



**basic education**

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

**QUALITATIVE ANALYSIS OF LEARNER RESPONSES  
AND  
EVALUATION OF THE QUESTION PAPERS (PER PAPER)  
NATIONAL SENIOR CERTIFICATE 2025  
WESTERN CAPE EDUCATION DEPARTMENT**

|                            |                               |          |                             |
|----------------------------|-------------------------------|----------|-----------------------------|
| <b>SUBJECT</b>             | <b>MATHEMATICS</b>            |          |                             |
| <b>QUESTION PAPER</b>      | <b>1</b>                      | <b>2</b> | <b>3</b>                    |
| <b>DURATION OF PAPER</b>   | <b>3 HOURS</b>                |          |                             |
| <b>INTERNAL MODERATOR</b>  | <b>ADNAAN EDERIES</b>         |          |                             |
| <b>CHIEF MARKER</b>        | <b>RENATE ROHRS</b>           |          |                             |
| <b>DATES OF MARKING</b>    | <b>FROM: 29 NOVEMBER 2025</b> |          | <b>TO: 10 DECEMBER 2025</b> |
| <b>HEAD OF EXAMINATION</b> | <b>MS LM BREDEKAMP</b>        |          |                             |

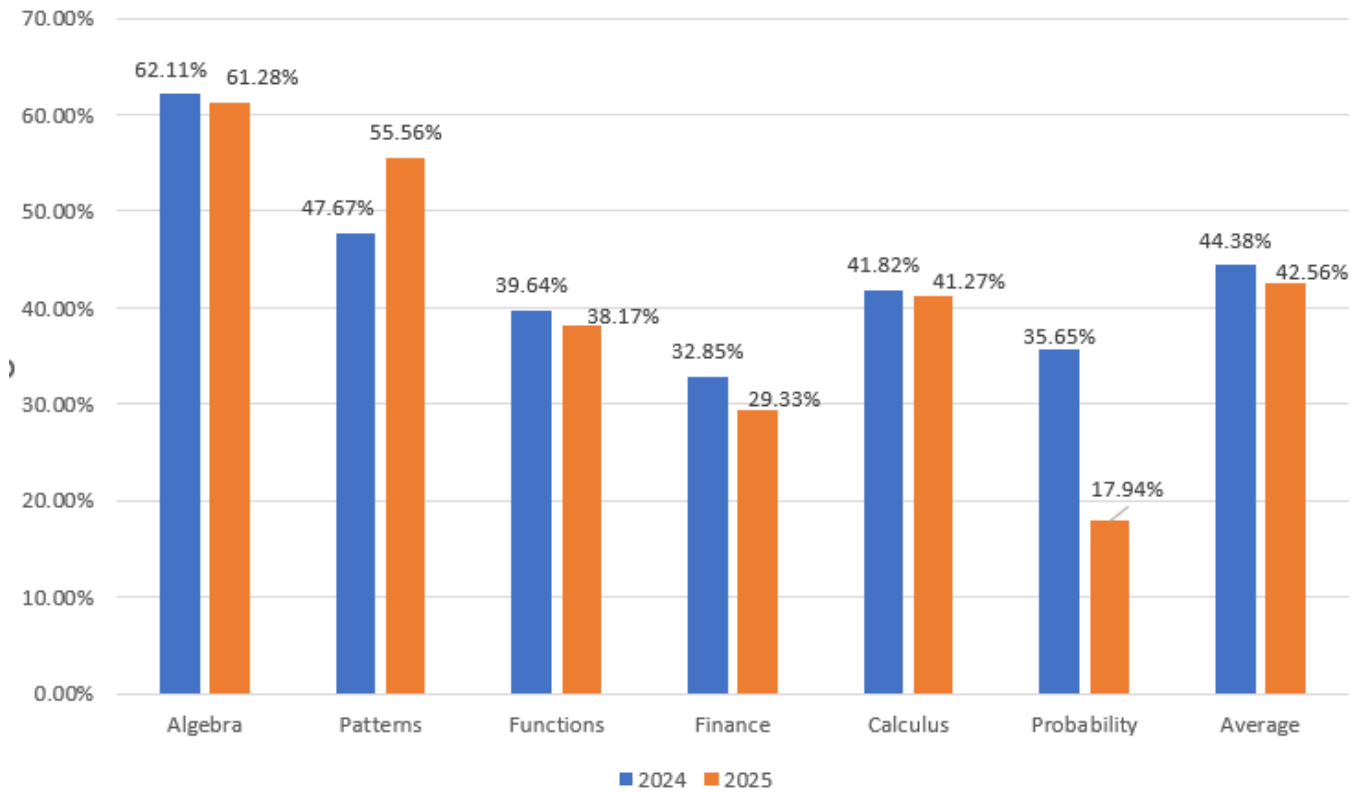
**REPORT 2: QUALITATIVE ANALYSIS OF LEARNER RESPONSES**

**SECTION 1: (GENERAL OVERVIEW OF LEARNER PERFORMANCE IN THE QUESTION PAPER AS A WHOLE)**

**In terms of the various content sections in Paper 1**

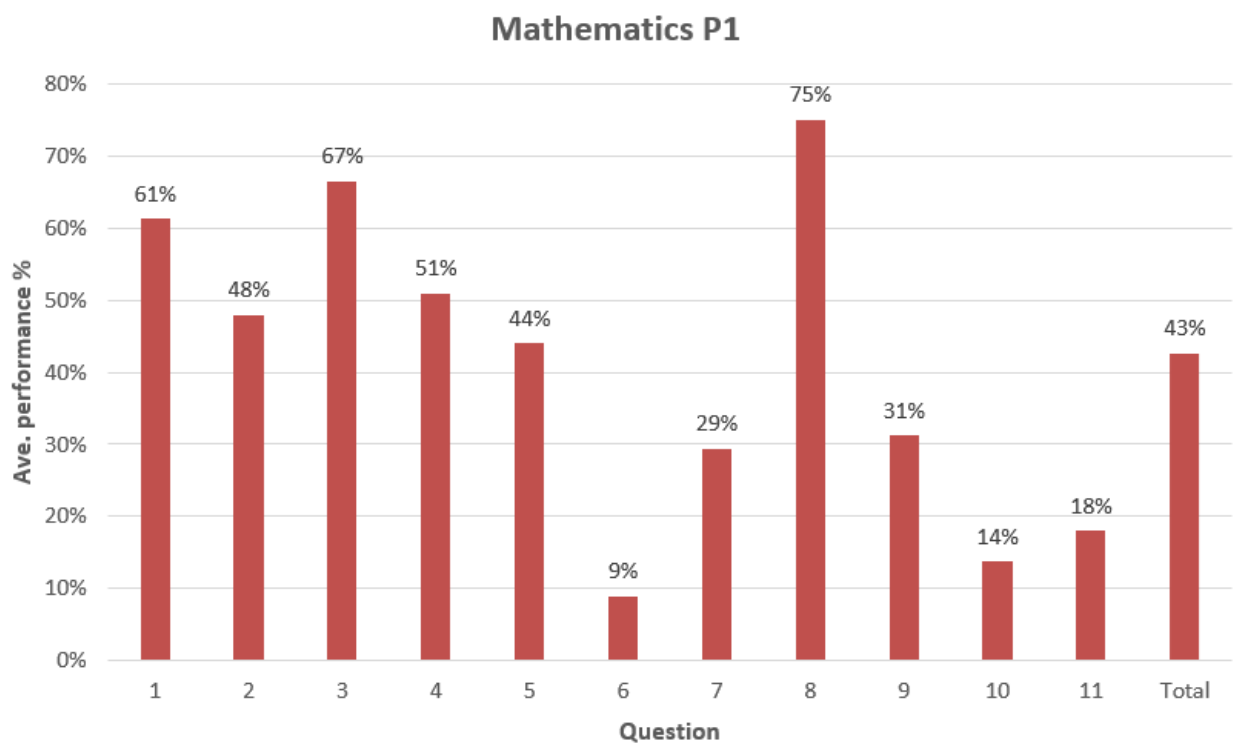
The table below compares the average percentage per content section for Paper 1 from a random sample of 100 candidates chosen for the Rasch analysis for 2024 and 2025

