curriculum. Definitions are covered in a range of DBE resource materials such as *Mind the Gap* and *The Revision Booklet*. These valuable and available resource materials should be used and integrated into the classwork and homework activities of learners.

QUESTION 2: FINANCE AND PROBABILITY

Common errors and misconceptions

(a) In Q2.1.3 most candidates could write the ratio but struggled or could not simplify the ratio.

(b) Most candidates could not understand the term 'cost effective' in Q2.1.4, which resulted in a large percentage of candidates not giving the correct answer.

(c) In Q2.1.5 candidates substituted the percentage value into the formula and not the calculated value of R69,58. Some candidates multiplied the monthly instalment by 48, ignoring the given information in the given context 'the last payment is the residual payment'.

(d) In Q2.1.6 most candidates struggled to calculate the second year's interest and could not work with different interest rates per year.

(e) Many candidates could not give the correct answer of 'three contracts' in Q2.2.1. Candidates wrote cellphone numbers instead of the number of contracts.

(f) In Q2.2.3 candidates could not do the simple VAT of 15% calculation while some candidates calculated the VAT on VAT.

(g) In Q2.2.4 candidates did not use the answer from Q2.2.3 to calculate the final amount as was expected from the follow-through calculation.

(h) Most candidates in Q2.2.5 expressed the probability using fractions or percentages, and they lost all marks. Some candidates could not recall that probability is expressed using the probability scale.

Suggestions for improvement

(a) Learners should be given time to work with ratios. Ratio is a basic skills topic in Mathematical Literacy. This means that learners' activities in class must integrate the topic of ratio across all Application topics.

(b) Teachers should focus on the language used in the financial section of budgets and financial documents. The skill of extracting information from the given context to do a basic mathematical calculation should be practised in class all the time.

(c) Subject advisors should conduct content workshops on how to calculate compound interest without using the compound interest formula. Teachers should provide examples of the interest rate to be used, which can change from one year to another.

(d) When learners calculate probability, they can compare their answers (fraction, decimal fraction or percentage form) with the probability scale.

(e) In formal and informal assessment, teachers should integrate questions on using the previous answers to calculate the current answer, i.e. this includes interpretation of the word 'hence'.

QUESTION 3: DATA HANDLING

Common errors and misconceptions

(a) In Q3.1.1 most candidates wrote 5 April 2021 directly from the question paper. Candidates could not count backwards and had a problem with the total number of days in March.

(b) Candidates struggled to write out the table value in words in Q3.1.2. 'Millions' was omitted in the final answer. Most learners could not convert the table value into the actual value.

(c) In Q3.1.5 candidates could not do the basic algebraic manipulation within an equation. Most candidates ignored the 2Ds in the calculation and divided by 7.

(d) Candidates could not relate the Net FSC of 15 657 million to the last week % in Q3.1.7. This suggests that candidates find it difficult to work with large numbers in complex tables.

(e) In Q3.2.2 candidates struggled with the interpretation of the percentage in context. When some got an answer above 100%, they changed their answer to fit between 0% and 100%.

Suggestions for improvement

(a) Teachers must provide learners with calendars to count back and forth to determine the date before and/or after a given date.

(b) Teachers should integrate large numbers when doing mathematical calculations. The difference of table values and actual values when dealing with large numbers should be regularly practised in class.

(c) Basic algebraic manipulation should be practised in class with all mathematical formulae across all Application topics. Informal and formal assessment should include these types of problems.

(d) Learners must be exposed to calculating a percentage with examples that show that percentage calculation can be greater than 100%.

QUESTION 4: FINANCE AND DATA HANDLING

Common errors and misconceptions

(a) Candidates did not convert the given quantities of grams to kilograms and they could not relate the cost rate to the mass of chicken in Q4.1.1.

(b) Some candidates in Q4.1.2 found different quantities challenging (e.g. 1 plate vs 8 ingredients) and added the plate too early in the calculation.

(c) In Q4.1.3 candidates calculated 50% of the selling price. They did not know that they could have subtracted the cost price from the selling price to calculate percentage profit.

(d) In Q4.2.1 candidates could not substitute values into the given formula and struggled with linear algebraic manipulation.

