

CHAPTER 9

MATHEMATICAL LITERACY

The following report should be read in conjunction with the Mathematical Literacy question papers of the November 2018 Examination.

9.1 PERFORMANCE TRENDS (2014 – 2018)

The overall performance at 30% and above declined slightly to 72,5% but the achievement at 40% and above has improved very slightly to 45,4 % in 2018 as compared to 2017.

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
2014	312 054	262 495	84,1	185 528	59,5
2015	388 845	277 593	71,4	172 214	44,3
2016	361 948	257 926	71,3	167 811	46,4
2017	313 030	231 230	73,9	140 991	45,0
2018	294 204	213 225	72,5	133 568	45,4

Figure 9.1.1 Overall achievement rates in Mathematical Literacy

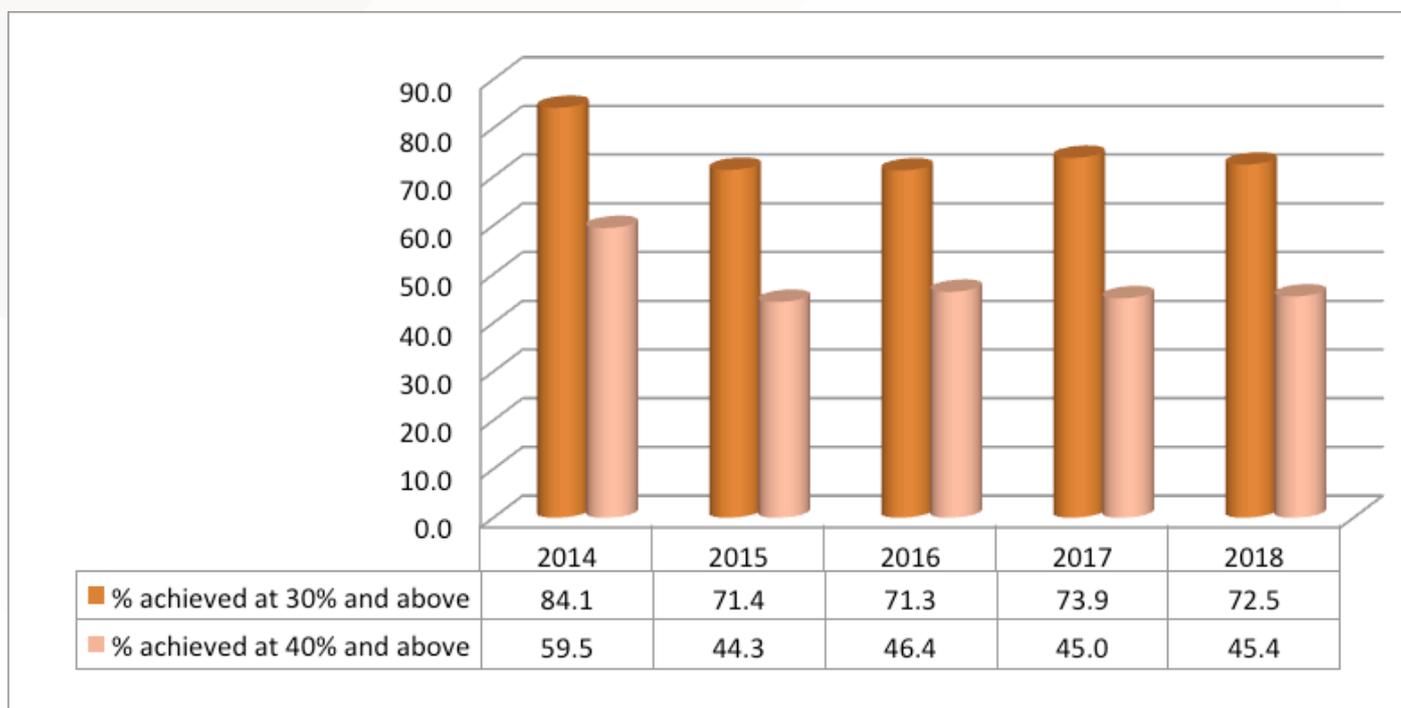
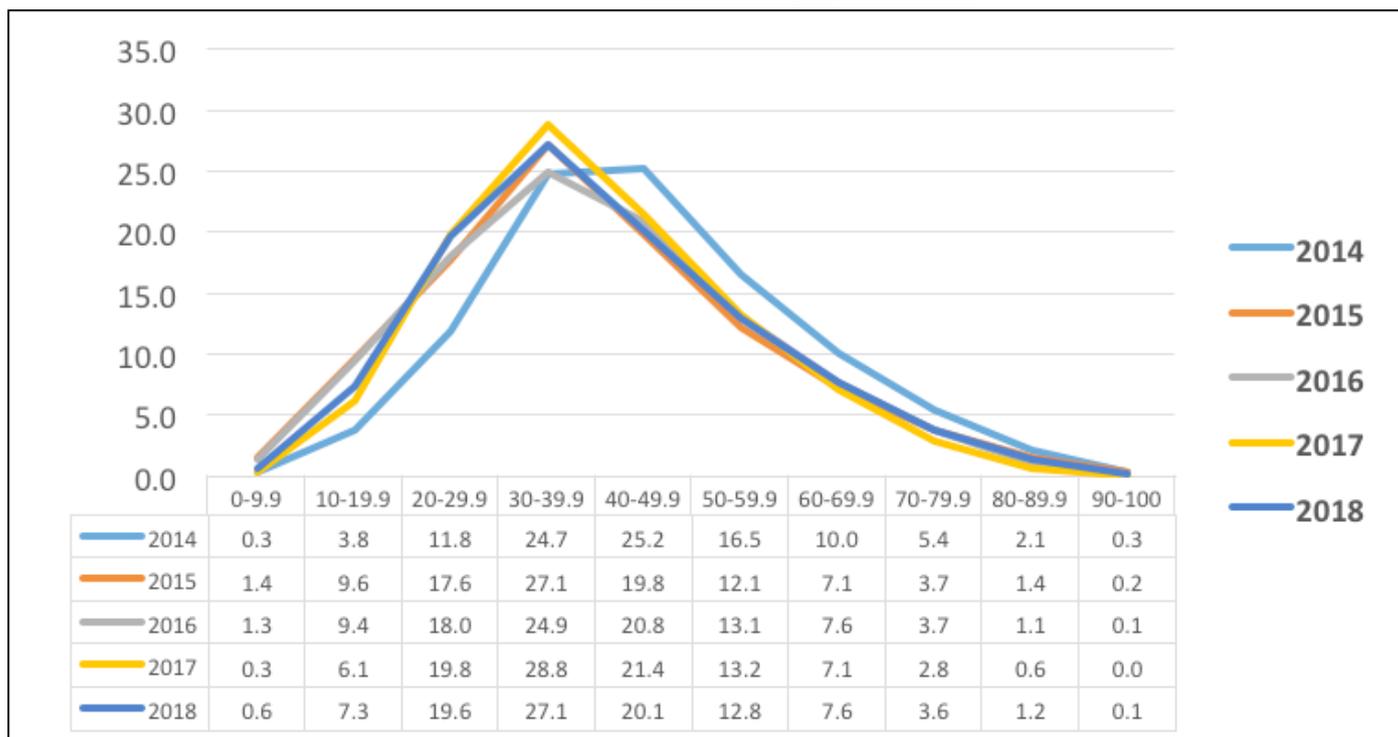


