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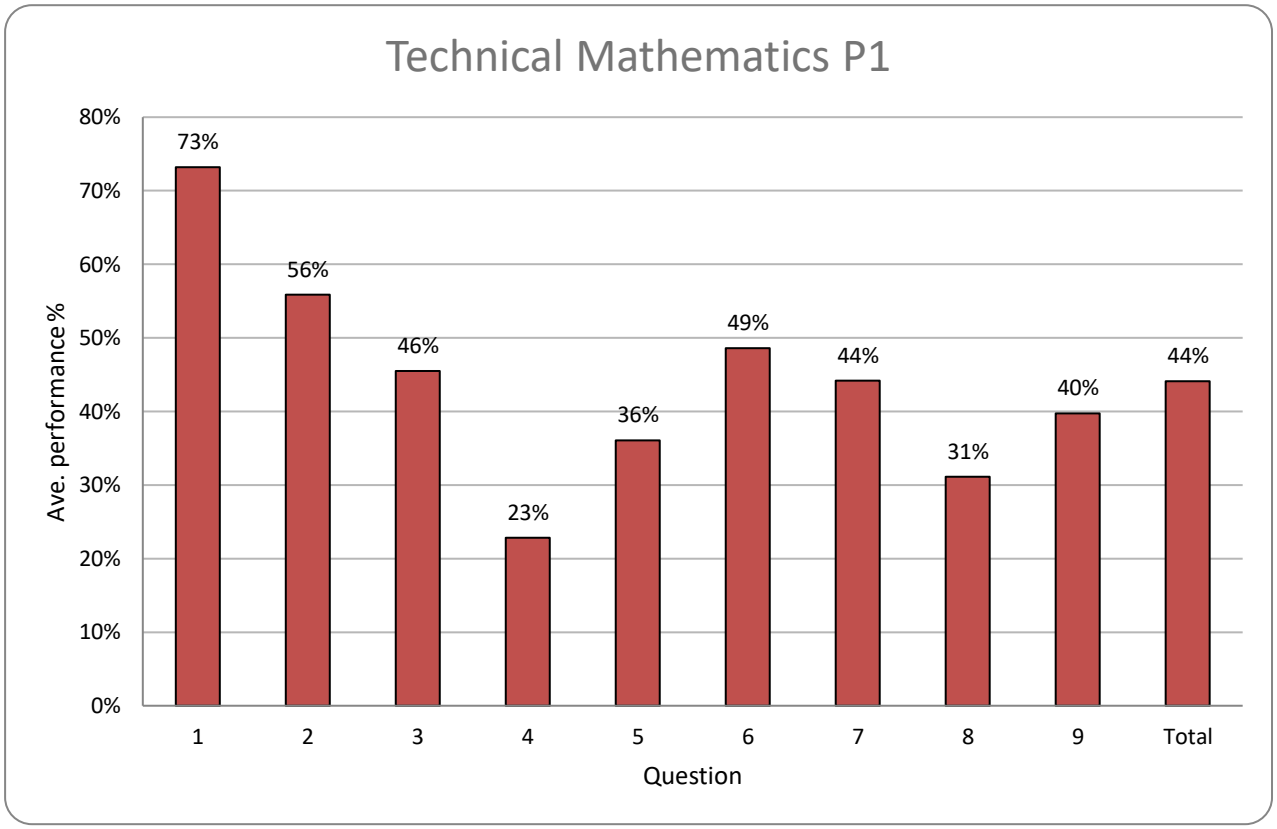
QUALITATIVE ANALYSIS OF LEARNER RESPONSES
AND
EVALUATION OF THE QUESTION PAPERS (PER PAPER)
NATIONAL SENIOR CERTIFICATE 2025
WESTERN CAPE EDUCATION DEPARTMENT