(e) Plotting points on a system of axes in Q4.2.2 is still a challenge for candidates. Candidates could not interpret the given scale on the axes and plotted points incorrectly.

Suggestions for improvement

(a) Learners need more practice in conversions in familiar and unfamiliar contexts.

(b) Teaching should also enhance the calculation of cost price and selling price when delivering the mathematical content in class. These subtopics should be tested on different cognitive levels and with multiset data.

(c) Learners need practice with the basic method of solving problems when a formula is given. This involves substituting values into a given formula, algebraic manipulation and, lastly, use of a calculator with BODMAS.

(d) Plotting points on a system of axes should be practised where the scale needs to be interpreted first before the points are plotted on the given system of axes.

QUESTION 5: DATA HANDLING AND FINANCE

Common errors and misconceptions

(a) In Q5.1.1 some candidates could not identify the correct tax bracket.

(b) In Q5.1.3 candidates could not link the person's age (i.e. 64-years-old vs 65-years-old) to subtract the secondary tax rebate.

(c) In Q5.1.4 most candidates did not add the second additional dependant for the medical credit; they simply added the three values from the given table.

(d) Most candidates in Q5.2.1 could not interpret the box-and-whisker diagram to answer the question. They simply gave the incorrect answer, 'Apple'.

(e) In Q5.2.2 candidates could not differentiate between range and IQR.

Suggestions for improvement

(a) Teachers must place emphasis on interpreting personal income tax tables. The personal income tax table is a tariff table. When delivering this content, teachers must scaffold the different steps, i.e. use taxable income to select the correct tax bracket, substitute values into the formula, calculate using BODMAS and subtract rebates according to age as well as medical credits, if applicable.

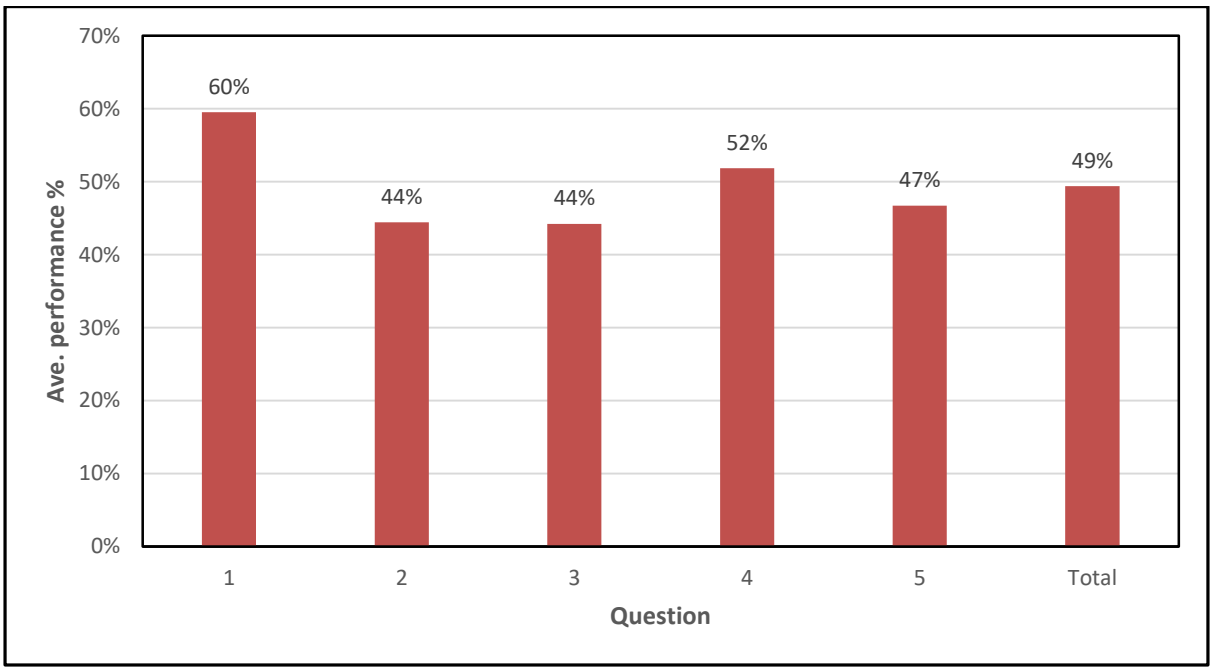
(b) Learners must practise the box-and-whisker plots in class with multiple sets of data as stipulated in the *CAPS*.