Figure 9.1.2 Performance distribution curves in Mathematical Literacy



9.2 GENERAL COMMENTS ON PAPER 1 AND PAPER 2

- a. **Terminology:** Learners must be taught definitions of common terms used in Mathematical Literacy e.g. ‘inflation’ and ‘perimeter’. Learners should compile a glossary at the back of their notebooks i.e. a list of new terms per topic, with a brief, but clear definition next to each term. A separate note book for this purpose may also be kept. By the end of a year, all learners should have a comprehensive glossary of all the relevant terms.
- b. **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 from the context and to identify the information that is relevant to each sub-question. Tables are often used to reduce written text.
- c. **Use past NSC papers:** Firstly, it must be noted that past question papers serve as one of many teaching and learning resources. It must be used for revision purposes only. Past papers cannot replace the CAPS document and Examination Guidelines. Every learner must have access to past examination papers. Teachers can adapt certain questions, especially questions that include working with large numbers. Secondly, teachers should ensure that learners revise questions that define mathematical terms, especially those questions that define terms in each context.
- d. **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 allows them to have immediate feedback and to gain 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 CAPS, such as *personal income tax* and *box-and-whisker plots*.
- e. **Previous recommendations:** Teachers should use 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; this includes learners’ inability to work with big numbers.

9.3 OVERVIEW OF LEARNER PERFORMANCE IN PAPER 1

General comments

- a. The 2018 question paper was set according to the new guideline document; consequently, Q1 is entirely based on short contexts, with all questions pitched at level 1.
- b. Teachers are advised to use the SC Mathematical Literacy Paper 1 (June 2017), NSC Mathematical Literacy Paper 1 (November 2017), SC Mathematical Literacy Paper 1 (June 2018) and the NSC Mathematical Literacy Paper 1 (November 2018) as exemplars for 2019 Mathematical Literacy learners.