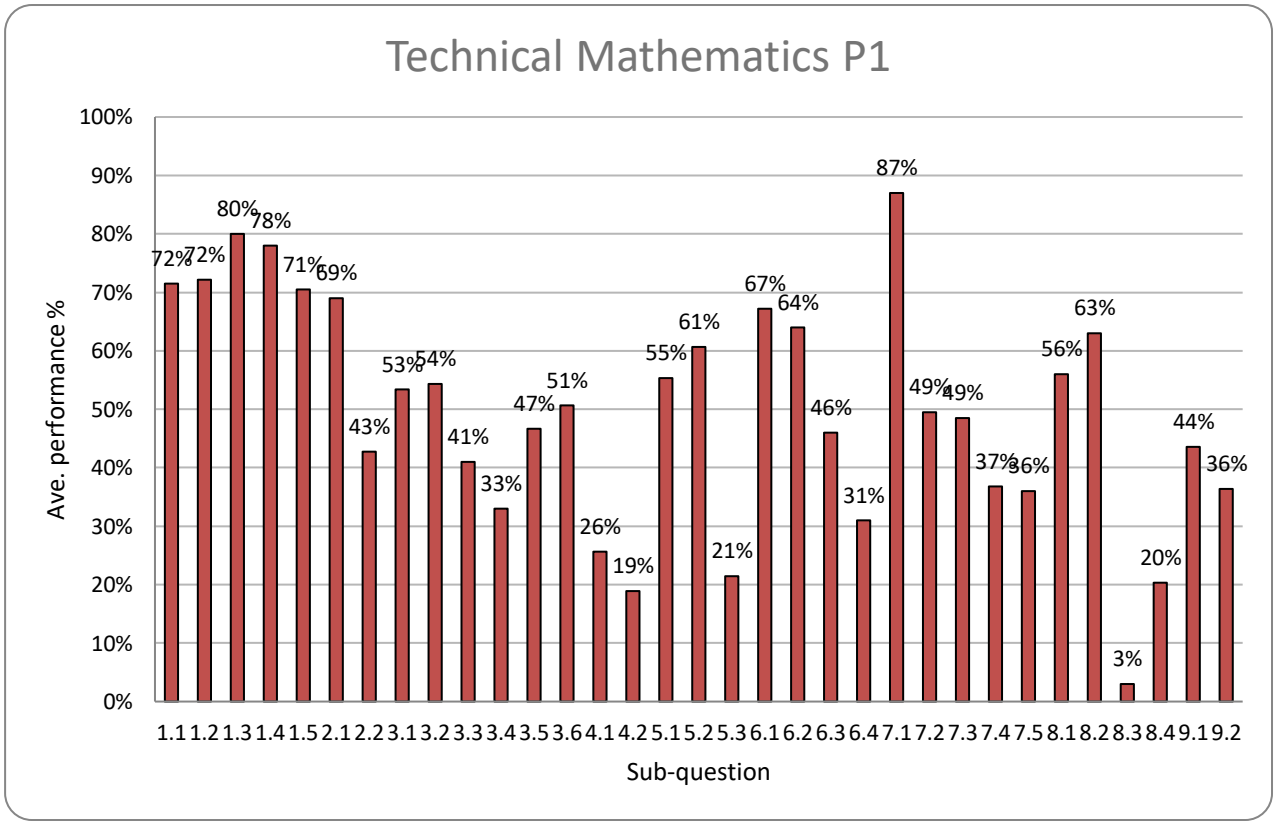
SUBJECT	**TECHNICAL MATHEMATICS**		
QUESTION PAPER	**1**	**2**	**3**
DURATION OF PAPER	**3 HOURS**		
INTERNAL MODERATOR	**LIESEL VAN DEVENTER**		
CHIEF MARKER	**JONATHAN DAMSELL**		
DATES OF MARKING	**FROM: 29 NOVEMBER 2025**	**TO: 10 DECEMBER 2025**	
HEAD OF EXAMINATION	**MS LM BREDENKAMP**		

REPORT 2: QUALITATIVE ANALYSIS OF LEARNER RESPONSES

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

		2025
Question	**Topic**	**Ave. performance %**
1	**Algebra**	73%
2	**Algebra**	56%
3	**Algebra**	46%
4	**Functions + graphs**	23%
5	**Finance**	36%
6	**Differential calculus**	49%
7	**Differential calculus**	44%
8	**Differential calculus**	31%
9	**Integration**	40%
Total		