## Mathematics P1



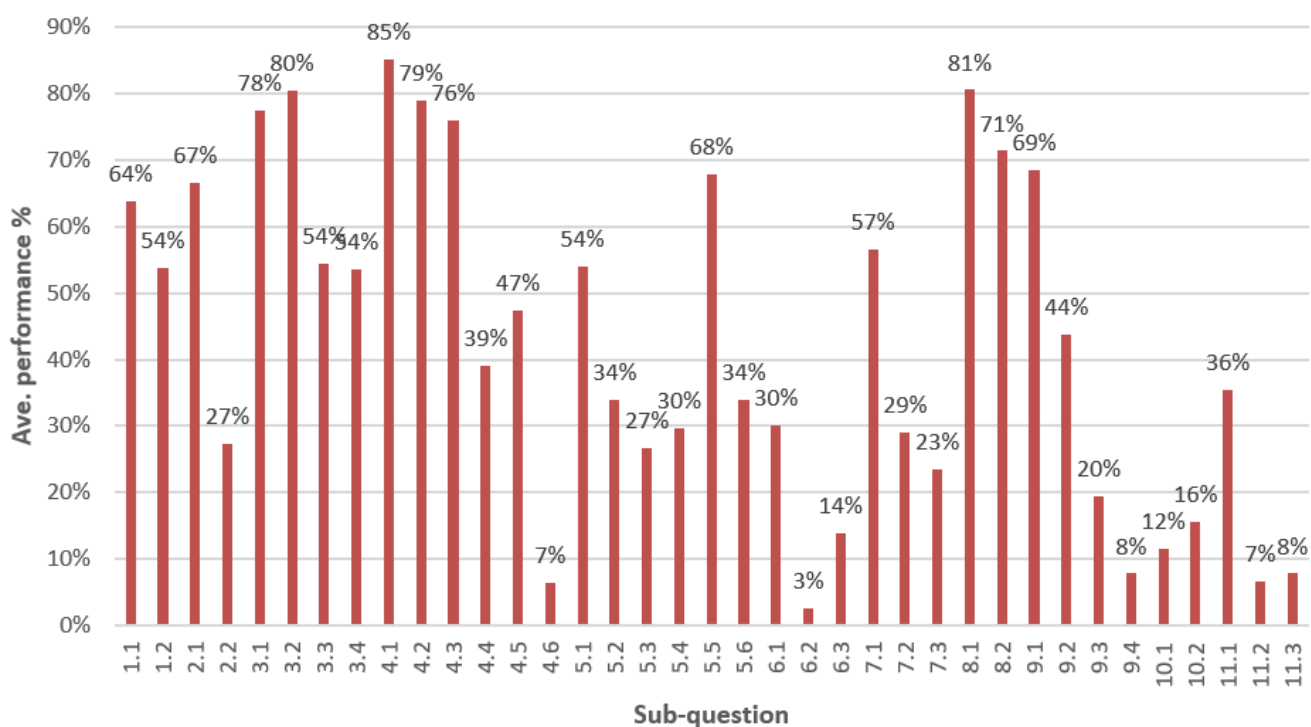
### In terms of the various questions in Paper 1

The table below shows the average percentage per question for Paper 1 from a random sample of 100 candidates chosen for the Rasch analysis.



In terms of the various subsections in Paper 1

## Mathematics P1



### SECTION 2: COMMENT ON CANDIDATES' PERFORMANCE IN INDIVIDUAL QUESTIONS

(It is expected that a comment will be provided for each question)

#### QUESTION 1

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

100 script Analysis:

| Question 1 |        |        |        |        |        |
|------------|--------|--------|--------|--------|--------|
| 1.1.1      | 1.1.2  | 1.1.3  | 1.1.4  | 1.1.5  | 1.2    |
| 100.00%    | 95.20% | 64.39% | 39.39% | 43.43% | 53.54% |

#### QUESTION 1 (Algebra and Equations)

|       |                    |     |
|-------|--------------------|-----|
| 1.1   | Solve for x:       |     |
| 1.1.1 | Very well answered | (2) |
| 1.1.2 | Very well answered | (4) |
| 1.1.3 | Well answered      | (4) |
| 1.1.4 | Poorly answered    | (4) |
| 1.1.5 | Poorly answered    | (5) |
| 1.2   | Well answered      | (6) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

1.1.1 Learners performed very well in this question.

1.1.2 Learners performed very well in this question.

When solving, some learners would discard one or both of the solutions, especially if it was negative i.e.

$$5x^2 + 9x + 2 = 0$$

$$x = \frac{-(9) \pm \sqrt{(4)^2 - 4(5)(2)}}{2(5)}$$

$$x \neq -0,26 \text{ or } x \neq -1,54$$

1.1.3 Many learners treated the inequality as an equality. Many learners struggled to interpret the correct answer from the inequality:

|                                                |                                                |
|------------------------------------------------|------------------------------------------------|
| $8x^2 - 2x > 0$                                | $8x^2 - 2x > 0$                                |
| $2x(4x - 1) > 0$                               | $2x(4x - 1) > 0$                               |
| $\therefore 2x > 0 \text{ or } 4x - 1 > 0$     | $\therefore x = 0 \text{ or } x = \frac{1}{4}$ |
| $\therefore x > 0 \text{ or } x > \frac{1}{4}$ | $\therefore 0 < x < \frac{1}{4}$               |

treated as an equality

incorrect interpretation of solution

1.1.4 This exponential equation could be transformed into a quadratic form which would facilitate solving, however, many learners factorised incorrectly:

|                                         |    |                                        |
|-----------------------------------------|----|----------------------------------------|
| $2 \cdot 2^{2x} - 9 \cdot 2^x + 4 = 0$  |    | $2 \cdot 2^{2x} - 9 \cdot 2^x + 4 = 0$ |
| $2 \cdot 2^2 2^x - 9 \cdot 2^x + 4 = 0$ | or | $2^x (2 \cdot 1^x - 9) + 4 = 0$        |
| $2^x (2 \cdot 2^2 - 9) + 4 = 0$         |    |                                        |