9.4 DIAGNOSTIC QUESTION ANALYSIS FOR PAPER 1

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 9.4.1 Average percentage performance per question for Paper 1

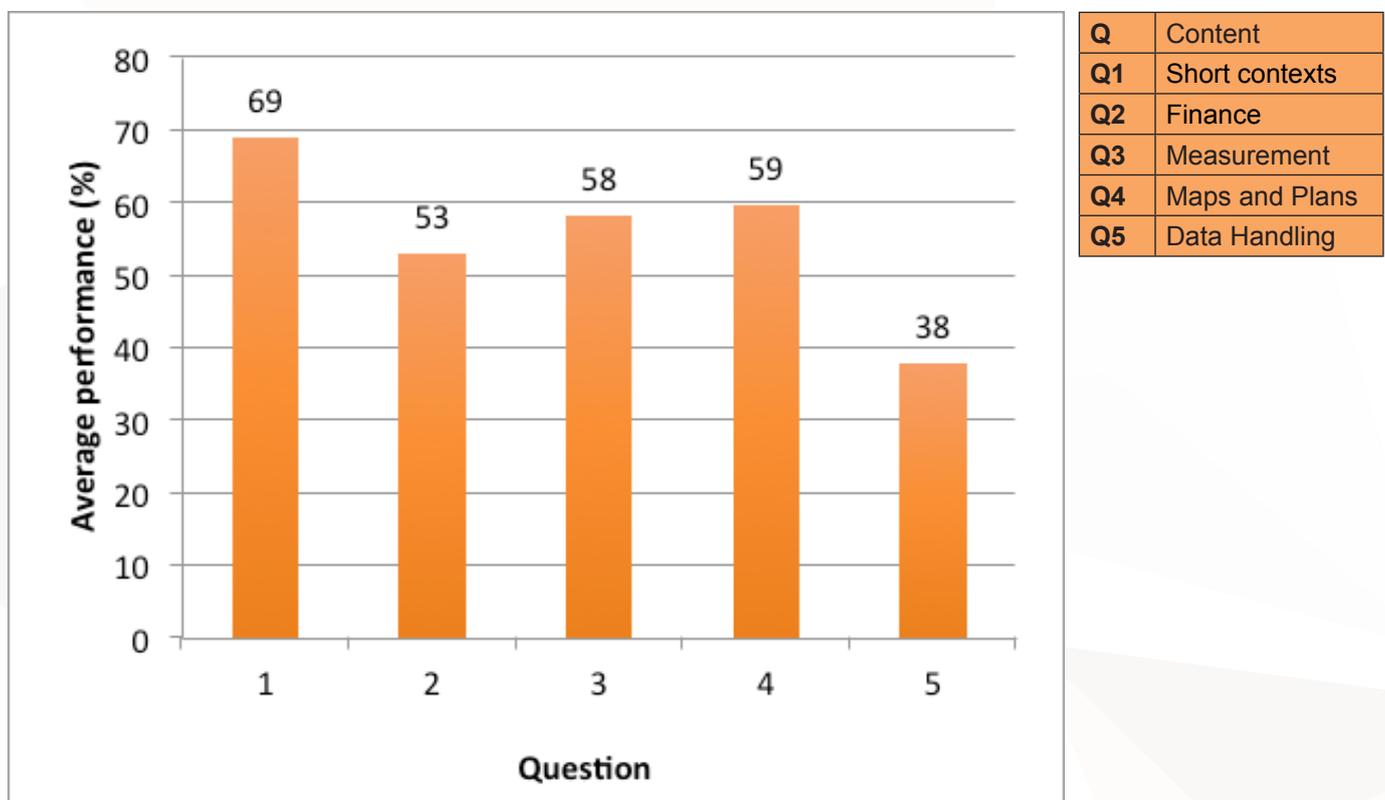
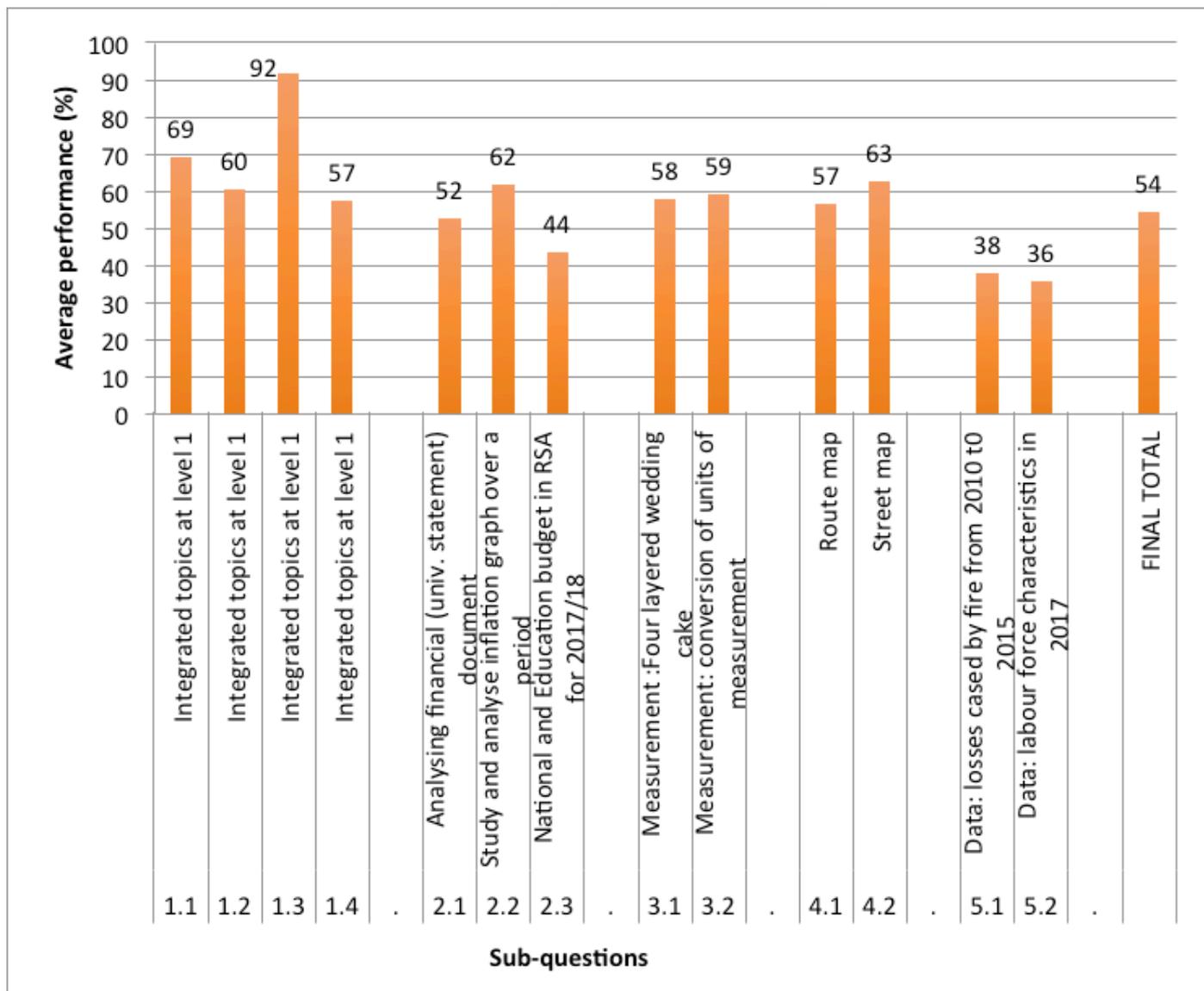