(c) Teachers must expose learners to a glossary of terms where the difference is in the definition of the Range and IQR.

9.5 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 2

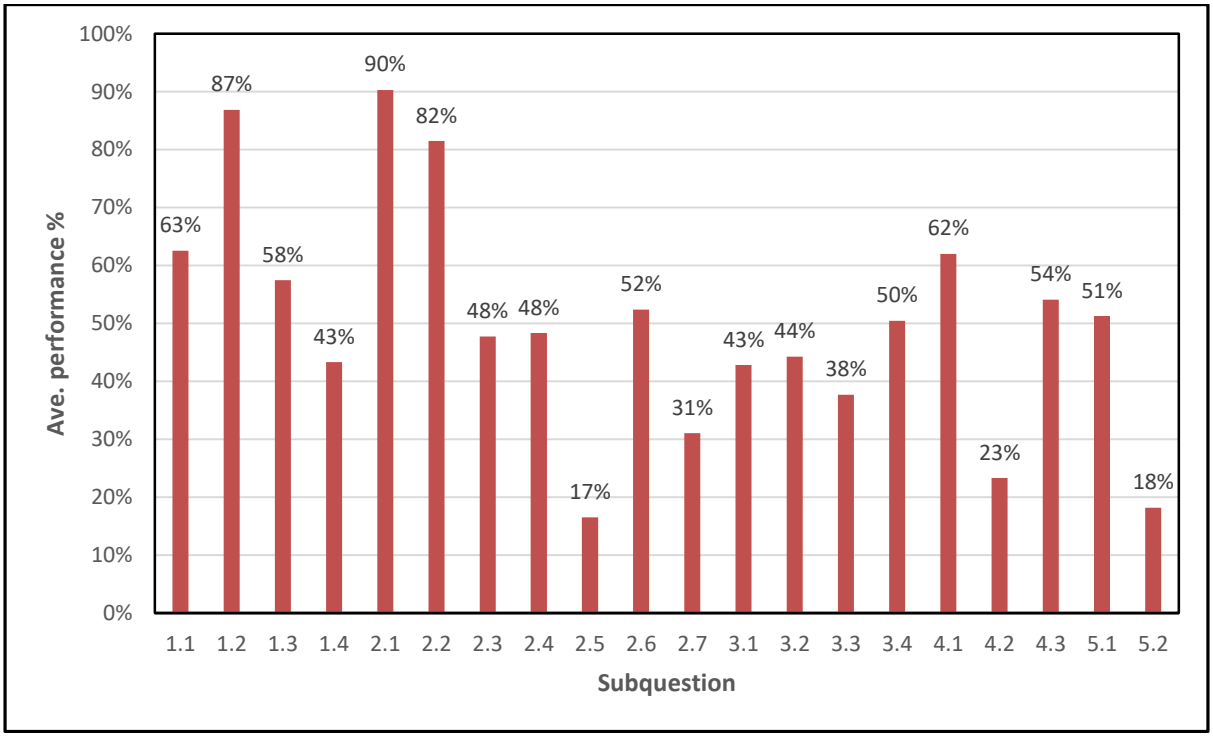
The following graph is based on data from a random sample of candidates. While this graph may not accurately reflect national averages, it is useful in assessing the relative degree of challenge of each question as experienced by candidates.