1.1.5 Many learners eliminated the outer surd successfully by squaring both sides. However, many did not isolate  $\sqrt{\frac{1}{x}}$  to eliminate the second surd and squared incorrectly.

$$\left( \sqrt{\sqrt{\frac{1}{x}} + 2} \right)^2 = \left( \frac{1}{\sqrt{x}} \right)^2$$

$$\sqrt{\frac{1}{x}} + 2 = \frac{1}{x}$$

$$\left( \sqrt{\frac{1}{x}} + 2 \right)^2 = \left( \frac{1}{x} \right)^2$$

$$\frac{1}{x} + 4 = \frac{1}{x^2}$$

Many learners did not check whether an invalid solution existed.

1.2 Most learners could formulate the first equation, however, struggled to formulate the second. The marking guideline was generous in its mark allocation for an incorrect second equation, as long as it led to a quadratic when solving the unknown variable(s). Some of the common incorrect equations for the second constraint were:

$$5xy = 6x^2 \text{ or } 5xy = 6 + \sqrt{x}$$

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                               |
| <b>(c)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b><i>Provide suggestions for improvement in relation to Teaching and Learning.</i></b>                                                                                       |
| <p>Educators need to emphasise that learners have the option of using the quadratic formula if they struggle with factorisation. When opting to use the quadratic formula, the standard form has to be written correctly for correct substitution.</p> <p>Educators should also emphasise the correct notation when solving inequalities. Many learners treat inequalities like equations. In addition, learners struggled to represent the solutions correctly. A graphical tool would assist in representing the answers correctly.</p> <p>Re-emphasise the exponential and surd laws pertaining to expressions and equations.</p> <p>Revise the construction of equations, from statements, as outlined in the Grade 9 syllabus.</p> |                                                                                                                                                                               |
| <b>(d)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b><i>Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.</i></b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                               |

**QUESTION 2**

**(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

100 script Analysis:

| Question 2 |        |        |        |        |
|------------|--------|--------|--------|--------|
| 2.1.1      | 2.1.2  | 2.1.3  | 2.2.1  | 2.2.2  |
| 67.34%     | 59.52% | 76.53% | 66.67% | 11.92% |

**QUESTION 2 (Patterns and Sequences)**

|       |                      |     |
|-------|----------------------|-----|
| 2.1   | Geometric Patterns   |     |
| 2.1.1 | Very well answered   | (3) |
| 2.1.2 | Very well answered   | (3) |
| 2.1.3 | Very well answered   | (2) |
| 2.2   | Arithmetic Patterns  |     |
| 2.2.1 | Very well answered   | (2) |
| 2.2.2 | Very poorly answered | (5) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

2.1.1 Learners who recognized the geometric pattern (as stated in the problem) equated the ratios correctly. Some struggled with the distributive law, leading to an incorrect answer. Many learners generally struggle when variables are present.

2.1.2 With the value of  $t$  given, learners successfully proceeded to calculate the number pattern and determine the general term. Very few learners could convert their respective answers into the prescribed form.

$8 ; -4 ; 2 ; \dots$

$$T_n = 8 \left( -\frac{1}{2} \right)^{n-1}$$

$$T_{25} = 8 \left( -\frac{1}{2} \right)^{24}$$

Many learners proceeded incorrectly as follows:

$$T_{25} = 8 \left( -\frac{1}{2} \right)^{24}$$

$$T_{25} = -4^{24}$$

2.1.3 This question was very well answered. When  $r$  was calculated incorrectly i.e.  $r < -1$  or  $r > 1$  learners substituted the incorrect  $r$  into  $S_{\infty} = \frac{a}{1-r}$ , not realising that the equation is only valid for  $-1 < r < 1$ .

|                                                                                                                                                                                                                                                              |                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 2.2.1                                                                                                                                                                                                                                                        | Most of the learners recognised the general term as $T_n = 4n - 1$ and proceeded to determine $T_6$ and $T_{14}$ respectively. |
| 2.2.2                                                                                                                                                                                                                                                        | Learners were not sure how to solve for k with the presence of p.                                                              |
| <b>(c) Provide suggestions for improvement in relation to Teaching and Learning.</b>                                                                                                                                                                         |                                                                                                                                |
| Revision on the fundamental concepts of geometric and arithmetic sequences, with the emphasis on problems with variables. The conceptual symbolic interpretation of sigma to be revised as well. In the latter use variables for the higher order questions. |                                                                                                                                |
| <b>(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.</b>                                                                                   |                                                                                                                                |
|                                                                                                                                                                                                                                                              |                                                                                                                                |