Figure 9.4.2 Average percentage performance per sub-question for Paper 1



9.5 ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS IN PAPER 1

The change in the sequence of questions still benefits candidates, with Q1 based on short level 1 contextual questions. This contributed to the improvement in the overall results in Mathematical Literacy in 2018.

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

Candidates performed well in this question.

Common errors and misconceptions

- Most candidates struggled to give the correct answer; most learners wrote Friday or 3 days in Q1.1.1.
- In Q1.1.3, candidates struggled to make a connection that 50% is $\frac{1}{2}$ half price.
- Conversion is still a challenge for most candidates in Q1.1.4. They could not recognize the 'NOTE: 1 litre = 1 000 ml', thus divided/ multiplied by 100 / 1 000.
- In Q.1.1.5, the 'NOTE' stating that all amounts given including the discount, was ignored by a few candidates.

- e. In Q1.1.6, some candidates struggled to write the data in descending order. They still confused the two terms i.e. ascending and descending order.
- f. In Q1.2.2, some candidates could not read the temperature between 40 °C and 50 °C on the thermometer. They gave 40° C instead of 44° C as an answer.
- g. In Q1.2.3, the meaning of *scale*, in context, was not provided by most candidates. They mixed the units in their definition of scale.
- h. In Q1.3.3, most candidates did not know which operation to use when finding *difference*. They added the two values instead of subtracting the two values.
- i. In Q1.4.1a, many candidates confused time with duration. They gave 12:00 as an answer instead of 12 hours.

Suggestions for improvement

- a. Teachers should incorporate more shopping leaflets, from stores, when selecting material to teach the topic of *personal finance*. This will enable learners to extract relevant information from leaflets with ease.
- b. Percentages, proper fractions and decimal fractions need to be revised on a regular basis, in Grade 12. Understanding conversion from percentages to proper fractions (and vice versa), will assist learners to know that 50% and a $\frac{1}{2}$ have the same numerical value.
- c. The assumption that learners should have mastered converting units of measurement in lower grades is a fallacy. Converting units of measurement within the metric system should be practised by learners on a regular basis during contact time.
- d. Teachers should allocate time, in class, to allow learners to develop the skill of extracting information from a given context.
- e. Mathematical terms like *ascending* and *descending* should be visible to learners, in a classroom, on wall charts. Informal testing items must include the testing of elementary mathematical terms.
- f. Teachers, where possible, should use kitchen scales, thermometers and other measuring apparatus in the classroom when teaching measurement in the FET phase. Learners will gain practical experience when taking readings from a variety of instruments.
- g. Teachers need to incorporate the number scale on a map, drawing, etc in number and word formats, e.g. 1:25; *one unit on the drawing represents twenty-five units, in reality*.
- h. The meaning of *difference* in a mathematical context is to *subtract*. Teachers should emphasise that, 'difference' in the context of Mathematical Literacy has the same meaning as to 'subtract'.
- i. Differences between time and duration need to be emphasised in class by the teacher.