Figure 9.5.1 Average performance per question in Paper 2



Q	Topic
1	Measurement, Maps, Plans and Other, Probability
2	Probability, Maps, Plans and Other
3	Measurement and Probability
4	Measurement, Maps, Plans and Other
5	Measurement, Maps, Plans and Other

Figure 9.5.2 Average performance per subquestion in Paper 2



Sub-Q	Topic	Sub-Q	Topic
1.1	Measurement & Finance	3.4	Maps, Plans & Other, Probability
1.2-1.3	Measurement	4.1	Measurement, Maps, Plans & Other, Finance
1.4	Maps, Plans & Other, Probability	4.2	Measurement
2.1-2.3	Maps, Plans & Other	4.3	Measurement, Maps, Plans & Other
2.4	Probability	5.1	Measurement, Maps, Plans & Other, Finance
2.5-2.7	Maps, Plans & Other	5.2	Measurement
3.1-3.3	Measurement		

9.6 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 2

QUESTION 1: SHORT CONTEXTS (INTEGRATED LEVEL 1 QUESTIONS ONLY)

Common errors and misconceptions

(a) Q1.1.1 was well answered by most candidates but some candidates multiplied the price of R100 instead of the mass 110 g.

(b) In Q1.1.2 some candidates still confused radius and diameter and multiplied by 2 instead of dividing by 2.

(c) Many candidates in Q1.1.3 wrote mm^2 instead of mm^3 as the correct unit for volume.

(d) In Q1.1.4 many candidates did not know the number of days in January and February. Other candidates subtracted to count the days in January (31 – 11) = 20 instead of including the 11th January. Some candidates could not identify that 2021 was not a leap year.

(e) Some candidates in Q1.1.5 calculated the total for two promotions instead of two containers of Pringles @ R100 for 6.

(f) Many candidates in Q1.3.1 incorrectly converted m to cm by multiplying by 10, while others divided by 100 instead of multiplying by 100.

(g) Most candidates in Q1.4.1 could not define the term layout plan. Many candidates confused the layout plan with a floor plan.

(h) Many candidates in Q1.4.2 counted only the light-coloured seats and disregarded the dark seats, thinking that they were not available. Other candidates included the hostess seat and got to 29 seats instead of 28 seats.

(i) In Q1.4.4 most candidates simply added the eats and drinks and arrived at 5 options instead of working with the total options by multiplying.

Suggestions for improvement

(a) Learners must practise basic skills at the beginning of each year from Grade 10 to 12.

(b) Teachers must train learners to round off only the final answer in the given context.

(c) Basic definitions should be tested in the classroom regularly.

(d) Teachers should expose learners to irregular shapes when calculating perimeter.

(e) Learners should be drilled on conversions, especially cm to m where the conversion factor is 100 and not 1 000.

(f) Teachers should differentiate between the area and the volume using the explanations of the two concepts, their formulae, number of dimensions used to calculate each quantity and the units of measurement.

(g) When covering substitutions in formulae, teachers should emphasise that learners place values exactly where they are supposed to be according to the given formula.

(h) A glossary should be given to learners before they begin to work with every section under a topic, together with explanations of concepts in every activity or task.

QUESTION 2: MAPS AND PLANS AND PROBABILITY

Common errors and misconceptions

(a) Q2.2 was a challenge for many candidates, especially those who are Afrikaans speaking, since a room is mostly referred to as a ‘vertrek’ and a bedroom as a ‘kamer’. Thus, when candidates were asked about a ‘kamer’ they automatically assumed that it referred to a bedroom. Hence, Afrikaans candidates wrote the answer as ‘bedroom 1’ instead of ‘living room’.

(b) Many candidates in Q2.3 could not read the correct direction because the north line was facing at an angle.

(c) In Q2.4 some candidates struggled with the NOT version of probability. For the most part they simply provided the probability of the interior doors instead of NOT the interior doors.

(d) Q2.5 was poorly answered. The words ‘critically comment’ were new to candidates and they were unsure of how they should respond. It was also unclear what constituted ‘a lot’ of sunlight. Thus, candidates referred to the afternoon sun as ‘a lot’ of sunlight. Many candidates simply remarked that the sun comes up in the west and that the kitchen does get a lot of sunlight.

(e) Q2.6 was answered fairly well by many candidates, however, some candidates did not know how to interpret the floor plan correctly. Some failed to distinguish between the living room and dining room.

(f) In Q2.7.1 many candidates simply copied the scale from the text as they did not understand what number format meant. For example, 1 cm : 1 000 mm or 1 : 1 000 instead of converting the mm to cm and arriving at an answer of 1 : 100.