Technical Mathematics P1
Ave. performance %
80%
70%
60%
50%
40%
30%
20%
10%
0%
73%
56%
46%
23%
36%
49%
44%
31%
40%
44%
1
2
3
4
5
6
7
8
9
Total
Question


Technical Mathematics P1
Ave. performance %
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
72%
72%
80%
78%
71%
69%
43%
53%
54%
41%
33%
47%
51%
26%
19%
55%
61%
21%
67%
64%
46%
31%
87%
49%
49%
37%
36%
56%
63%
3%
20%
44%
36%
1.1
1.2
1.3
1.4
1.5
2.1
2.2
3.1
3.2
3.3
3.4
3.5
3.6
4.1
4.2
5.1
5.2
5.3
6.1
6.2
6.3
6.4
7.1
7.2
7.3
7.4
7.5
8.1
8.2
8.3
8.4
9.1
9.2
Sub-question

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?

Most learners attempted the question; however, it is concerning that many still lack the basic skills required to solve a simple linear equation or to carry out fundamental algebraic manipulations. The average for this question is 73%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
1.1.1	Solve for x(factors)	2				72%
1.1.2	Solve for x(formula)		4			
1.1.3	Inequality		2			
1.2.1	Make y subject	1				72%
1.2.2	Simultaneous equation		5			
1.3.1	Subject of formula	1				80%
1.3.2	Substitution		2			
1.4	Binary number	1				78%
1.5	Evaluate in decimal	2				71%

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

Common errors:

1.1.1 Many candidates multiplied out the brackets instead of recognizing that the equation was already in factorized form. They failed to apply the zero-product rule and did not see that it was an "or" question, where solutions could be obtained by inspection.

It was disappointing to see many candidates cannot solve a basic equation like:

$2x\left(x-\frac{4}{9}\right)=0$

$2x=0$

$x=-2$

This is grade 8 work.

1.1.2 After removing the brackets, some candidates did not write the equation correctly in standard form, so their values for a, b and c were wrong.

1.1.3 A great many candidates treated the inequality as an equation.

1.2.2 Candidates get to the quadratic equation: $2y^2+3y-2=0$, but when they substitute into the formula they use an x, for example $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$, instead of using a y.

1.3.1 It is disappointing to see that Grade 12 learners are unable to change the subject of Formula as simple as making *N* the subject in: $BP=2\pi NT$.

1.4/1.5 It is evident that candidates who rely on the table method to convert decimal numbers to binary, or to perform calculations involving both binary and decimal numbers, are placed at a disadvantage compared with those who have calculators capable of performing these functions.

This creates an unequal situation, as some candidates must complete lengthy manual procedures while others can obtain answers quickly and accurately using their calculators.

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

- Learners need far more practice in the basic algebraic manipulation of linear equations. Many still struggle to isolate the variable using inverse operations, which is an essential skill across all topics in the curriculum. Teachers are encouraged to reinforce step-by-step methods for solving for x, such as systematically applying the inverse of addition, subtraction, multiplication, or division to both sides of an equation. Regular practice with simple examples—before progressing to more complex expressions—will help learners develop confidence and accuracy when solving equations.
- Teachers should ensure that learners have a solid understanding of the correct standard form of a quadratic equation.
- Notation in quadratic inequalities should be emphasized. Graphical tools should be shown to the learners to ensure they understand what the mathematical notation means on a graph.
- Learners should be taught how to manipulate the quadratic formula, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$, when required, so that it can be used to solve for y.

(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 emphasise the distinction between the terms "and" and "or" when working with inequalities. These terms are not interchangeable, and learners must understand that each conveys a different mathematical relationship.