QUESTION 2: FINANCE (UNIVERSITY ACCOUNT STATEMENT; INFLATION; NATIONAL BUDGET)

This is the longest question in the paper, and the performances of learners in this question were satisfactory and an improvement on 2017's sample.

Common errors and misconceptions

- Most candidates in Q2.1.1, Q2.2.1 and Q2.3.2 could not explain the meanings of the terms *interest*, *inflation* and *budget* within the given context.
- In Q2.2.4, many candidates were confused by the answer of 29 000%. They divided it by 1 000 to get to 29% or divided by 100 to get to 290%. They seem to believe that percentage increase is a number less than 100 or 300.
- Several candidates were not able to determine the cost price in Q2.2.5. They increased the amount by multiplying by 17,5% instead of dividing by 117,5%. They failed to handle this question as a VAT inclusive question.
- Throughout Q2, candidates could not read the correct values from a given table. A total of eleven marks was awarded in this question for reading correct values from a table.

Suggestions for improvement

- Learners should be afforded opportunities to define terms in their own words, as part of assessment. This will also ensure conceptual understanding.
- Teachers should emphasize that a percentage increase can be greater than 300%. Learners should do exercises where answers for percentage increase is greater than 300%.
- Teachers must draw similarities between a question like Q2.2.5 and a VAT inclusive/VAT exclusive question.
- Teachers must provide learners with opportunities to extract information from tables as often as possible.

QUESTION 3: MEASUREMENT (VOLUME; AREA; PERIMETER; CONVERSIONS: METRIC AND IMPERIAL; TIME)

There was an improvement in the performances of the candidates, in this topic, in the 2018 examination.

Common errors and misconceptions

- In Q3.1.1, candidates could add all the correct values, but conversion was incorrect from cm to mm. They either multiplied/divided by 100 / 1000.
- In Q3.1.2a, many candidates continue to confuse the concepts of *radius* and *diameter*. They divided the radius by two instead of multiplying by 2 to determine the diameter.
- Some candidates found it difficult to substitute the correct values into a given formula, in Q3.1.2b.
- In Q3.1.3, candidates could not define the term *perimeter*.
- In Q3.1.4, most candidates could not find the correct width on a 3-D shape. Instead, they used the height of the cylindrical shapes.

Suggestions for improvement

- Teachers should provide learners with conversion tables or methods like 'King Henry Died a Miserable Death Called Measles' (KHDAMDCM) when doing conversions from one unit of measurement to another.
- Meaning of mathematical terms such as radius and diameter should be reinforced on a regular basis.
- Teachers should provide learners with enough exercises on how to substitute correct values from tables (correct columns) into a given formula.
- Teachers should encourage learners to write a glossary at the back of their books of the different terms' meanings as they complete each topic.

QUESTION 4: MAPS AND PLANS (ROUTE/STREET MAP; TIME; PROBABILITY)

Candidates' performances in this question was satisfactory. This reflected an improvement in relation to previous years' performances.

Common errors and misconceptions

- In Q4.1.1, some candidates provided a set of directions instead of the general direction.
- In Q4.1.5, most candidates struggled to calculate the actual distance using the scale. Some common errors were: candidates could not measure the correct distance on the map and they could not do the scale calculation correctly.
- Many candidates could not convert hours to minutes in Q4.2.4.

Suggestions for improvement

- Learners need more practice on questions involving general direction questions and questions on a given set of directions. The difference between these two types of questions needs to be emphasised by the teacher when teaching maps.
- Teachers should note that when a scale is given, there is every chance that some actual measurement will be done. Therefore, learners should be afforded the opportunity to use their rulers in class to measure classroom items (books, pens, pencils, etc.) on a regular basis.
- Drilling on time conversion must be given special attention in class or in intervention programmes.

QUESTION 5: DATA HANDLING (BAR GRAPHS; PROBABILITY; MEASURES OF CENTRAL TENDENCIES)

This question required candidates to interpret tables with large numbers.

Common errors and misconceptions

- Most candidates did not write the value in millions, in Q5.1.1 and Q5.1.4. They just copied the table values.
- In Q5.1.2, several candidates could not calculate the final answer. They could not interpret the thousand separator on their calculators.
- Many candidates divided the table values and ignored the zeros in Q5.1.4.
- In Q5.2.1, most candidates could not define the term *unemployment*.

Suggestions for improvement

- A careful reading of tables is a crucial skill in solving mathematical problems. Teachers should give learners enough opportunities, during contact time, to practise and develop this skill.
- Teachers must incorporate large numbers in their lessons, across all topics in Mathematical Literacy. It is advisable that every assessment (formal or informal) task should involve a problem on big numbers so that learners can familiarise themselves with them.
- Teachers should encourage learners to write a glossary of the different terms' meanings, at the back of their books, as they complete each topic.