| QUESTION 3                                                                                                                                                                            |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------|--|--|-----|-----|-----|-----|--------|--------|--------|--------|
| (a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?                                                       |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| 100 script Analysis:                                                                                                                                                                  |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| <table><tr><th colspan="4">Question 3</th></tr><tr><td>3.1</td><td>3.2</td><td>3.3</td><td>3.4</td></tr><tr><td>78.28%</td><td>81.14%</td><td>54.88%</td><td>54.04%</td></tr></table> |                                                                                                                                                                     | Question 3 |        |  |  | 3.1 | 3.2 | 3.3 | 3.4 | 78.28% | 81.14% | 54.88% | 54.04% |
| Question 3                                                                                                                                                                            |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.1                                                                                                                                                                                   | 3.2                                                                                                                                                                 | 3.3        | 3.4    |  |  |     |     |     |     |        |        |        |        |
| 78.28%                                                                                                                                                                                | 81.14%                                                                                                                                                              | 54.88%     | 54.04% |  |  |     |     |     |     |        |        |        |        |
| QUESTION 3 (Patterns and Sequences - Quadratic)                                                                                                                                       |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.1                                                                                                                                                                                   | Very well answered (2)                                                                                                                                              |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.2                                                                                                                                                                                   | Very well answered (3)                                                                                                                                              |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.3                                                                                                                                                                                   | Well answered (3)                                                                                                                                                   |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.4                                                                                                                                                                                   | Well answered (2)                                                                                                                                                   |            |        |  |  |     |     |     |     |        |        |        |        |
| (b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.                      |                                                                                                                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.1                                                                                                                                                                                   | Learners correctly identified the pattern as quadratic and determined the answer by inspection.                                                                     |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.2                                                                                                                                                                                   | This familiar routine question was well answered.                                                                                                                   |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.3                                                                                                                                                                                   | Many learners determined the value of n for maximum depth, but did not proceed to determine the depth e.g.<br>$-2n + 38 = 0$<br>$-2n = -38$<br>$n = 19$             |            |        |  |  |     |     |     |     |        |        |        |        |
| 3.4                                                                                                                                                                                   | Similar to Question 3.3, many learners determined the number of seconds, but did not select the correct solution, as the question stated i.e. "for the second time" |            |        |  |  |     |     |     |     |        |        |        |        |

$$-n^2 + 38n - 1 = 104$$

$$n^2 - 38n + 105 = 0$$

$$(n - 35)(n - 3) = -38$$

$$n = 3 \text{ or } n = 35$$

**(c) Provide suggestions for improvement in relation to Teaching and Learning.**

**(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.**

#### **QUESTION 4**

**(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

100 script Analysis:

| Question 4 |        |        |        |        |       |
|------------|--------|--------|--------|--------|-------|
| 4.1        | 4.2    | 4.3    | 4.4    | 4.5    | 4.6   |
| 84.85%     | 79.80% | 75.76% | 39.39% | 47.81% | 6.57% |

#### **QUESTION 4 (Functions – Inverse Exponential and Log)**

|     |                      |     |
|-----|----------------------|-----|
| 4.1 | Very well answered   | (1) |
| 4.2 | Very well answered   | (1) |
| 4.3 | Very well answered   | (2) |
| 4.4 | Poorly answered      | (1) |
| 4.5 | Well answered        | (3) |
| 4.6 | Very poorly answered | (2) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

|     |                                                                                                                                                       |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.1 | Very well answered as the calculator could be used $t = \log_{\frac{1}{3}} 3$                                                                         |
| 4.2 | Many learners did not realise that the standard log graph intersected the x-axis at $x = 1$ .                                                         |
| 4.3 | Very well answered question                                                                                                                           |
| 4.4 | Many learners made the same error i.e. writing down the equation of the asymptote of $f$ ( $x = 0$ ) instead of the inverse                           |
| 4.5 | Many learners did not realise that the inverse of a decreasing log graph is a decreasing exponential graph.                                           |
| 4.6 | Learners generally struggle with translations and reflections. In addition, the learners had to determine a translated range for a restricted domain. |

|                                                                                                                                    |                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(c)</b>                                                                                                                         | <b>Provide suggestions for improvement in relation to Teaching and Learning.</b>                                                                                       |
| Teachers to remind students of the graphical inverse pairs i.e. surd with parabola, line with a line, log with an exponential etc. |                                                                                                                                                                        |
| <b>(d)</b>                                                                                                                         | <b>Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.</b> |
|                                                                                                                                    |                                                                                                                                                                        |

QUESTION 5

(a)
General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

100 script Analysis:

Question 5

|        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|
| 5.1    | 5.2    | 5.3.1  | 5.3.2  | 5.4    | 5.5    | 5.6    |
| 53.54% | 33.33% | 27.78% | 26.02% | 29.97% | 67.51% | 34.34% |

QUESTION 5 (Functions – Parabola & Hyperbola)

5.1

Well answered

(1)

5.2

Poorly answered

(1)

5.3.1

Very poorly answered

(2)

5.3.2

Very poorly answered

(2)

5.4

Poorly answered

(3)

5.5

Well answered

(6)

5.6

Poorly answered

(3)

(b)
Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

5.1

Many learners forgot to exclude the asymptote at  $x = 3$  from the domain.