QUESTION 2

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

The average for this question is 56%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
2.1.1	Formula for Δ	1				69%
2.1.2	Substitution into F		2			
2.1.3	Nature of roots	1				
2.2	Determine m, if roots are equal			4		43%

(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	Poor knowledge of the formula for the discriminant. Candidates get confused between the following formulae: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ and $\Delta = b^2 - 4ac$ and $y = \frac{4ac-b^2}{4a}$
2.1.2	Overall many substitution errors, for example: $x^2 - 2x + 2 = 0$ $\Delta = b^2 - 4ac$ $= -2^2 - 4(1)(2)$
2.1.3	Poor knowledge of the nature of the roots. Most candidates were unable to express the equation in the correct standard form that includes the variable m. Instead of writing $x^2 + 2x - 4 - m = 0$, many omitted the variable entirely and proceeded to calculate the discriminant as $\Delta = (2)^2 - 4(1)(-4)$, which is incorrect because it ignores the role of m in the equation.
(c)	***Provide suggestions for improvement in relation to Teaching and Learning.***
	• Teachers can emphasise that the expression for the discriminant comes directly from the quadratic formula, specifically from the part under the square root: $\sqrt{b^2 - 4ac}$. The quadratic formula is provided on the information sheet, and learners should be reminded to recognise and use it correctly. • Understanding the theory of the nature of roots is fundamental knowledge that learners must acquire. Teachers can reinforce this understanding through regular class tests.
(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 provide learners with the information sheet at the beginning of the year so that they know exactly which formulae are included. This allows them to become familiar with the layout of the sheet and to locate the required formulae quickly and confidently.

QUESTION 3	
(a)	***General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?***
The average for this question is 46%. Questions 3.3 and 3.4 were not answered well.	

	Content or Skill	L1	L2	L3	L4	Ave Performance
3.1.1	Simplify surd	2				53%
3.1.2	Simplify exponents		3			
3.2.1	Convert surd to exponential form	1				54%
3.2.2	Simplify log		2			
3.3.1	Write log in terms of p and q		2			41%
3.3.2	Write log in terms of p and q			3		
3.4	Solve log equation			5		33%
3.5.1	Argand diagram	1				47%
3.5.2	Express in rectangular form		2			
3.6	Solve equation with complex numbers		3			51%

(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 struggle to apply the fundamental rules of exponents, which affects their ability to simplify exponential expressions correctly.

3.1.1 Question states: **simplify,** some learners wrote $\sqrt[3]{27}\ \ p^{\frac{12}{3}}$, only one mark was given for $p^{\frac{12}{3}}$.

3.2.1 Learners factorized incorrectly.

3.3 Log laws were incorrectly applied.

3.4 **Common error:** Candidates dropped the log instead of applying the correct log property in $\log_3 x(x+2) = 1$.

Most did not state that a negative value of x is invalid.

The total of 5 marks allocated to this question is too low; a total of 6 marks would be more appropriate.

3.5.1 The question specifically asks to write the answer in the form: $V = rcis\,\theta$.

Some candidates wrote the answer as $V = r(\cos\theta + i.\sin\theta)\ \ or\ r\lfloor\theta$.

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

- Learners must be exposed to exponents that are fractions.
- Encourage learners to read the question and answer the question (e.g. 3.5.1) in the form that was specified in the question.
- Learners need more practice in solving logarithmic equations; especially the more complex ones where laws are used together with writing the log form to exponential form

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

Insufficient revision of grade 11 work.

QUESTION 4

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

The average for this question is 23%.

Question 4 was the weakest-performing question in the entire paper. In Question 4.1, candidates were required to draw a hyperbola and a straight line — content that is covered in Grade 11 and should be firmly mastered by now. This is foundational theory, and learners must know these basics to succeed in higher-level questions.

	Content or Skill	L1	L2	L3	L4	Ave Performance
4.1.1	Equations of asymptotes	2				26%
4.1.2	Domain	1				
4.1.3	x and y intercepts of g		2			
4.1.4	x intercept of g		2			
4.1.5	Sketch graphs		5			
4.1.6	Determine x for which $f(x) \leq g(x)$, where $x < 0$			2		
4.2.1	Equation of axis of symmetry	1				19%
4.2.2	Coordinates of B	2				
4.2.3	Value of q			3		
4.2.4	Range	1				
4.2.5	Equation of asymptote	1				
4.2.6	Determine equation of graph		2			

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

The lack of basic knowledge could be noted.