(g) In Q2.7.2 many candidates were unable to recognise that they could not continue using different units without converting first. Some candidates did not have a ruler to conduct measurements. Their values for the measurement of the inner wall ranged from 3,7 cm to 4,9 cm instead of 4,4 cm. They failed to convert to metric units after multiplying by the scale factor.

(h) Q2.7.3 was poorly answered. Many candidates completely misunderstood the question and referred to the machine making an exact copy and thus there should be no change in the scale. Many candidates did not know that a number scale is not accurate when copies of plans are made.

Suggestions for improvement

(a) Teachers should expose learners to different types of layout plans and not always use plans with north facing upwards.

(b) Teachers should emphasise that maps can be turned, so that the north line is facing forwards. This will allow learners to deal with questions on direction more successfully.

(c) Geography maps should be used to good effect in the Mathematical Literacy classroom.

(d) The concept of changing dimensions to the same unit should be reinforced by teachers. This is a skill that is first taught in Grade 10.

(e) Learners should be encouraged to know and comprehend the conversion factors of the metric system.

(f) Teachers should expose learners to advantages and disadvantages of each type of scale and include the assessment thereof in the tasks.

(g) Teachers should explain that NOT in probability is simply equal to 1 – the probability of an event happening.

QUESTION 3: MEASUREMENT AND PROBABILITY

Common errors and misconceptions

(a) Many candidates answered Q3.1.1 well. A few candidates added only one side and not both. Some candidates could not interpret the given sketch and added the outside measurements.

(b) Q3.1.2 was poorly answered. In determining the height B of the top shelf, candidates omitted one of the heights or the thickness of the base. The meaning of the word 'base' was also misunderstood. Examples of common errors were:

B = 80 cm – (40 + 4,5+1,5) cm = 34 cm

OR B= 80 cm – (40+1,5+1,5) cm = 37 cm

(c) Q3.2 was poorly answered. Candidates did not understand what a conversion factor was. Some candidates wrote down the conversion factor from memory without using the given information. Most candidates did not use the given conversion factor to determine the height of the bookshelf in inches.

(d) In Q3.3.1 many candidates used incorrect values to calculate the area. Some candidates could not link the outside length calculated in Q3.1.1 to this question in order to calculate the area. Candidates multiplied any two values given in the sketch. This clearly showed a lack of understanding of the concept area.

(e) Q3.3.2 was poorly answered. Candidates did not apply the squaring principle well. They did not divide by $(100)^2$ when converting cm^2 to m^2.

(f) Many candidates in Q3.3.3 did not understand the concept of spread rate of paint, hence multiplied by 6,9 instead of dividing. Many candidates also did not multiply the amount of paint needed by 3; instead, they multiplied by 2 ignoring the fact that the front of the bookshelf would be painted with two coats, and the back with only one coat.

(g) Most candidates answered Q3.3.4 well but some candidates could not convert 500 ml to litres.

(h) Some candidates in Q3.4.1 used the measurement of the file instead of the box. Concept of rounding down when dealing with packaging was a challenge to many.

(i) In Q3.4.2 candidates could not differentiate between files in the box and individual files placed on the shelf. Some candidates subtracted the loose files from the number of boxes of files. Hence this question was poorly answered.

(j) Q3.4.3 was well answered, while in Q3.4.4 many candidates could understand the concept of probability and the format in which the answer should be written. A number of candidates, however, omitted the percentage sign in the answer.

Suggestions for improvement

(a) Teachers are advised to encourage learners to read questions carefully, i.e. find out whether a question should be rounded to one or two decimal places.

(b) Real-life physical objects should be effectively used by teachers in the classroom, for example, boxes to show the difference between inside and outside measurements, height, width and length.

(c) In the context of probability, learners need to understand that the terminology 'outcomes' has the same meaning as the words 'choices' or 'combinations'.

(d) Learners need to practise writing answers with the correct units.

(e) Teachers must emphasise that all dimensions must be in the same unit before calculating.

(f) Learners should be exposed to activities which will require them to calculate spatial packing in various objects, for example, cupboards, boxes and crates.

(g) More multistep activities on area and volume should be given to learners for them to master these concepts.

(h) Learners must be made aware that the conclusion mark will not be given if there is no viable calculation.