5.2

Many learners determine point  $P(3; 8)$  correctly, but gave the following incorrect answers:  
 $y < 3$  or  $y \in \square$  or  $y < 8$

5.3.1

Learners generally struggle with functional questions given in symbolic form

5.3.2

Same comment as 5.3.1 with an additional solution due to symmetry.

5.4

Many learners attempted, incorrectly, the root method in proving the equation.

5.5

Well answered. Many learners struggled to obtain the x-intercept of the hyperbola. Some learners determined the distance between the x-intercepts of the parabola.

5.6

This was a higher order calculus integration question. Many learners determined the gradient of the tangent using the average gradient method. The most common error, however, was the following:  
 $f'(x) = -x + 3$   
 $\therefore m = -1$

|                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(c) Provide suggestions for improvement in relation to Teaching and Learning.</b>                                                                                                                                                               |
| Revise the domain and range of the different graphs as this is a knowledge question as well as the symbolic functional notation. Give students examples where the calculus is infused with the graphs (especially using the principle of tangents) |

|                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.</b> |
|                                                                                                                                                                            |

| QUESTION 6                                                                                                                                                          |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------|--|--|-----|-----|-----|--------|-------|--------|
| (a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?                                     |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| 100 script Analysis:                                                                                                                                                |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| <table><tr><th colspan="3">Question 6</th></tr><tr><td>6.1</td><td>6.2</td><td>6.3</td></tr><tr><td>30.30%</td><td>2.63%</td><td>14.14%</td></tr></table>           |                                                                                                                                                                              |        | Question 6 |  |  | 6.1 | 6.2 | 6.3 | 30.30% | 2.63% | 14.14% |
| Question 6                                                                                                                                                          |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| 6.1                                                                                                                                                                 | 6.2                                                                                                                                                                          | 6.3    |            |  |  |     |     |     |        |       |        |
| 30.30%                                                                                                                                                              | 2.63%                                                                                                                                                                        | 14.14% |            |  |  |     |     |     |        |       |        |
| QUESTION 6 (Functions – Line & Hyperbola)                                                                                                                           |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| 6.1                                                                                                                                                                 | Poorly answered                                                                                                                                                              | (1)    |            |  |  |     |     |     |        |       |        |
| 6.2                                                                                                                                                                 | Very poorly answered                                                                                                                                                         | (5)    |            |  |  |     |     |     |        |       |        |
| 6.3                                                                                                                                                                 | Very poorly answered                                                                                                                                                         | (2)    |            |  |  |     |     |     |        |       |        |
| (b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.    |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| 6.1                                                                                                                                                                 | Due to the absence of any numbers or letters on the diagram, learners could not answer the question.                                                                         |        |            |  |  |     |     |     |        |       |        |
| 6.2                                                                                                                                                                 | This was a problem-solving question in which three variables had to be solved. Three equations had to be created with variables which led to the low marks in this question. |        |            |  |  |     |     |     |        |       |        |
| 6.3                                                                                                                                                                 | This answer was independent of the sketch. As mentioned earlier, learners struggled with translations and reflections.                                                       |        |            |  |  |     |     |     |        |       |        |
| (c) Provide suggestions for improvement in relation to Teaching and Learning.                                                                                       |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| Expose learners to more unseen problem-solving examples                                                                                                             |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
| (d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc. |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |
|                                                                                                                                                                     |                                                                                                                                                                              |        |            |  |  |     |     |     |        |       |        |

**QUESTION 7**

**(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

100 script Analysis:

| Question 7 |        |        |       |
|------------|--------|--------|-------|
| 7.1        | 7.2    | 7.3.1  | 7.3.2 |
| 56.06%     | 28.54% | 34.55% | 9.60% |