4.1.1 Many learners simply wrote a number (for example, '3') instead of writing a full equation for the asymptotes such as ***y = 3***. No marks can be awarded for this response.

4.1.3/ 4.1.4 Many candidates could not determine the x and y intercepts to sketch the hyperbola and straight line.

4.2.1 Most candidates could not write the equation of the axis of symmetry from the given Sketch.

4.2.5 Once again, candidates did not write an **equation** for the asymptote. No marks awarded.

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

To prepare learners more effectively for questions involving the sketching of a hyperbola, straight line, exponential graph or parabola, teachers should regularly revise the basic theory:

- how to identify asymptotes and how to write their equations correctly
- how to determine the x and y intercepts
- axis of symmetry
- turning point

These are fundamental skills that underpin all graph-related questions, and learners are expected to master them.

This is basic theory, it requires consistent reinforcement.

(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 provide frequent drill-type practice in class, ensuring that learners can confidently substitute values, solve for intercepts, and interpret their results. Regular revision and short, focused exercises will help strengthen these essential skills and improve overall performance in graph questions.

QUESTION 5

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

The average for this question is 36%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
5.1.1	Formula -simple depreciation	1				55%
5.1.2	Substitution in F		2			
5.2	Compound interest		3			61%
5.3.1	Half original volume	1				21%
5.3.2	Rate reducing-balance method			4		
5.3.3	Reducing-balance method			4		

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

- Poorly answered in terms of so many learners using wrong formula at different sub-questions.
- The application of the formula $i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$ was not examined in this year's question paper.
- Common error: instead of substituting7,15% , they only substitute 7,15.
- Question 5 differed from previous papers, as learners are not accustomed to Finance questions that involve capacity and time (Question 5.3 – 9 marks).
- Learners were uncertain about which formulae to apply, with some showing limited understanding of the difference between growth and decay.

- Question 5.3.2 required the manipulation with $\sqrt[35]{\ }$ root, most candidates were unable to that.
- In Question 5.3.3, candidates were unsure whether *n* should be expressed in hours or minutes, as this type of question is not commonly asked.

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

- Terms like *straight-line depreciation* and *reducing-balance depreciation* must be regularly practised and reinforced during daily lessons to ensure learners fully understand the financial formulae.
- Expose learners to different scenarios when doing the finance chapter. It should not be limited to currency.

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

- Teachers must also focus on the use of simple and compound growth/decay formulae to solve problems including interest, hire purchase, inflation, population growth **and other real life problems.**
- These types of questions do not appear in all textbooks and therefore need to be sourced from additional materials.
- Perhaps a worksheet demonstrating different scenarios could be set up and shared with schools so they can prepare learners fully.
- 5.3.1-5.3.3, a nice, fairly difficult question. It took a "financial" question more into compound decrease with n being in minutes.

QUESTION 6

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

The average for this question is 49%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
6.1	First principles		5			67%
6.2.1	Simplify	1				64%
6.2.2	Differentiate	1				
6.3.1	Differentiate	2				46%
6.3.2	Differentiate		2			
6.3.3	Differentiate		3			
6.4.1	Gradient	1				31%
6.4.2	Determine a				5	

(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 First principles: learners struggled with the substitution.

6.2 / 6.3 Use the rule : $\frac{d}{dx}(ax^n) = anx^{n-1}$.

Learners confuse differentiation and integration.

6.4.1 Although this was intended to be a Level 1 question, learners were unable to identify the gradient from the given equation.

6.4.2 Candidates were unable to determine the x-value of the point of contact when the y-value was provided, and as a result, they struggled to find the value of a.

This was a difficult question, not unfair.

It stretches the learners with their understanding of derivative, equations and x- and y values.

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

- 6.1-6.3 was basic calculus, no surprises, if learners were drilled in this work, they could do really well.
- Learners must be exposed to first principles with a fraction.
- When teaching Calculus and Integration, emphasis should be placed on ensuring that learners clearly understand which methods and techniques are required in Questions 6 and 9. Learners often confuse differentiation and integration, and it is essential that they recognise the distinct rules for each.
- They must be taught to look carefully for the integration sign and apply the rules provided on the information sheet.
- Teachers should strongly reinforce this by exposing learners to a wide range of examples that show the different ways in which derivative and integral questions may be presented.