9.6 OVERVIEW OF LEARNER PERFORMANCE IN PAPER 2

General comment

The performances of candidates were like those recorded in the past. -

9.7 ANALYSIS OF LEARNERS' PERFORMANCE IN INDIVIDUAL QUESTIONS 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 9.7.1 Average percentage performance per question

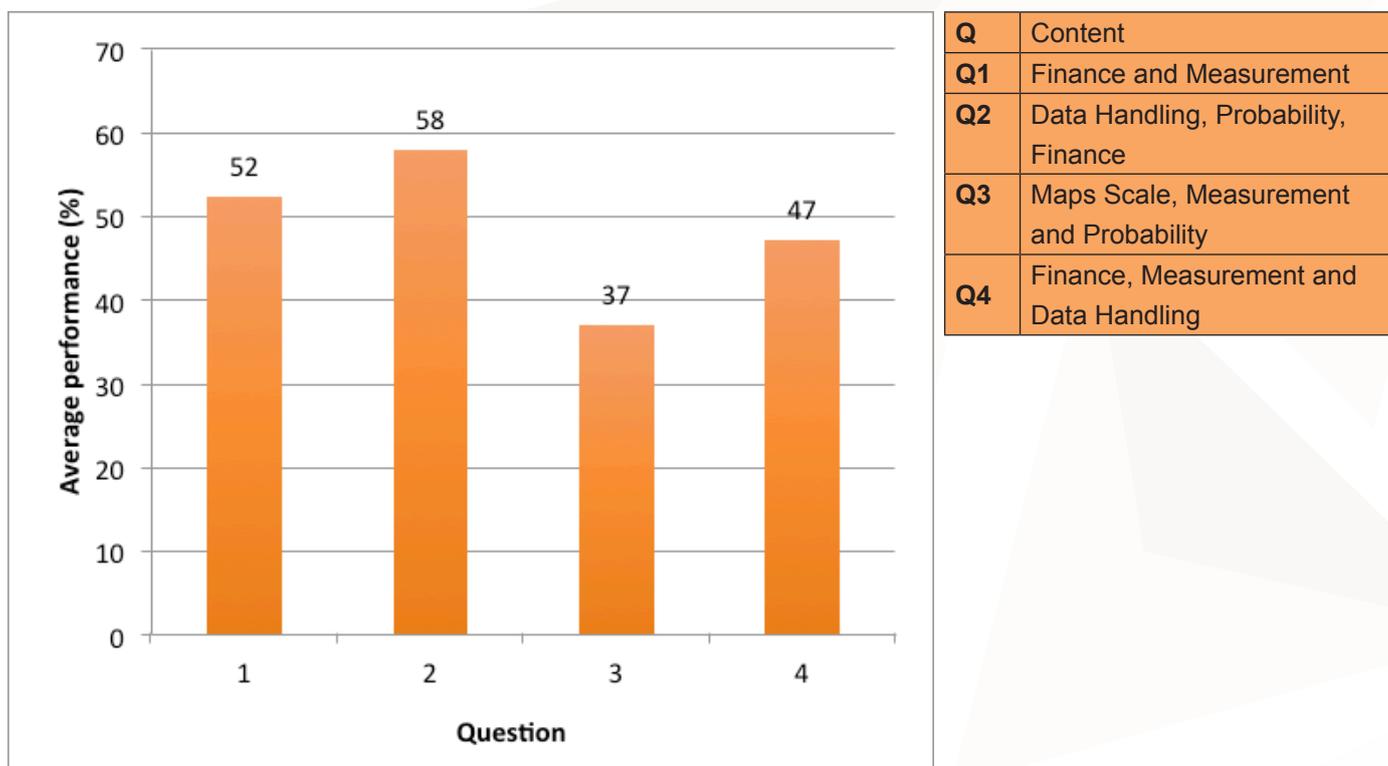
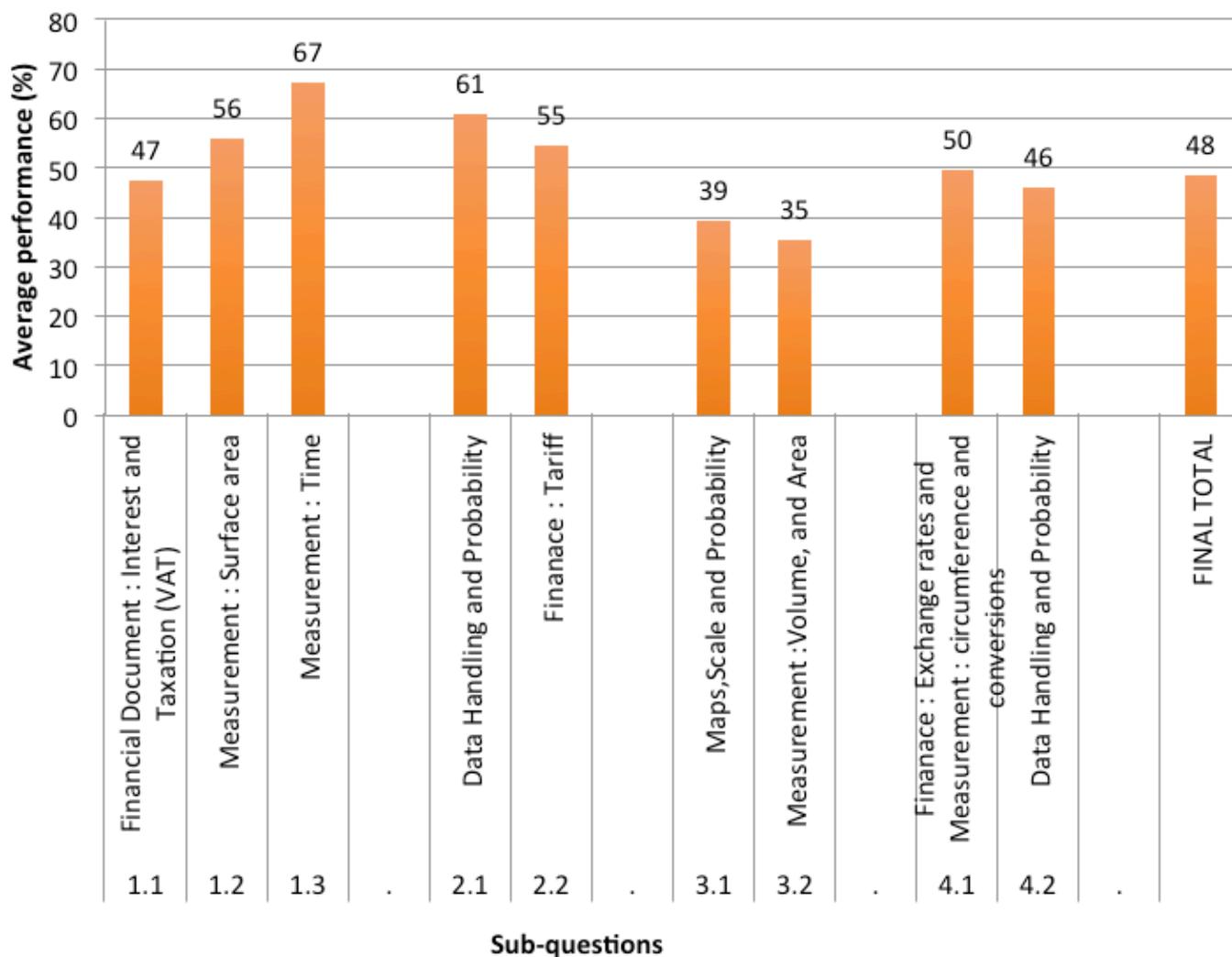