**QUESTION 7 (Financial Mathematics)**

|       |                      |     |
|-------|----------------------|-----|
| 7.1   | Well answered        | (2) |
| 7.2   | Very poorly answered | (4) |
| 7.3   | Annuity Formula      |     |
| 7.3.1 | Poorly answered      | (5) |
| 7.3.2 | Very Poorly answered | (4) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

|       |                                                                                                                                                                                                                                              |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.1   | Well answered question. Many learners used the incorrect simple interest formula i.e.<br>$A = 40000(1 + 0,078(5))$                                                                                                                           |
| 7.2   | Many learners did not realise that this was an annuity application due to the constant payment of R2300. The interest was compounded quarterly and the additional interest was added because it was deposited at the beginning of the month. |
| 7.3.1 | Most of the learners forgot it there was a delayed payment of three months and subsequently forgot to add it to the total period when solving.                                                                                               |
| 7.3.2 | As in Question 7.2, most of the learners did not realise that this was an annuity application. In addition, there was an additional interest payment.                                                                                        |

**(c) Provide suggestions for improvement in relation to Teaching and Learning.**

Learners must learn to read financial mathematics questions carefully to determine what has to be solved. Many of the questions were asked in previous papers, including the complex questions.

**(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.**

Teachers should expose learners to a variety of taxonomy level questions from past papers.

**QUESTION 8**

**(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

100 script Analysis:

| Question 8 |        |        |
|------------|--------|--------|
| 8.1        | 8.2.1  | 8.2.2  |
| 80.30%     | 92.93% | 60.61% |

**QUESTION 8 (Calculus)**

|       |                       |     |
|-------|-----------------------|-----|
| 8.1   | Very well answered    | (4) |
| 8.2   | Differentiation Rules |     |
| 8.2.1 | Very well answered    | (2) |
| 8.2.2 | Well answered         | (4) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

- 8.1 This question was very well answered.
- 8.2.1 This question was very well answered.
- 8.2.2 Learners struggled due to the monomial in the denominator before differentiation. Some of the common errors were:

$$y = \frac{2x^4 + 1}{x^2} \quad y = \frac{2x^4 + 1}{x^2} \quad y = \frac{2x^4 + 1}{x^2} \quad y = \frac{2x^4 + 1}{x^2}$$

$$\frac{dy}{dx} = \frac{8x^3}{2x} \quad y = 2x^2 + 1 \quad y = 2x^4 + 1 + x^2 \quad y = 2x^4 + 1 \cdot x^{-2}$$

**(c) Provide suggestions for improvement in relation to Teaching and Learning.**

With monomial denominators apply the reverse of the fractional addition rule i.e. change the expression, to be differentiated, from one term to two terms i.e.

$$y = \frac{2x^4 + 1}{x^2}$$

$$y = \frac{2x^4}{x^2} + \frac{1}{x^2}$$

before applying the exponential rules.

**(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.**

| QUESTION 9                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------|--|--|-----|-----|-----|-----|--------|--------|--------|-------|
| (a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?                                                                                                                                                                                    |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| 100 script Analysis:                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| <table><tr><th colspan="4">Question 9</th></tr><tr><td>9.1</td><td>9.2</td><td>9.3</td><td>9.4</td></tr><tr><td>68.94%</td><td>44.11%</td><td>19.44%</td><td>7.91%</td></tr></table>                                                                                                                               |                                                                                                                                                                                                                               | Question 9 |       |  |  | 9.1 | 9.2 | 9.3 | 9.4 | 68.94% | 44.11% | 19.44% | 7.91% |
| Question 9                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.1                                                                                                                                                                                                                                                                                                                | 9.2                                                                                                                                                                                                                           | 9.3        | 9.4   |  |  |     |     |     |     |        |        |        |       |
| 68.94%                                                                                                                                                                                                                                                                                                             | 44.11%                                                                                                                                                                                                                        | 19.44%     | 7.91% |  |  |     |     |     |     |        |        |        |       |
| QUESTION 9 (Calculus – Cubic Graph)                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.1                                                                                                                                                                                                                                                                                                                | Very well answered (4)                                                                                                                                                                                                        |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.2                                                                                                                                                                                                                                                                                                                | Well answered (3)                                                                                                                                                                                                             |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.3                                                                                                                                                                                                                                                                                                                | Very poorly answered (4)                                                                                                                                                                                                      |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.4                                                                                                                                                                                                                                                                                                                | Very poorly answered (6)                                                                                                                                                                                                      |            |       |  |  |     |     |     |     |        |        |        |       |
| (b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.                                                                                                                                                   |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.1                                                                                                                                                                                                                                                                                                                | Many learners forgot to set the gradient equal to zero when solving.                                                                                                                                                          |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.2                                                                                                                                                                                                                                                                                                                | Very few learners applied the correct condition for concavity i.e. for concave down $f''(x) < 0$                                                                                                                              |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.3                                                                                                                                                                                                                                                                                                                | Learners struggled with this higher order question as it involved a functional symbolic component and the point of inflection. Some learners tried to solve this question algebraically which resulted in a quartic function. |            |       |  |  |     |     |     |     |        |        |        |       |
| 9.4                                                                                                                                                                                                                                                                                                                | This was a problem-solving question and most of the learners struggled to interpret this question to determine the values of t.                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| (c) Provide suggestions for improvement in relation to Teaching and Learning.                                                                                                                                                                                                                                      |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| The first two questions are routine and needs more practice. As mentioned earlier, functional symbolic notation questions are problematic to students as they could not decipher what the question was asking. Expose students to the higher order questions which, once again, tests the application of tangents. |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |
| (d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.                                                                                                                                                |                                                                                                                                                                                                                               |            |       |  |  |     |     |     |     |        |        |        |       |