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

- The question on first principles is straightforward drill work and represents an assured 5 marks (3% of the paper) that every candidate should be able to obtain. Learners should be confident in securing these marks, and extensive practice on first principles is essential.

QUESTION 7

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

Poorly answered by some centres. The average for this question is 44%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
7.1	Y intercept	1				87%
7.2	Show that $a = 1$		2			49%
7.3	x- intercepts		4			49%
7.4	Turning points			5		37%
7.5	Cubic graph		4			36%

(b)	***Why was the question answered poorly? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.***
7.2	Candidates **used** the value of $a = 1$, instead of proving that $a = 1$.
7.3	A lot of candidates calculated the turning points instead of the x- intercepts. They swopped the two calculations in 7.3 and 7.4 and therefore lost a lot of marks. Many candidates used the formula $x = -\frac{b}{2a}$ to calculate the turning point.
(c)	***Provide suggestions for improvement in relation to Teaching and Learning.***
• Questions 7.3 and 7.4 are basic drill work. • Teachers must emphasise that when a proof is required, learners may not use the very value they are trying to prove. • Repetition is much needed and learners need to start attaching words to methods so they know when to do what.	
(d)	***Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.***
• The exam panel could maybe consider to stagger the question of the turning point, by first asking for: ❖ the derivative, ❖ then asking to solve x ❖ give the coordinates of the turning point This might make it clearer for learners to know when what should be done.	

QUESTION 8

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

The average for this question is 31%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
8.1	Total number of cakes	1				56%
8.2	Number sold at end of break		2			63%
8.3	Money earned				2	3%
8.4	Value of p			3		20%

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

- Candidates are generally more familiar with solving practical optimisation problems involving two- or three-dimensional contexts. As a result, many were unable to interpret the graph in this question.
- Many candidates experienced difficulty interpreting Question 8.3.
- Some teachers felt that Questions 8.3 and 8.4 should have been swapped. It would have been more logical to first determine the value of p (Question 8.4) and then calculate the

amount of money that Madlamini would earn (Question 8.3).

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

- Question 8 is an excellent example to use in class when teaching learners how to interpret graphs. More examples of this type of graph should be practised, as graph interpretation is an essential skill both in mathematics and in real-life situations.

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

- The application of calculus is a demanding conceptual part of the curriculum which was asked in a fairly fresh way.
  It required learners to think to the deeper level of this work, but the possibility of intelligent guesses made the question slightly more accessible.

QUESTION 9

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

The average for this question is 40%.

	Content or Skill	L1	L2	L3	L4	Ave Performance
9.1.1	Integration	2				44%
9.1.2	Integration			5		
9.2	Calculate ratio of areas				8	36%

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

9.1.2 Candidates mostly made errors when removing the brackets. The fact that there was $\frac{1}{x^2}$ in front of the bracket made it even more difficult.
A significant number of candidates applied **differentiation rules** instead of **integration rules** when required to determine the integral.

9.2 Many candidates did not use integration to determine the magnitude of the areas of regions A and B. Instead, they simply substituted the given x-values into the original function, which is not the method required to calculate area under a curve. As a result, no marks could be awarded for these responses.

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

- Candidates must be encouraged to keep the **information sheet** at hand, particularly in Question 9, where integration is assessed. Regular classroom practice on the correct application of integration rules is essential.
- Teachers should emphasise that the **primary purpose of integration** in this context is to determine the magnitude of the area enclosed by a curve and the x-axis, or by a curve,

the x-axis, and two ordinates. **Question 9.2 was poorly answered**, indicating a lack of conceptual understanding and procedural fluency.

- Learners should consistently practise starting an area problem with the **correct area notation**, after which the relevant integration rules should be applied.

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

- In question 9.2, **without integration, no marks can be awarded.**
- In Q9.2 the use of $\leq$ for example $0{,}18 < 0{,}2$ and $0{,}18 \leq 0{,}2$, forced the learners to think a bit more deeply as to the meaning of $<$ and $\leq$.