Figure 9.7.2 Average percentage performance per sub-question in paper 2



9.8 ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS IN PAPER 2

QUESTION 1: QUOTATION; SURFACE AREA; COST; TIME

Common errors and misconceptions

- (a) In Q1.1.1, some candidates could not use the discount and selling prices as fractions to determine the percentage.
- (b) In Q1.1.2, some candidates took the Total Due and divided it by 1,14 to find the value, exclusive of VAT.
- (c) In Q1.1.3, many candidates didn't know what 'smash and grab' film was because the context was unfamiliar to them.
- In Q1.1.4, most candidates struggled to grasp the concept that there are three periods involved. They still opted to use the compound interest formula despite this not being allowed by CAPS.
- In Q1.1.5, most candidates did not explain the mistake made by the dealer, when calculating the new selling price. However, they calculated the new selling price correctly.

- f. In Q1.2.1, some candidates did not increase the surface area by 2%. Therefore, they were unable to calculate the correct number of litres of paint required. Candidates were unable to round in context e.g. Litres of paint sold in 5l required = $\frac{6,00421776}{0.25} = 24,0168710 \approx 24l$, whereas it should have been 25l.
- g. In Q1.3, most candidates did not add the second 20 minutes for applying the second coat.

Suggestions for improvement

- a. Teachers should emphasise different ways to calculate percentages.
- b. Learners must be taught to spend more time on reading the correct values from a table/graph.
- c. Learners must master substitution skills through regular practice. Learners should be made aware of not changing signs when a formula is given.
- d. Learners must be exposed to activities which will require them to find errors across all the topics such as Finance, Measurement, etc.
- e. Learners should be taught that one cannot buy paint in portions, but rather in tins.
- f. Working with time scenarios and being able to add and subtract time, using hours and minutes and a combination of both must be taught.
- g. Teachers should refrain from using the compound interest formula.