| QUESTION 10                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|--|------|------|--------|--------|
| (a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| 100 script Analysis:                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| <table><tr><th colspan="2">Question 10</th></tr><tr><td>10.1</td><td>10.2</td></tr><tr><td>11.78%</td><td>15.82%</td></tr></table>                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                           |     | Question 10 |  | 10.1 | 10.2 | 11.78% | 15.82% |
| Question 10                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| 10.1                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 10.2                                                                                                                                                                                                                                                      |     |             |  |      |      |        |        |
| 11.78%                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15.82%                                                                                                                                                                                                                                                    |     |             |  |      |      |        |        |
| QUESTION 10 (Calculus – Min Max)                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| 10.1                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Very poorly answered                                                                                                                                                                                                                                      | (3) |             |  |      |      |        |        |
| 10.2                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Very poorly answered                                                                                                                                                                                                                                      | (3) |             |  |      |      |        |        |
| (b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| 10.1                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Many learners did not attempt this question at all. The question was based on grade 9 space and shapes involving a regular cylinder.                                                                                                                      |     |             |  |      |      |        |        |
| 10.2                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Learners were given the expression to differentiate in question 10.1, yet differentiated it poorly. The presence of the constant i.e. $\pi$ seemed to have exacerbated the situation. Those who managed to solve did not eliminate the solution $x = 0$ . |     |             |  |      |      |        |        |
| (c) Provide suggestions for improvement in relation to Teaching and Learning.                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| <p>The min/max, in this case, was scaffolded to allow learners to obtain at least half the marks i.e. when differentiating, however, learners omitted the whole question.</p> <p>Teach learners to simplify expressions such that the constant(s) are written as coefficients before differentiation as this would simplify the differentiation process i.e.</p> $V = \frac{25x^2}{4\pi} - \frac{x^3}{4\pi}$ $V = \frac{25}{4\pi}x^2 - \frac{1}{4\pi}x^3$ |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |
| (d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                           |     |             |  |      |      |        |        |

**QUESTION 11**

**(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

100 script Analysis:

| Question 11 |        |       |        |        |
|-------------|--------|-------|--------|--------|
| 11.1.1      | 11.1.2 | 11.2  | 11.3.1 | 11.3.2 |
| 21.55%      | 50.17% | 6.82% | 13.13% | 5.30%  |

**QUESTION 11 (Probability)**

|        |                      |     |
|--------|----------------------|-----|
| 11.1.1 | Poorly answered      | (3) |
| 11.1.2 | Well answered        | (3) |
| 11.2   | Very Poorly answered | (4) |
| 11.3.1 | Very Poorly answered | (2) |
| 11.3.2 | Very poorly answered | (4) |

**(b) Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

- 11.1.1 Many learners used a cyclic argument in assuming  $e$  was 84, before proving that  $e$  was 84.
- 11.1.2 Most of the learners used the value of  $e$  from question 11.1.1, completed the table to solve the question.
- 11.2 This was a higher order question and learners struggled to construct a tree diagram and taking into consideration that the probability of one event was three times another.
- 11.3 Both problems were higher order and the condition in question 11.3.1 prevailed in question 11.3.2.

**(c) Provide suggestions for improvement in relation to Teaching and Learning.**

Learners are usually given a partially populated contingency table and asked to complete it. Thereafter they are asked to prove whether it is independent or not independent. This question was the reverse and learners struggled as they have not seen a similar example.

If the events are independent, then the ratio approach could be used as all the ratios are constant i.e.

|        | Juice | Energy Drinks | Total |
|--------|-------|---------------|-------|
| Female | 48    | 72            | 120   |
| Male   | 36    | 54            | 90    |
| Total  | 84    | 126           | 210   |

$$\frac{e}{210} = \frac{36}{90} = \frac{48}{120}$$
$$e = 84$$

$$\frac{72}{120} = \frac{54}{90} = \frac{126}{210}$$

$$\frac{48}{84} = \frac{72}{126} = \frac{120}{210}$$

Similarly :

$$\frac{48}{84} = \frac{72}{126} = \frac{120}{210}$$

$$\frac{36}{84} = \frac{54}{126} = \frac{90}{210}$$

The creation and application of tree diagrams should be revised

**(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.**