QUESTION 4: MAPS AND PLANS AND MEASUREMENT

Common errors and misconceptions

(a) Q4.1.1 was answered well. Candidates were able to interpret the given information correctly. In some cases, candidates did not know what is meant by an irregular shape.

(b) In Q4.1.2 and Q4.1.3 some of candidates used their personal experiences instead of responding by using the given information.

(c) In Q4.1.4 some candidates substituted the hypotenuse of the triangle into the given formula instead of the height of the triangle.

(d) Q4.1.5 was poorly answered. Many candidates did not understand the 10 m roll was sold as a unit and not per metre. In the second option which was sold per metre, candidates wrote 18,852 m instead of rounding the answer up to 19 m.

(e) Q4.2 was challenging for most candidates for the following reasons:
- Candidates could not convert from litres to cm^3.
- Candidates substituted incorrectly.
- Candidates could not make the radius the subject of the formula.
- Candidates were unable to find the square root. Instead they divided by 2.

(f) Many candidates in Q4.3.1 swopped the values of the ratio. Other candidates used incorrect values when writing down the ratio.

(g) Q4.3.2 was poorly answered because it required a double conversion. Candidates had to convert from inches to feet and then from feet to mm. Some candidates converted from inches to feet and left the answer as feet.

(h) Q4.3.3 and Q4.3.4 were well answered, however, in Q4.3.5 some candidates struggled with the concept of transposing a 2D picture into a 3D sketch.

Suggestions for improvement

(a) Teachers should ensure that learners know how to convert square units.

(b) Learners must practise reading the information provided and the question posed before explaining to the teacher what is required in their expected responses.

(c) As the concept of 'structures' appears to be unfamiliar to some learners, they need to be exposed to urban and non-urban concepts, especially those that can be related to everyday life.

(d) Conversion between the metric scale and imperial units should be practised regularly by learners.

(e) Teachers should expose learners to various formulae whereby the unknown is not necessarily the subject of the formula, e.g. finding the radius using the formula for calculating the volume of a cylinder.

(f) Such questions should be frequently included in informal tasks so that learners can get familiar with changing the subject of the formula, i.e. in the formula $V = \pi r^2 h$ and in the operation involving the square root.

(g) Teachers should train learners to round off final answers only and not to do this in the intermediate steps in a calculation.

(h) Exposure to different types of assembly diagrams will benefit learners in visualising plans more effectively.

QUESTION 5: MAPS AND PLANS AND MEASUREMENT

Common errors and misconceptions

(a) Except for the candidates who could not convert minutes to fractions of hours, Q5.1.1 was well answered.

(b) Q5.1.2 was well answered. Some candidates only wrote the distances and not the names of the cities.

(c) Most candidates answered Q5.1.3 correctly. A few candidates could not give the correct sequence of the cities. Some candidates were unable to interpret the time difference between the cities on the map. They confused time with distance.

(d) Q5.1.4 was poorly answered. Many candidates struggled to convert using metric units. Some candidates confused the rate per litre with the amount of litres in a gallon.

(e) Q5.1.5 was challenging for most candidates for the following reasons:
- Candidates could not convert.
- Candidates could not grasp the concept of rate (18 miles per gallon).
- They did not understand what was expected of them and several determined how much petrol would be left from 2 full tanks; this is a misconception as the tank still had petrol in it when it was filled again.

(f) Candidates substituted incorrectly in Q5.2. Many of those who substituted correctly struggled to change the subject of the formula.

Suggestions for improvement

(a) Learners must be exposed to maps with measurements that are not in metric units.

(b) Before attempting measurement questions, learners must deliberately analyse the map or plan to present appropriate responses.

(c) Learners should be taught that some problem-solving questions must take reality into account, for example, 'petrol must be filled into the tank before the tank runs dry'.

(d) Manipulation of variables in formulae is a skill that learners must acquire through practice.

(e) Teachers should encourage learners to use the LOLT at all times during the lessons. Scenarios should be discussed and critically analysed during lessons in order to give learners the opportunity to think critically and develop analytical and problem-solving skills.

(f) Teachers should frequently interchange the use of the two formulae for temperature to determine the unknown, especially the one involving a fraction, i.e. $℃ = \frac{5}{9} \times (℉ - 32)$.