QUESTION 2: DATA ANALYSIS; UBER TRAVEL COST

Common errors and misconceptions

- a. In Q2.1.1, some candidates used incorrect data instead of the % change column. They swapped values and this led to a positive answer. They struggled to arrange negative and positive values that were mixed. Some arranged the negative numbers as follows: -1; -2; -5; -12 instead of -12; -5; -2; -1
- b. In Q2.1.2, some candidates referred the trend as increase without referring to the product and the period.
- c. In Q2.1.3, a few candidates could mention two different products but did not give the explanation to support the statement.
- d. In Q 2.1.4, most candidates were not aware that the data could not be presented in one single pie chart.
- e. In Q2.1.5, candidates were unable to plot negative values.
- f. In Q2.2.1, the incorrect formula was used to calculate the value of B. Candidates also added all the cost values on the table for column UberLUX.
- g. In Q2.2.2, candidates did not know when to multiply or to divide. In some cases, candidates wrote: $\$4,65 \times \$0,90$ as opposed to $\$4,65/0,90$.
- h. In Q2.2.3, most candidates used 1,9 hours instead of 69 minutes.
- i. In Q2.2.4, understanding a cancellation fee posed a challenge, as candidates lacked exposure to or experience of the Uber context.

Suggestions for improvement

- a. Teachers should give learners sufficient exercises on how to substitute correct values from tables (correct columns) into a given formula.
- b. Learners should be exposed to questions working with two or more formulae.
- c. Teachers should reinforce questions where learners are required to decrease or increase values by a percentage.
- d. Learners should be made aware of the impact that the choice of a sample has on the reliability of the data.
- e. Teachers must expose learners to questions on the organisation and representation of data. Graphs with different scales should be assessed regularly to train learners to read values or plot the points on the grid.
- f. Learners should be taught how a trend should be described.

QUESTION 3: MAP ANALYSIS; MEASUREMENT; LAYOUT ANALYSIS

Common errors and misconceptions

- a. In Q3.1.1, candidates could not identify the number of stations that only had only coke and water.
- b. In Q3.1.2, some candidates were unable to give the correct direction and gave 'South' as their answer.
- c. In Q3.1.3, candidates could not explain that the height is increasing from the start mark to 10 km. Some candidates could not identify the lowest and highest height. If they did, they could not simplify the ratio as 1: ...
- d. In Q3.1.4, although the explanation for cut-off times were given, candidates could not explain the reason for cut-off times.
- e. In Q3.1.5, most candidates only gave one calculation and concluded without comparing the speed of the two runners.
- f. In Q3.2.1, candidates failed to subtract the inner diameter. Some simply worked with 31,2 (the diameter) and not the radius. A further challenge posed by this question was the changing of the subject of the formula. Few learners could do this correctly.
- g. In Q3.2.2, interpretation of the context of modelling and packaging proved to be beyond the grasp of many candidates.
- h. In Q3.2.3, the length occupied by 4 buckets was not calculated. The formula for the percentage increase was not given.

Suggestions for improvement

- a. Learners must be aware that especially in Paper 2, they may not always be provided with formulae.
- b. Learners should be exposed to a variety of contexts when dealing with calculations of surface area, perimeter, volume and costs.
- c. Teachers should emphasise the concepts of *radius*, *diameter* and other terms related to measurements. The difference between these terms should clearly be communicated and learnt.
- d. Learners should be exposed to different methods of conversion to understand the concept of converting different units of measurement.
- e. Teachers should expose learners to various formulae where 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.

QUESTION 4: TICKET COSTS; CURRENCY CONVERSION; DATA ANALYSIS

Common errors and misconceptions

- a. In Q4.1.1, candidates omitted the discount for online tickets. Some candidates divided instead of multiplied when converting to Rand.
- b. In Q4.1.2, some candidates only divided by 3,28 and left their answer as is. The concept of rounding off to the nearest metre was ignored in some instances.
- c. In Q4.2.1, candidates confused the number format in the final answer.
- d. In Q4.2.2, some candidates did not add the total for East and West Midlands.
- e. In Q4.2.3, most candidates incorrectly included the 2010 data instead of starting from 2011. This led to incorrect totals.
- f. In Q4.2.4. the Inter Quartile Range question proved to be challenging as:
 - * The data was not arranged;
 - * The wrong set of data was used;
 - * The candidates could not identify the quartiles;
 - * The range was calculated.
- g. In Q4.2.5, most candidates with a language barrier struggled to express their views in words.
- h. In Q4.2.6, most candidates did not even attempt this question – many of those who tried, either got it wrong or scored a few marks. Two unknowns were a serious challenge as well as the *mean* concept.

Suggestions for improvement

- a. Teachers should teach learners first to make sense of the information before attempting the questions.
- b. Learners must be taught to look at how values are allocated, e.g. 115,3 thousand OR 115 300. Learners should not give answers in decimals.
- c. Teachers should not just focus on the calculation of the mean with a normal data set. They should give learners more challenging sums regarding this topic.
- d. Teachers should explain (and demonstrate with examples from past papers) the meaning of the word *hence* as it has been observed that some candidates did not link the previous question to the next one.
- e. Learners should be trained to perform calculations involving ratios and emphasis should be placed on the following aspects:
 - * Convert between different forms of a ratio;
 - * Different formats for expressing ratios;
 - * Why no units are included in a ratio.
- f. Teachers should encourage candidates to use the LOLT always during the lessons. Scenarios should be discussed and critically analysed during lessons to give learners the opportunity to think critically and develop analytical and problem-solving skills.